INGENIERIE

SAFETY BULLETIN

February 2021

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contact@airflex-ingenierie.fr

Subject of the Month:

Workshop for Skydiving Community within EU

25 Feb 2021 - UPDATED

This workshop is organised by EASA in close cooperation with Austro Control, TrafiCom and Transportstyrelsen and is intended to address the specific safety aspects of parachute/skydiving aircraft operations.

Target audience are stakeholders and authorities (EASA Member States only) involved in parachute operations as well as large skydiving operators.

The workshop includes presentations on the major accidents, identified safety issues and lessons learned.

Participants are invited to actively share their experience and measures to improve safety and prevent accidents.

Following this workshop it is intended that the skydiving community can develop a sample operation manual and guidance material.

In case you have any further questions regarding this workshop, please send them to: CT5-Workshops@easa.europa.eu

Event Proceedings (links Ctrl+clic)

AI 2 Introduction Background Skydiving WS

AI 3 Briefing on accident in Sweden on 14 July 2019

AI 4.1. Lessons learnt Action taken Training Manual

AI 4.2.0 Operations manual

AI 4.2.1 Skydiving Flights - Recent experience in Italy

AI 4.3 Human Factors within skydiving operation

AI 4.4 Other safety aspects

AI 4.5 Skydiving Aircraft Maintenance Experience

AI 6 Closure and way forward

Agenda Workshop for Skdiving Community

Cabinet d'Expertise en Aéronautique - Inscrit près la cour d'appel d'Amiens – Indépendant de l'EASA

15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

EASA releases the second package of Easy Access Rules as dynamic online publications

In our continuous effort to improve access to our regulatory material, EASA eRules project has been producing consolidated publications under the name of 'Easy Access Rules' in PDF format. They are well-known among the stakeholders and belong to our most downloaded documents.

EASA has started to make available these 'Easy Access Rules' also as dynamic online publications. The format of those publications is designed also for tablets and mobile phones and allows to filter through the content in order to get the view tailored to your needs.

As the second package, the following Easy Access Rules are available as online publications:

- Easy Access Rules for Unmanned Aircraft Systems (Online format)
- Easy Access Rules for Airworthiness and Environmental Certification (Regulation (EU) No 748/2012) (Online format)
- Easy Access Rules for Additional Airworthiness Specifications (Regulation (EU) 2015/640) (Online format)
- Easy Access Rules for Standardised European Rules of the Air (SERA) (Online format)
- Easy Access Rules for Balloons (Online format)
- Easy Access Rules for the Basic Regulation (Regulation (EU) 2018/1139) (Online format)

Already in December 2020, the following online publications of Easy Access Rules were released:

- Easy Access Rules for Air Operations (Online format)
- Easy Access Rules for Continuing Airworthiness (Online format)
- Easy Access Rules for Aerodromes (Online format)

About eRules

EASA eRules is a rules digitalisation project. It offers consolidated rules for their easy access in the PDF format as well as – now – as online publications. eRules is part of the CORAL Programme supporting the EASA digitalisation goal of delivering an integrated digital system and a user-friendly one-stop digital experience.

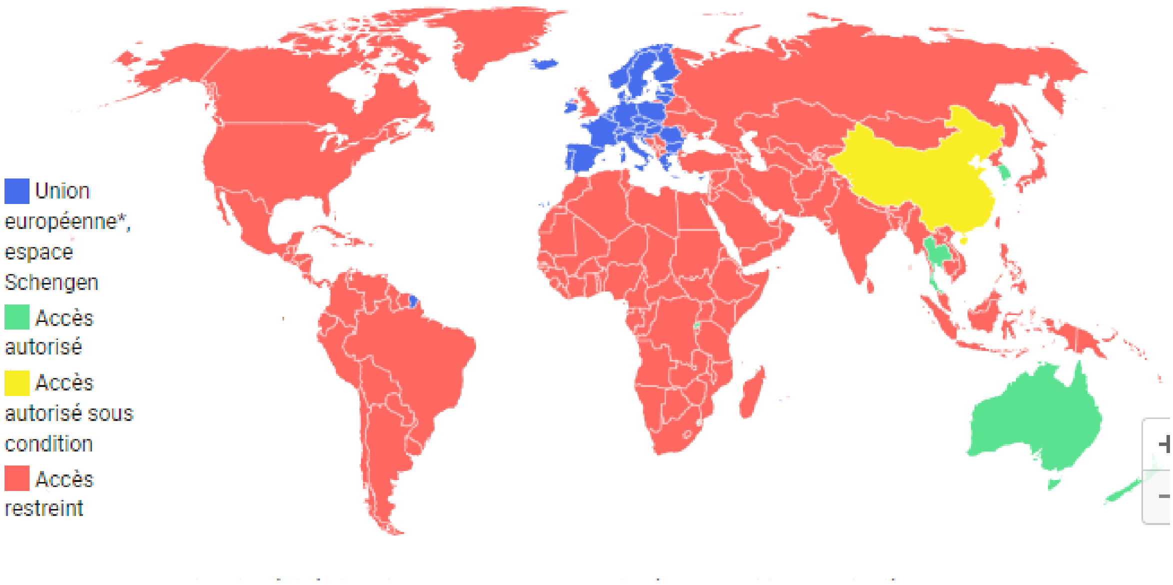
We welcome your feedback on this new format.

Interested in other easy access rules?

In the future, we will publish more 'Easy Access Rules' in this new format. Stay informed when we published them by following the steps below:

Easy Access Rules | EASA (europa.eu)

Travelcare for travelers and crewmembers



ICAO and WCO issue joint calls on vaccine supply chain priorities, new customs and security guidelines

We have issued a joint statement with the World Customs Organization (WCO) calling on governments to demonstrate maximum flexibility with respect to border clearance and air transport supply chain operations essential to the effective distribution of COVID-19 vaccines and related medical supplies.

In a separate but related development, we developed new guidelines with the WCO to help countries achieve better alignment of their customs and security procedures.

Signed by ICAO Secretary General Dr. Fang Liu and WCO Secretary General Dr. Kunio Mikuriya, the joint statement on vaccines urges the rapid establishment of the infrastructure needed to support end-to-end vaccine storage and logistics for public supplies. Improved open collaboration between the aviation and customs communities and partnering organizations is also strongly emphasized.

ICAO and the WCO are encouraging countries to designate required aviation staff as 'key workers' providing an essential service, in alignment with the WHO's Roadmap for Prioritizing Uses of COVID-19 Vaccines.

"ICAO continues to work very closely with regional and international organizations, and industry partners such as the International Air Transport Association (IATA) and Airports Council International (ACI), to provide up-to-date guidance to government aviation authorities, airlines, and airports," Dr. Liu emphasized.

"To better expedite air cargo operations, and distribution of the COVID-19 vaccines, governments are being urged to bring these matters to the immediate attention of their national health and transport authorities, customs authorities, local governments, and any other concerned parties."

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

The new Joint WCO-ICAO Guiding Principles for Pre-Loading Advance Cargo Information will build on earlier progress achieved by ICAO and WCO on another important risk management approach, one focused on the pre-loading of advance cargo information and designed exclusively to prevent explosives from being placed in air cargo shipments.

"Since the 2010 incident where air cargo was attempted to be used as a delivery mechanism for explosive devices, the WCO and ICAO have been partnering to secure and protect the air cargo and mail supply chain, in addition to other objectives relating to the unfettered movement of people, goods, and conveyances across international borders," Dr. Liu noted.

ICAO Guidance for Air Travel through the COVID-19 Public Health Crisis

Airport Module (icao.int)

Aircraft Module (icao.int)

Crew Module (icao.int)

Cargo Module (icao.int)

Background

The impact of the coronavirus disease (COVID-19) pandemic on global air transport is without precedent. Airports have seen a 28.4 per cent decline in global passenger traffic volumes for the first quarter of 2020, equivalent to a reduction of 612 million passengers in absolute terms. For airlines, the revenue passenger kilometres flown (RPKs) worldwide were down by 94% on the previous year. International RPKs were down 98%, as the passenger side of the industry was virtually grounded. With second waves of the virus impacting various countries and leading to renewed travel restrictions, international air travel remains minimal at -88% down on last year in August. These volumes (domestic and international traffic) are expected to decrease by 50.4 per cent for 2020 as a whole as compared to 2019 figures. ICAO estimates that, by the end of 2020, the COVID-19 impact on scheduled international passenger traffic could reach reductions of up to 71 per cent of seat capacity and up to 1.5 billion passengers globally. Airlines and airports face a potential loss of revenue of up to 314 billion USD and 100 billion USD, respectively, for 2020.

Overview

This document provides a framework for addressing the impact of the current COVID-19 pandemic on the global aviation transportation system. The appendix to this document includes mitigation measures needed to reduce public health risk to air passengers and aviation workers while strengthening confidence among the travelling public, aviation workers, the global supply chain and governments. This will assist in accelerating demand for essential and non-essential air travel impacted by COVID-19. Complementing this material, this document also points to guidance material developed by international industry organizations which aims to assist in mitigating the impact of COVID-19.

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With help and guidance from the civil aviation stakeholder community, ICAO recommends a phased approach to enable the safe return to high-volume domestic and international air travel for passengers and cargo. The approach introduces a core set of measures to form a baseline aviation health safety protocol to protect air passengers and aviation workers from COVID-19. These measures will enable the growth of global aviation as it recovers from the current pandemic. It is, however, important to recognize that each stage of that recovery will need a recalibration of these measures in support of the common objectives, which are to safely enable air travel, incorporate new public health measures into the aviation system, as well as support economic recovery and growth. Our work must recognize the need to reduce public health risk while being sensitive to what is operationally feasible for airlines, airports and other aviation interests. This is essential to facilitate the recovery during each of the forthcoming stages.

Objectives

In the aftermath of the COVID-19 outbreak, States, including government regulators, airports, airlines and aircraft manufacturers among other stakeholders of the aviation ecosystem, developed, in coordination with public health authorities, a set of measures aimed at reducing health risks to air travellers, aviation workers and the general public. These measures, applicable to States, airport operators, airlines and others in the air transport industry, are designed to enable a consistent and predictable travel experience. They will also contribute to the efficient, safe, secure and sustainable transport by air of an increasing number of passengers and cargo, and will minimize the risk of COVID-19 transmission between and among these groups and the general public. The implementation of these measures will facilitate and strengthen the global recovery from the COVID-19 pandemic.

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Guiding considerations

In developing the measures contained in the appendix, the drafters were guided by the following considerations:

1. Remain Focused on Fundamentals: Safety, Security, and Efficiency
2. Promote Public Health and Confidence among Passengers, Aviation Workers, and the General Public
3. Recognize Aviation as a Driver of Economic Recovery

Based on these guiding considerations, the drafters further agreed that these measures should be:

- implemented in a multi-layer approach commensurate to the risk level and shall not compromise aviation safety and security;
- able to capitalize on the sector's longstanding experience and apply the same principles used for safety and security risk management. This includes monitoring compliance, reviewing the effectiveness of measures at regular intervals, and adapting measures to changing needs as well as improved methods and technologies;
- able to minimize negative operational and efficiency impacts while strengthening and promoting public confidence and aviation public health;
- consistent and harmonized to the greatest extent appropriate, yet flexible enough to respond to regional or situational risk-assessment and risk-tolerance. The acceptance of equivalent measures based on shared principles and internationally recognized criteria will be a fundamental enabler to restore air services on a global level;
- supported by medical evidence and consistent with health best practices;
- non-discriminatory, evidence-based, and transparent;
- cost effective, proportionate and not undermining to the equal opportunity to compete;
- highly visible, and communicated effectively and clearly to the aviation community as well as the general public; and
- consistent with international requirements, standards, and recommended practices applicable to aviation and public health.

Risk-based stages for mitigation measures

Resumption of higher volumes of passenger air travel will be dependent on a number of factors, including foremost public health agency guidelines (driven by travel risk levels), governmental travel restrictions and requirements, passenger confidence, and air carrier and airport operational capacity.

A risk-based approach will enable the transition between stages of restarting operations and the adjustment of mitigation measures based on risk, while recognizing that reverting to previous stages may be necessary. The goal is to maximize consistency and develop criteria for data reporting and the monitoring processes in support of evaluation and progression to the next stage(s). It is currently not feasible to provide any specificity of timing between these stages. At the time this document was published, most of commercial passenger aviation was in Stage 0 or 1.

Stage 0:

A situation with travel restrictions and only minimal movement of passengers between major domestic and international airports.

Stage 1:

Initial increase of passenger travel. This initial stage will coincide with relatively low passenger volumes, allowing airlines and airports to introduce aviation public health practices appropriate to the volume. There will be significant challenges as each stakeholder community adapts to both increased demand and the new operational challenges associated with risk mitigation. Health measures for travel required at airports will need to, at a minimum match those from other local modes of transport and infrastructure.

Stage 2:

As health authorities review the applicability of measures based on recognized medical criteria, passenger volumes will continue to increase. Several measures that were required in Stages 0 and 1 may be lifted. Health measures for travel required at airports will need to match those from other local modes of transport and infrastructure.

Stage 3:

This stage may occur when the virus outbreak has been sufficiently contained in a critical mass of major destinations worldwide as determined by health authorities. The reduction of national health alert levels and associated loosening of travel restrictions will be key triggers. Risk mitigation measures will continue to be reduced, modified, or will be stopped in this stage. There may not be effective pharmaceutical interventions (e.g. therapies or vaccines) commonly available during Stage 3, but contact tracing and testing should be readily available. Until specific and effective pharmaceutical interventions are available, States may need to continue to loosen or reinstate public health and social measures throughout the pandemic.

Stage 4:

This stage begins when specific and effective pharmaceutical interventions are readily available in most countries. There may be a set of residual measures/mitigations that could be retained, although these should also undergo a periodic review process.

Note: There are no hard boundaries in these stages and the transition between them can be in either direction.

See attached

EASA Advice

Maintaining safety focus during the COVID-19 pandemic

These are difficult times for the aviation industry and resuming operations in such a challenging economic climate makes it hard to know where best to focus your safety efforts. This Together4Safety collaborative article provides you with lots of tips to help you identify the activities that are the best use of your time and resources.

See attached

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Introduction

As you negotiate the COVID-19 pandemic it is likely that your organization is faced with both economic and practical pressures as your operations return to service. This challenge is not necessarily new to the pandemic, but it is brought into focus by a situation that none of us has faced before.

You are not facing this challenge alone. This article aims to provide some ideas that will help you to chart a path to recovery – you can find these in the guidelines that are attached to this article. Also, we want to encourage you to use our Air Ops Community as a way to connect with a community of safety professionals facing the same challenges. Through collaboration we can help each other through this crisis.

Charting a path to recovery

The COVID-19 pandemic has affected almost every aspect of our lives in recent months. As an aviation professional you will have seen our industry and our livelihoods affected in ways none of us could have imagined even in the first quarter of 2020. As your efforts concentrate on a recovery strategy, your situation will be unique both in terms of the scale and the combination of challenges that you will face. This will be set against an unprecedented and complex financial backdrop of government support, cash management, cost management and raising capital. The effects of this harsh financial environment on operations will likely challenge you like never before. Given the commonly heard airline mantra of "safety being the top priority", quite how to maintain that expectation will take a clear focus and great teamwork within your organisation.

As an industry, our route to recovery consists of 4 key activities that reflect the challenges we face and hopefully these will help to guide you at a practical level over the coming months. By focusing your efforts on these goals, you will help increase the chance of successfully negotiating the difficulties that you are likely to face. At a fundamental level, these goals are:

1. Welcoming your passengers so they feel safe to travel;
2. Caring for our people through the crisis.
3. Operating safely and effectively.
4. Enhancing environmental sustainability.

How Covid-19 had impacted the way we manage safety

Our industry boasts an impressive safety record. This has been hard won throughout the evolution of both technology and our management systems. One of the most significant concerns raised by regulators and industry is the negative potential of reducing our focus on safety given the clear economic and practical pressures of the COVID-19 pandemic versus the allocation of scarce resources and budget. Managing safety hazards and associated threats is all about operational context. It is important that you are able to manipulate your management system to focus organisational efforts to where they are most needed. This means analysing and managing the practical risks your organisation faces as effectively as possible. Despite the pressures created by COVID-19, it is crucial to remember that no one knows your organisation better than you, who lives and breathe it every day.

The barriers at your disposal to manage the situation

Using the Bowtie methodology, EASA considered the effectiveness of the main barriers that you will have in place to control the threats caused by a challenging financial environment. They will be very familiar to you as they are all components of your existing management system.

Clearly, the financial health of the organisation puts pressure on decision making and behaviours in all areas of an operation. However, this should not affect the safety barriers that are built into the compliance requirements. Your ensuring that there are enough people available with the required mix of skills (both safety and operational staff) is a fundamental part of operating safely. But there are many other parts to consider. Others include making sure that you maintain up-to-date IT/rostering/planning systems and have the required equipment, tools and materials.

As a cornerstone of any organisation complying with safety management regulations, risks should be reduced to an acceptable level. This should consider whether risks are being managed to as low as reasonably practical (ALARP), an approach which deliberately filters out affordability unless the cost is grossly disproportionate to the risk reduction effect.

Work as imagined and work as done, practical drift, norms and culture

Due to the difficulties generated by COVID-19, organisations face enormous pressures to deal with multiple issues simultaneously. As a result, it is understandable that your workforce may make decisions in their day-to-day operational roles that are different to those they would have made pre-pandemic. Such decisions may be conscious or subconscious, but the outcomes are much the same.

More than ever, you will need to fall back on your safety policies. These set out the values of speaking up, saying stop if anyone is feeling uncomfortable, acting with integrity, and always putting the safety interests of the travelling public first. Peter Drucker is quoted as saying that, "Culture eats strategy for breakfast". This is especially relevant in the current environment and is often reflected in most serious incident or accident reports.

So, what's different about operating in the context of COVID-19?

Your teams will perhaps be drawn into something called 'group think', where the desire for harmony or conformity in a team of people which results in an irrational decision-making outcome.

The pressures that they face might cause them to let their guard down or be tempted to cut corners, given the novel atmosphere in which they might be working;

They may be operating in new situations where their capacity or capability is adapting to something unfamiliar;

There might be an unspoken or tacit approval for a 'can-do' attitude that changes the rules of normal operations and situational awareness;

Given the threats to the barriers in the COVID-19 restart, a powerful message comes from revisiting the safety space model.

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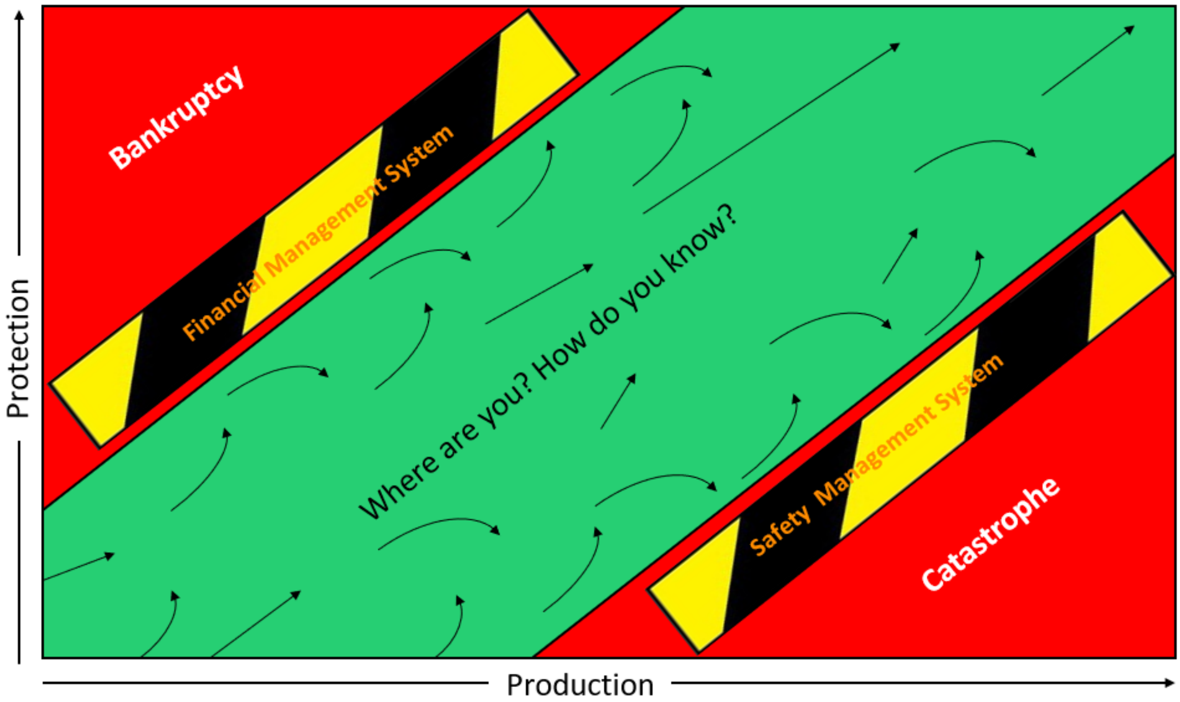
Business challenges and safety effectiveness



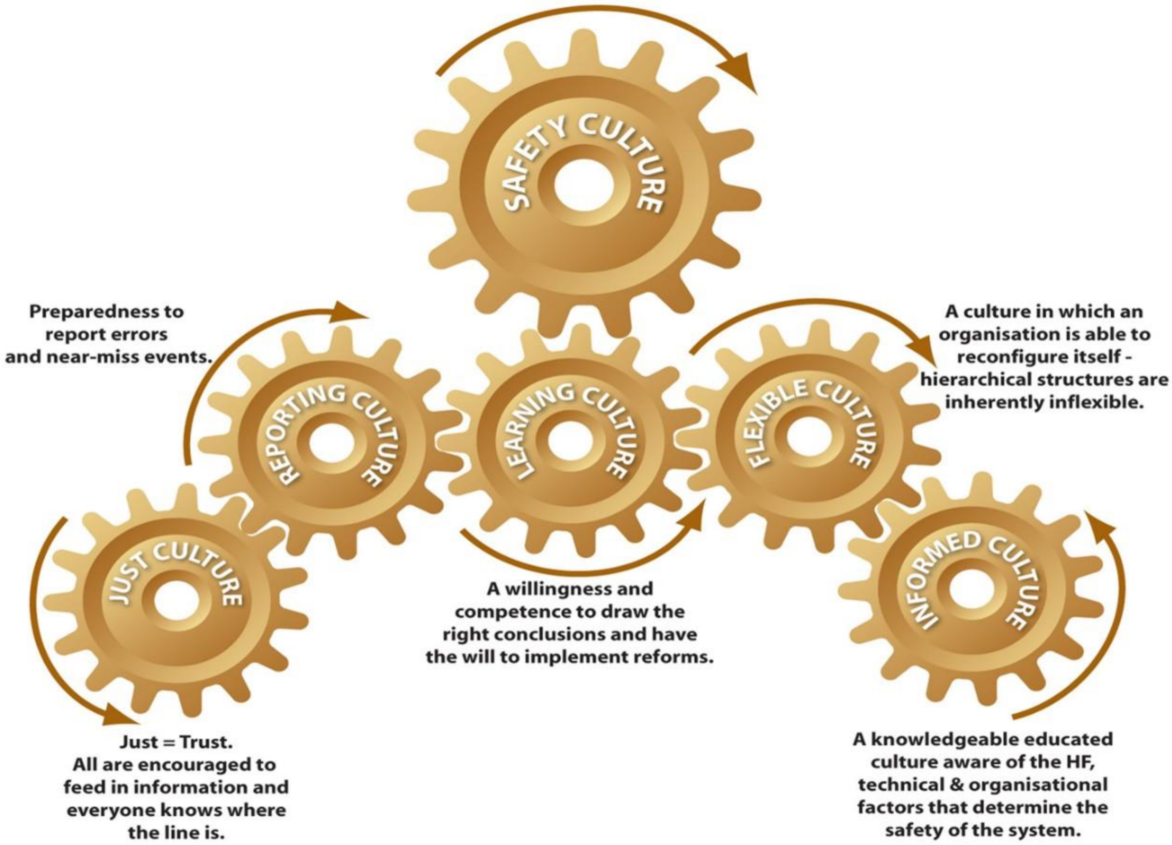
We have both financial and safety management systems to protect our businesses. They are designed to avoid our crossing the line into to either bankruptcy or a negative safety outcome. Regardless of the business pressures it is important to still understand the things that erode the safety barriers in your operation that move you from the safety of the 'green' area towards the 'red'. This is something that you will already know, but due to present circumstances you will have an immediate need to understand these threats in real time and to manage them as quickly and deftly as possible.

In his review of the 2006 RAF Nimrod accident in Afghanistan, Charles Haddon-Cave's cited a NASA safety model of which in turn, is based on James Reason's safety model. This model describes a 'flexible culture'. Haddon-Cave states:

"An organisation that is flexible and value-based, i.e. is guided by core principles, is more likely to deal with the challenges of changing circumstances and hazards…. A Flexible Culture allows all employees to question procedures, behaviour and their seniors…. The flexibility to question procedures, behaviour or seniors means that potentially unsafe practices may be stopped and interrupted before they result in actual mishap".

Referring to the four-element NASA model he added 'questioning culture'. He said:

"The keystone of a strong Safety Culture is, in my view, however, a vital fifth element, namely a Questioning Culture. At all stages of the safety pilgrimage it is vital to ask questions such as "What if?", "Why?", "Can you explain?", "Can you show me?", "Can you prove it?". Questions are the antidote to assumptions, which so often incubate mistakes".



Trust and communication

So, how can you quickly adopt the flexible and questioning approaches above? As well as acting to meet the intent of the EASA regulations in planning and resourcing of your operations, another vital aspect is to include listening and acting on what your people are telling you as to where things aren't right. Your front-line staff are the ones who are managing the novel daily threats and issues that they encounter, thereby keeping your organisation in the green zone. To do that, you need to create ways of communicating that are simple, rapid and effective; adopting a flexible and questioning stance. Lines of accountability need to remain, but creating flatter, more informal ways of communicating to provide feedback and reporting is needed, which will address any threats and hazards to in real time.

Management must take every opportunity to demonstrate to their teams that they are actively seeking feedback, thereby creating safe, transparent and open ways to exchange information that help to maintain the safety of the operation. Whether this is linked directly to the safety barriers we have outlined here, or whether it is more to do with peer support and mental wellbeing, all are equally important at this time.

At a time when employment prospects are uncertain, speaking up may be made more difficult if there is a perceived lack of trust or a weak just culture. But both the information gained as a result of this exchange and the strengthening of a just culture are precisely what management teams should be actively encouraging. This will enable information to flow quickly enough to avoid surprises, and more importantly, accidents.

Conclusion

Your management systems are designed to keep passengers and staff safe. In many organisations there is currently a massive effort underway to avoid bankruptcy through optimising financial management systems, and using all possible tools and mechanisms available to adapt and survive. To minimise the likelihood of having serious incidents or accidents you need to ask yourself if you are giving equal attention to your safety management systems. It is important that you and your organisation are fully exploiting both systems equally to effectively manage the safety space. In doing so, you can minimise the likelihood of having a very costly, safety-related event or accident while staying in business as you restart operations and recover financially.

French Advice (in French)

joe_20210216_0040_0001 - LOI n° 2021-160 du 15 février 2021 prorogeant l'état d'urgence sanitaire (1)

Covid-19 : ces 20 départements sous surveillance en métropole (lefigaro.fr)

Covid-19 : ces 20 départements sous surveillance en métropole

INFOGRAPHIE - Environ 25 millions de Français sont concernés et pourront faire l'objet d'un confinement local. Voici les cartes pour tout comprendre.

Par Gildas Des Roseaux, Service Infographie et Nicole Triouleyre

Publié le 25/02/2021 à 20:06, mis à jour hier à 11:21

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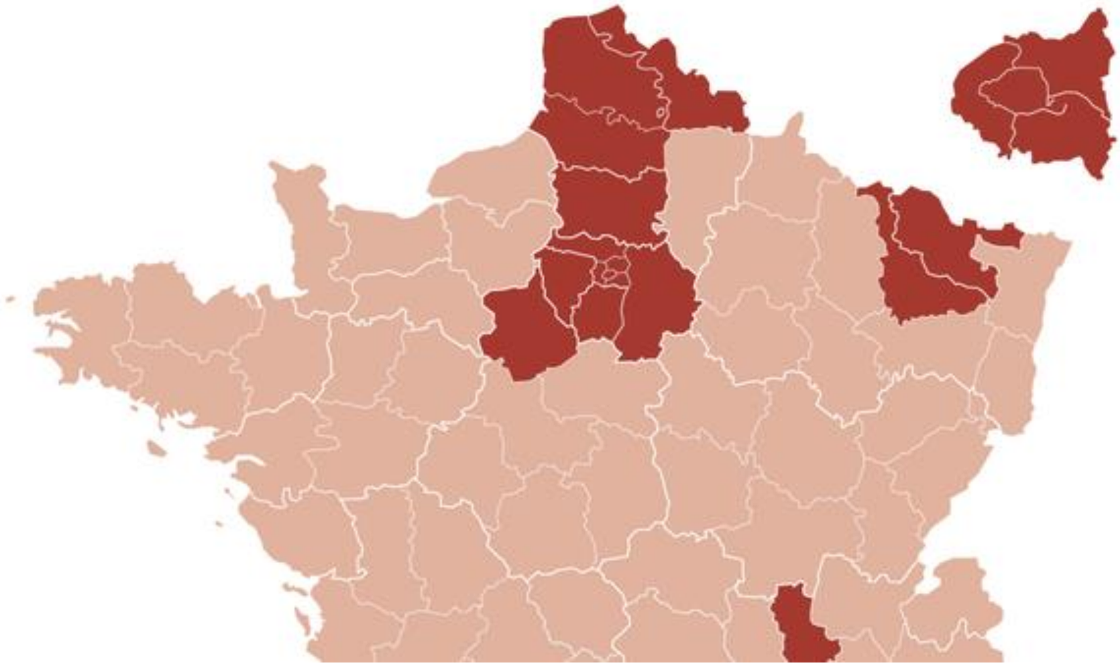


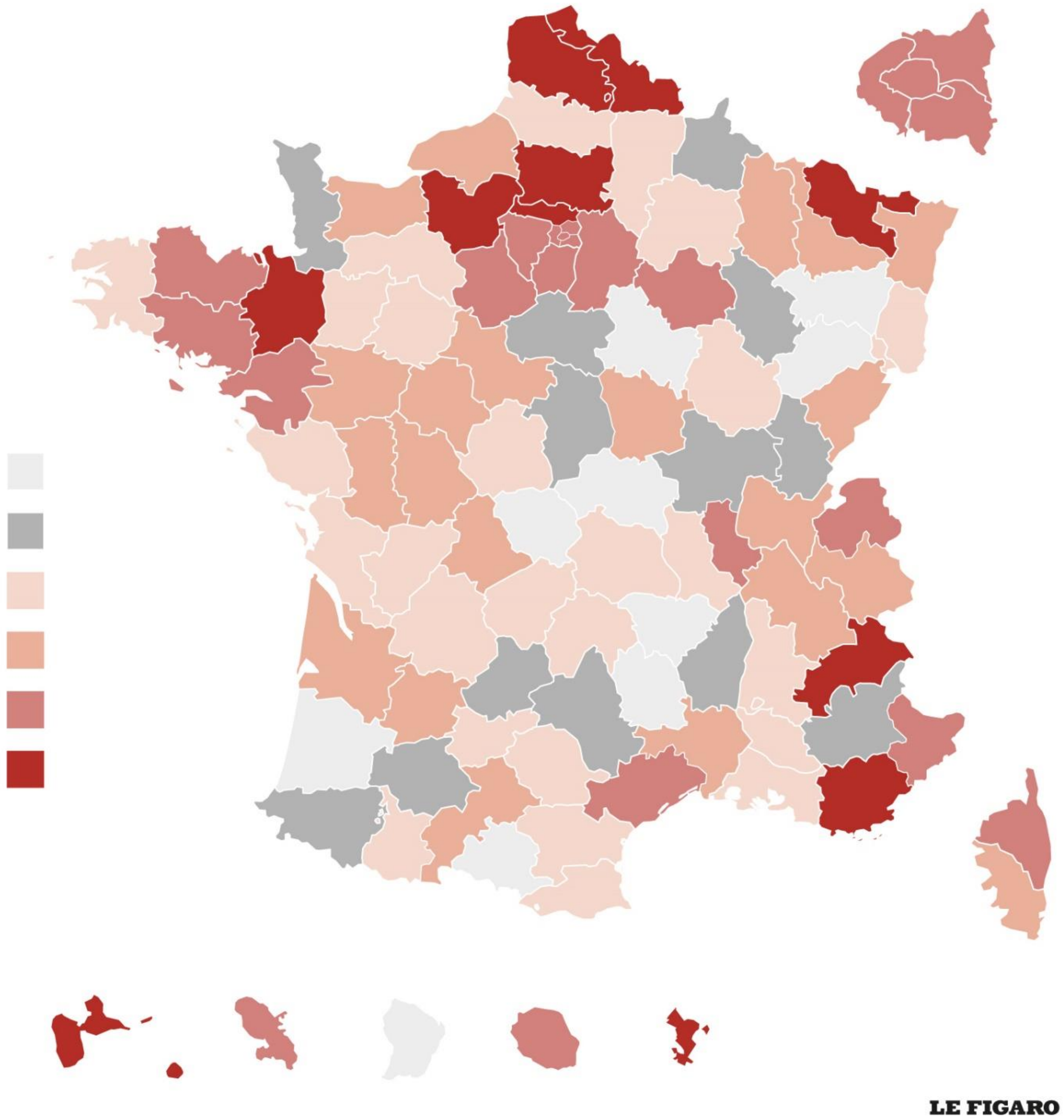
Alors que l'exécutif évoquait mercredi une situation préoccupante dans dix départements, puis une quinzaine jeudi matin, c'est finalement vingt départements qui sont désormais mis sous surveillance.

Niveau d'incidence autour de 250 cas pour 100.000 habitants, part de variants, pression hospitalière «proche du seuil critique» et «circulation virale qui commence à s'accélérer sérieusement» ont présidé à leur désignation.

Ces territoires pourront faire l'objet de mesures de confinements locaux à partir du week-end du 6 mars si la situation continuait à se dégrader, après « concertations avec les élus », a indiqué Jean Castex, le chef du gouvernement, lors de sa conférence de presse.

Le premier ministre a par ailleurs précisé que le variant anglais du coronavirus, plus contagieux, «concerne désormais à peu près la moitié des personnes atteintes de la Covid en France».

Ce variant, qui représentait moins de 40% selon des chiffres diffusés il y a une semaine, fait craindre une explosion épidémique en raison de sa plus grande contagiosité.



Présence des variants sur le territoire % DE VARIANTS PAR DÉPARTEMENT

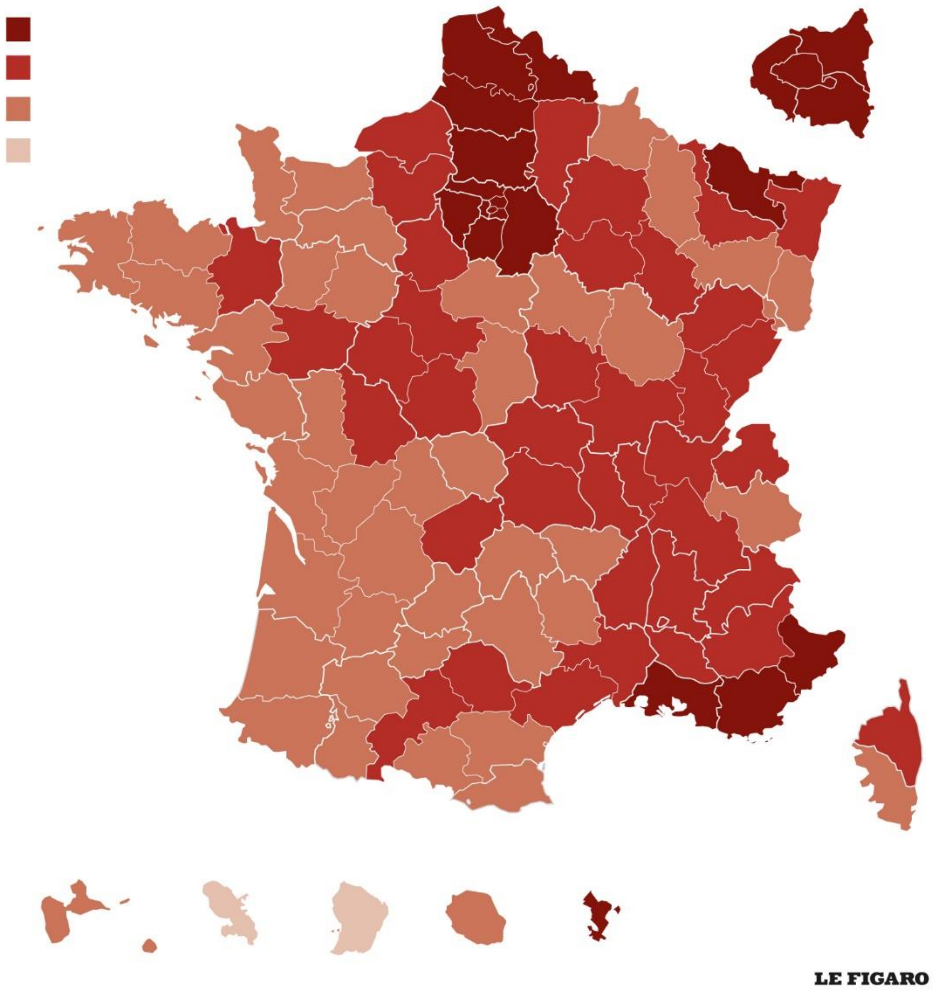
Mercredi 24 février, le porte-parole du gouvernement, Gabriel Attal alertait sur la situation, «elle se dégrade», expliquait-il à l'issue du Conseil des ministres, et «est très préoccupante dans une dizaine de départements».

Alors que les Alpes-Maritimes et Dunkerque ont imposé un confinement partiel pour les deux week-ends à venir, l'heure est aux mesures territorialisées. «Certains territoires imposent même des décisions, des mesures rapides et fortes face aux risques imminents devant nous», a insisté Gabriel Attal.

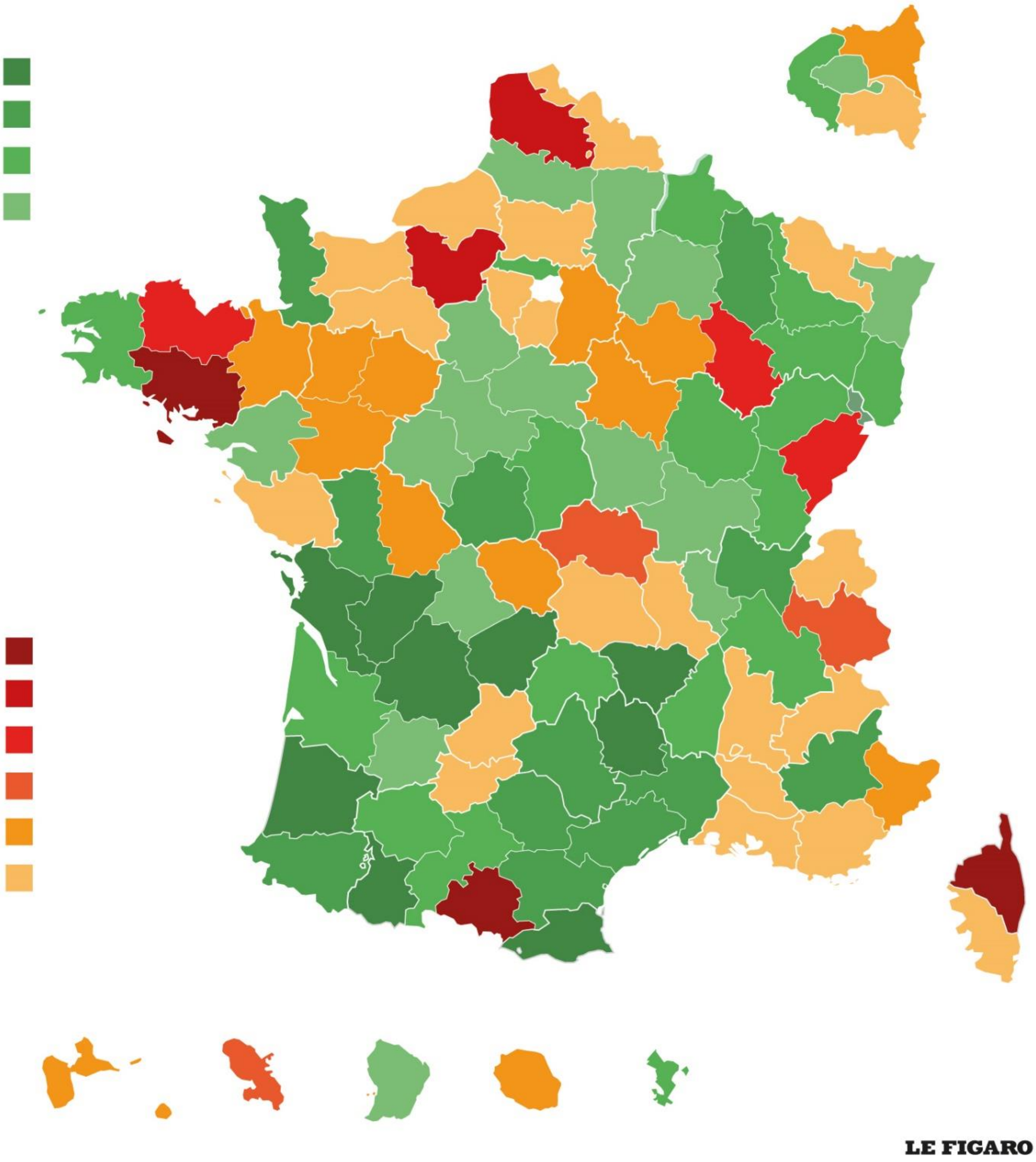
Le Nord, l'Île-de-France, la Moselle et le Sud-Est

Les dix départements les plus touchés, et qui présentent les pires taux d'incidence (supérieurs à 290 cas positifs pour 100.000 habitants), selon Santé Publique France sont les Alpes-Maritimes (599,8 cas pour 100 000 habitants), le Pas-de-Calais (352,4), les Bouches-du-Rhône (335,2), la Seine-Saint-Denis (317,8), le Var (314), la Moselle (310,8), le Nord (304), Paris (303,6), le Val-de-Marne (301) et la Somme (297).

D'autres départements présentent des taux d'incidence élevés, supérieurs à 250 cas positifs pour 100.000 habitants, comme l'Oise dans les Hauts-de-France ou le Val-d'Oise, et l'Essonne en Île-de-France. L'ouest du pays présente des taux d'incidence bien moins importants, en Bretagne, Nouvelle Aquitaine ou Occitanie.



Parmi ces départements rouges, le Pas-de-Calais est celui qui connaît la plus forte tension hospitalière, avec un taux de remplissage de ses services de réanimation qui atteint 128%. Mais cet indicateur est inquiétant dans d'autres départements, qui ne sont pas dans les dix précédemment mentionnés, comme dans la Drôme, où ce taux atteint 138 %, ou dans les Hautes-Alpes, où il flirte avec les 150 %.



Le Pas-de-Calais a aussi enregistré ces derniers jours une hausse des hospitalisations dues au Covid-19 parmi les plus importantes, puisque ce chiffre avoisine les 50%. Le Morbihan, la Haute-Corse, ou encore l'Ariège font également face à des augmentations fortes de ces hospitalisations. À Paris, la moyenne des hospitalisations est en baisse.

Covid-19: Ce que la fermeture des frontières change pour les expatriés | lepetitjournal.com

Par Damien Bouhours | Publié le 31/01/2021 à 18:00 | Mis à jour le 02/02/2021 à 17:14

Le reconfinement en France, ce n'est pas pour maintenant. Une interdiction de voyage en dehors de l'espace européen, sauf motif impérieux, est cependant en vigueur depuis ce dimanche. Qu'est-ce que cela implique pour les Français de l'étranger ?

Alors qu'un reconfinement était pressenti, le Premier ministre Jean Castex a finalement annoncé vendredi soir un durcissement des restrictions sanitaires bien différent, en tout cas pour le moment. Depuis dimanche 31 janvier minuit, « toute entrée en France et toute sortie de notre territoire à destination ou en provenance d'un pays extérieur à l'Union européenne sera interdite, sauf motif impérieux ».

Quels sont les motifs impérieux ?

Alors que la propagation du virus sur le territoire français inquiète, notamment via les variants britannique et sud-africain, le gouvernement français a décidé de fermer toutes ses frontières extérieures à l'espace européen (Union européenne, Andorre, Islande, Liechtenstein, Monaco, Norvège, Saint-Marin, Saint-Siège et Suisse), et ce jusqu'à nouvel ordre.

Pour pouvoir voyager en dehors de l'espace Schengen et vers les territoires d'Outre-mer, les ressortissants français devront pouvoir justifier d'un motif impérieux d'ordre personnel ou familial, motif de santé relevant de l'urgence ou motif professionnel ne pouvant être différé. Le secrétaire d'Etat au Tourisme, aux Français de l'étranger et à la Francophonie, Jean-Baptiste Lemoyne, a publié la liste indicative de ces motifs et des pièces justificatives à fournir.

Peut-on voyager en Europe ?

Il est possible pour les ressortissants français de voyager dans l'espace européen. Il faudra présenter à leur retour en France un test PCR négatif de moins de 72 heures. Les travailleurs transfrontaliers, les transporteurs routiers et les personnes vivant dans un rayon de 30 km d'une frontière sont exemptés de ces mesures.

Les expatriés peuvent-ils revenir en France ?

Les ressortissants français peuvent revenir en France. Ils devront cependant présenter une attestation sur l'honneur aux compagnies de transport avant embarquement (cliquez ici pour obtenir l'attestation), ainsi qu'un test PCR négatif de moins de 72 heures. Les voyageurs devront également s'isoler pendant 7 jours à leur arrivée.

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Pour retourner dans leur pays d'expatriation, les Français de l'étranger devront également justifier d'un motif impérieux (comme par exemple la reprise d'une activité professionnelle). Attention cependant à bien vous renseigner sur les mesures prises par votre pays d'accueil, certains Etats ayant, eux aussi, fermé leurs frontières aux ressortissants étrangers, complètement ou sous certaines conditions, et/ou ayant instauré des tests obligatoires et/ou des périodes d'isolement.

Damien Bouhours
Diplômé de sociologie à l'Université de Nantes et Tromsø (Norvège), il a vécu plus d'une décennie en Asie du Sud-Est (Laos et Thaïlande). Il a rejoint lepetitjournal.com en 2008 dont il est directeur éditorial et partenariats.

Motifs impérieux

Liste indicative des motifs impérieux justifiant des déplacements entre le territoire français et un pays ou territoire n'appartenant pas à l'espace européen

Motifs impérieux d'ordre personnel ou familial :

- Décès d'un membre de la famille en ligne directe d'un frère ou d'une sœur / Visite à une personne dont le pronostic vital est engagé, pour les membres de la famille en ligne directe ;

  Pièces exigibles : acte ou certificat de décès, certificat médical établissant la situation de la personne dont le pronostic vital est engagé

- Garde d'enfants par le parent investi de l'autorité parentale ou dont le droit de garde est reconnu par une décision de justice

  Pièces exigibles : décision de justice et pièce justificative du lieu de domicile

- Assistance aux personnes âgées, malades ou handicapées ne disposant d'aucun autre soutien ;

  Pièces exigibles : documents établissant la relation entre la personne aidante et la personne aidée, et attestant de la situation de la personne aidée

- Convocation par une autorité judiciaire ou administrative

  Pièce exigible : convocation par l'autorité administrative ou judiciaire

- Impossibilité légale ou économique de rester sur le territoire sur lequel se trouve la personne

  Pièces exigibles : Titre de séjour expirant, acte de licenciement, etc...

- Mise en sécurité de la personne (protection de l'enfance et lutte contre les déplacements illicites d'enfants à l'étranger / protections des victimes de violence intrafamiliales)

  Pièces exigibles : Tout document établissant la matérialité des faits

- Retour vers la résidence principale lorsque le voyage a été commencé avant le 31 janvier 2021

  Pièces exigibles : justificatif de résidence principale, présentation du billet aller au retour dans le cadre d'un billet aller-retour, l'aller devant être antérieur au 31 janvier 2021

- Étudiants en début, reprise ou fin de cycle d'études

  Pièce exigible : certificat de scolarité établi par l'établissement

Motif impérieux de santé :

- Urgence médicale vitale (pour la personne ainsi qu'un accompagnant si sa présence est indispensable)

  Pièces exigibles : certificat médical, preuve d'une hospitalisation programmée, etc...

Motifs impérieux professionnels :

- Missions indispensables à la poursuite d'une activité économique, requérant une présence sur place qui ne peut être différée et dont le report ou l'annulation aurait des conséquences manifestement disproportionnées ou serait impossible (dont les professionnels du transport)

  Pièces exigibles : attestation de l'employeur, carte professionnelle des équipages du transport international de marchandises, du transport international de passagers, du transport international maritime

- Professionnel de santé concourant à la lutte contre la Covid 19 ou participant à des opérations de coopération d'intérêt majeur en matière de santé ;

  Pièce exigible : carte professionnelle

- Missions ponctuelles liées à l'exercice de prérogatives de puissance publique (dont les missions diplomatiques) ne pouvant être différées ou reportées.

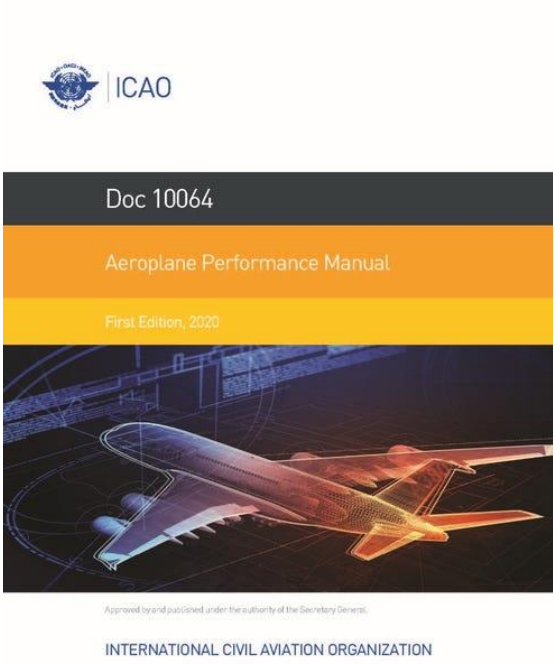
  Pièce exigible : carte professionnelle , ordre de mission

- Sportifs professionnels de haut niveau pour la participation à des rencontres validées par le ministère des sports

  Pièce exigible : carte professionnelle, certificat délivré par l'organisateur en lien avec le ministère des sports

What about this month:

Aeroplane Performance Manual (Doc 10064)



This manual was developed to combine guidelines on operational requirements regarding aeroplane performance. It supplements the provisions of Annex 6 — Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes, Chapter 5, Aeroplane performance operating limitations and Annex 8 — Airworthiness of Aircraft, Part IIIB, as applicable to turbine-powered subsonic transport-type aeroplanes over 5 700 kg maximum certificated take-off mass having two or more engines.

This manual contains guidance material previously presented in Annex 6, Part I, Attachment B, Aeroplane performance operating limitations, which has been removed with Amendment 40 C (applicability 2020). This manual also provides new guidance for aeroplane operations on contaminated runways, following the implementation of a new global reporting format for assessing and reporting runway surface conditions. Its content was developed in coordination with the Friction Task Force on the basis of existing and proposed national regulations, the removal of Annex 6, Part I, Attachment B, and guidance on the application of Standards and Recommended Practices (SARPs) concerned with the Runway Condition Report (RCR). In addition, the manual addresses current regulatory shortcomings regarding obstacle clearance.

A single manual for aeroplane performance represents a holistic approach to support the SARPs of multiple Annexes, namely Annex 6, Annex 8, Annex 14 — Aerodromes, and Annex 15 — Aeronautical Information Services, as well as existing associated guidance material. The guidance contained herein describes a possible means for achieving the intended level of safety, however, it is recognized that this may not be the only way of meeting the intent for individual aeroplane manufacturers and operators.

1st Webinar on Fatigue Risk Management in Cargo and On-Demand Operations

Date & Time

15/03/2021, 13:00 - 16:00 (UTC+1)

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

Description

EASA is organising a Webinar on fatigue risk management (FRM) in cargo and on-demand operations. The event is primarily intended for representatives from national aviation authorities, the European aviation industry and crew organisations and will take place on March 15, 2021 from 13:00 to 16:00.

This interactive online workshop will include practical examples of implementations of FRM in cargo / on-demand operations and a presentation of state-of-the-art technology to support FRM.

With the kind support of Cargolux, the European Cockpit Association and Thales.

In case you have any further questions regarding this workshop, please send them to: safetypromotion@easa.europa.eu

Registration

If you belong to the target group and are interested to participate in this workshop, please register.

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FAA regulations

Draft ACs

Advisory Circular

150/5345-53D - Airport Lighting Equipment Certification Program

150/5370-14B - Hot Mix Asphalt Paving Handbook

Forms - Orders & Notices

JO 7340.626 - ICAO THREE LETTER DESIGNATOR (3LD) "MVK" AND ASSOCIATED CALL SIGN "MINN STATE"

AL 4665.1G - Regional Office Parking Regulation and Car Pool Program

1370.120A - Section 508 Accessibility Policy

JO 7340.625 - CALL SIGN, 3LD, AND COMPANY NAME CHANGE TO ICAO CALL SIGN "CASINO EXPRESS" AND 3LD "CXP"

JO 7340.624 - ICAO THREE LETTER DESIGNATOR (3LD) "PPJ" AND ASSOCIATED CALL SIGN "PREMIER JETS"

VS 8000.375 - Aviation Safety Voluntary Safety Reporting Program

8900.579 - LOA D098, Short-Term Operations in Airspace Requiring Specific Approval

8900.578 - Decommissioning OpSpec/MSpec B059, Canadian MNPS Airspace

JO 7340.623 - ICAO THREE LETTER DESIGNATOR (3LD) "GZR" AND ASSOCIATED CALL SIGN "GEZIRA"

JO 7340.622 - ICAO THREE LETTER DESIGNATOR (3LD) "JLC" AND ASSOCIATED CALL SIGN "ANGELIC"

7050.1B - Runway Safety Program with Change 1

JO 7340.621 - Foreign ICAO 3LD Additions, Deletions, and Modifications (excluding U.S.)

JO 7340.619 - ICAO THREE LETTER DESIGNATOR (3LD) "VYR" AND ASSOCIATED CALL SIGN "VEYRON"

JO 7340.620 - ICAO THREE LETTER DESIGNATOR (3LD) "LLN" AND ASSOCIATED CALL SIGN "ALLEN"

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EASA regulations

Approval Data Library | EASA (europa.eu)

Rules

Final Special Condition ref. SC-D25.856-01 on "Passenger Protection from External Fire" - Issue 01

Equivalent Safety Finding ref. ESF-D25.807-01 on "Ditching Emergency Exit for Passengers – Water Dam" - Issue 01

Proposed Equivalent Safety Finding ref. ESF-D25.807-01 on "Ditching Emergency Exit for Passengers – Water Dam" - Issue 01

Proposed Special Condition SC E-20 Hazardous Rotor Growth - Issue 01

Proposed Special condition "SC GAS" Gas Airships - Issue 01

Special Conditions for Gyroplane combined with Road Vehicle use - Issue 02

Regulations | EASA (europa.eu)

FO.TCO.00168 - Third Country Operator One-off notification

FO.TCO.00160 - Application for Third Country Operator Authorisation (TCO Authorisation)

FO.TCO.00160 | EASA (europa.eu)

Commission Implementing Regulation (EU) 2021/97 - Commission Implementing Regulation (EU) 2021/97 of 28 January 2021 amending and correcting Regulation (EU) 2015/640 as regards the introduction of new additional airworthiness requirements

Easy access Rules

Easy Access Rules for Additional Airworthiness Specifications (Regulation (EU) 2015/640)

Agency Decisions

Overview | EASA (europa.eu)

Notices of Proposed Amendment

Notices of Proposed Amendment (NPAs) | EASA (europa.eu)

ASECNA

AIP ASECNA

Regulations

Notam

Consultation NOTAM (asecna.aero)

French regulations

JORF

joe_20210228_0051_0007 - Arrêté du 24 février 2021 portant création d'une zone interdite temporaire dans la région de Dunkerque (Nord) identifiée ZIT Dunkerque, dans la région d'information de vol de Paris- Active H 24 du 3 mars 2021 à 6 heures au 20 mars 2021 à 20 heures.

joe_20210228_0051_0006 - Arrêté du 24 février 2021 portant création d'une zone interdite temporaire dans la région de Calais (Pas-de-Calais) identifiée ZIT Calais, dans la région d'information de vol de Paris - Active H 24 du 3 mars 2021 à 6 heures au 20 mars 2021 à 20 heures.

joe_20210227_0050_0048 - Arrêté du 22 février 2021 relatif à la mise en œuvre de dispositions provisoires en matière d'observation visuelle sur l'aérodrome de Lyon Saint-Exupéry

joe_20210226_0049_0017 - Arrêté du 22 février 2021 modifiant l'arrêté du 25 septembre 1992 fixant la liste des unités, formations et services du ministère des armées ouvrant droit à l'indemnité pour services aériens

joe_20210223_0046_0022 - Arrêté du 11 février 2021 portant obligation d'emport d'équipement de navigation de surface conforme à la spécification de navigation RNP 1 pour les aéronefs à destination de l'aérodrome Paris-Charles de Gaulle

joe_20210220_0044_0033 - Arrêté du 16 février 2021 modifiant l'arrêté du 14 février 2018 relatif au référent déontologue de la direction générale de l'aviation civile

joe_20210218_0042_0016 - Arrêté du 16 février 2021 relatif à la médaille de l'aéronautique

joe_20210218_0042_0013 - Décret n° 2021-169 du 16 février 2021 modifiant le décret du 16 mai 1949 relatif à la médaille de l'aéronautique

joe_20210218_0042_0002 - Ordonnance n° 2021-167 du 17 février 2021 relative à l'hydrogène

joe_20210218_0042_0001 - Rapport au Président de la République relatif à l'ordonnance n° 2021-167 du 17 février 2021 relative à l'hydrogène

joe_20210217_0041_0006 - Arrêté du 11 février 2021 relatif à l'interdiction d'exploitation pour des motifs de sécurité de certains transporteurs aériens extracommunautaires

joe_20210211_0036_0084 - Décision du 4 février 2021 relative au concours pour l'admission des élèves pilotes de ligne au titre de l'année 2021

joe_20210211_0036_0083 - Arrêté du 10 février 2021 portant création de deux zones interdites temporaires dans le département de la Loire-Atlantique, dans la région d'information de vol de Brest - Active le jeudi 11 février 2021 de 8 heures à 18 heures.

joe_20210210_0035_0019 - Arrêté du 9 février 2021 portant création d'une zone interdite temporaire dans la région des Sables-d'Olonne (Vendée), identifiée Retour Participants Vendée Globe, dans la région d'information de vol de Brest - Active du mardi 16 février 2021 à 00 h 00 au dimanche 28 février 2021 à 23 h 59.

joe_20210210_0035_0003 - Arrêté du 1er février 2021 modifiant l'arrêté du 24 janvier 2014 modifié fixant la liste des exploitants auxquels sont affectés des quotas d'émission de gaz à effet de serre et le montant des quotas affectés à titre gratuit pour la période 2013-2020

joe_20210204_0030_0059 - Arrêté du 19 janvier 2021 portant tarification des publications d'information aéronautique sur support physique

joe_20210204_0030_0001 - LOI n° 2021-107 du 3 février 2021 autorisant la ratification du protocole portant amendement de la convention relative aux infractions et à certains autres actes survenant à bord des aéronefs (1)

Montreal_Prot_2014_FR

See attached

La France signe le Protocole de Montréal du 4 avril 2014 amendant la (...) - Représentation permanente de la France auprès de l'Organisation de l'Aviation Civile Internationale (OACI) (delegfrance.org)

OSAC-DSAC

Flash 13 - Conformité du référentiel des organismes agréés

Bulletin officiel de la DGAC

TRAA2106033X - AVENANT DU 22 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-CE DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET SYSAT GROUPE 2 (TRANCHES 1 ET 2).

TRAA2106056X - AVENANT DU 24 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/DO-EC DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET SYSAT GROUPE 2 (TRANCHES 1 ET 2).

TRAA2101346S - DÉCISION DU 19 FÉVRIER 2021 PORTANT HOMOLOGATION DES TARIFS DE LA REDEVANCE POUR SERVICE RENDU AU TITRE DES MISSIONS DE COORDINATION ET DE FACILITATION HORAIRES SUR LES AÉRODROMES.

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

TREA2105708S - DÉCISION DU 23 FÉVRIER 2021 PORTANT DÉLÉGATION DE SIGNATURE (DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE NORD-EST).

TREA2105802S - DÉCISION DSNA/D N°02/2021 DU 17 FÉVRIER 2021 MODIFIANT LA DÉCISION DSNA/D N°52/2020 DU 21 DÉCEMBRE 2020 RELATIVE À LA MISE EN ŒUVRE DES RÉSERVES OPÉRATIONNELLES DANS LES ORGANISMES DE CONTRÔLE DE LA NAVIGATION AÉRIENNE.

TREA2105412S - DÉCISION DU 16 FÉVRIER 2021 MODIFIANT LA DÉCISION DU 5 AOÛT 2019 PORTANT ORGANISATION DES DÉLÉGATIONS DE LA DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE SUD-EST.

TREA2030577S - DÉCISION N° 2020-6 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2104479S - DÉCISION DU 10 FÉVRIER 2021 MODIFIANT LA DÉCISION DU 1ER MARS 2019 PORTANT NOMINATION DES MEMBRES DE LA COMMISSION DE DISCIPLINE DES PERSONNELS NAVIGANTS NON PROFESSIONNELS.

TRAA2034081X - CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-S DU 9 FÉVRIER 2021 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LES PROJETS SYSAT GROUPE 2 (TRANCHES 1 ET 2) ET RTC (REMOTE TOWER CENTER).

TRAA2104695X - AVENANT DU 9 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-GSO DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET SYSAT GROUPE 2 (TRANCHES 1 ET 2).

TRAA2104434X - AVENANT DU 9 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/DTI DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LES PROJETS SYSAT GROUPE 2 (TRANCHES 1 ET 2), CATIA TRANCHE 1, RTC REMOTE TOWER CENTER ET VIGIE DE SAINT DENIS.

TRAA2104689X - AVENANT DU 9 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-OI DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET VIGIE SAINT DENIS.

TRAA2104531X - AVENANT DU 9 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-SE DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À

L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET SYSAT GROUPE 2 (TRANCHES 1 ET 2).

TRAA2104532X - AVENANT DU 9 FÉVRIER 2021 À LA CONVENTION DE DÉLÉGATION DE GESTION SDFI/SNA-SSE DU 21 DÉCEMBRE 2020 RELATIVE AU PILOTAGE ET À L'EXÉCUTION BUDGÉTAIRE PLURIANNUELLE DES PROJETS D'INVESTISSEMENTS DE LA DSNA CONCERNANT LE PROJET SYSAT GROUPE 2 (TRANCHES 1 ET 2).

TREA2104368S - DÉCISION DU 9 FÉVRIER 2021 MODIFIANT LA DÉCISION DU 15 JUILLET 2020 PORTANT ORGANISATION DE LA DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE ANTILLES-GUYANE.

TREA2104658S - DÉCISION DU 9 FÉVRIER 2021 MODIFIANT LA DÉCISION DU 28 JUILLET 2020 PORTANT ORGANISATION DE LA DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE SUD-OUEST.

TREA2104467S - DÉCISION DU 9 FÉVRIER 2021 PORTANT DÉLÉGATION DE SIGNATURE (DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE NORD).

TRAA2104293S - DÉCISION DU 5 FÉVRIER 2021 PORTANT ORGANISATION DE L'AGENCE COMPTABLE DU BUDGET ANNEXE « CONTRÔLE ET EXPLOITATION AÉRIENS ».

TREA2030604S - DÉCISION N° 2020-13 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2030602S - DÉCISION N° 2020-12 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2030605S - DÉCISION N°2020-14 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2030601S - DÉCISION N° 2020-11 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2030597S - DÉCISION N° 2020-8 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSION DE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2030600S - DÉCISION N° 2020-10 DU 22 DÉCEMBRE 2020 PORTANT SANCTION EN MATIÈRE DE QUOTAS D'ÉMISSIONDE GAZ À EFFET DE SERRE (TRANSPORT AÉRIEN).

TREA2103679S - DÉCISION DU 2 FÉVRIER 2021 MODIFIANT LA DÉCISION DU 7 JANVIER 2021 PORTANT ORGANISATION DE LA DIRECTION DE LA SÉCURITÉ DE L'AVIATION CIVILE SUD-EST

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CNPG2102889X - CONVENTION DU 14 NOVEMBRE 2020 PORTANT DÉLÉGATION DE GESTION RELATIVE À LA MISE EN OEUVRE DU DÉBAT PUBLIC RELATIF AU SIXIÈME APPEL D'OFFRE D'ÉOLIEN EN MER.

TRAA2103550S - DÉCISION DU 2 FÉVRIER 2021 PORTANT ORGANISATION DE L'AGENCE COMPTABLE DU BUDGET ANNEXE « CONTRÔLE ET EXPLOITATION AÉRIENS ».

TRAA2102972S - DÉCISION DSNA/D N°200098 EN DATE DU 31 DÉCEMBRE 2020 MODIFIANT LA DÉCISION DSNA/D N°190146 DU 10 JUILLET 2019 PORTANT ORGANISATION DE LA DIRECTION DES OPÉRATIONS DE LA DIRECTION DES SERVICES DE LA NAVIGATION AÉRIENNE MODIFIÉE.

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European Centre for Cybersecurity in Aviation (ECCSA)

See : https://www.easa.europa.eu/eccsa

19 Feb 2021

EFBC

dataSIMS Avionics ARINC 664-1 – Local Buffer Overflow (PoC)

Exploit Title: dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC) # Exploit Author: Kağan Çapar # Date: 2020-02-17 # Vendor Homepage: https://www.ddc-web.com/ # Software Link: https://www.ddc-web.com/en/connectivity/databus/milstd1553-1/software-1… # Version: 4.

19 Feb 2021

EFBC

[local] dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC)

Exploit Title: dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC) # Exploit Author: Kağan Çapar # Date: 2020-02-17 # Vendor Homepage: https://www.ddc-web.com/ # Software Link: https://www.ddc-web.com/en/connectivity/databus/milstd1553-1/software-1… # Version: 4.

19 Feb 2021

EFBC

Where does the transponder read altitude, or does ATC get it from radar?

I'm no expert, but from what I gather the transponder has a direct connection to the altimeter pre -Kollsman window. Not sure how that's possible but it's something along those lines. Essentially the transponder reports your flight level to ATC no matter what— it always reports your altitude assuming an altimeter setting of 29.

23 Feb 2021

ABC

The Virginia-Class Attack Submarine Is Becoming the Navy's Undersea Spy

by Kris Osborn Here's What You Need to Remember: Virginia-class submarines are engineered with "Fly-by-Wire" capability which allows the ship to quietly linger in shallow waters without having to surface or have each small move controlled by a human operator.

22 Feb 2021

ABC

Praetor 500 Enters Brazilian Market

Embraer has delivered the first Praetor 500 going to a Brazilian customer, it announced today. The follow-on to the Legacy 450, the Praetor 500 received Brazilian ANAC certification in August 2019, followed by EASA and FAA nods in September 2019. Deliveries of the midsize jet began that year, including to fractional provider Flexjet.

20 Feb 2021

ABC

dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC)

Exploit Title: dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC) # Exploit Author: Kağan Çapar # Date: 2020-02-17 # Vendor Homepage: https://www.ddc-web.com/ # Software Link: https://www.ddc-web.com/en/connectivity/databus/milstd1553-1/software-1… # Version: 4.

19 Feb 2021

ABC

dataSIMS Avionics ARINC 664-1 – Local Buffer Overflow (PoC)

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19 Feb 2021

ABC

[local] dataSIMS Avionics ARINC 664-1 - Local Buffer Overflow (PoC)

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19 Feb 2021

ABC

Where does the transponder read altitude, or does ATC get it from radar?

I'm no expert, but from what I gather the transponder has a direct connection to the altimeter pre -Kollsman window. Not sure how that's possible but it's something along those lines. Essentially the transponder reports your flight level to ATC no matter what— it always reports your altitude assuming an altimeter setting of 29.

17 Feb 2021

ABC

Embraer Praetor 600 earns Canadian type certificate

Transport Canada Civil Aviation (TCCA) has granted a type certificate to Embraer's super-midsize Praetor 600. The Praetor 600 is the best performing super-midsize jet ever developed, surpassing all its main design goals and becoming capable of flying beyond 4,000 nautical miles in long-range cruise speed or beyond 3,700 nautical miles at Mach .

12 Feb 2021

ABC

Embraer Gets Canada OK for Praetor 600, Reports 2020 Results

Embraer's Praetor 600 super-midsize jet has received type certification from Transport Canada, expanding its presence in the North American market, the company announced Friday. The approval came on the same day the Brazilian manufacturer reported a 35 percent drop in deliveries overall in 2020 with....

09 Feb 2021

ABC

TransDigm Group Reports Fiscal 2021 First Quarter Results

CLEVELAND Feb. 9, 2021 /PRNewswire/ -- TransDigm Group Incorporated (NYSE: TDG), a leading global designer, producer and supplier of highly engineered aircraft components, today reported results for the first quarter ended January 2, 2021, which were significantly impacted by the COVID-19 pandemic.

Cabinet d'Expertise en Aéronautique - Inscrit près la cour d'appel d'Amiens – Indépendant de l'EASA

15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

05 Feb 2021

ABC

Πρώτη πτήση για το μαχητικό F-15EX

Το νέο μαχητικό F-15EX της Boeing ολοκλήρωσε την πρώτη του πτήση στις 2 Φεβρουαρίου, ανοίγοντας τον δρόμο για την έγκαιρη παράδοση των πρώτων δύο αεροσκαφών στην αμερικανική πολεμική αεροπορία αργότερα μέσα στον τρίμηνο. Το αεροσκάφος απογειώθηκε και προσγειώθηκε στο διεθνές αεροδρόμιο του Σεντ....

05 Feb 2021

ABC

AINdebrief Episode 33 | February 5, 2021

AIN editor in chief Matt Thurber recently had a rare opportunity to fly the Dassault Falcon 7X flight-test aircraft fitted with an experimental single-power throttle lever dubbed SmartThrottle. Because SmartThrottle was integrated with the fly-by-wire digital flight control system, Dassault also was....

03 Feb 2021

ABC

[Video] Il primo volo del Boeing F-15EX apre la strada per le consegne all'aeronautica militare americana

Il "nuovo" jet da combattimento della Boeing, l'F-15EX ha completato il suo primo volo, il 2 febbraio 2021, aprendo la strada verso la consegna anticipata dei primi due jet alla US Air Force alla fine di questo trimestre. Il jet è decollato ed è atterrato dall'aeroporto internazionale di St.

03 Feb 2021

ABC

10H20 Premier vol du F-15EX destiné à l'US Air Force

Le F-15EX pour l'US Air Force Le nouvel avion de chasse Boeing F-15EX a réalisé son premier vol le 2 février 2021, ouvrant la voie à la livraison rapide des deux premiers biréacteurs à l'US Air Force plus tard au cours de ce trimestre. L'avion a décollé et a atterri de l'aéroport international St.

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

U.A.S. – Drones

See : https://www.easa.europa.eu/eccsa

UTM Framework Edition 3

See attached

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NAT OPS Bulletin

NAT OPS Bulletins - All Documents (icao.int)

see attached

IOSA

IATA - IOSA

IATA is working to ensure the IOSA Program continues to meet industry needs during the COVID-19 crisis.

The IOSA Support Program (link) provides operators, due for an IOSA renewal registration audit, who are unable to undergo an onsite audit with the possibility of undergoing a remote audit with a limited scope and reduced fees. The rules related with this option are found in the IPM Ed 12 – Temporary Appendix (TA)

This TA also formalizes the requirement for all IOSA registered operators to submit the IOSA questionnaire (SAR.F23 form) every 60 calendar days. See our guidance on how register, access and complete the form. The completed questionnaires can be requested in the same way as for IOSA Audit Reports.

Relevant documents, such as Operator Alerts and Temporary Revisions to the IOSA manuals are available in our documentation site. Subscrib to receive notifications when a new document has been released. For questions or comments, contact us at iosa@iata.org.

Related documents can also be found here:

- IOSA Support Program (pdf)
- IOSA Guidance for Safety Monitoring under COVID-19 Ed. 3 (pdf)
- IPM Ed 12 – Temporary Appendix (pdf)
- ISM Ed 13 - Remote Audit - Revision 1 (pdf)
- IAH P&G Ed 10 - Temporary Appendix (pdf)
- IOSA Operator Alert 16 (pdf)

Safety Alerts

Affected Product(s)	Effective Date	Subject and Additional Information
Seattle TAC	February 25, 2021	Barcode Date Error. See the 20-01 VIS Safety Alert (PDF) for complete information.
28-Day and 56-Day NASR Subscriber File, AWY.txt File	February 25, 2021	The AWY.txt file contains an error for the V157 Airway. See the 21-02 NASR Safety Alert (PDF) for complete information.
Visual Charts	February 25, 2021	56-Day Cycle Visual Charts. See the 21-01 VIS Charting Notice (PDF) for complete information.
Digital Chart Supplement	February 25, 2021	XML Code Revisions. See the 20-17 CS Charting Notice (PDF) for complete information.
Whitehorse Sectional Aeronautical Chart	February 25, 2021	Discontinuation of Whitehorse Sectional Aeronautical Chart. See the 20-02 VIS Charting Notice (PDF) for complete information.

Safety information bulletin

Affected Product(s)	Effective Date	Subject and Additional Information
Seattle TAC	February 25, 2021	Barcode Date Error. See the 20-01 VIS Safety Alert (PDF) for complete information.
28-Day and 56-Day NASR Subscriber File, AWY.txt File	February 25, 2021	The AWY.txt file contains an error for the V157 Airway. See the 21-02 NASR Safety Alert (PDF) for complete information.
Visual Charts	February 25, 2021	56-Day Cycle Visual Charts. See the 21-01 VIS Charting Notice (PDF) for complete information.
Digital Chart Supplement	February 25, 2021	XML Code Revisions. See the 20-17 CS Charting Notice (PDF) for complete information.
Whitehorse Sectional Aeronautical Chart	February 25, 2021	Discontinuation of Whitehorse Sectional Aeronautical Chart. See the 20-02 VIS Charting Notice (PDF) for complete information.

FAA

All Information for Operators (InFOs) (faa.gov)

All Safety Alerts for Operators (SAFOs) (faa.gov)

https://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/MainFrame?OpenFrameSet

04/02/2021	AIR-21-03	Robinson R44 Helicopters - Electrical Power System - Ameri-King Radio Frequency Interference Direct Current Line Filter Smoke/Fire
08/02/2021	BEA-2021-01R1	Embraer S.A. EMB-500 aeroplanes - Hydraulic Powerpack Failures
11/02/2021	AIR-21-04	Embraer S.A. EMB-500 aeroplanes - Hydraulic Powerpack Failure

EASA

EASA Safety Publications Tool (europa.eu)

https://www.easa.europa.eu/community/topics/maintaining-safety-focus-during-covid-19-pandemic

04/02/2021	AIR-21-03	Robinson R44 Helicopters - Electrical Power System - Ameri-King Radio Frequency Interference Direct Current Line Filter Smoke/Fire
23/02/2021	2021-04	New Noga Light Ltd NL-93 Night Vision Goggles – Replacement

French DGAC

Infos sécurité

Issue Date	Reference	Révision	Subject
06/07/2012	2007 - 01	4	Erreurs de masse et de centrage
16/01/2007	2007 - 02	0	Réaction de l'équipage à un RA TCAS « Adjust Vertical Speed »
16/01/2007	2007 - 03	0	Gestion par les équipages des rebonds éventuels à l'atterrissage
05/12/2007	2007 - 04	2	Précautions d'utilisation d'un avion multi-réacteurs exploité avec un inverseur de poussée désactivé
26/01/2011	2008 - 01	2	Procédures pour limiter les risques liés au givrage
	2008 - 02		Respect de la limitation de vitesse à 250 kts sous le FL 100
05/01/2010	2010 - 01	1	Souffle des réacteurs
10/06/2011	2011 - 01	1	Conditions d'utilisation des inverseurs de poussée ou de pas d'hélices
30/06/2011	2011 - 02	1	Vent arrière au sol et sur les trajectoires d'approche finale
11/08/2011	2011 - 03	0	Système d'avertissement de cisaillement de vent explorant vers l'avant (predictive windshear)
11/05/2012	2012 - 01	1	Réduction des distances déclarées en piste 08L/26 R à LFPG suite à des travaux
10/06/2012	2012 - 02	1	Balisage lumineux de la partie finale de la piste
11/07/2012	2012 - 03	2	Situations d'altitude douteuse ou erronée
	2012 - 04		Prise en compte des passagers "hors normes" dans les calculs de masse et centrage
01/02/2013	2013 - 01	1	Allumage du rotating (feu à éclats rouge) au cours d'activités d'assistance en escale
12/03/2013	2013 - 02	1	Confusion en approche entre deux pistes ou entre une piste et un taxiway parallèle
22/03/2013	2013 - 03	1	Révision des niveaux minimaux de frottement
16/04/2013	2013 - 04	1	Suppléance du commandant de bord par un copilote de relève en croisière
	2013 - 05		Prévention et récupération des pertes de contrôle en vol
14/05/2013	2013 - 06	1	Rôle du PNF (Pilot Non-Flying) ou PM (Pilot Monitoring)
16/07/2013	2013 - 07	1	Messages en cas de bas niveau carburant

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

27/03/2014	2013 - 08	2	Les interceptions de glide par le haut
18/09/2013	2013 - 09	1	Vitesse en approche finale
28/01/2014	2014 - 01	1	Présence et aptitude de passagers assis au niveau des portes de type III et IV
23/10/2014	2014 - 02	1	Caractérisation de l'état de la piste en conditions météorologiques dégradées sur la base des reports pilotes (PIREP)
03/11/2014	2014 - 03	1	Feux de bord de piste d'aérodrome
23/12/2014	2014 - 04	1	Givrage des aéronefs au sol
21/04/2015	2015 - 01	1	Prise en compte des menaces locales
03/11/2015	2015 - 02	1	Expérimentation d'une séparation latérale réduite à 25NM sur les tracks Atlantique Nord
18/04/2016	2016 - 01	2	Emport des petits transporteurs personnels à batteries au lithium
12/05/2016	2016 - 02	1	Utilisation du radar météorologique et formations associées
08/07/2016	2016 - 03	1	Signaux manuels d'urgence normalisé SSLIA
03/11/2016	2016 - 04		Traitement de surface des chaussées aéronautiques par grenaillage
31/08/2017	2017 - 01	1	Gestion du souffle lors des évolutions d'un hélicoptère sur une plate-forme hospitalière
23/11/2017	2017 - 02	1	Déneigement des hélicoptères avant mise en route
21/12/2017	2017 - 03	1	RA-TCAS IFR VFR en basses couches
22/12/2017	2017 - 04	1	Entretien de la bande de piste
08/06/2018	2018 - 01	2	Compétences des équipages en approches de non précision (NPA)
12/03/2018	2018 - 02	1	Prévention et récupération des pertes de contrôle en vol
05/04/2018	2018 - 03	1	Limitation de vitesse à 250 kt sous 3050 m (10 000ft) AMSL
06/11/2018	2018 - 04	1	Extinction des veilleuses avant le contact avec le sol
31/07/2019	2019 - 01	1	Impact des groupes de passagers dont la masse diffère sensiblement des valeurs forfaitaires sur les calculs de masse et centrage
13/08/2019	2019 - 02	1	Ecrasement des PED en cabine
20/01/2020	2020 - 01	1	Threat and Error Management (TEM)
27/01/2020	2020 - 02	1	Coronavirus '2019-nCoV' Infections – Operational Recommendations
03/02/2020	2020 - 03	1	Data Link Exemptions and Flight Plans
28/10/2020	2020-4		Perte de qualité de signal GNSS par interférence ou brouillage de fréquence
29/10/2020	2020-5		Prévention des émanations ou des odeurs de fumées dans les cabines ou les postes de pilotage d'avions
08/02/2021	2021-01		Risques d'interférence du signal de la téléphonie 5G sur les radioaltimètres et systèmes embarqués utilisant la hauteur radioaltimétrique
13/02/2021	2021-02		Recommandation de port du casque de vol pour les pilotes aux commandes opérant sur des hélicoptères

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

Objectifs de sécurité

Issue Date
Objectif Sécurité N° 1 - thème : Erreur de chargement (PDF - 113.13 Ko)
Objectif Sécurité N° 2 - thème : Incursion sur piste depuis une bretelle intermédiaire (PDF - 235.19 Ko)
Objectif Sécurité N° 3 - thème : Risque aviaire au décollage (PDF - 139.63 Ko)
Objectif Sécurité N° 4 - thème : Givrage/dégivrage (PDF - 220.06 Ko)
Objectif Sécurité N° 5 - thème : Souffle des réacteurs (PDF - 202.47 Ko)
Objectif Sécurité N° 6 - thème : Approche non stabilisée (PDF - 916.97 Ko)
Objectif Sécurité N°7 - thème : Cisaillement de vent à l'arrondi (PDF - 288.14 Ko)
Objectif Sécurité N° 8 - thème : Transgression délibérée lors de travaux sur piste (PDF - 277.21 Ko)
Objectif Sécurité N° 9 - thème : Erreurs de maintenance (PDF - 335.89 Ko)
Objectif Sécurité N° 10 - thème : Le vent arrière au sol et en finale (PDF - 979.45 Ko)
Objectif Sécurité N° 11 - thème : Erreurs de la chaine altimétrique (PDF - 1.13 Mo)
Objectif Sécurité N° 12 - thème : Les dangers de la période hivernale (PDF - 985.75 Ko)
Objectif Sécurité N° 13 - thème : "Objectif : destination" (PDF - 1.41 Mo)
Objectif Sécurité N° 14 - thème : Les orages et leurs dangers (PDF - 1.45 Mo)
Objectif Sécurité N° 15 - thème : Assistance en escale : préparer au sol la sécurité du vol (PDF - 1.84 Mo)
Objectif Sécurité N° 16 - thème : Exploitation des hélicoptères et sécurité (PDF - 960.45 Ko)
Objectif Sécurité N° 17 - thème : Quand la pression se fait sentir (PDF - 1.53 Mo)
Objectif Sécurité N° 18 - thème : Remise de gaz et perte de contrôle (PDF - 1.91 Mo)
Objectif Sécurité N° 19 - thème : Les écarts routiniers (PDF - 3.74 Mo)
Objectif Sécurité N° 20 - thème : Gérer le changement (PDF - 3.49 Mo)
Objectif Sécurité N° 21 - thème : Les alarmes (PDF - 6.01 Mo)
Objectif Sécurité N° 22 - thème : Perte de vitesse non détectée (PDF - 743.31 Ko)
Objectif Sécurité N° 23 - thème : Givrage au sol, danger en vol (PDF - 1.31 Mo)
Objectif Sécurité N° 24 - thème : Vérifier, recouper = sécurité (PDF - 2.58 Mo)
Objectif Sécurité N°25 – thème : Du malentendu à l'accident (PDF - 3.08 Mo)
Objectif Sécurité N°26 - thème : En présence d'une figure d'autorité (PDF - 2.33 Mo)
Objectif Sécurité N°27 - thème : Question de confiance (PDF - 1.69 Mo)
Objectif Sécurité, le bulletin sécurité de la DSAC - N°28 - thème : Stop ou envol ? (PDF - 1011.94 Ko)
Objectif Sécurité, le bulletin sécurité de la DSAC - N°29 - thème :Entrainé vers le danger?

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

Conflict zone information bulletin

Conflict Zone Information Bulletin (CZIB's) | EASA (europa.eu)

NO CHANGES

Certification Up date

FAA do not need to be followed in this part? due to ECFR – See part Regulation or safety Bulletins for completion.

EASA

EASA.SAS.A.098 - Glasflugel 304B

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

Master MEL-OSD

MMEL

Document Title:	MMEL B737 MAX Rev 3, Boeing 737 MAX, B-737-8/-8200/-9
Summary:	Outlines the Master Minimum Equipment requirements and procedures for Boeing 737 MAX aircraft models 737-8, 737-8200, and 737-9. Provides lists/tables and resources for use by inspectors, pilots, technicians, and others in the field and public sector.
Documents for Download:	Draft Document (PDF) Draft Document Comment Grid (MS Word)
Reference:	**Title 14 of the Code of Federal Regulations (14 CFR)** • Part 91, General Operating and Flight Rules • Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations • Part 125, Certification and Operations: Airplanes Having A Seating Capacity of 20 or More Passengers or A Maximum Payload Capacity of 6,000 Pounds or More; and Rules Governing Persons On Board Such Aircraft • Part 129, Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged In Common Carriage • Part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft. MMEL Policy Letter PL-25, MMEL and MEL Definitions MMEL Policy Letter PL-34, MMEL and MEL Preamble MMEL Policy Letter PL-36, 14 CFR Part 91 MEL Approval and Preamble
Comments Due:	February 24, 2021

Document Title:	MMEL CE-525C Rev 2, Textron Aviation Model 525C, CJ4
Summary:	Outlines the Master Minimum Equipment List requirements and procedures for the Textron Aviation Model 525C (CJ4) aircraft. Provides lists/tables and resources for use by inspectors, pilots, technicians, and others in the field and public sector.
Documents for Download:	Draft Document (PDF) Draft Document Comment Grid (MS Word)
Reference:	**Title 14 of the Code of Federal Regulations (14 CFR)** • Part 91, General Operating and Flight Rules • Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations • Part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft. MMEL Policy Letter PL-25, MMEL and MEL Definitions MMEL Policy Letter PL-34, MMEL and MEL Preamble MMEL Policy Letter PL-36, 14 CFR Part 91 MEL Approval and Preamble

ocument Title:	MMEL A320 Rev 28a, Airbus, A318/A319/A320/A321
Summary:	Outlines the Master Minimum Equipment requirements and procedures for Airbus aircraft models A318, A319, A320, and A321. Provides lists/tables and resources for use by inspectors, pilots, technicians, and others in the field and public sector.
Documents for Download:	Draft Document (PDF) Draft Document Comment Grid (MS Word)
Reference:	***Title 14 of the Code of Federal Regulations (14 CFR)*** • Part 117, Flight and Duty Limitations and Rest Requirements: Flightcrew Members

ocument Title:	MMEL A320 Rev 28a, Airbus, A318/A319/A320/A321
	• Part 121, Operating Requirements: Domestic, Flag, and Supplemental Operations • Part 125, Certification and Operations: Airplanes Having A Seating Capacity of 20 or More Passengers or A Maximum Payload Capacity of 6,000 Pounds or More; and Rules Governing Persons On Board Such Aircraft • Part 129, Operations: Foreign Air Carriers and Foreign Operators of U.S.-Registered Aircraft Engaged In Common Carriage • Part 135, Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft. MMEL Policy Letter PL-25, MMEL and MEL Definitions MMEL Policy Letter PL-34, MMEL and MEL Preamble

OSD – FSBR

Operational Evaluation Guidance Material (OE GM) / Operational Evaluation Reports (OEB) / Operational Suitability Data (OSD) | EASA (europa.eu)

NP CHANGES

FAA Safety Briefing

NONE FOR FEB 2021

Publications

EASA Air Ops Risk Review for 2020

see attached

The aviation sector was massively disrupted in 2020, leading to a new safety landscape. EASA has produced its preliminary safety review for Air Ops in 2020. This should be considered in conjunction with the Review of Aviation Safety Issues Arising from the COVID-19 Pandemic. Prior to the crisis, the safety landscape was stable and known but we are now faced with a totally new situation where new risks have emerged. These risks include dealing with the rapid storage and de-storage of aircraft, management of wildlife hazards due to the reduced amount of aviation activity, and the degradation of skills and knowledge of aviation personnel caused by the reduction in operations. The rise of cyber-security and other security threats impacting safety has led the Agency to devote significant resources in these areas.

In June 2021, the SAFE 360 conference will enable the 360° industry-wide review of the most critical safety issues that are currently impeding recovery. An important objective for the Agency will be to further work on integrating safety, security and cyber-security risks to ensure a total system risk management approach. Such a consolidation of safety activities and intelligence capabilities will greatly enhance the European Aviation Community's reactiveness to aviation risks. There are also a wide range of safety actions planned in the European Plan for Aviation Safety (EPAS) that will further strengthen the aviation system as we return to normal operations

You are encouraged to download the report and join in the safety conversations on the Air Ops Community Site.

'There's A Place for You in Space'

Space — it's big, it's dark, and there's so much that we don't know about it yet. Every day, scientists are working to help us discover and uncover the wonders of space. In this episode, we'll hear from FAA experts what role the agency plays in commercial space transportation, from licensing to launch and reentry.

Listen to the episode on FAA.gov, Apple Podcasts, Stitcher, or Google Podcasts!

Since 1969, when we watched Neil Armstrong walk on the moon, a trip into space has been a dream for many.

Now, with the recent progress in commercial space transportation, that dream may come true — sooner than you'd think. The FAA works with businesses and government to make commercial space flight a reality. That's right. We're talking about space tourism, trips with human spaceflight participants — paying passengers, not trained astronauts.

Implementation Workshop on the Global Reporting Format for Runway Surface Conditions

The new ICAO methodology for assessing and reporting runway surface conditions, commonly known as the Global Reporting Format (GRF), enables the harmonized assessment and reporting of runway surface conditions and a correspondingly improved flight crew assessment of take-off and landing performance.

The GRF is described through amendment 13-B to Annex 14 - Aerodromes, Volume I - Aerodrome Design and Operations; Annex 3 - Meteorological Service for International Air Navigation; Annex 6 - Operation of Aircraft, Part I - International Commercial Air Transport - Aeroplanes and Part II - International General Aviation - Aeroplanes; Annex 8 - Airworthiness of Aircraft; Annex 15 - Aeronautical Information Services and Procedures for Air Navigation Services (PANS) - Aerodromes (PANS-Aerodromes, Doc 9981), Aeronautical Information Management (PANS-AIM, Doc 10066) and Air Traffic Management (PANS-ATM, Doc 4444).

EU has already adopted Regulations (EU) 2019/1387, (EU) 2020/469 and (EU) 2020/2148 which establish the requirements for the implementation of the GRF in EU.

The GRF related requirements will apply in EU as of August 12, 2021.

The objective of the workshop is to raise awareness and support the deployment of the GRF in EU and to familiarize National Aviation Authorities and Industry (Aerodrome Operators, Air Operators, Aeroplane Manufacturers, Air Traffic Services Providers, Aeronautical Information Service Providers and General Aviation) with the EU regulatory requirements.

EASA will organize a workshop on March 10, 2021 dedicated to the industry and a second one on March 17, 2021 dedicated to the National Aviation Authorities.

EASA launches information sessions to support implementation phase of ageing aircraft structure rule

The European Union Aviation Safety Agency (EASA) launched information sessions to support the implementation phase of the ageing aircraft structure rule, which was published on August 06, 2020 by the European Commission, refer to Regulation (EU) 2020/1159.

This Regulation amends the additional airworthiness specifications contained within Commission Regulation (EU) 2015/640 (Part 26) with respect to three topics that EASA proposed through opinions 12/2016 for ageing aircraft structures and 04/2019 for reduction of runway excursion and conversion of class D cargo compartments.

The 'ageing aircraft' rule addresses safety risks related to ageing phenomena in the structures of large aeroplanes. These risks include fatigue of the basic type design, widespread fatigue damage (WFD), corrosion, fatigue of changes and repairs, and continued operation with unsafe levels of fatigue cracking. Design approval holders are required to develop data to support continuing structural integrity programmes for specific categories of large aeroplanes. At the same time, operators of those aeroplanes need to revise their aircraft maintenance programmes to incorporate those data and to address the adverse effects of changes and repairs on each airframe and its associated maintenance requirements.

The Air Transport Monthly Monitor for January 2021

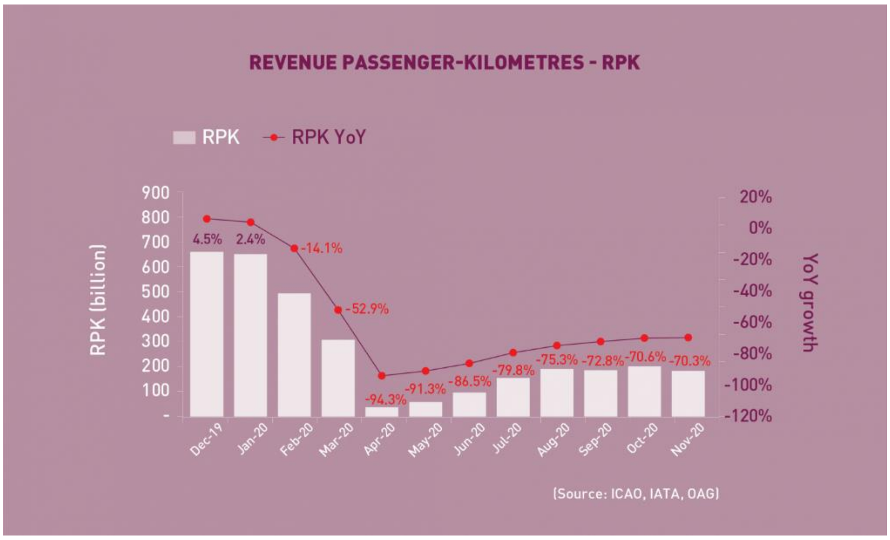
The air transport industry is not only a vital engine of global socio-economic growth, but it is also of vital importance as a catalyst for economic development. Not only does the industry create direct and indirect employment and support tourism and local businesses, but it also stimulates foreign investment and international trade.

Informed decision-making is the foundation upon which successful businesses are built. In a fast-growing industry like aviation, planners and investors require the most comprehensive, up-to-date, and reliable data. ICAO's aviation data/statistics programme provides accurate, reliable and consistent aviation data so that States, international organizations, aviation industry, tourism and other stakeholders can:

- make better projections;
- control costs and risks;
- improve business valuations; and
- benchmark performance.

The UN recognized ICAO as the central agency responsible for the collection, analysis, publication, standardization, improvement and dissemination of statistics pertaining to civil aviation. Because of its status as a UN specialized agency, ICAO remains independent from outside influences and is committed to consistently offering comprehensive and objective data. Every month ICAO produces this Air Transport Monitor, a monthly snapshot and analysis of the economic and aviation indicators.

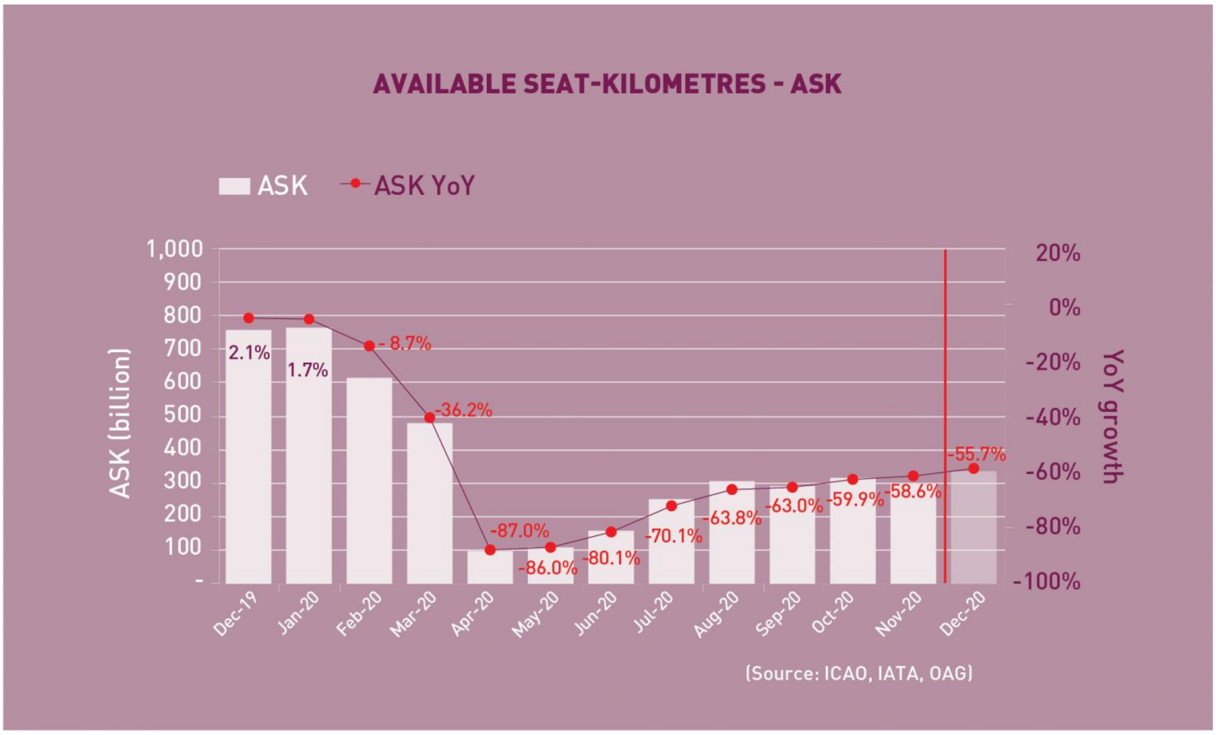
The numbers that are shared in the article below reflect the situation as it was in November 2020. The analysis of the economic and aviation indicators we share here reflect the continuing impact of COVID-19 on this industry.



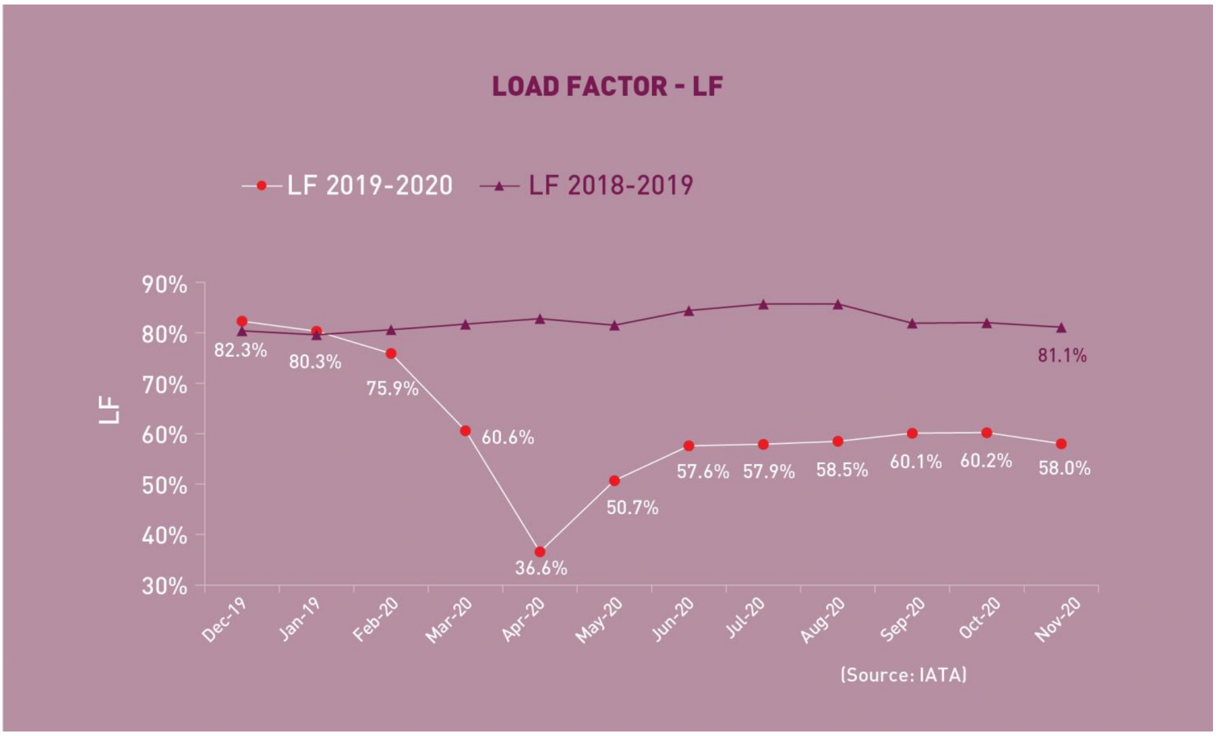
World passenger traffic fell by -70.3% YoY in November 2020, +0.3 percentage point up from the decline in the previous month. Air travel recovery was hampered by the resurgence in outbreaks and the resulting reimposition of restrictions. The impact on regions was a mix. Whereas Europe recorded a deterioration in traffic, other regions ticked up somewhat with Latin America/Caribbean showing the fastest improvements. Domestic travel recovery in China continued to be the best performing market albeit with a slight slowdown.

International passenger traffic fell by -88.3% YoY in November 2020, -0.5 percentage point down from the decline in the previous month. Recovery in international travel further weakened mainly due to the larger fall in Intra-Europe traffic.

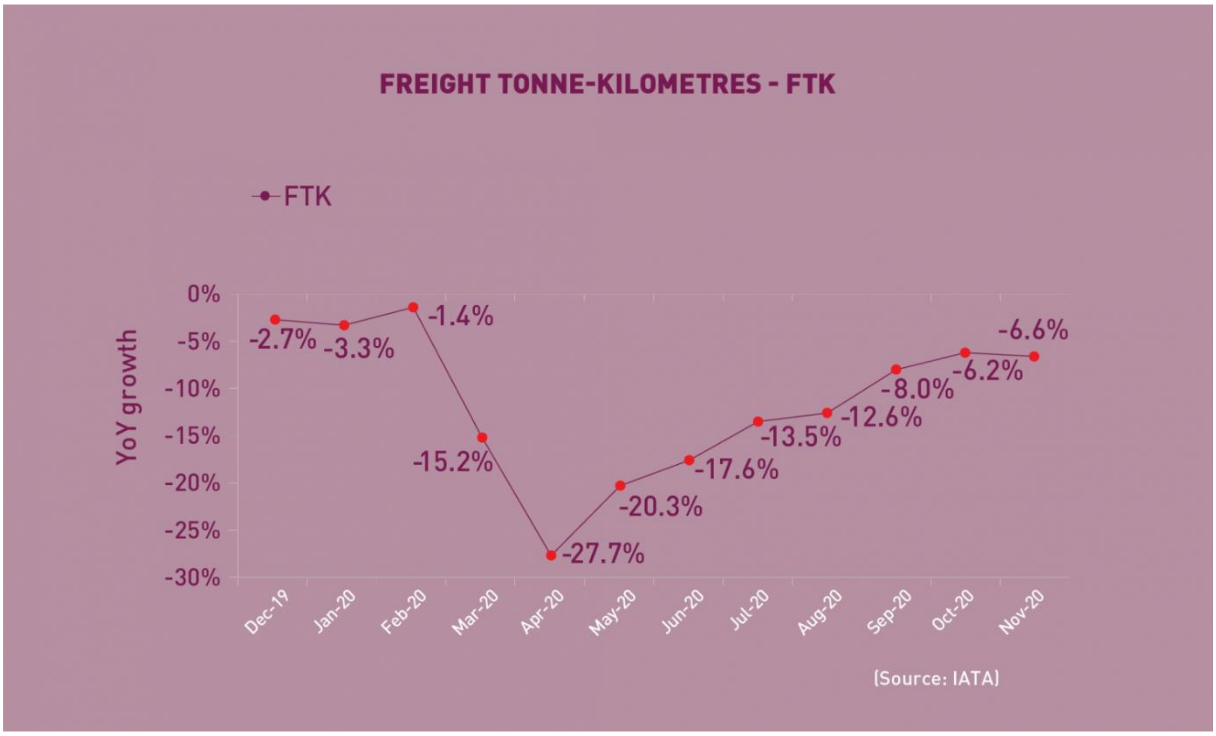
The international tourist arrivals also remained stagnant and followed a similar trend as international passenger traffic.



Capacity worldwide fell by -58.6% YoY in November 2020, +1.3 percentage points up from the decline in the previous month (-59.9%). Approaching the end-of-year travel period, airlines are expected to add more capacity. As a result, capacity contraction in December would ease to -55.7% YoY.



The passenger Load Factor reached 58.0% in November 2020, -2.2 percentage points lower than the previous month. As the decline in air travel demand was deeper than the capacity cut, the November LF was -23.1 percentage points lower than the rate in the same period of 2019.



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World freight traffic reported a decline of -6.6% YoY in November 2020, -0.4 percentage point down from the fall in the previous month. Air cargo recovery softened slightly as the virus resurgence had affected demand in certain markets. On the other hand, demand in air cargo in November also benefitted from the peak e-commerce events such as Black Friday and Double 11. Overall, recovery in air cargo stalled since the improvements in Asia/Pacific were offset by the setbacks in other regions, particularly in Latin America/Caribbean and Europe. Nevertheless, expectations for December remain optimistic as the economic recovery will likely continue and the consumer consumption during the holiday shopping season will also be supportive.

Top 15 airlines

n terms of RPK, the Top 15 airline groups accounted for 58.4% of the world's total RPK in November 2020 and declined by –63.0% YoY. This decline was 7.3 percentage points smaller than the fall in world's average RPK, with all airlines in the Top 15 posting contractions.

Top 15 ranking fluctuated in the month of November due to the uneven impact of the renewed outbreaks on air travel recovery across regions.

China Southern, Air China, and China Eastern retained the Top 3 positions and demonstrated the most resilience within the Top 15, albeit with slight moderation. Hainan Airlines climbed up one position to 8th while maintaining a similar level of traffic as the previous month.

Four US airlines, American, United, Delta and Southwest, occupied the places of 4th to 7th, with YoY traffic decline ranging from -58 to -67% – slight improvements from October owing to the increased travel during Thanksgiving holidays. Southwest ranked one position up to 7th, improving faster than the other three US airlines.

Airlines in Europe saw further deterioration in traffic recovery, impacted by the surge in COVID-19 cases and the associated more strict measures. Five airlines in the region ranked between 9th and 13th. AF-KLM dropped two positions to 9th, whereas the others stayed relatively stable.

For the first time since April 2020, Emirates and LATAM reappeared in the Top 15, and ranked at 14th and 15th, respectively.

TOP 15 AIRLINE GROUPS (RANKED BY RPK)

Airline group	RPK (billion)	YoY	% Share of World Total	Cumulative % Share
China Southern	16.2	↓ -29.3%	8.8%	8.8%
Air China	11.5	↓ -38.5%	6.2%	15.0%
China Eastern	10.5	↓ -42.0%	5.7%	20.7%
American	10.2	↓ -60.3%	5.5%	26.2%
United	9.6	↓ -62.9%	5.2%	31.4%
Delta	9.2	↓ -66.8%	5.0%	36.4%
Southwest	7.1	↓ -58.1%	3.9%	40.2%
Hainan Airlines	6.5	↓ -47.8%	3.5%	43.7%
AF-KLM	5.8	↓ -74.1%	3.2%	46.9%
Aeroflot	4.1	↓ -64.0%	2.2%	49.1%
IAG	4.1	↓ -81.2%	2.2%	51.4%
Turkish Airlines	3.7	↓ -69.9%	2.0%	53.4%
Lufthansa Group	3.2	↓ -85.3%	1.7%	55.1%
Emirates	3.1	↓ -86.6%	1.7%	56.8%
LATAM Airlines Group	3.1	↓ -70.6%	1.7%	58.4%
Top 15 Total RPKs	**108 billion**	**↓ -63.0%**	**58.4%**	
World Total RPKs	**185 billion**	**↓ -70.3%**	**100%**	

(Source: ICAO, airline's webistes)

Note: Total scheduled and non-scheduled services

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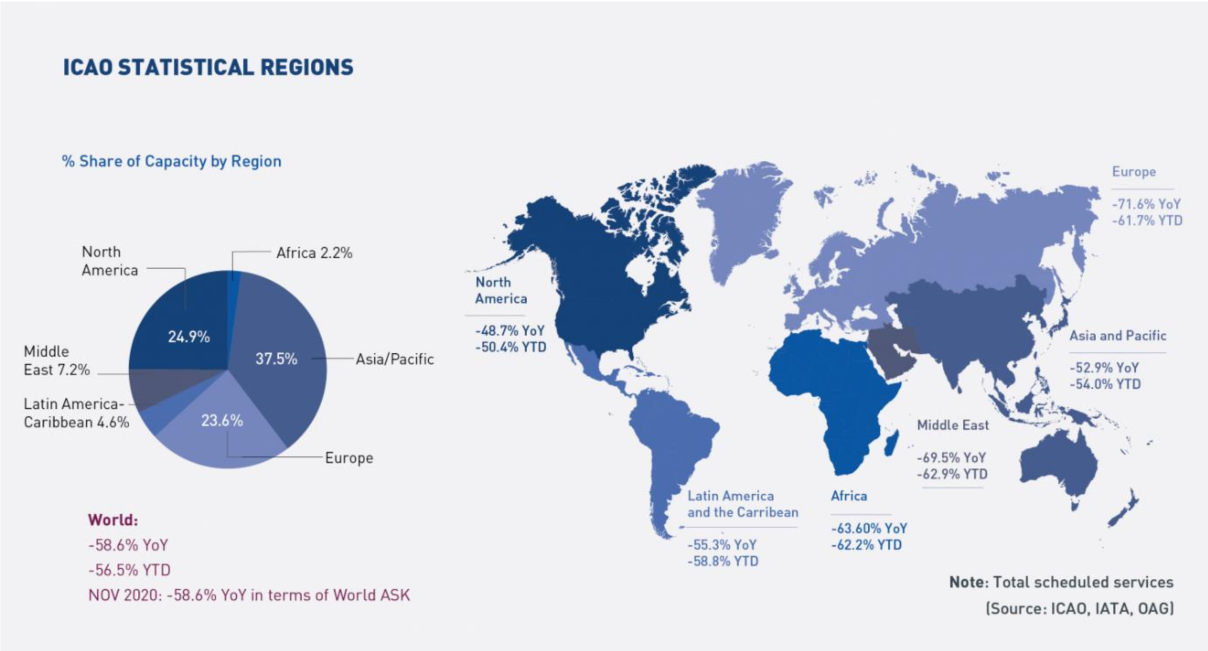
Economic Impacts of COVID-19 on Civil Aviation



In light of the rapidly spreading disease named as COVID-19, the International Civil Aviation Organization (ICAO) actively monitors its economic impacts on civil aviation and regularly publishes updated reports and adjusted forecasts. The latest version can be viewed here and all full reports are available further below.

LATEST REPORT ON THE ECONOMIC IMPACTS OF COVID-19 ON CIVIL AVIATION

ICAO has also worked alongside the DGCA of Turkey to develop interactive dashboards to monitor four key aspects of the impact of COVID-19 on civil aviation - operational impacts, economic impacts, aircraft utilizations and impacts on country-pair traffic.

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COVID-19 AIR TRAFFIC DASHBOARD

Analysis of Economic Impacts of COVID-19

When assessing the economic impacts on civil aviation, ICAO works with many different scenarios in order to reflect the very uncertain nature of the current situation and the rapidly changing environment. The actual path will eventually depend upon various factors, inter alia, duration and magnitude of the outbreak and containment measures, availability of government assistance, consumers' confidence and economic conditions.

1. Baseline : hypothetical situation without COVID-19 outbreak with forecasts as originally planned;
2. Indicative Scenario 1 - "V-Shaped" : follows the normal shape for recession where a brief period of contraction is followed by quick/smooth recovery - most optimistic path indicated with a ;
3. Indicative Scenario 2 - "U-Shaped" : indicates prolonged contraction and muted recovery with a possibility of no return to trend line of growth (L-shaped) - most pessimistic path indicated with a ;

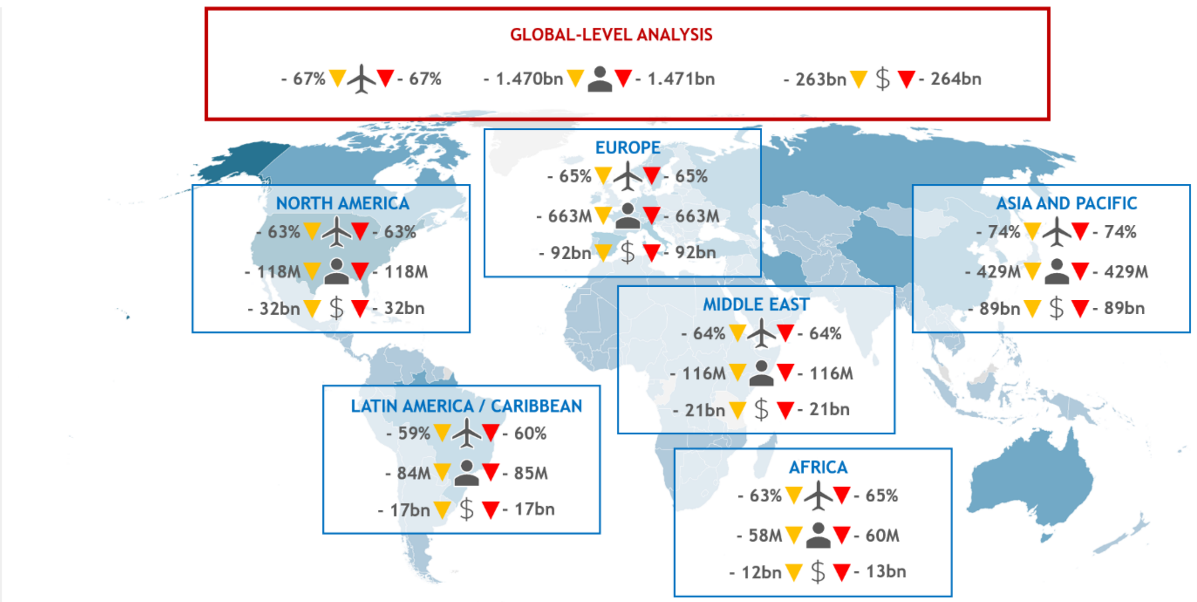
The analytical focus revolves around two scenarios, which shall not be considered as forecasts of what is likely to happen, but merely indicators of possible paths or consequential outcomes out of many. Each scenario considers 4 different paths to take into account differentiated terms of supply (output) and demand (spending).

The analytical timeframe has now been extended to Mar 2021 and therefore covers the full year of 2020 and Q1 2021.

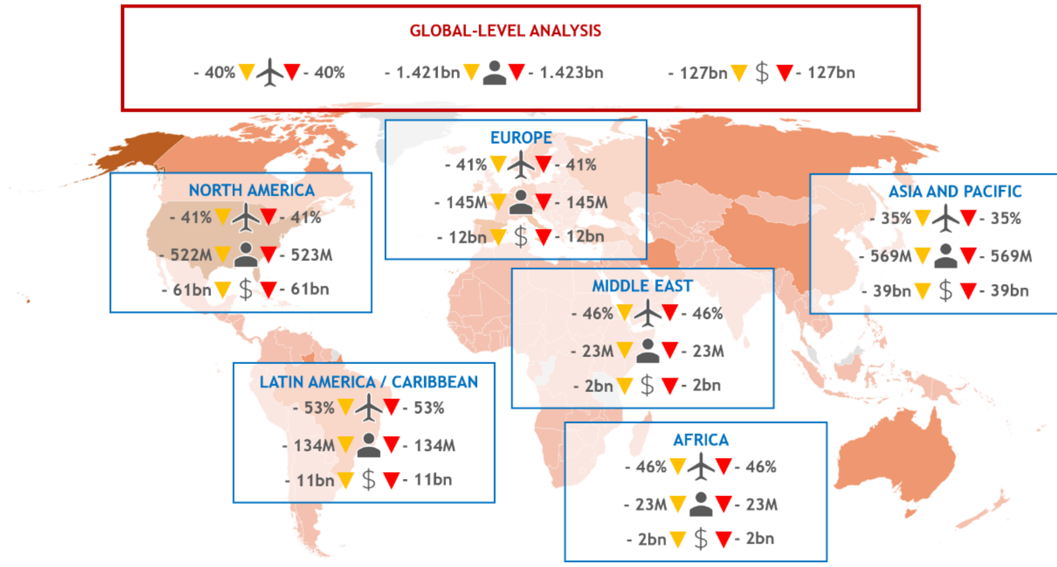
ICAO is working alongside the Airport Council International (ACI) in monitoring the developments and to leverage their expertise and analysis conducted on the economic impacts of COVID-19 on airports.

Global Estimates of Impacts in briefICAO_SR_2020_final_web

Global-level Analysis of Impacts on International Traffic



Global-level Analysis of Impacts on Domestic Traffic



Impacts of COVID-19 across industries

The COVID-19 virus has spread worldwide without acknowledging borders. It has impacted all industries, all sectors and all aspects of our lives with devastating economic and financial losses and significant uncertainties.

Within the spirit of collaboration, the below chart gathers information from international organizations representing the impacted industries. This information is subject to frequent change and you are invited to visit the official website of each organization for most up-to-date figures.

Figures are sourced from the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), the Airports Council International (ACI), the UN World Tourism Organization (UNWTO), the World Trade Organization (WTO) and the International Monetary Fund (IMF). All figures are in comparison to 2019 data, except for figures marked with an asterix (*) which are compared to 2020 baseline.

ICAO Reports on the Effects of COVID-19 on Civil Aviation

[Economic Impacts of COVID-19 on Civil Aviation (icao.int)]

Economic Context for Civil Aviation

Aviation provides the only rapid worldwide transportation network, which makes it essential for global business. It generates economic growth, creates jobs, and facilitates international trade and tourism.

See attached

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

How can we build back better European aviation after COVID-19?

I would like to invite you to a live EUROCONTROL Aviation StraightTalk on Tuesday 23 February, 15:00-15:45 CET, with one of European aviation's top business leaders: Ben Smith, CEO Air France-KLM.

Ben is an industry veteran with a truly global perspective, taking the reins at Air France-KLM in 2018 after highly successful stints managing Air Canada and two of its subsidiary brands, Air Canada Rouge and Tango.

He now heads a group notable for its strong cross-market segment strategy. Europe's fourth largest aviation group pre-pandemic, and first in terms of international traffic departing from Europe, Air France-KLM comprises not only two iconic brands deeply rooted in the identity and the economy of France and the Netherlands, but also a regional subsidiary (Air France HOP), a low-cost carrier (Transavia) and cargo operations (Martinair). In 2019, the Group carried 104 million passengers and flew 2,053 flights daily – before COVID hit, forcing the group's airlines to slash operations by 55% in 2020, operating just 920 flights a day.

Now, after almost a year in the shadow of COVID, this exclusive interview with Ben promises a chance to look to the future and see how European aviation can build back better as the pandemic comes under control and traffic recovers once again.

Ben's views on how 2021 will develop will provide key insights for everyone in aviation. The pandemic has had a huge impact on 'hub and spoke' carriers reliant on their international networks, with both Air France and KLM receiving state aid packages to ease liquidity issues. With him, we'll be exploring how he sees market segments evolving, the importance of joint ventures and alliances, how the group can increase its competitive advantage in the highly competitive long-haul segment, the expected impact of vaccination rollouts, and how aviation can recover from the crisis to offer a better, safer, seamless and environmentally sustainable experience for passengers.

This will be our 19th Aviation StraightTalk and our 10th to livestream, in what has become a must-watch business briefing for everyone working in aviation.

I will provide a very quick market update at the start of this webinar, with Andrew Charlton, journalist and Aviation Advocacy Managing Director, conducting the interview.

Eamonn Brennan

Director General EUROCONTROL

Sites de surveillance

https://flightsafety.org/toolkits-resources/

https://aviation-safety.net

http://www.skybrary.aero

https://asrs.arc.nasa.gov/

Bulletin Officiel des Ministères de la Transition écologique et solidaire et de la Cohésion des territoires et des Relations avec les collectivités territoriales (developpement-durable.gouv.fr)

SIA - La référence en information aéronautique - Page d'accueil (aviation-civile.gouv.fr)

Info sécurité DGAC | Ministère de la Transition écologique (ecologie.gouv.fr)

http://www.developpement-durable.gouv.fr/Objectif-Securite-lebulletin.html

http://www.bea.aero/

http://ad.easa.europa.eu/sib-docs/page-1

https://www.easa.europa.eu/eccsa

http://www.jigonline.com/all-bulletins/

Accueil (defense.gouv.fr)

ECCSA - Technology Watch | EASA (europa.eu)

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15, le souguehain – Sénécourt – 60140 BAILLEVAL - tél : +33 (0)6 13 66 05 99 - mail : *philippe.julienne.aeroprojet@live.fr*

ICAO

SAFETY

Safety Report

2020 Edition

A Coordinated, Risk-based Approach to Improving Global Aviation Safety

The air transport industry plays a major role in global economic activity and development. One of the key elements to maintaining the vitality of civil aviation is to ensure safe, secure, efficient and environmentally sustainable operations at the global, regional and national levels.

A specialized agency of the United Nations, the International Civil Aviation Organization (ICAO) was established in 1944 to promote the safe and orderly development of international civil aviation throughout the world.

ICAO promulgates Standards and Recommended Practices (SARPs) to facilitate harmonized regulations in aviation safety, security, efficiency and environmental protection on a global basis. Today, ICAO manages over 12 000 SARPs across the 19 Annexes and five Procedures for Air Navigation Services (PANS) to the Convention on International Civil Aviation (Chicago Convention), many of which are constantly evolving in tandem with latest developments and innovations. ICAO serves as the primary forum for co-operation in all fields of civil aviation among its 193 Member States.

Improving the safety of the global air transport system is ICAO's guiding and most fundamental strategic objective. The Organization works constantly to address and enhance global aviation safety through the following coordinated activities:

- Policy and Standardization;
- Monitoring of key safety trends and indicators;
- Safety Analysis; and
- Implementing programmes to address safety issues.

The ICAO Global Aviation Safety Plan (GASP) presents the strategy in support of the prioritization and continuous improvement of aviation safety. The GASP sets the goals and targets and outlines key safety enhancement initiatives (SEIs) aimed at improving safety at the international, regional and national levels.

This edition of the Safety Report is structured in alignment with the 2020–2022 edition of GASP and the new edition of the Global Air Navigation Plan (GANP), which provides global strategic guidelines to drive the evolution of the air navigation system. This report provides a summary of initiatives to improve aviation safety and provides updates on some safety performance indicators (SPIs), including accidents that occurred in 2019, and related risk factors. Results of analysis from the 2015–2019 reports are used as benchmarks for comparison, although it must be noted that numbers presented in this report may not exactly match earlier editions due to data updates during the intervening period.

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International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Quebec, Canada
H3C 5H7

www.icao.int

DISCLAIMER

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Note: The ICAO regional aviation safety group (RASG) regions are used in the report and are listed in Appendix 1. This document focuses primarily on scheduled commercial flights. The scheduled commercial flights data was based on the Official Airline Guide (OAG) combined with internal ICAO preliminary estimates.

Contents

Executive Summary

Yearly accident statistics indicate an increase in both the total number of accidents as well as the global accident rate in 2019. From 2018 to 2019, there was a 16 per cent increase in the total number of accidents, as reported by States. The global accident rate of 2.9 accidents per million departures also increased by 12 per cent from the 2018 rate of 2.6 accidents per million departures. The accidents used for these statistics were reviewed and validated by the ICAO Safety Indicators Study Group (SISG), and involved scheduled commercial operations of aircraft with a certified maximum take-off weight (MTOW) of over 5 700 kg as defined in ICAO Annex 13 — *Aircraft Accident and Incident Investigation*.

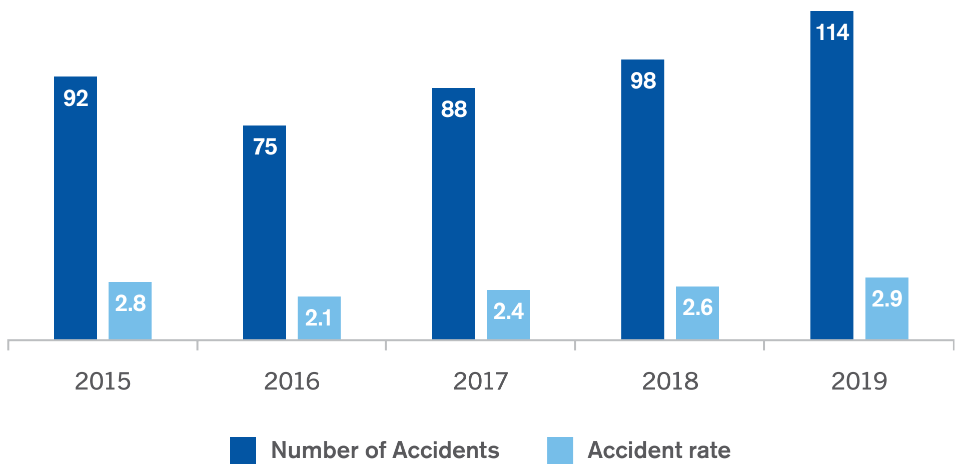


Chart 1. | Accident records: 2015–2019 scheduled commercial operations

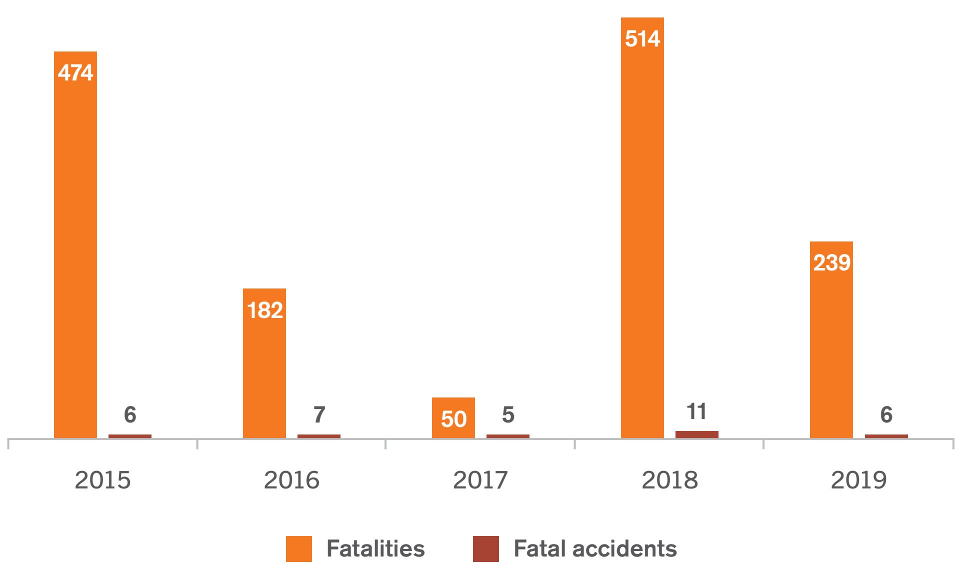


Chart 2. | Fatal accident records: 2015–2019 scheduled commercial operations

In 2019, scheduled commercial air transport accidents resulted in 239 fatalities representing a significant decrease from 514 in 2018. The number of fatal accidents also decreased from 11 in 2018 to six in 2019. Figure 1 shows the number of fatal accidents by ICAO RASG region.

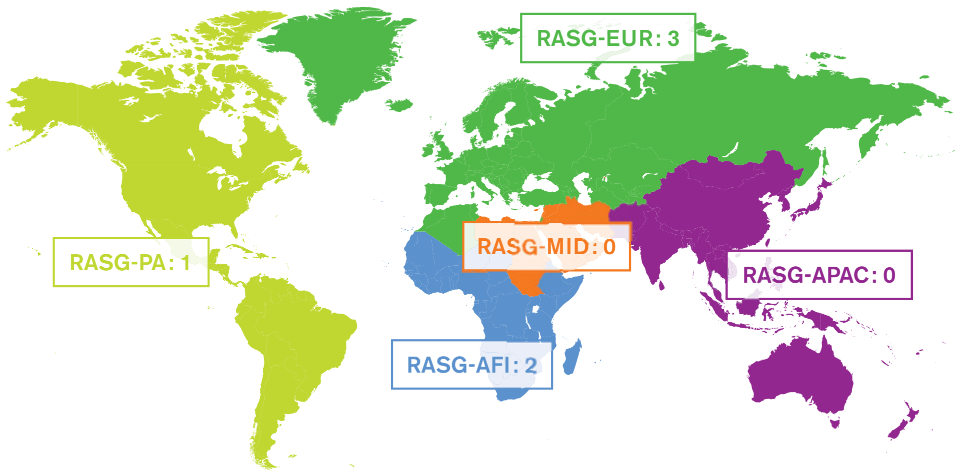


Figure 1. | Number of fatal accidents by RASG region

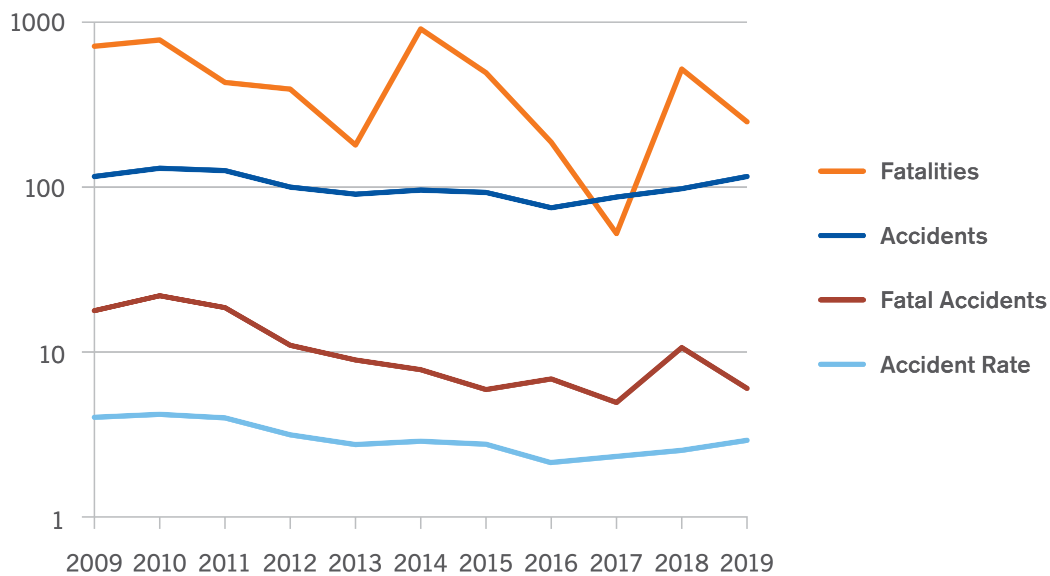


Chart 3. | Historical safety trends for scheduled commercial operations

The 40th Session of the ICAO Assembly was convened in Montréal from 24 September to 4 October 2019, during which it agreed on resolution A40-1: ICAO global planning for safety and air navigation, endorsing the 2020–2022 edition of *Global Aviation Safety Plan* (GASP, Doc 10004). The Assembly also agreed to the following safety-related resolutions:

- A40-2: Protection of accident and incident investigation records;
- A40-3: Protection of safety data and safety information collected for maintaining or improving safety and of flight recorder recordings in normal operations;
- A40-5: Regional implementation support mechanisms; and
- A40-6: Regional cooperation and assistance to resolve safety deficiencies, establishing priorities and setting measurable targets.

The third High-level Safety Conference (HLSC 2021), which has been tentatively scheduled a year ahead of the 41st Session of the ICAO Assembly, will provide a forum for technical discussions to formulate a set of high-level recommendations and decisions on main safety issues as well as selected air navigation matters. These recommendations will be taken into consideration for the preparation of the Business Plan and Budget to be presented to the 41st Assembly.

The 2020–2022 edition of the GASP presents a series of goals, targets and indicators to support its vision, which is to achieve and maintain the aspirational safety goal of zero fatalities in commercial operations by 2030 and beyond, and its mission, which is to continue to enhance aviation safety performance internationally by providing a collaborative framework for States, regions and industry.

The purpose of the GASP is to continuously reduce fatalities and the risk of fatalities. To do so, it presents five high-risk categories of occurrence (HRCs) all States need to address, namely: controlled flight into terrain (CFIT), loss of control in-flight (LOC-I), runway excursion (RE), runway incursion (RI) and mid-air collision (MAC). Through the GASP, ICAO provides safety enhancement initiatives (SEIs) to continuously reduce operational safety risks and implement regional and industry safety risk management activities to address the HRCs.

ICAO is committed to improving aviation safety and fostering cooperation and communication among stakeholders. ICAO works closely with established regional entities, such as regional aviation safety groups (RASGs), regional safety oversight organizations (RSOOs), cooperative development of operational safety and continuing airworthiness programmes (COSCAPs) and regional accident and incident investigation organizations (RAIOs), to identify hazards and mitigate regional operational safety risks.

The ICAO Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA) determines States' capabilities for safety oversight by assessing and monitoring the effective implementation (EI) of the critical elements (CEs) of a safety oversight system. The global average EI increased from 67.43 per cent in 2018 to 68.83 percent in 2019, with 46 per cent of States having achieved the 2022 target of 75 per cent EI, as established in the 2020–2022 edition of the GASP. In 2019, ten ICAO Member States had a total of six Significant Safety Concerns (SSCs) in the areas of Personnel Licensing, Aircraft Operations and Air Navigation Services. As of December 2019, three State safety programme implementation assessments (SSPIAs) were conducted for three States.

Toward the end of 2019, the coronavirus disease (COVID-19) pandemic began gaining momentum and created a situation that would be very disruptive for the aviation industry. ICAO responded with the timely development of guidance material, practical checklists and tools to support States in the implementation of contingency arrangements to reduce the risks of the spread of COVID-19 and to restart the aviation system from the crisis.

In response to existing and emerging trends, ICAO is working in partnership with the international aviation community to achieve future safety improvements, with an emphasis on improving safety performance through standardization, monitoring and implementation. The 2020 edition of the Safety Report, as usual, provides a high-level summary of ICAO's achievements to enhance aviation safety in 2019 and updates key safety performance indicators with reference to the 2015–2019 time period. In addition, it includes some initiatives to support States for managing safety risks during the COVID-19 pandemic.

2020–2022 edition of the ICAO Global Aviation Safety Plan (GASP)

The *Global Aviation Safety Plan* (GASP, Doc 10004) sets forth ICAO's safety strategy, which supports the prioritization and continuous improvement of aviation safety. Its purpose is to continuously reduce fatalities, and the risk of fatalities, by guiding the development of a harmonized safety strategy and the implementation of regional and national aviation safety plans.

GASP Goals and Targets

Aspirational Safety Goal

The GASP's aspirational safety goal is to achieve and maintain zero fatalities in commercial operations by 2030 and beyond. This goal is deemed "aspirational" as it represents an ambition of achieving an even safer aviation system. The year 2030 has been selected as the period for reaching this goal as the traffic volume is forecasted to double by then. It is also the target year for the United Nations (UN) *2030 Agenda for Sustainable Development* and the GASP has been aligned with the timelines of this Agenda.

GASP Goals

A series of goals support the aspirational safety goal. These goals also contribute to the achievement of several UN Sustainable Development Goals (SDGs). The 2020–2022 edition of the GASP contains six goals as shown in Figure 2.

Figure 2. | GASP goals

GASP Targets

Each GASP goal contains one or more targets with specific desired outcomes from actions taken by States, regions and industry to achieve the goal within a set timeframe, as shown in Figure 3.

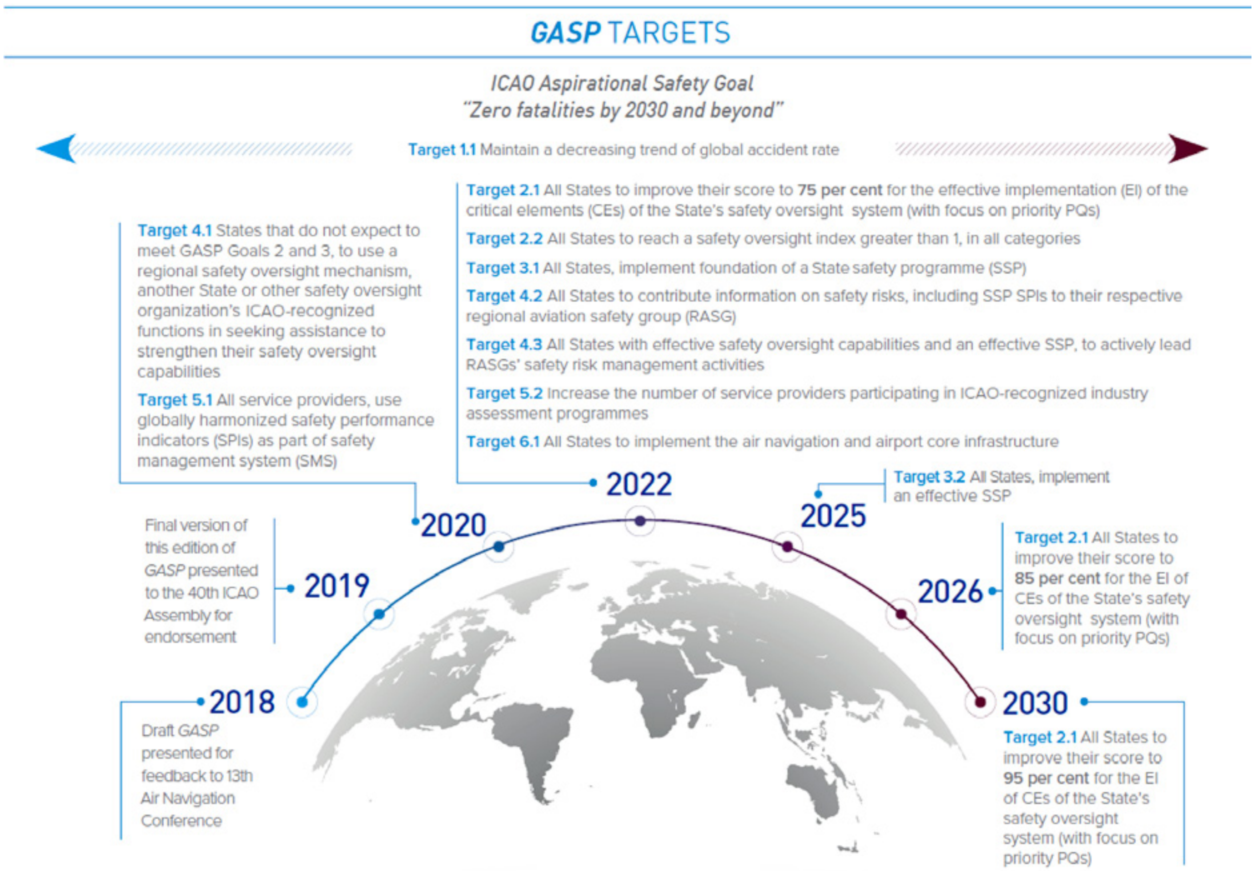


Figure 3. | GASP targets

High-risk Categories of Occurrence (HRCs)

The high-risk categories of occurrence (HRCs) need to be addressed to mitigate the risk of fatalities. The types of occurrences deemed global HRCs (previously referred to as "global safety priorities") were selected based on actual fatalities, high fatality risk per accident, or the number of accidents and incidents.

The following HRCs, in no particular order, have been identified for the 2020–2022 edition of the GASP:

- Controlled flight into terrain (CFIT)
- Loss of control in-flight (LOC-I)
- Mid-air collision (MAC)
- Runway excursion (RE)
- Runway incursion (RI)

Global Aviation Safety Roadmap

The GASP also includes the global aviation safety roadmap, which serves as an action plan that addresses organizational challenges (ORG roadmap) and operational safety risks (OPS roadmap) to assist the aviation community in achieving its goals through a structured, common frame of reference for all relevant stakeholders. The ORG roadmap, as shown in Figure 4, is made up of two components, which focuses on the State safety oversight system and the State safety programme (SSP). The OPS roadmap focuses on the continuous reduction of operational safety risks, and regional and industry safety risk management activities to address the HRCs.

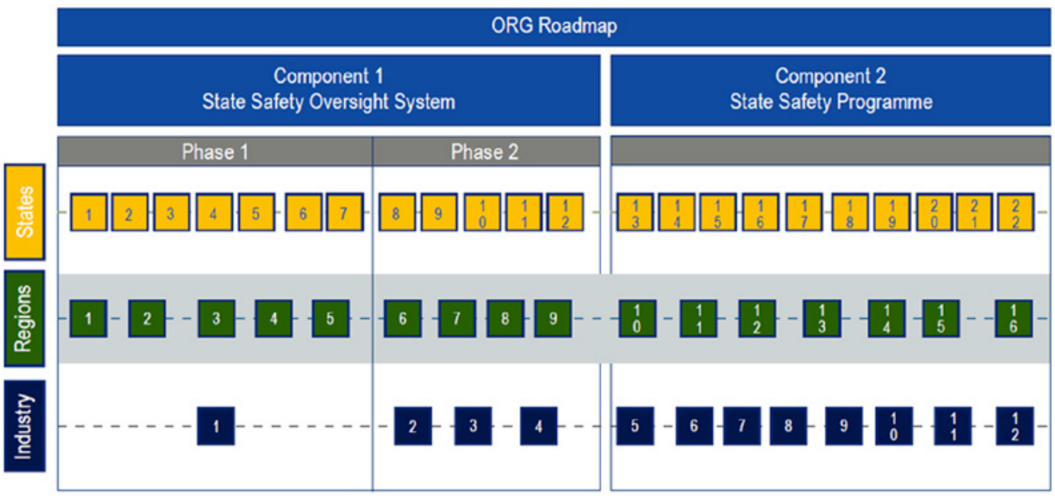


Figure 4. | **GASP ORG roadmap**

More information on the GASP is available at www.icao.int/gasp.

Effective Implementation of State Safety Oversight System

Each ICAO Member State should establish and implement an effective safety oversight system, in order to address all areas of aviation activities. The Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA) measures the effective implementation (EI) of a State's safety oversight system.

To standardize the conduct of audits under USOAP CMA, ICAO established protocol questions (PQs) based on safety-related ICAO Standards and Recommended Practices (SARPs) established in the Annexes to the Chicago Convention, Procedures for Air Navigation Services (PANS) and ICAO guidance material. Each PQ contributes to assessing the EI of one of the eight critical elements (CEs) in one of the eight audit areas. The eight CEs are:

- primary aviation legislation (CE-1);
- specific operation regulations (CE-2);
- State system and functions (CE-3);
- qualified technical personnel (CE-4);
- technical guidance, tools, provisions of safety-critical information (CE-5);
- licensing, certification, authorization and/or approval obligations (CE-6);
- surveillance obligations (CE-7); and
- resolution of safety issues (CE-8).

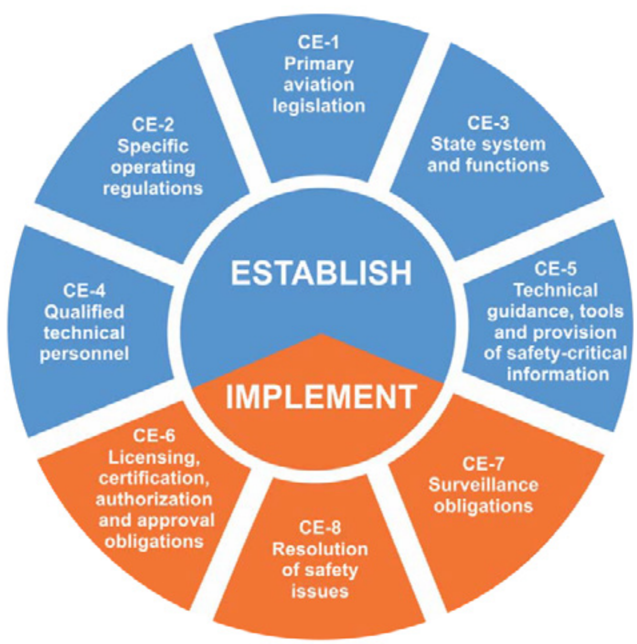


Figure 5. | Critical elements of a State's safety oversight system

The eight audit areas identified in the USOAP are:

1) primary aviation legislation and civil aviation regulations (LEG);
2) civil aviation organization (ORG);
3) personnel licensing and training (PEL);
4) aircraft operations (OPS);
5) airworthiness of aircraft (AIR);
6) aircraft accident and incident investigation (AIG);
7) air navigation services (ANS); and
8) aerodromes and ground aids (AGA).

The use of standardized PQs ensures transparency, quality, consistency, reliability and fairness in the conduct and implementation of USOAP CMA activities.

Figure 6 shows that as of 15 March 2020, the average EI for audited States was 68.83 per cent. It was 67.43 per cent for the same period in 2019. 46 per cent of the States have an EI of above 75 per cent – all States are expected to achieve this (Target 2.1) by 2022. Figure 7 shows a map of all the ICAO Member States having an overall EI above the target. Six of ICAO's 193 Member States had not yet received a USOAP audit.

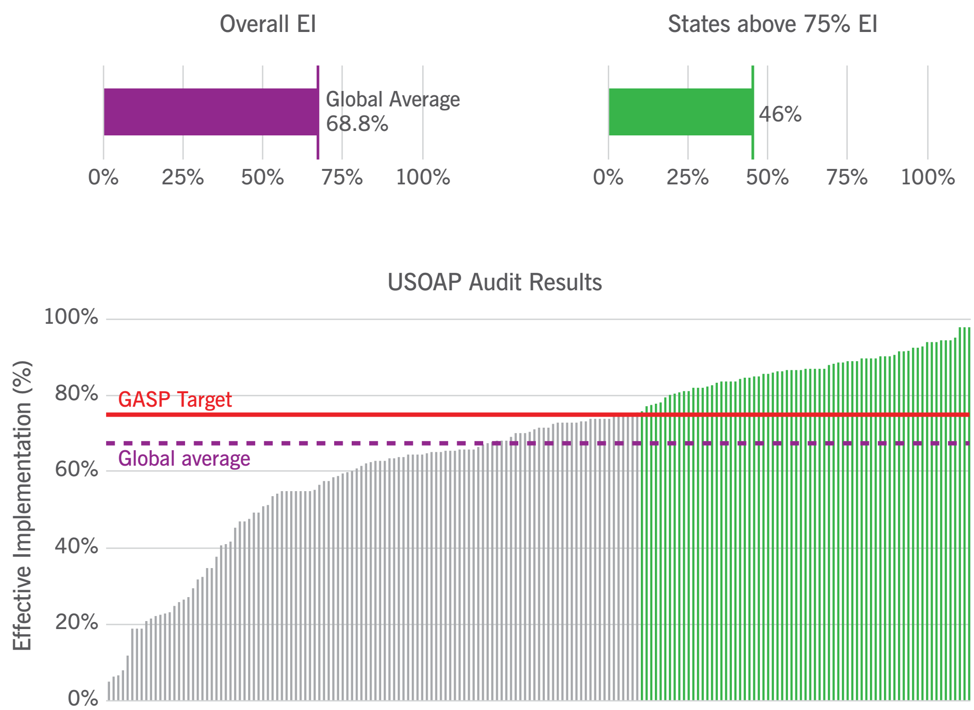


Figure 6. | **Global USOAP audit results**

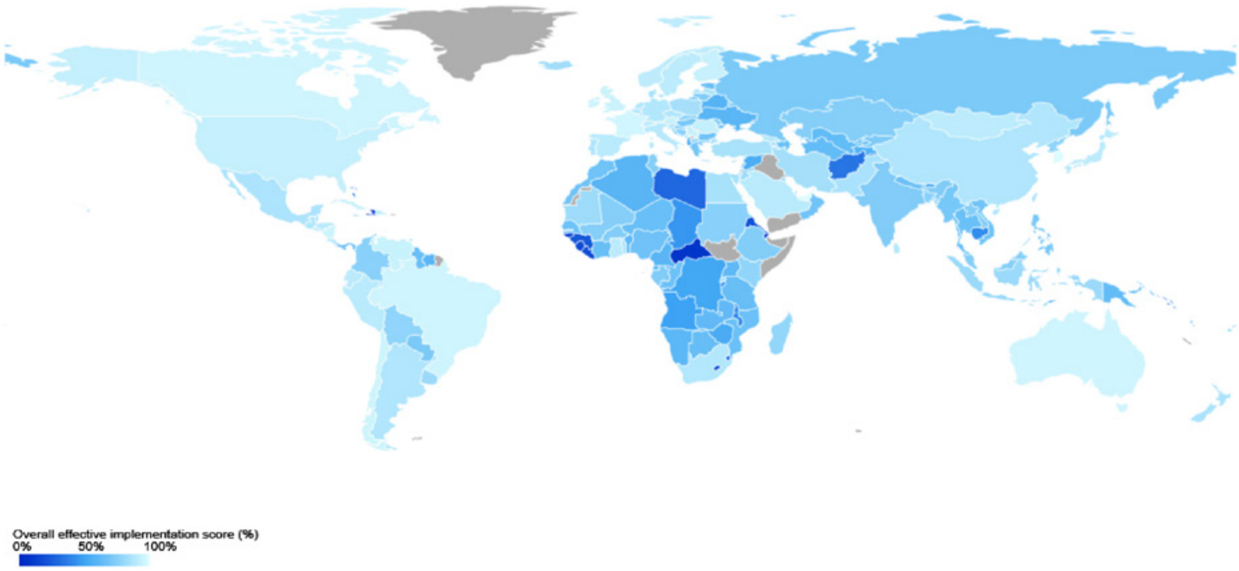


Figure 7. | **Overall Effective Implementation (EI)**

States, listed in alphabetical order, with an EI above 75 per cent (as of 15 March 2020)				
Argentina	Croatia	Honduras	Netherlands	Slovenia
Armenia	Cuba	Iceland	New Zealand	South Africa
Australia	Cyprus	Indonesia	Nicaragua	Spain
Austria	Czechia	Iran (Islamic Republic of)	North Macedonia	Sri Lanka
Bahrain	Democratic People's Republic of Korea	Ireland	Norway	Sudan
Bangladesh	Denmark	Israel	Pakistan	Sweden
Belgium	Dominican Republic	Italy	Peru	Switzerland
Belize	Ecuador	Jamaica	Poland	Togo
Bolivia (Plurinational State of)	Egypt	Japan	Portugal	Trinidad and Tobago
Bosnia and Herzegovina	El Salvador	Jordan	Qatar	Turkey
Brazil	Fiji	Kenya	Republic of Korea	United Arab Emirates
Cabo Verde	Finland	Kuwait	Romania	United Kingdom
Canada	France	Latvia	Rwanda	United States
Chile	Georgia	Madagascar	San Marino	Uruguay
China	Germany	Mauritania	Saudi Arabia	Venezuela (Bolivarian Republic of)
Colombia	Ghana	Mexico	Serbia	
Costa Rica	Guatemala	Mongolia	Singapore	
		Montenegro	Slovakia	

Examining the results by CE, Chart 4 shows that only CE-1 and CE-2 have achieved the target of 75 per cent. No audit areas, however, with the exception of AIR, have achieved the target of 75 per cent EI as indicated in Chart 5. More information about USOAP CMA results can be found in the latest USOAP report, which is published every three years, on the ICAO website https://www.icao.int/safety/CMAForum/Documents/USOAP_REPORT_2016-2018.pdf.

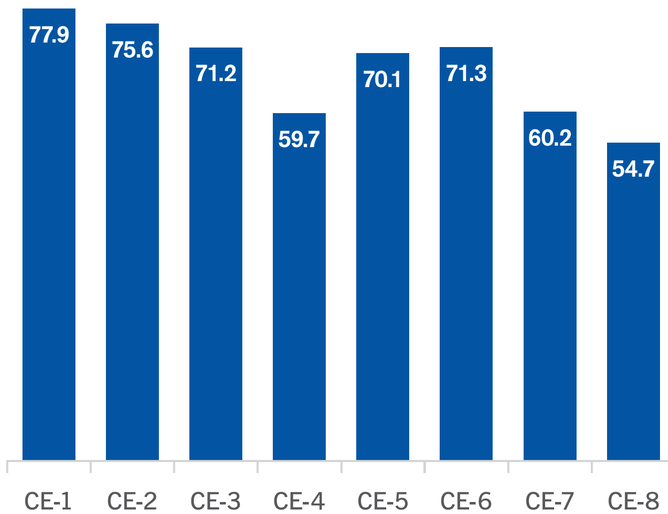


Chart 4. | Global audit results (average EI percentage by CEs)

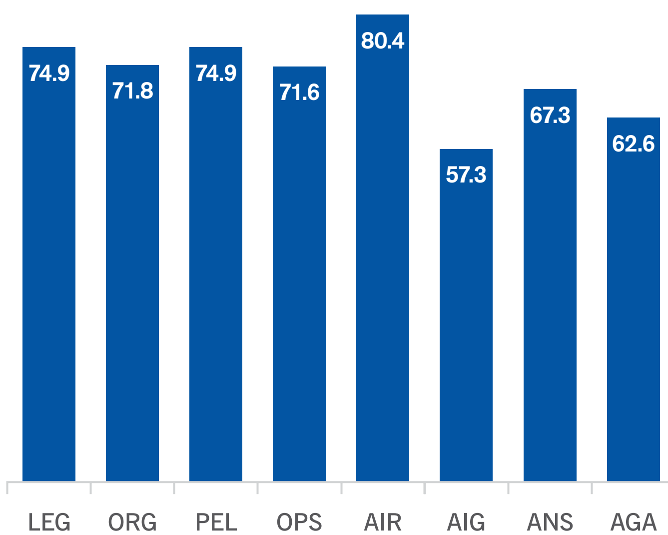


Chart 5. | Global audit results (average EI percentage by audit area)

Implementation Support for Safety Management

Safety Management Implementation website

The Safety Management Implementation (SMI) website (www.icao.int/SMI) was developed to complement the fourth edition of the *Safety Management Manual* (Doc 9859), which contains guidance to support Amendment 1 to Annex 19 – *Safety Management*. The website serves as a repository for the sharing of practical examples and tools among the aviation community in support of effective safety management implementation, including those related to safety oversight systems in support of the No Country Left Behind (NCLB) initiative.

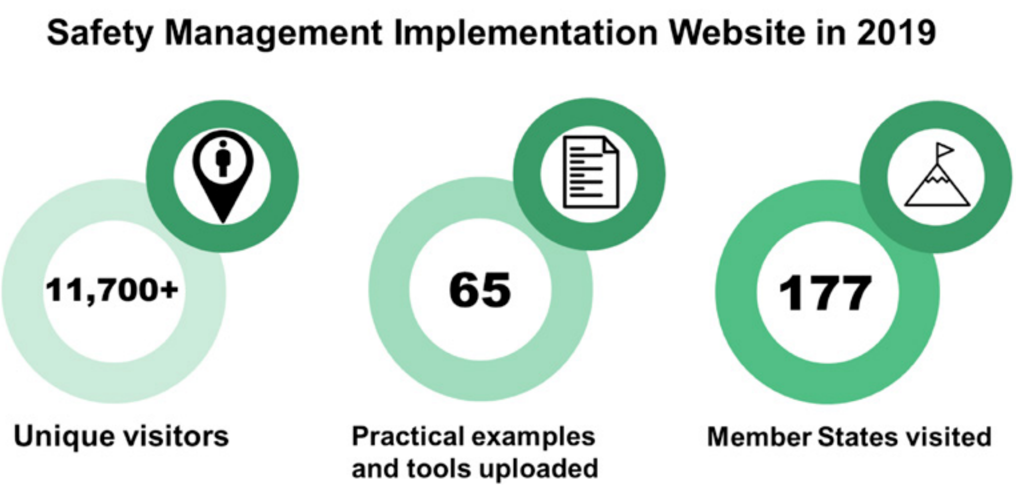


Figure 8. | SMI website statistics

As of 15 March 2020, there are 65 practical examples posted on the website. In 2019, more than 11 700 visitors from 177 Member States and all ICAO Regions visited the website. Practical examples and tools are being collected and developed on a continuous basis through coordination with relevant expert groups and once validated by the Safety Management Panel are posted on the SMI website. The goal is to have practical examples and tools demonstrating each policy, procedure, activity or process mentioned in the fourth edition of Doc 9859 by 2021.

Safety Management Tools

SSP Gap Analysis

The second High-level Safety Conference held in Montréal, from 2 to 5 February 2015 (HLSC 2015) recommended that States use the self-reporting SSP Gap Analysis tool, available on the ICAO integrated Safety Trends Analysis and Reporting System (iSTARS). The application was updated in 2019 to reflect Amendment 1 to Annex 19 and the fourth edition of Doc 9859. It now comprises 62 questions, which cover all the requirements of an SSP and provides project owners the opportunity to develop an implementation plan to address the gaps identified.

As of 15 March 2020, 135 Member States had created an SSP gap analysis project on iSTARS, with four States indicating completion of their SSP implementation plan at level 4. Detailed information can be found in Chart 6.

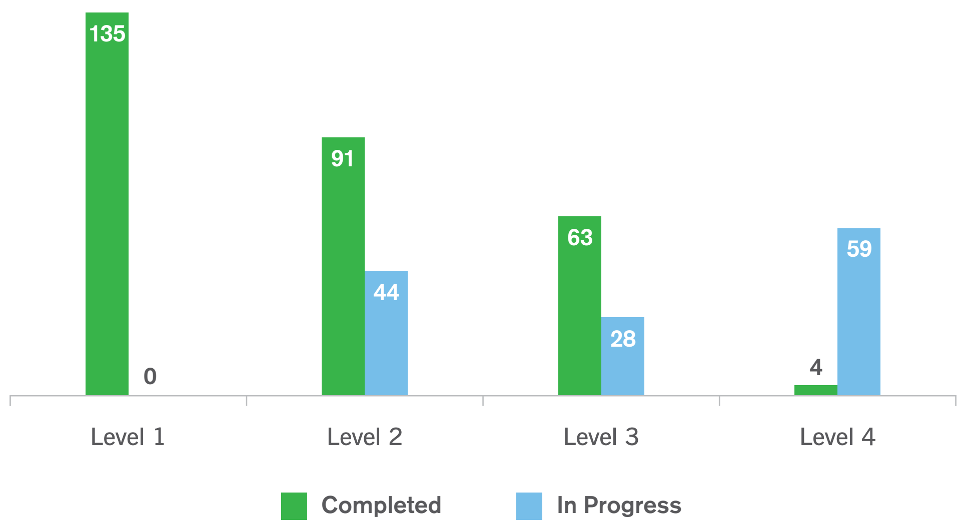


Chart 6. | SSP implementation progress – gap analysis

State Safety Programme (SSP) Implementation

ICAO measures SSP implementation in levels as follows:

- Level 1: States having started a GAP analysis
- Level 2: States having reviewed all the GAP analysis questions
- Level 3: States having defined an implementation plan to address the gaps
- Level 4: States having closed all actions and fully implemented their SSPs

SSP Foundation Protocol Questions (PQs)

SSP Foundation

Status of SSP Foundation Protocol Questions

Of the 943 USOAP Protocol Questions (PQs), 299 of these are used to assess the foundation of an effective State safety programme (SSP). They are referred to as “SSP foundation PQs” and are grouped into subject areas. States should include the resolution of these PQs as part of their SSP implementation plan. The concept of “SSP foundation” replaces the 60 per cent EI score, previously used in the GASP, as a threshold to be achieved before starting SSP implementation. Rather than serving as a prerequisite, the intent is to include these PQs as part of the SSP implementation plan to ensure the SSP will be effective and sustainable. States are expected to reach 100 per cent for this indicator, eliminating the need to achieve a prerequisite before even starting their SSP implementation. The full list of SSP foundation PQs can be found on the SSP Foundation tool, available on iSTARS since 2017. As of 15 March 2020, the global average EI of SSP Foundation PQs is 73.71 per cent, as shown in Figure 9.

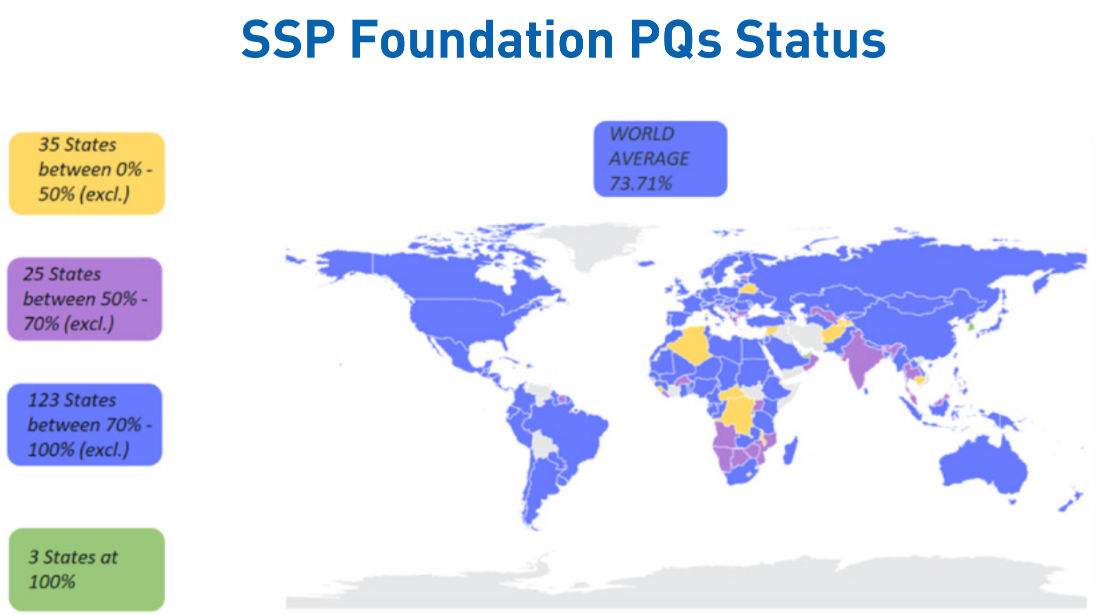


Figure 9. | SSP Foundation PQ status 2019

SSP Implementation Assessments (SSPIAs) under the USOAP CMA

ICAO has rolled out SSP implementation assessments (SSPIAs), a qualitative (non-quantitative) assessment of a State's progress in implementing an SSP, under the USOAP CMA using SSP-related PQs that have been updated to reflect Amendment 1 to Annex 19, which became applicable in November 2019, the fourth edition of Doc 9859 as well as the lessons learned from voluntary and confidential SSP implementation assessments conducted previously.

Those PQs are not linked to critical elements (CEs), but to applicable SSP components. They are broken down into eight areas:

- SSP general aspects (GEN);
- safety data analysis general aspects (SDA);
- personnel licensing and training (PEL);
- aircraft operations (OPS);
- airworthiness of aircraft, authorized maintenance organization aspects only (AIR);
- air navigation services, air traffic service aspects only (ANS);
- aerodromes and ground aids (AGA); and
- aircraft accident and incident investigation (AIG)

The relationship between USOAP CMA PQs, USOAP SSP Foundation PQs and USOAP SSP-related PQs are shown in the Figure 10 below.

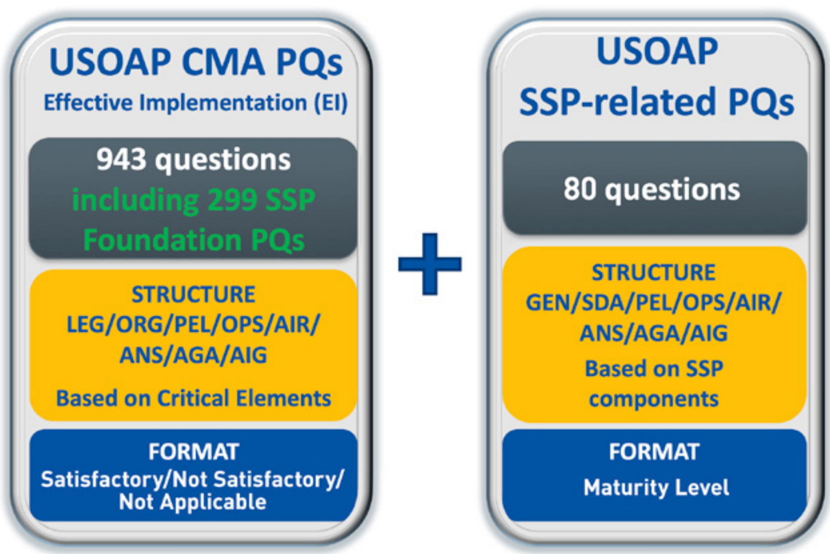
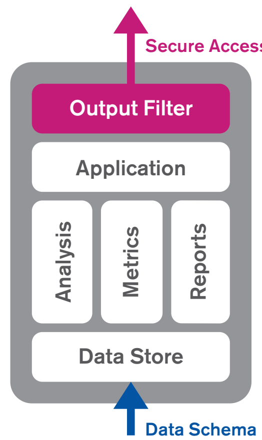


Figure 10. | Relationship between SSP Foundation PQs and SSP-related PQs

As part of Phase 1, from 2018 through 2020, ICAO is conducting voluntary and non-confidential SSPIAs. As of December 2019, three SSPIAs were completed under Phase 1 for Finland, Spain and the United Arab Emirates. The SSPIA final reports, which contain a summary of achievements in SSP implementation, is available to all ICAO Member States on the USOAP CMA Online Framework (OLF).

In 2020, ICAO will start developing guidance to support the determination of maturity level for each SSP-related PQ. Phase 2 of the SSPIAs conducted in 2021 and onwards, will use this guidance to support the determination of maturity levels. This will measure a State's progress in SSP implementation, quantitatively. The assessment tool, including SSP-related PQs and guidance will be published on the OLF at least six months in advance of the first SSPIA scheduled to be conducted under Phase 2.

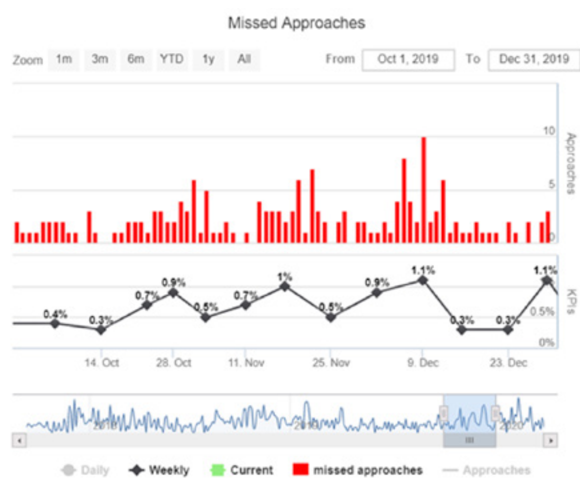
Safety Information Monitoring System



The ICAO Safety Information Monitoring System (SIMS) is a web-based safety data and information system comprised of applications that generate indicators to support ICAO Member States in their safety management efforts. SIMS promotes cooperation amongst States and industry to collect and analyse available information pertinent to the monitoring of safety performance.

SIMS resides on the ICAO secure portal and currently has more than 400 users from 70 ICAO Member States. The evolution of SIMS continues as ICAO Member States are encouraged to join this project. Currently available applications on SIMS include: Horizontal Flight Efficiency (Airspace Monitoring); Vertical Flight Efficiency (Approach Monitoring); Runway Safety Event Monitoring; Foreign Ramp Inspections data sharing; and Occurrences Monitoring. Each application has indicators allowing States to monitor the safety performance of their State. The Foreign Ramp Inspections data sharing application, allows safety information sharing within the RASG regions.

ICAO Member States can use the SIMS platform to transform their data into meaningful information, as a cost-effective way to gain direct insight into their stored data without having to develop complex in-house information technology systems. It includes and encourages participation of service providers, who as per Annex 19, are expected to establish a safety management system (SMS). ICAO has collaborated with third-party data providers in support of automatic dependent surveillance broadcast (ADS-B) data for its applications. The use of ADS-B data is one of the primary data sources for SIMS indicators, in addition to data provided via a secured system by States. ICAO has developed a SIMS legal framework that addresses, among others, data privacy and safety data protection elements.



For more information about SIMS, visit www.icao.int/safety/sims or send an email to sims@icao.int to initiate your participation.

Safety Management Capacity Building

In 2019, ICAO organized seven Safety Management Capacity Building Workshops (SMCBWs) to support States in developing the capacity needed to effectively implement a State safety programme (SSP). The five-day workshops included 12 interactive sessions, including hands-on exercises, allowing aviation professionals become familiar with the recent ICAO safety management-related provisions and assist them to overcome safety management challenges faced by their States.

In total, over two hundred participants from 130 States attended the SMCBWs, as shown in Figure 11 below.

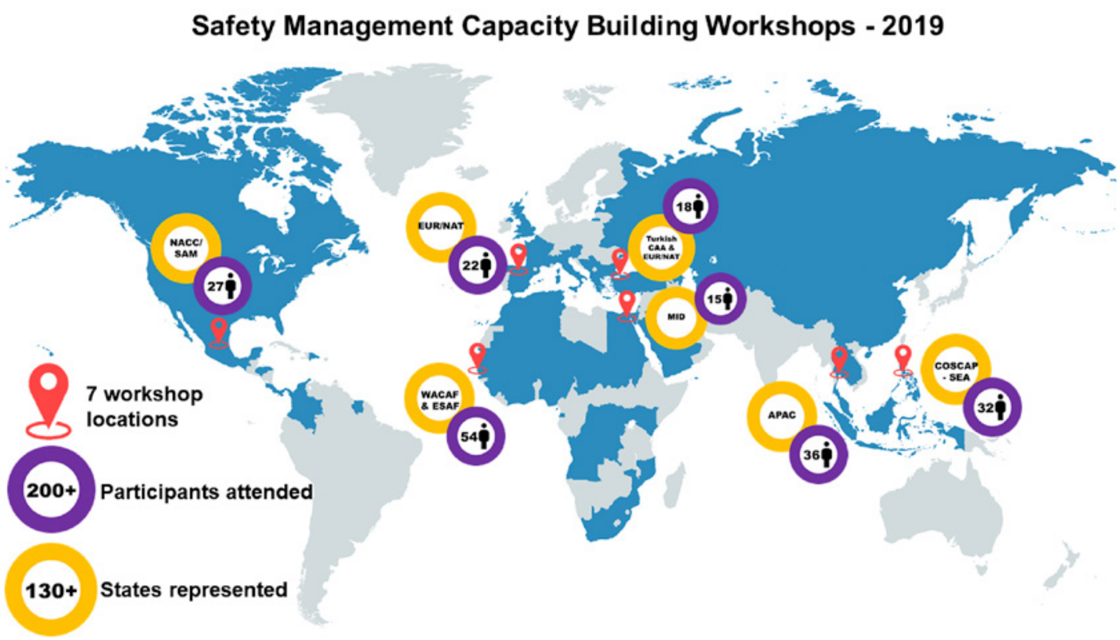


Figure 11. | **Safety Management Capacity Building Workshops - 2019**

Furthermore, an updated version of the ICAO Safety Management Online Course was launched early in 2019 and was recommended as a prerequisite for the SMCBWs.

In collaboration with ICAO's Global Aviation Training Office, and based on the competency-based training methodology described in the *Training Development Guide* (Doc 9941), a new ICAO SSP classroom course was developed and its validation delivery was successfully completed in January 2020. This course aims to build the participants' competencies (knowledge, skills and attitudes) to perform their tasks. Feedback obtained from the SMCBWs were used to design a mature course that meets the needs of the aviation community.

To support the selection of the appropriate course, based on the roles related to the implementation and operation of the SSP, an ICAO SSP course matrix has been developed. More information about ICAO Safety Management training can be found at https://www.icao.int/training/Pages/Safety-Management-Training-Programme-(SMTP).aspx.

ICAO Technical Assistance Activities

In line with the No Country Left Behind (NCLB) initiative, ICAO continued to provide States with technical assistance programmes in various forms, including technical assistance projects utilizing the Safety Fund (SAFE) to help States strengthen their safety oversight capacity.

In 2019, four projects were successfully completed, two were initiated, four are on-going and two are in the planning stages. Among the completed projects, Uruguay demonstrated a big success by improving its overall effective implementation (EI) of their safety oversight system by 21 per cent. By the same token, the Sierra Leone project, implemented by a third party, was successfully concluded. Supported by a strong commitment by the State, a very positive improvement is expected, which will be verified through the Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA) activity planned in 2021. Two new projects launched in 2019 for the Eastern Caribbean Civil Aviation Authority (ECCAA) and Barbados are well underway, positive outcomes are anticipated once the projects are completed. In total, 33 projects have been completed since the Fund's establishment. Details about the SAFE is available at www.icao.int/SAFE.

SAFE-funded technical assistance projects have become effective vehicles for the enhancement of State safety oversight systems, including the timely resolution of Significant Safety Concerns (SSCs) in some States, as has been verified by USOAP CMA activities.

Coordinating Global Assistance for Aviation's High-priority Safety Targets

Financial support or in-kind resources are essential to driving continued progress on global aviation safety targets – especially in least developed nations. ICAO coordinates assistance to States for safety project and programme implementation, supported by a global Safety Fund (SAFE) that manages voluntary contributions from donors.

If your State or donor organization wishes to assist ICAO and the aviation community to address serious safety deficiencies in States in need, please visit the SAFE website today or contact ICAO via the details provided below. No matter how large or how small your intended contribution, it's never too late to make safety your priority.

ICAO

SAFETY

www.icao.int/safety/scan/Pages/Safety-Fund-SAFE.aspx safefund@icao.int

Safety Recommendations addressed to ICAO

Annex 13 — *Aircraft Accident and Incident Investigation* requires States to investigate accidents and incidents for the prevention of such occurrences.

One of the outputs of the safety investigation process is a set of Safety Recommendations (SR), which may be addressed to States (for example, the State of Design of an aircraft) or to ICAO if the investigators have suggestions for changes to ICAO documents. ICAO will inform the originating body, within 90 days of receipt of the Safety Recommendation, the actions taken by ICAO, the actions intended to be taken by ICAO or reasons why no action will be taken by ICAO. Some of the Safety Recommendations addressed to ICAO are forwarded to relevant expert groups, which may lead to amendments and/or developments of ICAO documents.

In 2019, ICAO received four Safety Recommendations from four States. These recommendations may be accessed at https://www.icao.int/safety/airnavigation/AIG/Pages/Safety-Recommendations-addressed-to-ICAO.aspx. Chart 7 below depicts the number of safety recommendations addressed to ICAO in the past five years.

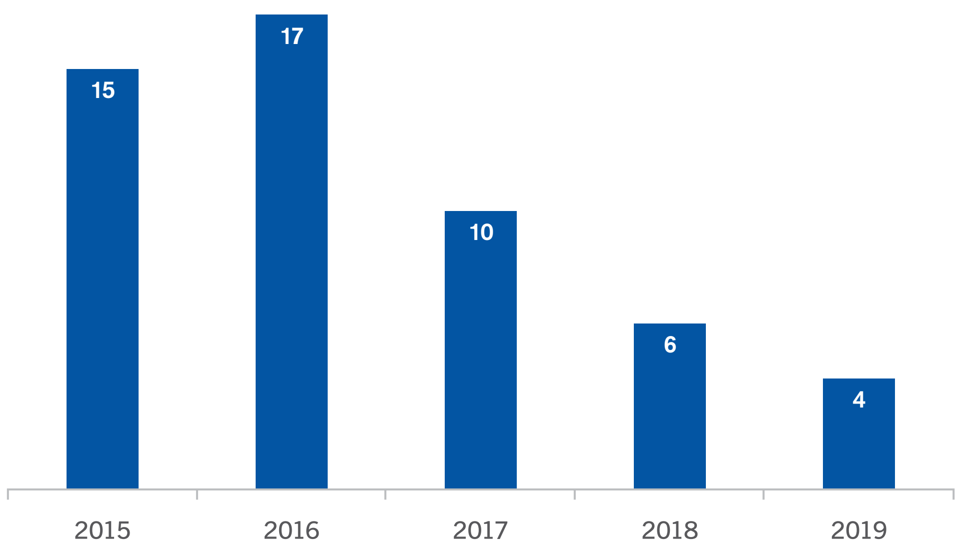


Chart 7. | Safety Recommendations received by ICAO (2015–2019)

Accident Statistics and Analysis – Scheduled Commercial Air Transport

The safety performance of the GASP is measured by a series of metrics as defined by the GASP indicators. Goal 1 of the GASP is to achieve a continuous reduction of operational safety risks. This reduction is achieved by a series of actions targeting the high-risk categories of occurrence (HRCs). The target associated with this goal (Target 1.1) is the decrease of the global accident rate for commercial scheduled operations. Several indicators are linked to this target including number of accidents, fatal accidents and fatalities by State, region or globally, as well as accident rates (i.e. number of occurrences per million departures). GASP indicators also include the percentage of occurrences related to the HRCs.

Overall Safety Performance Indicator – Global Accident Rate

ICAO's global accident rate provides an overall indicator of safety performance for air transport operation. The accident rate is based on scheduled commercial operations involving fixed-wing aircraft with a maximum take-off weight (MTOW) above 5 700 kg. Aircraft accidents are reviewed and validated by the ICAO Safety Indicators Study Group (SISG) using definitions provided in Annex 13.

Data on departures is collated by ICAO's Air Transport Bureau and comprises scheduled commercial operations that involve the transportation of passengers, cargo and mail for remuneration. Estimates are made where data has not been provided by States, and as new data is provided to ICAO, it will be incorporated into the database. It is worth noting that this may cause small changes to the calculated rates from year to year.

Chart 8 below shows the global accident rate trend (per million departures) over the previous five years, with 2019 having an accident rate of 2.9 accidents per million departures, an increase of 12 per cent from the previous year.

Scheduled commercial accidents in 2019 are listed in Appendix 2.

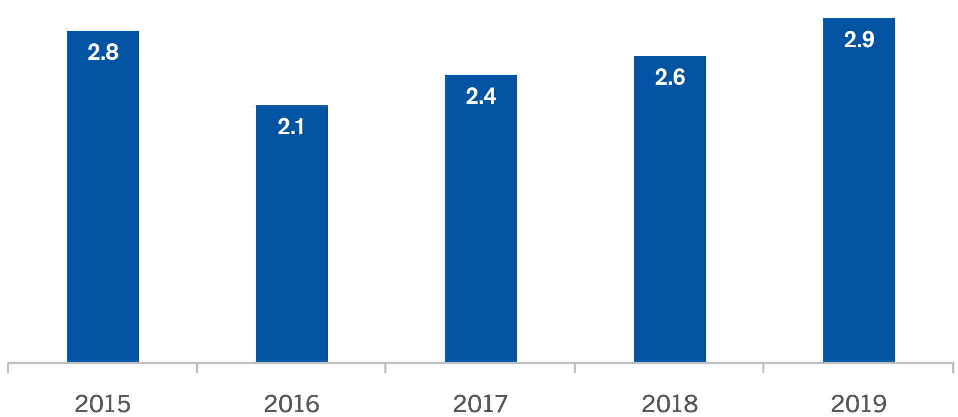


Chart 8. | Global accident rates (accidents per million departures)

Accident and Fatality Trend

The number of worldwide accidents and fatal accidents on scheduled commercial flights during the 2015–2019 period are shown in Chart 9.

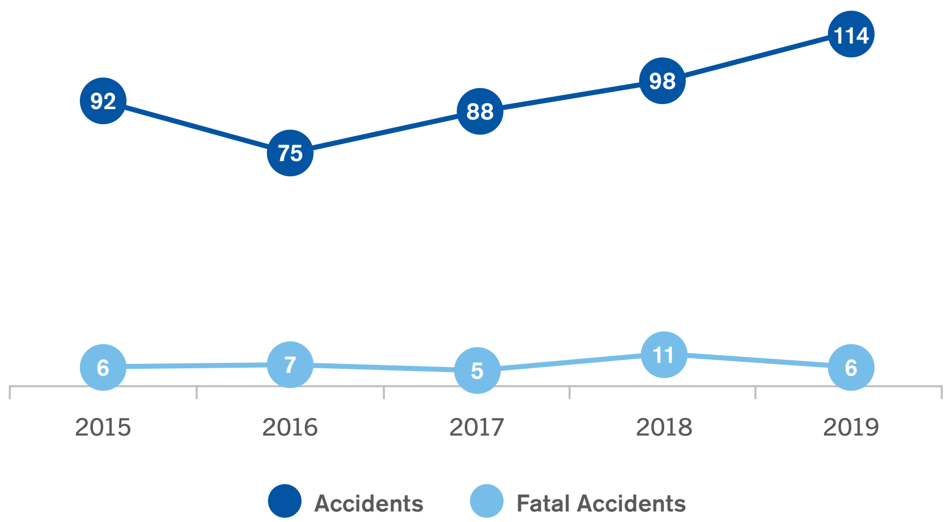


Chart 9. | **Accident trend**

Between the years 2015 to 2019, the trend of the annual number of accidents has increased. The lowest count recorded was 75 accidents in 2016 and the highest was 114 in 2019. However, the number of fatal accidents per year significantly decreased from 11 in 2018 to 6 in 2019. Chart 10 shows the number of fatalities associated with the above-mentioned fatal accidents decreased more than half from 514 in 2018 to 239 in 2019.

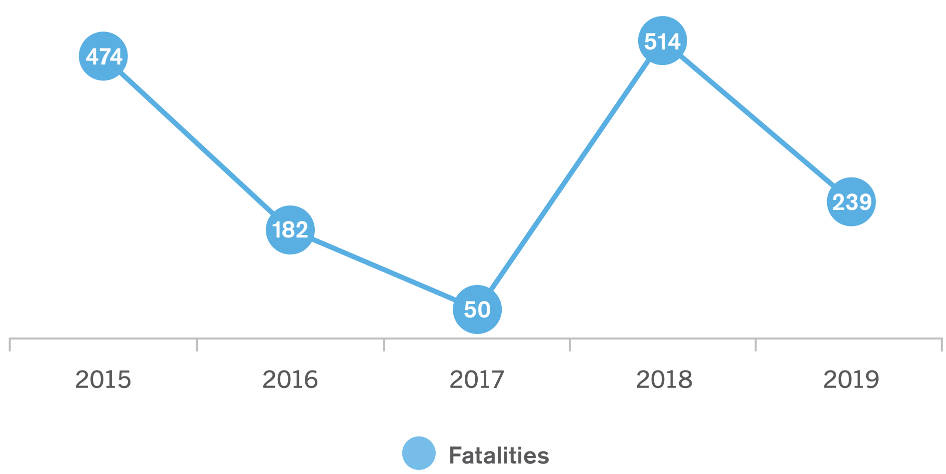


Chart 10. | **Fatalities trend (2015–2019)**

Accidents Overview by Occurrence Category

ICAO Member States are required to report accidents and serious incidents in accordance with Annex 13 through the ICAO Accident/Incident Data Reporting (ADREP) system. The SISG validates and categorizes the accidents for commercial operations, including scheduled and non-scheduled, involving aircraft with MTOW over 5 700 kg using the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team (CICTT) taxonomy for occurrence categories.

Chart 11 shows an accidents overview for scheduled commercial operations by CICTT occurrence categories. The occurrence category of turbulence encounter (TURB) accounted for the most accidents that caused serious injuries to aircrews or passengers in 2019. All the fatal accidents involved the following categories: loss of control in-flight (LOC-I); runway excursion (RE); icing (ICE); and system/component failure or malfunction (non-powerplant) (SCF-NP) as indicated in Chart 12. The occurrence category of SCF-NP includes the accident of an Ethiopian Airlines Boeing 737-8 (MAX) aircraft on 10 March 2019. A similar accident occurred with a Lion Air Boeing 737-8 (MAX) aircraft on 29 October 2018. The United States National Transportation Safety Board (NTSB) participated in the investigation of both above-mentioned accidents and on 19 September 2019, issued the Safety Recommendation Report "*Assumptions Used in the Safety Assessment Process and the Effects of Multiple Alerts and Indications on Pilot Performance*". These two accidents resulted in the grounding of the global fleet to the present time.

Detailed information about the CICTT occurrence category can be found in Appendix 2.

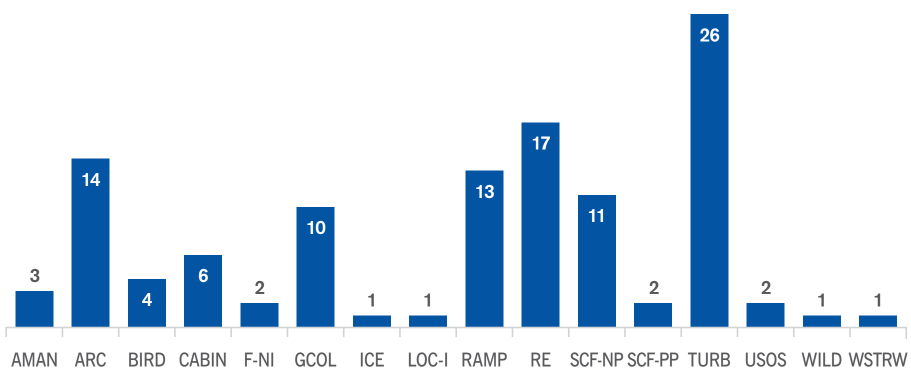


Chart 11. | Accidents overview by occurrence category

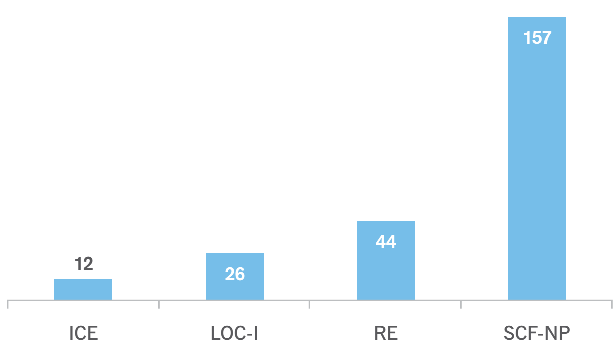


Chart 12. | Total fatalities by occurrence category

High-risk Categories of Occurrence

Based on actual fatalities, high fatality risk per accident or the number of accidents and incidents, as well as results from the analysis of safety data collected from proactive and reactive sources of information from ICAO and other non-governmental organizations, ICAO has identified five high-risk categories of occurrence (HRCs) as global safety priorities in the 2020–2022 edition of the GASP:

a) controlled flight into terrain (CFIT);
b) loss of control in-flight (LOC-I);
c) mid-air collision (MAC);
d) runway excursion (RE); and
e) runway incursion (RI).

ICAO uses these HRCs as a baseline in its safety analysis to achieve a continuous reduction of operational safety risks (Goal 1) and its linked targets and indicators, as presented in the GASP.

Chart 13 below shows that in 2019, the five HRCs for scheduled commercial air transport operations represented 29 per cent of all fatalities, 67 per cent of fatal accidents, 16 per cent of the total number of accidents and 24 per cent of the accidents that destroyed or caused substantial damage to aircraft.

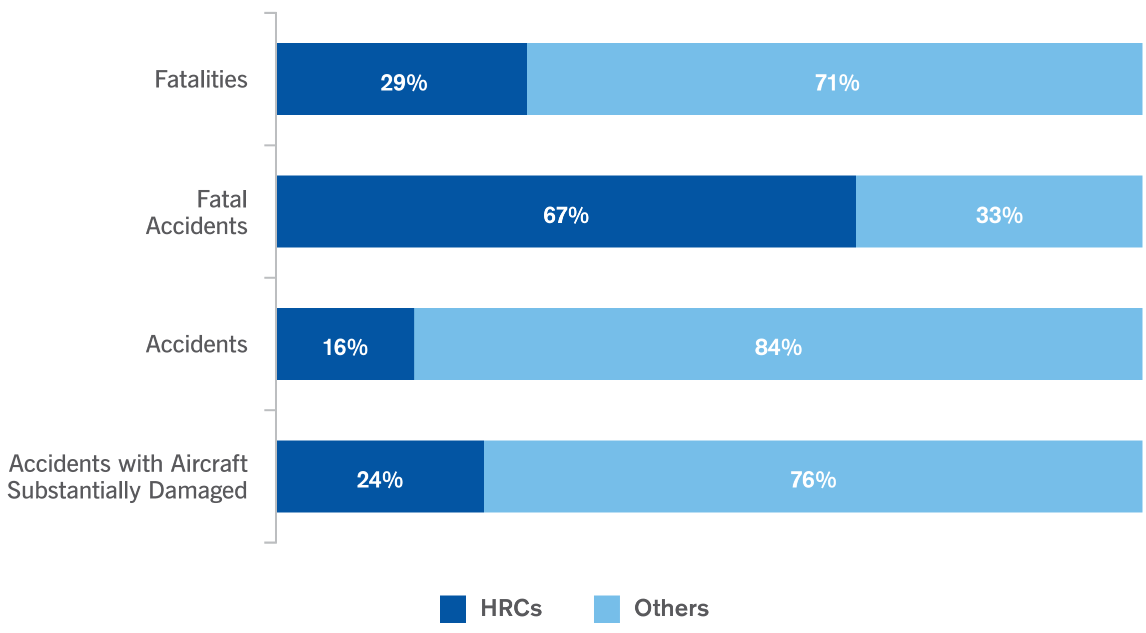


Chart 13. | HRC accident distribution

A breakdown of the five HRCs in 2019 and the respective distribution of fatalities, fatal accidents and accidents are shown in Chart 14 below. Accidents related to runway excursion (RE) accounted for 14.9 per cent of all accidents in 2019, and included half of all fatal accidents with 44 fatalities. There was one fatal accident related to loss of control in-flight (LOC-I) that represented 16.7 per cent of fatal accidents with 26 fatalities. There were no accidents related to controlled flight into terrain (CFIT), mid-air collision (MAC) and runway incursion (RI) in 2019. In addition, there were 80 HRCs of serious incidents reported by ICAO Member States as required by Annex 13 in 2019.

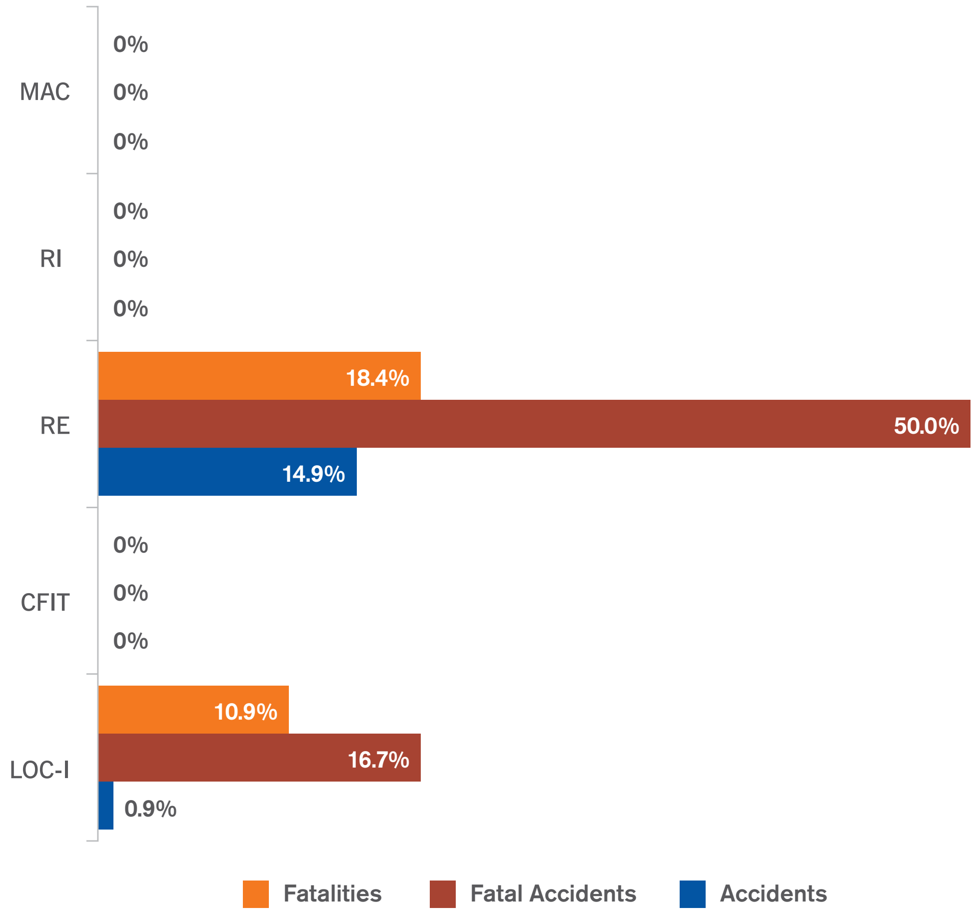


Chart 14. | **High-risk category accident overview**

Regional Accident Statistics

To further analyse the state of aviation safety, the accident data for scheduled commercial air transport operations is categorized according to RASG region, by State of Occurrence. Tables 1 and 2 below provide details on the state of aviation safety in different RASG regions for 2019 in the context of global outcomes. The States included in each RASG region used in this report can be found in Appendix 1.

It is worth noting these statistics are based on ADREP data reported by the State of Occurrence in 2019. Partly due to the small number of departures, some regions experience a large fluctuation in the accident rate from year to year. For this reason, these numbers should be considered in relation to the total number of accidents to gain an overall perspective.

RASG Region	Estimated Departures	Number of Accidents	Accident Rate (per million departures)	Fatal Accidents	Fatalities
AFI	1,130,861	9	8.0	2	183
APAC	12,663,222	17	1.3	Nil	Nil
EUR	9,826,990	29	3.0	3	55
MID	1,311,340	2	1.5	Nil	Nil
PA	13,856,870	54	4.0	1	1
International waters	n/a	3	n/a	Nil	Nil
WORLD	**38,789,283**	**114**	**2.9**	**6**	**239**

Table 1. | Departures, accidents and fatalities by RASG region based on State of Occurrence

RASG Region	Share of Traffic (%)	Share of Accidents (%)	Share of Fatalities (%)
AFI	2.9	7.9	76.6
APAC	32.6	14.9	Nil
EUR	25.3	25.4	23.0
MID	3.4	1.8	Nil
PA	35.7	47.4	0.4

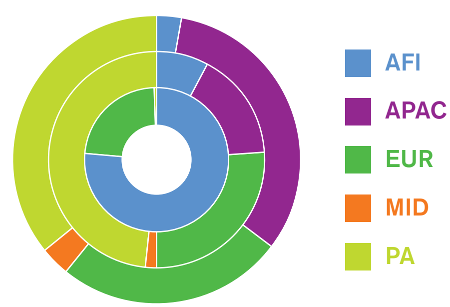


Table 2. | Share of traffic, accidents and fatalities by RASG region based on State of Occurrence

Accidents by RASG Region

Chart 15 below shows the percentage of accidents and related fatalities for each ICAO RASG region based on State of Occurrence for scheduled commercial operations in 2019. States included in each RASG region are listed in Appendix 1.

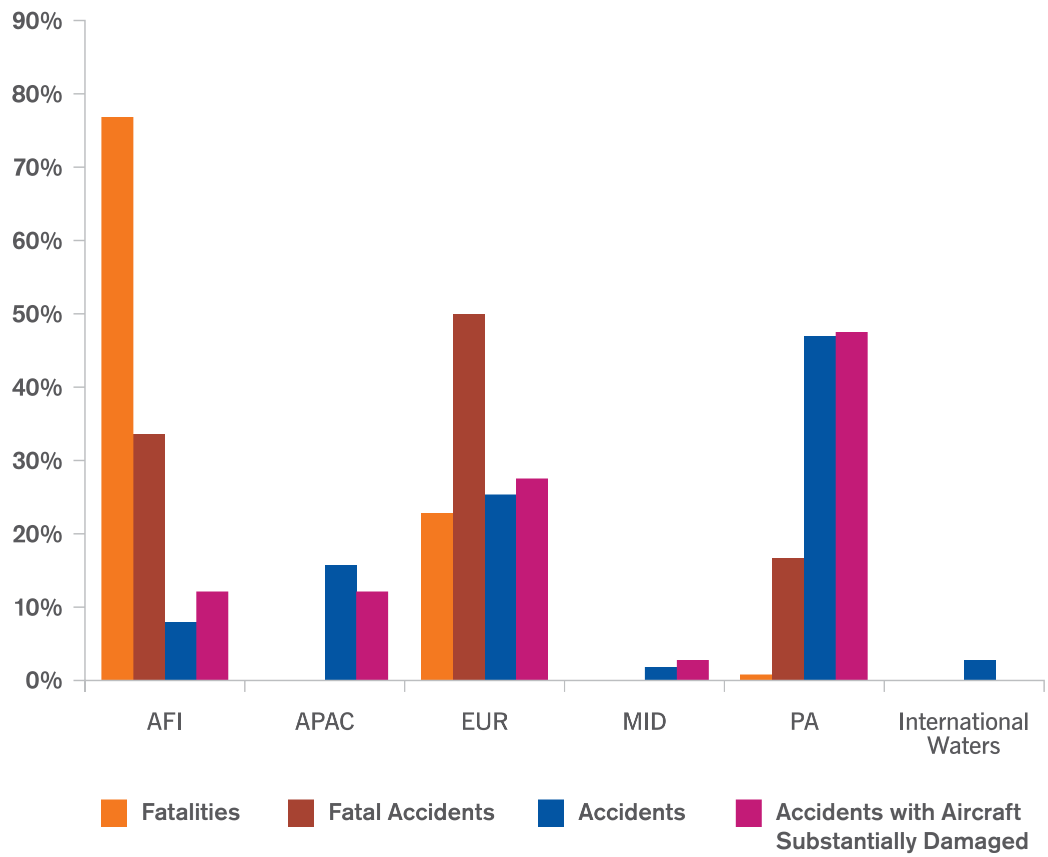


Chart 15. | Accident overview by RASG region

In 2019, the Asia and Pacific (APAC) and Middle East (MID) Regions did not experience fatal accidents, and one fatal accident with only one fatality occurred in the Pan American (PA) Region. Three accidents occurred over international waters in 2019.

GSIE Harmonized Accident Rate

In the spirit of promoting aviation safety, the United States, the European Commission, International Air Transport Association (IATA) and ICAO signed a Memorandum of Understanding (MoU) on a Global Safety Information Exchange (GSIE) on 28 September 2010 during the 37th Session of the ICAO Assembly. The objective of the GSIE is to identify information that can be exchanged between the parties to enhance risk reduction activities in the area of aviation safety.

The GSIE developed a harmonized accident rate at the beginning of 2011. This was accomplished through close cooperation between ICAO and IATA to align accident definitions, criteria and analysis methods used to calculate the harmonized accident rate, which is considered a key safety indicator for commercial aviation operations worldwide. The joint analysis includes accidents following the ICAO Annex 13 criteria for all typical commercial airline operations for scheduled and non-scheduled flights. These accidents were reviewed and validated by the ICAO Safety Indicators Study Group (SISG).

Starting in 2013, ICAO and IATA have increasingly harmonized the accident analysis process and have developed a common list of accident categories to facilitate the sharing and integration of safety data between the two organizations.

Harmonized Analysis of Accident

A total of 135 accidents were considered as part of the harmonized accident criteria in 2019. These comprise scheduled and non-scheduled commercial operations, including ferry flights for aircraft with an MTOW above 5 700 kg. The GSIE harmonized accident rate for the period from 2015 to 2019 is shown in Chart 16 below. Since 2013, the accident rate has been broken down by operational safety component, accidents involving damage to aircraft with little or no injury to persons, and accidents with serious or fatal injuries to persons.

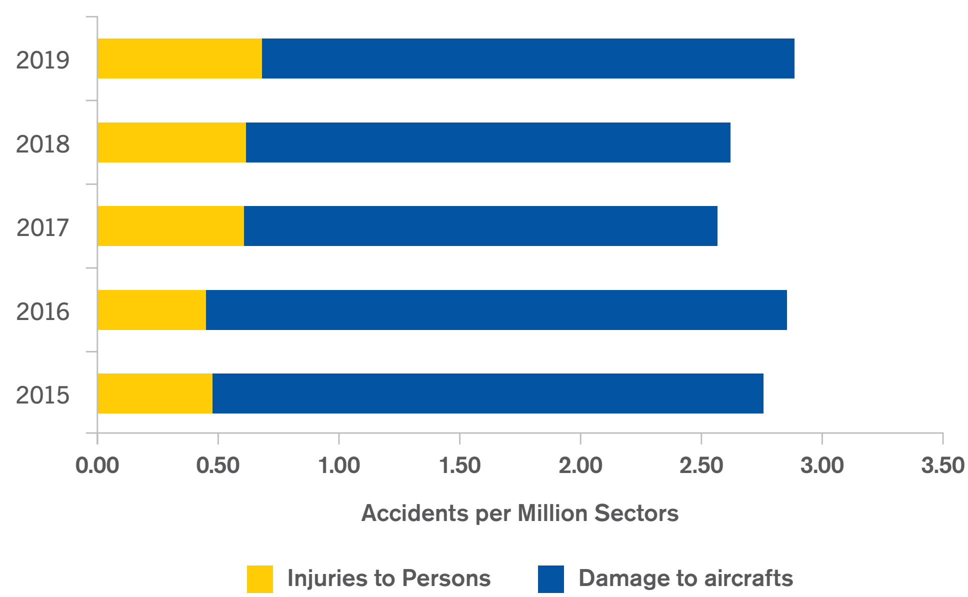


Chart 16. | GSIE harmonized accident rate (accidents per million sectors)

Definitions and Methods

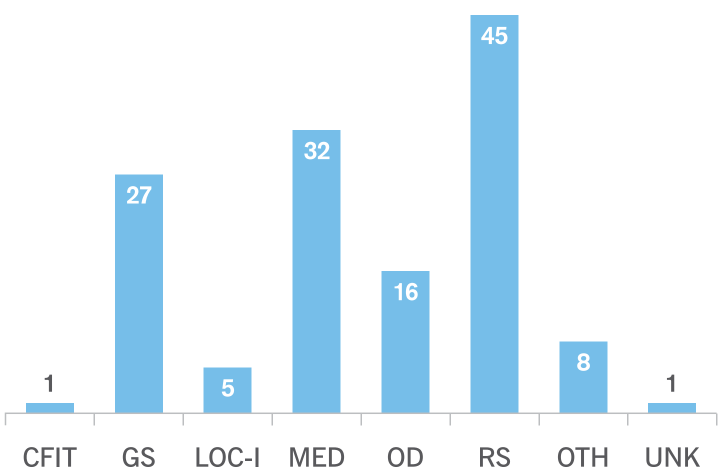
In order to build upon the harmonized accident rate presented in the last five safety reports, ICAO and IATA worked closely to develop a common taxonomy that would allow for a seamless integration of accident data between the two organizations. A detailed explanation of the harmonized accident categories and how they relate to the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team (CICTT) occurrence categories can be found in Table 3.

Accidents by Category

Differences between the approaches of the ICAO (CICTT Occurrence Categories) and IATA (Flight-crew centric Threat and Error Management Model) classification systems required the harmonization of the accident criteria to be used. The breakdown of accidents by harmonized category is shown below.

Full details of categories can be found in Table 3.

Number of Accidents by Category



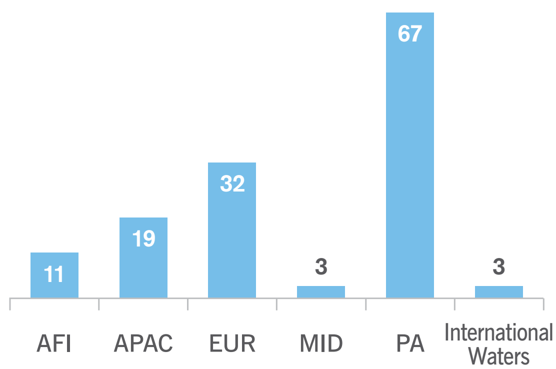
Accident Categories	
CFIT	Controlled Flight into Terrain
GS	Ground Safety
LOC-I	Loss of Control in-Flight
MED	Injuries to and/or Incapacitation of Persons
OD	Operational Damage
RS	Runway Safety
OTH	Other
UNK	Unknown

Note: IATA ACTG classified only four accidents as LOC-I, the fifth one could not be assigned an End state due to insufficient data. ICAO SISG categorized two accidents in the LOC-I arena as one being ICE and the other one as SCF-NP. IATA ACTG did not categorize any CFIT accidents in 2019. The one CFIT accident that was assigned by ICAO SISG, IATA ACTG categorized it as Other End State.

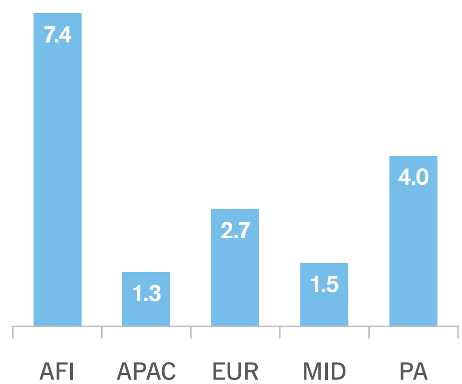
Accidents by Region of Occurrence

A harmonized regional analysis is provided by the ICAO RASG regions based on the State of Occurrence. The number of accidents and harmonized accident rate by region are shown in the charts below.

Number of Accidents per Region of Operator



Accident Rate per Region of Operator



Future Development

Both ICAO and IATA continue to work closely together and, through their respective expert groups, provide greater alignment in their analysis methods and metrics for the future. This ongoing work will be shared with GSIE participants, States, international organizations and safety stakeholders in the interest of promoting common, harmonized safety reporting at the global level.

Category	Description
Controlled Flight into Terrain (CFIT)	Includes all instances where the aircraft was flown into terrain in a controlled manner, regardless of the crew's situational awareness. Does not include undershoots, overshoots or obstacles on takeoff and landing which are included in Runway Safety.
Loss of Control In-flight (LOC-I)	Loss of control in-flight that is not recovered.
Runway Safety (RS)	Includes runway excursions and incursions, undershoot/overshoot, tail strike and hard landing events.
Ground Safety (GS)	Includes ramp safety, ground collisions, all ground servicing, pre-flight, engine start/ departure and arrival events. Taxi and towing events are also included.
Operational Damage (OD)	Damage sustained by the aircraft while operating under its own power. This includes in-flight damage, foreign object debris (FOD) and all system or component failures.
Injuries to and/or Incapacitation of Persons (MED)	All injuries or incapacitations sustained by anyone coming into direct contact with any part of the aircraft structure. Includes turbulence-related injuries, injuries to ground staff coming into contact with the structure, engines or control surfaces aircraft and on-board injuries or incapacitations and fatalities not related to unlawful external interference.
Other (OTH)	Any event that does not fit into the categories listed above.
Unknown (UNK)	Any event whereby the exact cause cannot be reasonably determined through information or inference, or when there are insufficient facts to make a conclusive decision regarding classification.

Category	CICTT Occurrence Categories	IATA Classification End States
Controlled Flight into Terrain (CFIT)	CFIT, CTOL	CFIT
Loss of Control In-flight (LOC-I)	LOC-I	LOC-I
Runway Safety (RS)	RE, RI, ARC, USOS	Runway Excursion, Runway Collision, Tailstrike, Hard Landing, Undershoot, Gear-up Landing / Gear Collapse
Ground Safety (GS)	G-COL, RAMP, LOC-G	Ground Damage
Operational Damage (OD)	SCF-NP, SCF-PP	In-flight Damage
Injuries to and/or Incapacitation of Persons (MED)	CABIN, MED, TURB	None (excluded from IATA Safety Report)
Other (OTH)	All other CICTT Occurrence Categories	All other IATA End States
Unknown (UNK)	UNK	Insufficient Data

Table 3. | GSIE harmonized accident categories

Safety Enhancement Initiatives

ICAO continues to develop and implement safety initiatives to support States to meet the goals and targets set in the GASP and improve global aviation safety. This includes guidance to support States for managing safety during the coronavirus disease (COVID-19) pandemic.

Regional cooperation and GASOS

Aviation safety has improved globally through the regional collaboration of organizations such as regional safety oversight organizations (RSOOs), regional accident and incident investigation organizations (RAIOs) and cooperative development of operational safety and continuing airworthiness programmes (COSCAPs). Despite the continuous development of regional collaboration, many of these organizations still face some specific challenges.

To support these regional efforts, ICAO established the RSOO Cooperative Platform (RSOO CP) in 2017 to facilitate the sharing of experiences and best practices between RSOOs and their interfacing with ICAO. Further, ICAO established a programme known as the Global Aviation Safety Oversight System (GASOS) that presents a standardized set of criteria upon which regional organizations can be assessed and measure their improvement against.

During its 217th Session, the ICAO Council approved GASOS and subsequently the Assembly, at its 40th Session, adopted Resolution A40-6 — *Regional cooperation and assistance to resolve safety deficiencies, establishing priorities and setting measurable targets*. This resolution approved the implementation and further development of GASOS to help strengthen, assess and support RSOOs, RAIOs and COSCAPs with the goal of assisting Member States in improving safety oversight, accident and incident investigation, and safety management functions.

Since the 40th Assembly, ICAO has made significant strides in advancing GASOS and ensuring that any legal and liability issues are being properly mitigated, including the creation of a template of a Memorandum of Understanding (MoU) that addresses any outlying liability risks associated with the implementation of GASOS, as it is currently constituted.

In addition to the MoU, ICAO developed the necessary processes and procedures to successfully launch the GASOS programme, including the *Global Aviation Safety Oversight System Manual* (to be published as Doc 10143) and a quality management system (QMS), which comprises a quality management manual along with the necessary documented processes, procedures and guidance for the proper operation of GASOS.

Furthermore, three GASOS pilot assessments undertaken within the last two years have already proven to be beneficial. ICAO conducted pilot assessments on three RSOOs in the areas of: generic aspects (GEN); aircraft operations (OPS); airworthiness of aircraft (AIR); aerodromes and ground aids (AGA); and air navigation services (ANS). These assessments were based on a robust set of objective criteria, which consists of a total of 1 093 assessment questions.

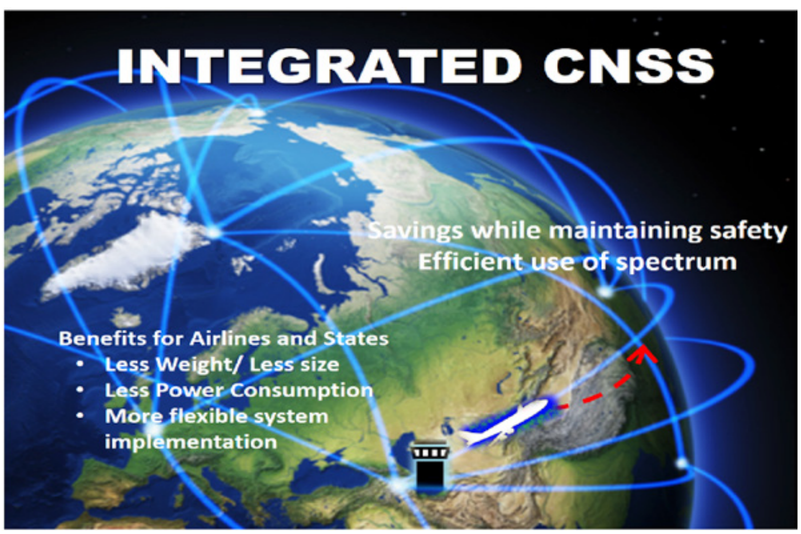
To further support regional cooperation, the RSOO CP has been working to strengthen and promote RSOOs in order for them to better support their States. To further advance these efforts, the RSOO CP in September 2019 adopted a three-year work programme focused on exchanging information, providing guidance, coordinating assistance and building partnerships. These initiatives will continue to strengthen the capacities of RSOOs and actively contribute to ICAO's global and regional programmes and activities. The RSOO CP and GASOS, working in parallel, equip ICAO with the necessary tools to better identify where deficiencies may occur within these organizations. The two programmes allow ICAO and its partners, where possible, to focus resources through the Aviation Safety Implementation Assistance Partnership (ASIAP) by coordinating and cooperating on technical assistance activities in order to improve identified deficiencies, thus strengthening regional cooperation and improving aviation safety around the world in an efficient and effective manner. Information on GASOS can be found at https://www.icao.int/safety/GASOS/Pages/default.aspx.

The future of aviation Communications, Navigation, Surveillance and Frequency Spectrum

Existing aeronautical communications, navigation and surveillance (CNS) systems are dated, proven and possess exceptional long active lifespans – beyond fifty years, in comparison with any other industry. However, considering the current state of the art of radio system, the aeronautical CNS systems are not particularly frequency spectrum efficient. Hence, ICAO and the aviation industry need to develop an action plan to progress as well.

Frequency spectrum is a finite and limited resource, managed by the International Telecommunication Union (ITU) through its four yearly World Radiocommunication Conference (WRC) process. Availability of the necessary protected radio frequency spectrum is a critical prerequisite for the safe and efficient implementation of CNS/air traffic management (ATM) systems. However, as demand for radio spectrum from non-aviation users keeps growing, aviation faces an ever-increasing competition for the limited available spectrum, in particular from mobile and broadband wireless access services.

The 13th Air Navigation Conference (AN-Conf/13), held in Montréal from 9 to 19 October 2018, approved Recommendation 2.2/1 c), which instructed ICAO to "launch a study, built on a multidisciplinary view of the C, N and S elements and frequency spectrum, to evolve the required CNS and frequency spectrum access strategy and systems roadmap in the short, medium and long term, in a performance-based and service-oriented manner, to ensure that CNS systems remain efficient users of the spectrum resource". ICAO has now initiated this work under the Integrated Communication Navigation Surveillance and Spectrum (ICNSS) and Annex 10 — *Aeronautical Telecommunications* streamline project.



Unless aviation can continue to prove that the aeronautical CNS systems are spectrum efficient, aviation will be forced to share the protected aeronautical frequency allocations with non-aeronautical users, with resulting reduction in quality of service due to interference or may even lose access altogether to certain frequency bands, critical to the current provision of CNS. Ultimately, this could result in an overall reduction in the safety and efficiency of the aeronautical system as a whole. A better way forward is to facilitate a continuing and timely evolution of the aeronautical CNS systems. This will be necessary for two interrelated reasons, the first, to make more efficient use of the spectrum as per the ITU directive and the second, to make way for growth in air traffic from traditional airspace users as well as the explosive growth expected from new entrants such as the drone industry. The ICNSS project was conceived to deal with these issues.

The ICNSS project will have two streams, the ICNSS Roadmap and the CNS Standards. The roadmap stream will develop the CNSS roadmap on flexible and continuing technical evolution. The standards stream will define performance standards versus technical specifications, which will contain means of compliance. Alongside these streams, candidate frameworks for governance, prioritization and business cases will be developed.

It is envisaged that the future avionics providing for aeronautical safety CNS and their supporting ground systems will be built on integrated CNS system elements, facilitating efficient use of the valuable frequency spectrum resource. Utilizing the state of the art technologies, such as software defined radios, the avionics and their ground counterparts will have the capability to evolve as technology advances, with minimum costs to States, air space users and aerospace industry.

Cabin Safety

Cabin safety contributes to the prevention of accidents and incidents, the protection of the aircraft's occupants through proactive safety management including hazard identification and safety risk management, and the increase of survivability in the event of an emergency situation. The main role of cabin crew focuses on the evacuation of an aircraft in the event of an accident. This role contributes to the aspirational safety goal of zero fatalities set forth in the *Global Aviation Safety Plan* (GASP, Doc 10004) by ensuring passenger safety. In addition, cabin crew members also play an important proactive role in managing safety, which can contribute to the prevention of accidents. This role includes, but is not limited to:

a) preventing incidents from escalating in the cabin, such as smoke or fire;

b) informing the flight crew of abnormal situations observed in the cabin or relating to the aircraft, such as pressurization problems, engine anomalies and contamination of critical surfaces; and

c) preventing unlawful interference and managing passenger events that can compromise safety and security of the flight, such as hijackings.

The ICAO Cabin Safety Group (ICSG) is an international, joint industry-regulatory group composed of cabin safety experts from civil aviation authorities, airlines, aircraft manufacturers and non-governmental organizations. The ICSG serves as the expert group, providing advice to ICAO on cabin safety-related matters and assisting in the development or revision of requirements, guidance material and implementation support to enhance cabin safety on a global scale. Since the creation of ICAO's dedicated cabin safety initiative in 2012, ICAO has developed several guidance materials, including:

- Doc 10002, *Cabin Crew Safety Training Manual*;
- Doc 9481, *Emergency Response Guidelines for Incidents Involving Dangerous Goods* (updated to include cabin crew procedures for dealing with Lithium battery fires);
- Cir 340, *Guidelines for the Expanded Use of Portable Electronic Devices;*
- Doc 10049, *Manual on the Approval and Use of Child Restraint Systems* (second edition published);
- Cir 344, *Guidelines on Education, Training and Reporting Practices Related to Fume Events* (which includes cabin crew-related procedures and training);
- Doc 10062, *Manual on the Investigation of Cabin Safety Aspects in Accidents and Incidents* (which focuses on survival factors in investigations);
- Doc 10072, *Manual on the Establishment of Minimum Cabin Crew Requirements;*
- Doc 10086, *Manual on Information and Instructions for Passenger Safety* (including brace positions);
- Doc 10111, *Manual on the Implementation and Use of Cabin Electronic Flight Bags*;
- Cir 352, *UN OHCHR-ICAO Guidelines for Training Cabin Crew on Identifying and Responding to Trafficking in Persons,* developed in conjunction with the United Nations (UN) Office of the High Commissioner for Human Rights (OHCHR); and
- Cir 356, *Guidelines on Digital Learning for Cabin Crew Training* (including use of virtual reality).

Further information about ICAO's cabin safety initiatives can be found at www.icao.int/cabinsafety.

Runway Safety – 2019 Success Story

Runway safety (RS) continues to remain aviation's biggest safety challenge, representing more than half of accidents reported to ICAO for commercial operations, including scheduled and non-scheduled, involving aircraft with a certified MTOW over 5 700 kg in 2019 as shown in Chart 17.

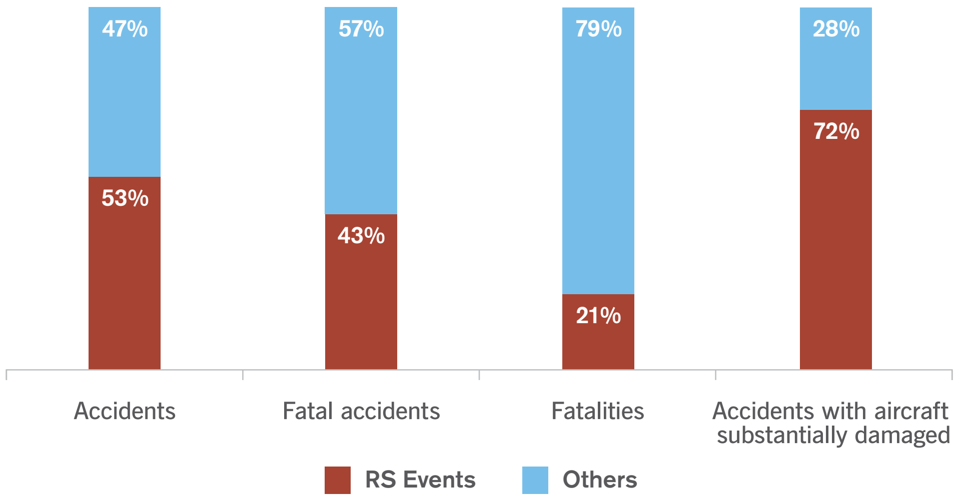


Chart 17. | Runway safety-related accidents overview 2019

Note: Events related to runway safety include the following CICTT occurrence categories: abnormal runway contact, bird strike, runway excursion, runway incursion, loss of control on ground, ground collision, ground handling, collision with obstacles, aerodrome and undershoot/overshoot.

Since 2011 the ICAO-led Runway Safety Programme (RSP) has been collaborating on initiatives to reduce runway safety-related accidents and incidents worldwide. A key initiative is the Global Runway Safety Action Plan (GRSAP), which provides recommended actions for all runway safety stakeholders aimed at reducing the risks related to runway safety, in particular runway excursions and runway incursions.

ICAO and its RSP partners also continue to support the establishment of effective airport Runway Safety Teams (RSTs) as a way to improve runway safety through Runway Safety Go-Team missions. The Runway Safety Go-Teams are comprised of ICAO and RSP partner organization experts, which perform multi-disciplinary technical assistance visits to requesting international airports to assist in establishing and improving the effectiveness of the airport RST. In 2019 there were eight Go-Team missions completed at airports in Azerbaijan, Belarus, Botswana, Cameroon, Lebanon, Morocco and Ukraine. In total there have been 40 ICAO Runway Safety Go-Team missions conducted since the launch of this initiative in 2014.

The Global Reporting Format (GRF) for runway surface conditions is another important runway safety-related initiative. ICAO continues to support States and stakeholders with their preparations for the 4 November 2021 applicability date. In March 2019 a global symposium was hosted in Montréal, with 350 delegates from 48 Member States and seven international organizations attending. This has been followed-up by a series of focused regional seminars, with eight hosted during 2019. In parallel, training courses for airport, airline and air traffic control (ATC) staff were under development through ICAO's Trainair Plus programme, in cooperation with Airports Council International (ACI), International Air Transport Association (IATA) and Civil Air Navigation Services Organisation (CANSO), respectively. The course for airport operations staff was delivered in 2019, and those for flight crew and ATC staff would be ready in 2020.

A competency-based approach to dangerous goods training and assessment

The Council approved amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284), which will be incorporated in the 2021–2022 Edition of the Technical Instructions. The amended provisions support a competency-based approach to dangerous goods training and assessment based on the principles provided in the *Procedures for Air Navigation Services — Training* (PANS-TRG, Doc 9868). They have been several years in the making and take into account feedback from States, international organizations and industry that was provided throughout the process. While the objective of ensuring personnel are trained to perform their dangerous goods functions commensurate with their responsibilities has not changed, the new provisions remove some of the prescriptive requirements of dangerous goods training, which may not always target specific training needs. The new provisions focus on the intent of dangerous goods training, which is to ensure personnel are competent to perform any function for which they are responsible prior to performing them.

New guidance material has been developed to support a competency-based approach to dangerous goods training and assessment. Since ICAO regions and Member States have differing regulatory, operational, technical and organizational environments, it does not prescribe a “one-size-fits-all” training programme. Instead, it provides generic tools to develop dangerous goods training programmes that can be adapted for specific needs. It is based on the more detailed material provided in the PANS-TRG.

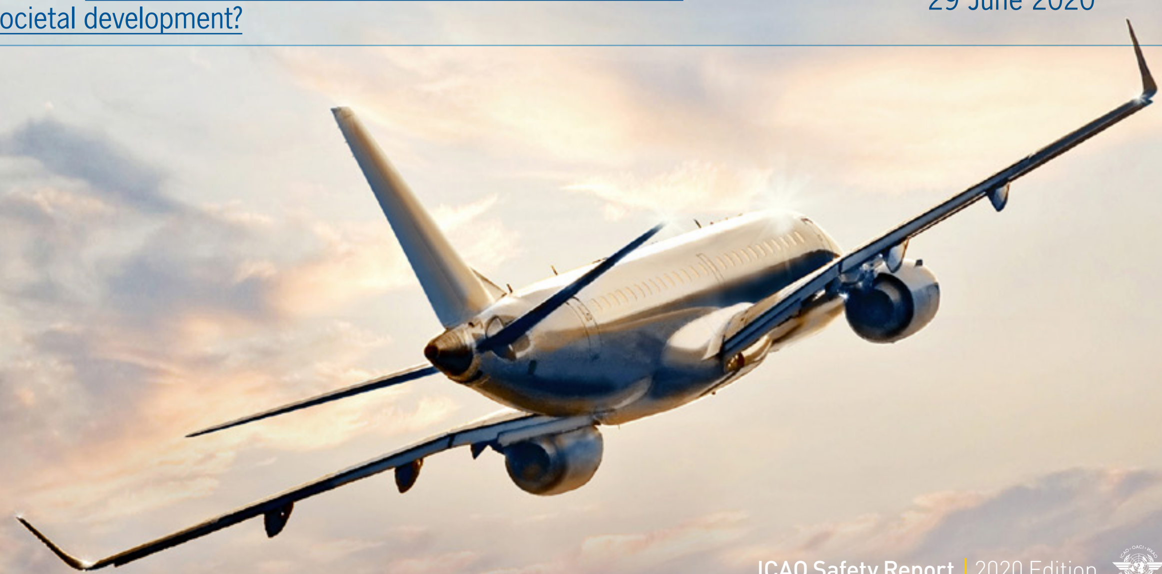
ANC Talks

In January 2020, the newly elected President of the Air Navigation Commission (ANC), Mr. Nabil Naoumi, launched "ANC Talks", an open forum where the ANC and aviation stakeholders discuss challenges and opportunities encountered in the aviation sector. This initiative allows for discussions on implementation issues, and the talks are structured in such a way that communication is improved and work with aviation stakeholders is promoted, ultimately enhancing the relationship between ICAO, the aviation industry and other aviation stakeholders.

The outcome of ANC Talks is made available to the general public. An article summarizing discussions is published after each meeting on the ICAO Uniting Aviation Blog (https://www.unitingaviation.com). The President of the ANC also holds separate interview meetings with invited stakeholders, available on the ICAO TV (https://www.icao.tv).

Below is the list of articles published in the ICAO Uniting Aviation Blog and the associated date of publication. Interview videos can be accessed through the same link:

Published Articles on the ICAO Uniting Aviation Blog	Date of publication
ANC Talks: ICAO's Air Navigation Commission	5 February 2020
ANC Talks: Issues that Affect Airports	19 February 2020
ANC Talks: The Airbus 220 Aircraft	24 March 2020
ANC Talks: SITA brings cybersecurity to the discussions	29 April 2020
ANC Talks: Competency-based Training and Assessments in Aviation	12 May 2020
ANC Talks: Loon and Airbus Zephyr take Aviation to New Heights	21 May 2020
ANC Talks with EASA: As Innovation Grows, so does Aviation	27 May 2020
ANC Talks with EUROCONTROL: European Aviation, COVID-19 and the Recovery	12 June 2020
ANC Talks: A new digital era of aviation and the path forward for airspace and traffic management	19 June 2020
ANC Talks: How does business aviation contribute to economic and societal development?	29 June 2020



COVID-19 pandemic – The ICAO Council Aviation Recovery Task Force

From the onset of the COVID-19 crisis, the aviation system has faced ever-growing challenges. Following the ICAO Council *Declaration on the novel coronavirus* (COVID-19) adopted on 9 March 2020, the ICAO Council Aviation Recovery Task Force (CART) was established. The CART, which is composed of representatives from States, and international, regional and industry organizations, and supported by the ICAO Secretariat, was tasked to identify and recommend strategic priorities and policies to address these challenges and to provide global guidance for a safe, secure and sustainable restart and recovery of the aviation system.

The CART has since published the CART Report (https://www.icao.int/covid/cart/Pages/CART-Report--Executive-Summary.aspx) and the *Take-off: Guidance for Air Travel through the COVID-19 Public Health Crisis* (https://www.icao.int/covid/cart/Pages/CART-Take-off.aspx) to support Member States and the aviation industry.

CART Report

A safe, secure and sustainable restart and recovery of the global aviation sector is best supported by an internationally harmonized approach based on the following 10 principles outlined in the CART Report:

1. **Protect people: harmonized but flexible measures.** States and industry need to work together to put in place harmonized or mutually accepted risk-based measures to protect passengers, crew and other staff throughout the travel experience.
2. **Work as one aviation team and show solidarity.** The respective plans of ICAO, States, international and regional organizations, and the industry should complement and support each other. While national and regional needs may require different approaches, States should harmonize responses to the extent possible, in line with ICAO's Standards, plans and policies.
3. **Ensure essential connectivity.** States and industry should maintain essential connectivity and global supply chains, especially to remote regions, isolated islands and other vulnerable States.
4. **Actively manage safety-, security- and health-related risks.** States and industry should use data-driven systemic approaches to manage the operational safety-, security-, and health related risks in the restart and recovery phases, and adapt their measures accordingly.
5. **Make aviation public health measures work with aviation safety and security systems.** Health measures must be carefully assessed to avoid negatively impacting aviation safety and/or security.
6. **Strengthen public confidence.** States and industry need to work together, harmonizing practical measures and communicating clearly to ensure passengers are willing to travel again.

7. **Distinguish restart from recovery.** Restarting the industry and supporting its recovery are distinct phases which may require different approaches and temporary measures to mitigate evolving risks.
8. **Support financial relief strategies to help the aviation industry.** States and financial institutions, consistent with their mandates, should consider the need to provide direct and/ or indirect support in various proportionate and transparent ways. In doing so, they should safeguard fair competition and not distort markets or undermine diversity or access.
9. **Ensure sustainability.** Aviation is the business of connections, and a driver of economic and social recovery. States and industry should strive to ensure the economic and environmental sustainability of the aviation sector.
10. **Learn lessons to improve resilience.** As the world recovers, the lessons learned have to be used to make the aviation system stronger.

The CART Report also outlines the measures compatible with safety and security requirements to be taken and the recommendations to follow up at the international, national and local level.

These measures are grouped into four categories:

a) **Aviation safety-related measures.** States may temporarily depart from ICAO Standards but must do so in a manner that does not compromise safety and security, and which is duly reported to ICAO. These departures should not be retained beyond the crisis.
b) **Aviation public health-related measures.** States should establish public health procedures aligned with the guidance included in the Take-off: Guidance for Air Travel through the COVID-19 Public Health Crisis. The necessity of these measures should be regularly reviewed. The measures which are no longer relevant should be discontinued when the need for their application has ceased to exist.
c) **Security- and facilitation-related measures.** States should enhance cross-sectoral coordination by establishing a national air transport facilitation committee or equivalent, and systematically use the passenger health locator form as a reference. It is States' responsibility to maintain security across all operations.
d) **Economic and financial measures.** These should be inclusive, targeted, proportionate, transparent, temporary and consistent with ICAO's policies, while striking an appropriate balance of interests without prejudice to fair competition.

The CART Report contains the following 11 recommendations:

Recommendation 1: During the global COVID-19 outbreak, Member States should continue updating COVID-19 Contingency Related Differences (CCRDs) in the Electronic Filing of Differences (EFOD) subsystem.

Recommendation 2: Member States should avoid retaining any COVID-19 related alleviation measures as soon as normal operations are resumed. Differences that remain after the contingency if any should be filed in the EFOD system.

Recommendation 3: Member States should expedite the development of guidance for safety management of new operations or operation change during this crisis.

Recommendation 4: Global and regional harmonization of procedures is essential to strengthen public and passenger confidence in air travel. To that end, Member States should establish aviation public health procedures aligned with the guidance in the Take-off: Guidance for Air Travel through the COVID-19 Public Health Crisis.

Recommendation 5: In order to support the fastest possible return to normal aviation operations, Member States should regularly review the necessity of continuing the application of risk mitigation measures as the risk of COVID-19 transmission diminishes; and measures which are no longer needed should be discontinued.

Recommendation 6: Member States that have not done so should immediately establish a National Air Transport Facilitation Committee (or equivalent) as required by Annex 9 to increase national level cross-sectoral coordination.

Recommendation 7: Member States should systematically use a Passenger Health Locator Form to ensure identification and traceability of passengers to help limit the spread of the disease and resurgence of the pandemic.

Recommendation 8: While temporarily adapting their security-related measures, using the guidance provided, Member States should strengthen their oversight system to ensure these measures are consistently applied with the objective of protecting aviation against acts of unlawful interference.

Recommendation 9: Member States should take measures to ensure that relevant personnel are provided training to identify and manage unruly passenger situations related to non-respect of essential aviation public health and safety measures.

Recommendation 10: Member States should consider appropriate extraordinary emergency measures to support financial viability and to maintain an adequate level of safe, secure and efficient operations, which should be inclusive, targeted, proportionate, transparent, temporary and consistent with ICAO's policies, while striking an appropriate balance among the respective interests without prejudice to fair competition and compromising safety, security and environmental performance.

Recommendation 11: Member States should facilitate information-sharing and exchange on their actions and best practices by contributing to an ICAO database of measures.

The CART recommendations and guidelines are continuously reviewed and updated based on the latest medical and operational advice, and are intended to harmonize and not replace the COVID-19 recovery roadmaps currently established by States, regions or industry groups.

Take-off: Guidance for Air Travel through the COVID-19 Public Health Crisis

The CART Take-off guidance includes a section on public health risk mitigation measures, in addition to four operational modules relating to airport guidelines, aircraft guidelines, crew guidelines and cargo guidelines.

This document provides a framework for addressing the impact of the current COVID-19 pandemic on the global aviation transportation system. The appendix to this document includes mitigations needed to reduce public health risks to air passengers and aviation workers while strengthening confidence among the travelling public, the global supply chain and governments. This will assist in accelerating demand for essential and non-essential air travel impacted by COVID-19.

With help and guidance from the civil aviation stakeholder community, ICAO recommends a phased approach to enable the safe return to high-volume domestic and international air travel for passengers and cargo. The approach introduces a core set of measures to form a baseline aviation health safety protocol to protect air passengers and aviation workers from COVID-19. These measures will enable the growth of global aviation as it recovers from the current pandemic.

More information about the CART can be found at https://www.icao.int/covid/cart/Pages/default.aspx.

COVID-19 pandemic – CAPSCA and the Public Health Corridor

The ICAO Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation (CAPSCA) programme, established in 2006 in response to the severe acute respiratory syndrome (SARS) crisis, is a voluntary multi-sectoral platform combining resources and expertise from both aviation and public health sectors to support the preparedness for, and management of, public health events affecting civil aviation. The CAPSCA network links ICAO, the World Health Organization (WHO) and other United Nations (UN) entities, international aviation organizations, civil aviation authorities and public health organizations at global, regional and national levels.

CAPSCA recommends the implementation of a "Public Health Corridor" (PHC) concept to ensure continued flight operations with minimal restrictions, whilst preventing the spread of infection of COVID-19 through air travel and protecting the health and safety of crew and passengers. The PHC has been developed using a risk-based approach, taking into account safety management principles. The key elements of this strategy are the use of "clean" crew, "clean" aircraft, "clean" airport facilities, "clean" cargo and transporting "clean" passengers. "Clean" in this context refers to implementing measures to ensure as far as possible a "COVID-19 free" status.

Given the absence of a vaccine and definitive treatment, and the limitations on testing and resources, the risk of contracting COVID-19 when travelling by air cannot be completely eliminated, however, the risk to crew and passengers can be mitigated significantly by implementing various layers of measures. CAPSCA guidance material and supporting activities will be adjusted periodically based on new scientific developments to ensure that the implemented measures mitigate risk as far as possible.

CAPSCA and the PHC are mechanisms for implementing the ICAO Council Aviation Recovery Task Force (CART) guidance material relating to general public health measures as well as the specific recommendations specified in the airport, aircraft, crew and cargo modules. Assistance is provided at global, regional and national levels to support States and industry for the restart and recovery of the aviation system.

CAPSCA activities in response to the COVID-19 pandemic include:

- **Developing guidance material**, including Electronic Bulletins supporting the CART and contributing to WHO guidance material development.
- **Sharing guidance material**, including ICAO guidance material and information, WHO and other public health guidance material and publication of CAPSCA members' best-practices papers and other associated guidance material on the CAPSCA website.
- **Tools development and review**, including online surveys, forms to ensure uniform implementation of guidance material, review of the CAPSCA assistance visit checklist, data-driven applications and analysis of information shared by Member States.
- **Capacity-building and training**, including the current CAPSCA on-line training package to develop capacity to conduct CAPSCA assessment visits, training through regional CAPSCA meetings which is currently being conducted on-line and through webinars and supporting WHO regional training activities.
- **Providing subject matter advice** on an ad-hoc basis upon request to support States in their activities and the implementation of guidelines.

- **CAPSCA assistance visits** assessing preparedness and response plans, conducting a gap analysis, assess implementation of the International Health Regulations and ICAO health-related SARPs, providing recommendations for improvement.
- **Developing templates and procedures** to facilitate the implementation of the PHC.

The PHC expands on CAPSCA activities and focuses on implementation activities, including:

- implementation of guidance material through the i-Package on the PHC;
- implementation of new tools such as online tools and smartphone applications;
- enhancing capacity-building and training, including the PHC online course and PHC webinars; and
- assessment of and information-sharing regarding implementation of CAPSCA and CART guidance in collaboration with public and private stakeholders to facilitate harmonized implementation and mutual recognition of implemented measures.

More information about CAPSCA can be found at https://www.icao.int/safety/aviation-medicine/Pages/CAPSCA.aspx.

COVID-19 pandemic – Update on operational safety activities

Meeting the obligations of the Convention

The initial priority of States' response to the COVID-19 pandemic has included ensuring that international operations, albeit in limited capacity, can continue unhindered. Due to restrictions with access to training and medical facilities, States are offering operators alleviations from medical and training requirements that have resulted in the need to record temporary differences. A method to allow States to file temporary differences to Standards and Recommended Practices (SARPs), as well as the provision of clear information on what differences they are prepared to accept from other States, has become essential to allow operations to continue.

The relevant articles of the Convention are:

> **Article 38** – *Departures from international standards and procedures*, which requires States to notify ICAO of any differences to the SARPs that arise;
>
> **Article 39** – *Endorsement of certificates and licenses*, which states that any aircraft or person that does not satisfy in full applicable Standards or conditions shall have endorsed on or attached to relevant certificate or license a complete enumeration of the details or particulars in respect of which the aircraft or person does not satisfy such requirements or conditions; and
>
> **Article 40** – *Validity of endorsed certificates and licenses*, which provides that no aircraft or personnel having certificates or licenses so endorsed shall participate in international navigation, except with the permission of the State or States whose territory is entered.

ICAO carried out a thorough review of all Annexes and identified a set of SARPs that included explicit references to renewal periods or recency requirements. To support States in filing and accessing the required information, the COVID-19 Contingency Related Differences (CCRD) (available at www.icao.int/safety/COVID-19OPS/Pages/ccrd.aspx), a sub system of the Electronic Filing of Differences (EFOD) system, has been developed to allow States to file temporary differences to SARPs and to publish the differences they are prepared to accept from other States. The system ensures continued operations in compliance with Articles 38, 39 and 40 of the Convention. On 3 April 2020, ICAO issued State letter AN 11/55-20/50 informing States of the establishment of the CCRD and requested that information be provided to facilitate continuance of international air transport while respecting the requirements of the Convention. To date, a total of 181 States have provided information in the CCRD, an unprecedented number of responses; this has supported the continued operations of aircraft.

Additional SARPs have since been subsequently identified and included in the CCRD tool. Although these SARPs do not explicitly have limitations contained in the text, they have been considered to be of sufficient importance for States to review and document their differences. An example of such is the requirement in Annex 6 — *Operation of Aircraft* for the continued validity of the approval for approved maintenance organizations. This does not specify the means to demonstrate continued validity; many States, however, require a biannual on-site inspection, which has not been possible to comply with.

Developing guidance

To support civil aviation authorities (CAAs) in the decision-making process for the issuance of alleviations, ICAO has developed a number of "Quick Reference Guides" (QRG) describing State and industry best practices on a variety of subjects. These guides have been designed to be published quickly and updated as often as required, depending on the circumstances. Maximum use has been made of ICAO expert groups (panels, task forces, study groups, etc.), although the time-sensitive nature of the work requires that the usual process of review, comment and publication have been expedited.

Guidance has also been developed on conducting risk assessments to support the State alleviations, including the publication of the first edition of the *ICAO Handbook for CAAs on the Management of Aviation Safety Risks related to COVID-19* (Doc 10144). To complement the content of the Handbook, ICAO is collecting and sharing examples and tools through a dedicated page created under the Safety Management Implementation (SMI) website (www.icao.int/SMI-COVID19SRM).

Webinars, training and tools

Additional information has been provided to States and industry via a series of webinars, based on the QRG subject areas, which allow for more detailed explanations of the issues involved and facilitate question and answer sessions responding to specific areas of interest to participants.

States and operators also needed to be able to plan for the lifting of COVID-19 related extensions and exemptions, and anticipate the needs as a result of deferred certificate validity renewals backing up. In line with safety management principles, ICAO has developed the monitoring and planning tool (MPT) to support States and organizations in their planning activities related to the aftermath of COVID-19 alleviation measures.

The primary context of the tool is the management of the likely backlog due to reduced activities during the COVID-19 crisis. The tool also helps States visualize the alleviations granted and establish a dialogue with operators to better anticipate the demand of services.

Implementation packages

On 17 July 2020, ICAO issued Electronic Bulletin 2020/40 informing States of the availability of implementation packages (iPacks) to support States in their response, recovery and resilience efforts following the COIVD-19 outbreak. The iPack contents include standardized guidance material, training, workshops, tools and subject matter expert support which aim to facilitate and guide the implementation of the applicable ICAO provisions by State entities. iPacks on aviation safety risk management and aerodromes restart are two such examples.

COVID-19 pandemic – Safety Risk Management

ICAO has developed the *Handbook for CAAs on the Management of Aviation Safety Risks related to COVID-19* (Doc 10144). The terminology is aligned with ICAO Doc 9859 and can be applied by States at any level of SSP implementation.

The guidance outlines important aspects for CAAs to consider at different stages of the pandemic. It discusses the assessment and prioritization of risks based on collection and analysis of data, application of safety management principles to support risk-based decision-making, and management and monitoring of CAA approvals in light of the flexibility needed across the aviation system to continue safe operations. It also introduces concepts such as the plan-do-check-act (PDCA) cycle as shown in Figure 12.

The successful management of the pandemic requires the assessment and management of risks that extend beyond the boundaries of managing aviation safety risks as defined in Annex 19. To that end, integrated risk management tools are being considered to support States, taking into account different risk domains, including safety, security, environment and financial.

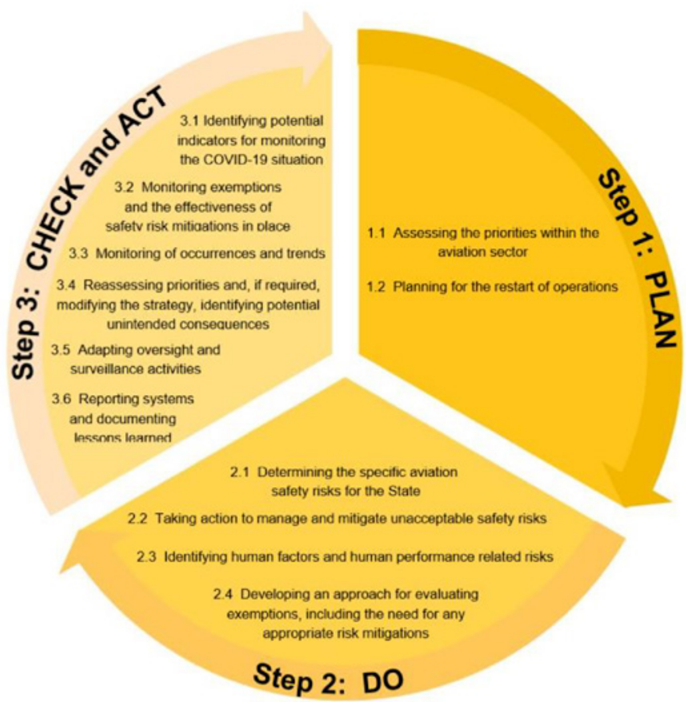


Figure 12. | **PDCA cycle for managing aviation safety risks during COVID-19**

Once the pandemic is over, CAAs should capitalize on their efforts to apply lessons learned during the COVID-19 pandemic to continue building on their SSP implementation, making further progress towards addressing contingency planning and improving the effectiveness of their safety management functions. The Handbook is available at no cost and can be downloaded at www.icao.int/COVID-19-SRM. Webinars and online training were developed to support the application of this content.

COVID-19 pandemic - Strategies for UAS

The COVID-19 pandemic has presented circumstances to the world that require ongoing diligence and resources. The global spread commands innovative solutions and among those solutions, unmanned aircraft systems (UAS) can play a vital role.

A delivery logistics company is using UAS to transport COVID-19 samples in urban areas of Ghana and Rwanda, and transporting an expanded mix of products to meet health facilities' critical needs as demand surges. The protocols were formalized identifying the precise movement of each COVID-19 sample. Allocation of specific UA was made for transporting to and from the health facilities as well as required procedures for sanitizing the UA and the flight operations environment. Personnel received training on proper sample packaging, marking and use of proper protective equipment according to WHO recommendations.

Transport Canada is presently evaluating multiple prospective operation types submitted by Canadian UA operators. The various operation types involve transporting biological samples and medicines to isolated communities; delivery of essential goods and medicines to indigenous communities; or transporting supplies to food banks. Canada has asked the fundamental question as to how it can best adapt its current transportation model to accommodate the many distribution needs efficiently and effectively. As Transport Canada evaluates its UA transportation options, it does so with the consideration of less congested skies, which is another result from the current health crisis.

States throughout the world have acquired experience with UAS operations that are similar in nature to one another. Testing corridors have been established and trial delivery operations have ensued. In some States, training is underway on different types of UA, health applications and collecting and processing data. All of these activities from personal protective equipment (PPE) delivery to mapping data that will help model the spread of a virus are invaluable for the current pandemic and especially effective during future health events, with refined coordination and preparation.

ICAO brought together experts from several States, United Nations System agencies and non-governmental organizations to assist in producing guidance material for emergency response. ICAO has published Humanitarian Aid and Emergency Response guidance for UAS and has developed UAS model regulations. ICAO is currently working on a cohesive UAS roadmap to assist States with implementation of these provisions. The need to harmonize UAS regulations amongst Member States for operations across borders and within regions is a key consideration.

The COVID-19 pandemic is teaching all of us about the degree to which coordination and preparation is necessary to respond to this and future outbreaks. ICAO's U-AID webpage provides guidance material to assist States in preparing for emergency response events insuring a holistic approach. Under supporting material, government ministries, agencies and local entities with whom coordination is vital are provided as well as mission planning samples, carriage of dangerous goods information and establishing methods for societal communications. The link to ICAO's Humanitarian Guidance and Emergency Response material can be found at: https://www.icao.int/safety/UA/UAID/.

An important aspect of adequate crisis planning is training. Training in advance of a crisis is paramount. Knowledge and skill of UA flight operations; how to handle, package, label and record medical samples for transport; and how to properly collect, process and assess data collected by UA are all areas that require training in preparation for an emergency response.

The ICAO guidance can be used for the COVID-19 pandemic or any other natural or manmade emergency situation. The key is to be prepared. Review of the model regulations and guidance material which provide foundational information for States will assist personnel in the necessary preparation. These materials will be updated over time, as knowledge and experience expand. For specific questions or concerns on emergency preparedness by UAS, please contact us at RPAS@icao.int.

COVID-19 pandemic – Aerodrome Operations and Infrastructure

Aerodromes are a unique ecosystem in the aviation industry where interaction takes place among passengers, with staff and with other authorities in a common space. With the rapid spread of COVID-19, aerodromes were forced to shut down or operate with reduced capacity. In this context, it is important for States to be prepared to cope with various challenges during these unprecedented times.

ICAO published, on its COVID-19 website, guidance for States concerning issues pertaining to issuance/renewal of aerodrome certificates, need for stakeholder engagement before closing aerodromes and a sample safety checklist for resuming aerodrome operations.

Aerodrome Certification

Aerodrome certification is an effective tool to ensure safe and efficient aerodrome operations. During the COVID-19 pandemic, States were advised of the options to provide interim aerodrome certificates or extend the validity of aerodrome certificates, where required for a defined period based on established guidelines.

Aerodrome Closures

Uncoordinated aerodrome closures will affect the aviation industry especially for aircraft in a state of emergency, operations related to humanitarian aid, medical and relief flights, and alternate aerodromes for en-route operations. States were advised to coordinate with the public health authorities, aircraft operators, ANSPs, aerodrome operators, etc., to address the needs and concerns of all the stakeholders, before initiating any action to close an aerodrome.

Resuming Aerodrome Operations

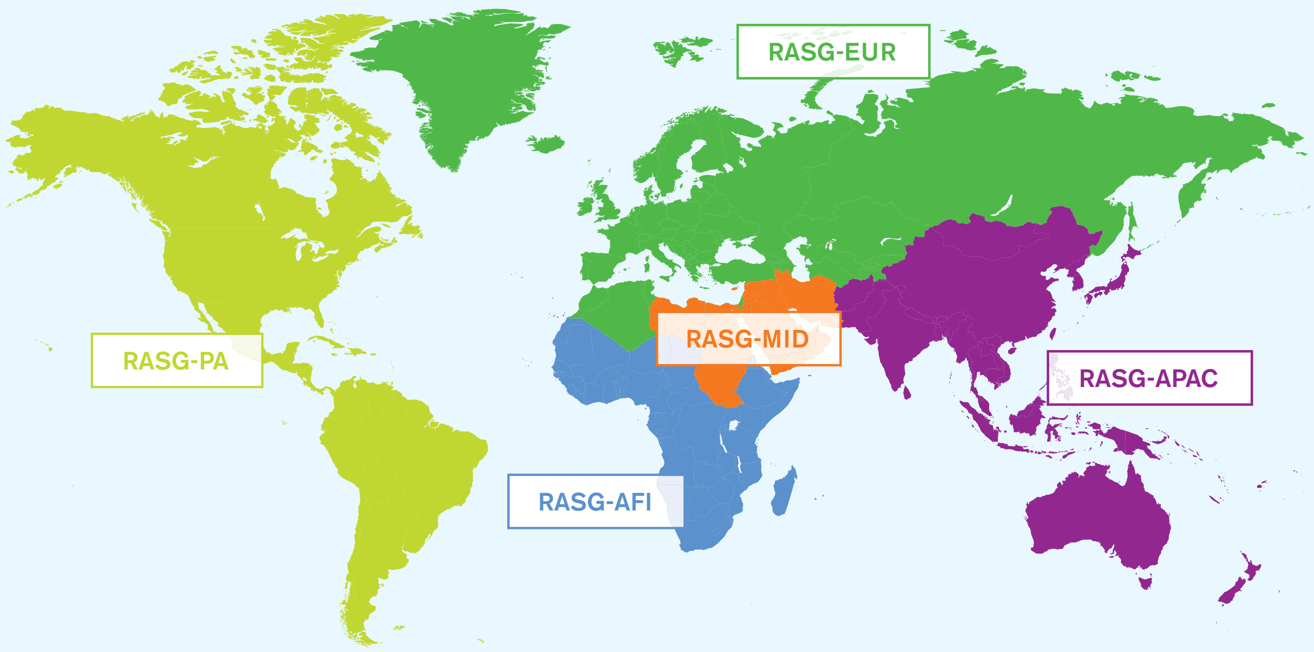
Resuming aerodrome operations after a full or partial aerodrome closure involves extensive preparatory checks to ensure safety and efficiency. To this end, States were provided with a sample checklist to facilitate a quick recovery for aerodromes by checking key elements in areas such as aerodrome infrastructure, aerodrome operations, certification and compliance, and coordination and collaboration.

More information can be found at https://www.icao.int/safety/COVID-19OPS/Pages/aga.aspx.

Appendix 1

Regional Aviation Safety Group (RASG) Regions

The assignment of States or areas to specific groupings is for statistical convenience and does not imply any assumption regarding political or other affiliation of States or territories by ICAO.



RASG-AFI (48)

Angola	Congo	Ghana	Mauritius	Somalia
Benin	Côte d'Ivoire	Guinea	Mozambique	South Africa
Botswana	Democratic Republic of the Congo	Guinea-Bissau	Namibia	South Sudan
Burkina Faso	Djibouti	Kenya	Niger	Togo
Burundi	Equatorial Guinea	Lesotho	Nigeria	Uganda
Cameroon	Eritrea	Liberia	Rwanda	United Republic of Tanzania
Cabo Verde	Eswatini	Madagascar	Sao Tome and Principe	Zambia
Central African Republic	Ethiopia	Malawi	Senegal	Zimbabwe
Chad	Gabon	Mali	Seychelles	
Comoros	Gambia	Mauritania	Sierra Leone	

RASG-APAC (39)

Afghanistan
Australia
Bangladesh
Bhutan
Brunei Darussalam
Cambodia
China
Cook Islands
Democratic People's Republic of Korea
Fiji
India
Indonesia
Japan
Kiribati
Lao People's Democratic Republic
Malaysia
Maldives
Marshall Islands
Micronesia (Federated States of)
Mongolia
Myanmar
Nauru
Nepal
New Zealand
Pakistan
Palau
Papua New Guinea
Philippines
Republic of Korea
Samoa
Singapore
Solomon Islands
Sri Lanka
Thailand
Timor-Leste
Tonga
Tuvalu
Vanuatu
Viet Nam

RASG-EUR (56)

Albania
Algeria
Andorra
Armenia
Austria
Azerbaijan
Belarus
Belgium
Bosnia and Herzegovina
Bulgaria
Croatia
Cyprus
Czechia
Denmark
Estonia
Finland
France
Georgia
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Kazakhstan
Kyrgyzstan
Latvia
Lithuania
Luxembourg
Malta
Monaco
Montenegro
Morocco
Netherlands
North Macedonia
Norway
Poland
Portugal
Republic of Moldova
Romania
Russian Federation
San Marino
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Tajikistan
Tunisia
Turkey
Turkmenistan
Ukraine
United Kingdom
Uzbekistan

RASG-MID (15)

Bahrain
Egypt
Iraq
Iran (Islamic Republic of)
Jordan
Kuwait
Lebanon
Libyan Arab Jamahiriya
Oman
Qatar
Saudi Arabia
Sudan
Syrian Arab Republic
United Arab Emirates
Yemen

RASG-PA (35)

Antigua and Barbuda
Argentina
Bahamas
Barbados
Belize
Bolivia (Plurinational State of)
Brazil
Canada
Chile
Colombia
Costa Rica
Cuba
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Saint Kitts and Nevis
Saint Lucia
Saint Vincent and the Grenadines
Suriname
Trinidad and Tobago
United States
Uruguay
Venezuela (Bolivarian Republic of)

Appendix 2

List of Scheduled Commercial Accidents in 2019

Local Date	Model	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-01-03	Embraer ERJ190-100	United States	PA		CABIN
2019-01-08	Airbus A320-200	United States	PA		RAMP
2019-01-17	Boeing 737-800 & Boeing 737-800	Malta	EUR		GCOL
2019-01-18	Boeing 777-200	South Pacific ocean	International water		TURB
2019-01-23	de Havilland DHC8-100	Canada	PA		RE
2019-01-26	ATR 72-600	India	APAC		ARC
2019-01-28	ATR 72-200	Spain	EUR		RE
2019-01-28	Boeing 727-200	United States	PA		ARC
2019-01-29	Boeing 737-800	Germany	EUR		SCF-NP
2019-02-03	Boeing 787-8	United States	PA		CABIN
2019-02-05	Boeing 737-800	Costa Rica	PA		TURB
2019-02-08	Airbus A321-200	Denmark	EUR		ARC
2019-02-13	Embraer ERJ170	United States	PA		TURB
2019-02-17	Boeing 737-800	United States	PA		TURB
2019-02-27	Boeing B777-200	United States	PA		TURB
2019-02-28	Embraer ERJ 190-200	United Kingdom	EUR		F-NI, EVAC
2019-03-01	Airbus A320-200	United Kingdom	EUR		SCF-PP, EVAC
2019-03-02	de Havilland DHC8-400	United Kingdom	EUR		GCOL
2019-03-03	Beechcraft 1900D	Algeria	EUR		SCF-NP
2019-03-03	Airbus A320-200	Brazil	PA		USOS
2019-03-04	Embraer EMB145	United States	PA		USOS
2019-03-07	Boeing 737-300	Bolivia (Plurinational State of)	PA		SCF-NP
2019-03-08	ATR 42-500	Russian Federation	EUR		RE
2019-03-10	Boeing 737 MAX 8	Ethiopia	AFI	157	SCF-NP, LOC-I
2019-03-10	Boeing 737-800 & Boeing 757-300	United States	PA		GCOL
2019-03-10	Bombardier CL600 2C10 & Bombardier CL600 2D24	United States	PA		RAMP
2019-03-19	Fokker 28 MK100	Iran (Islamic Republic of)	MID		SCF-NP, ARC
2019-03-21	ATR 72-200	Sao Tome and Principe	PA		RAMP
2019-03-23	Airbus A320-200	United Kingdom	EUR		SCF-NP, RAMP

List of Scheduled Commercial Accidents in 2019 (continued)

Local Date	Model	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-03-27	Boeing 737-700	United States	PA		BIRD
2019-04-03	Airbus A320-200	United Kingdom	EUR		RAMP
2019-04-04	Boeing MD88	United States	PA		GCOL
2019-04-04	de Havilland DHC8-400	Austria	EUR		ARC, WSTRW
2019-04-08	BAe Jetstream 4100	Dominican Republic	PA		ARC
2019-04-10	Airbus A321-200	United States	PA		ARC
2019-04-11	Boeing 737-900	United States	PA		CABIN
2019-04-22	Airbus A320-200	Thailand	APAC		TURB
2019-05-02	Boeing 737-800	Japan	APAC		TURB
2019-05-03	Boeing DC-3	Canada	PA		SCF-PP
2019-05-05	Sukhoi Superjet 100-95B	Russian Federation	EUR	41	ARC, WSTRW, RE, F-PI, EVAC
2019-05-08	de Havilland DHC8-400	Bangladesh	APAC		ARC, RE
2019-05-10	de Havilland DHC8-300	Canada	PA		GCOL
2019-05-13	Boeing 737-900	Republic of Korea	APAC		TURB
2019-05-24	Airbus A320-200	Indonesia	APAC		RAMP
2019-05-25	Boeing 737-800	United States	PA		TURB
2019-05-28	Airbus A320-200	United States	PA		CABIN
2019-06-09	Boeing 737-900	United States	PA		ARC
2019-06-15	ATR 42-300	Brazil	PA		SCF-NP, ARC, EVAC
2019-06-15	Boeing 757-200	United States	PA		ARC, RE
2019-06-17	Boeing 737-800	United States	PA		RAMP
2019-06-18	Airbus A330-200	China	APAC		TURB
2019-06-23	Airbus A320-200	Italy	EUR		CABIN
2019-06-27	Antonov An-24RV	Russian Federation	EUR	2	RE, SCF-PP, F-POST
2019-07-02	Boeing 737-800	India	APAC		RE
2019-07-09	Boeing 737-800& Airbus A320-200	Netherlands	EUR		RAMP
2019-07-10	Airbus A380-800	Indian Ocean	International water		TURB
2019-07-12	ATR 42-500	Greece	EUR		RE
2019-07-12	ATR 72-200	Nepal	APAC		RE
2019-07-17	Bombardier CL 600 2B19	United States	PA		GCOL
2019-07-19	de Havilland DHC8-400	Canada	PA		ARC
2019-07-20	ATR 42-500	Pakistan	APAC		RE
2019-07-22	Boeing 767-300	United States	PA		TURB

List of Scheduled Commercial Accidents in 2019 (continued)

Local Date	Model	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-07-23	Boeing 737-300	Nigeria	AFI		ARC
2019-07-23	Boeing 757-300	United States	PA		RAMP
2019-07-24	Boeing 777-300	France	EUR		RAMP
2019-07-30	Airbus A319-100	Germany	EUR		RAMP
2019-07-31	Bombardier CL600 2D24	United States	PA		RAMP
2019-08-02	Airbus A330-200	Atlantic ocean	International water		TURB
2019-08-02	ATR 72-200	Myanmar	APAC		ARC
2019-08-02	Boeing 787-8 & Airbus A340-300	Canada	PA		GCOL
2019-08-03	Boeing 737-300	Bolivia	PA		SCF-NP, ADRM
2019-08-06	Boeing 737-900ER & Airbus A320-200	United States	PA		GCOL, ADRM
2019-08-08	Airbus A320-200	United States	PA		TURB, CABIN
2019-08-08	Airbus A321-200	United States	PA		ARC, WSTRW
2019-08-12	Boeing 787-9	United Kingdom	EUR		RAMP
2019-08-15	Boeing 787-8	China	APAC		TURB
2019-08-15	Airbus A321-200	Russian Federation	EUR		BIRD
2019-08-16	de Havilland DHC 8-200	Kenya	AFI		WILD
2019-08-21	Airbus A340-600	Turkey	EUR		TURB
2019-08-26	Boeing MD88	United States	PA		TURB
2019-08-26	ATR72-200	Iran (Islamic Republic of)	MID		ARC
2019-08-27	Airbus A330-300	China	APAC		F-NI
2019-08-27	Airbus A320-200	United States	PA		TURB
2019-09-06	Airbus A319-100	United States	PA		TURB
2019-09-07	ATR72-200	Columbia	PA		ARC
2019-09-09	Airbus A319-100	Germany	EUR		TURB
2019-10-01	Boeing 777-300	Indonesia	APAC		TURB
2019-10-11	Fokker F50	Kenya	AFI		RE
2019-10-12	ATR 42-500	Japan	APAC		AMAN
2019-10-12	Embraer EMB110	Bahamas	PA		SCF-NP, ARC, RE
2019-10-17	Saab 2000	United States	PA	1	RE
2019-10-29	De Havilland DHC8-400	United States	PA		BIRD
2019-11-03	Boeing B787-8	Spain	EUR		AMAN
2019-11-11	Embraer EMB145	United States	PA		RE
2019-11-16	Boeing 777-300 & Airbus A330-200	Germany	EUR		GCOL

List of Scheduled Commercial Accidents in 2019 (continued)

Local Date	Model	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-11-21	Boeing 737-800	Ukraine	EUR		RE
2019-11-23	Boeing 737-800	Germany	EUR		RAMP, OTHR
2019-11-23	Boeing 737-400	Colombia	PA		SCF-NP, ARC
2019-11-24	Dornier 228-200	Democratic Republic of Congo	AFI	26	LOC-I
2019-11-25	de Havilland DHC8-300	Zambia	AFI		WSTRW
2019-11-25	Airbus A330-300	Myanmar	APAC		ARC
2019-11-27	Airbus A350-900 & Airbus A330-200F	Democratic Republic of Congo	AFI		GCOL
2019-12-10	de Havilland DHC8-400	South Sudan	AFI		RE
2019-12-14	Bombardier CL600 2D24	United States	PA		CABIN
2019-12-15	Embraer EMB145	United States	PA		TURB
2019-12-16	Airbus A330-200	Spain	EUR		TURB
2019-12-16	Embraer EMB135	United States	PA		TURB
2019-12-18	Embraer ERJ190	United States	PA		TURB
2019-12-19	Boeing 737-900	United States	PA		AMAN
2019-12-21	Boeing 737-700	United States	PA		BIRD
2019-12-22	Boeing 737-800	United States	PA		SCF-NP, ARC
2019-12-25	Airbus A320-200	Japan	APAC		TURB
2019-12-27	Fokker F28 Mk0100	Kazakhstan	EUR	12	ICE, LOC-I
2019-12-28	Let L410	Democratic Republic of Congo	AFI		RE

CICTT Occurrence Categories

Code	Description
ADRM	Aerodrome
AMAN	Abrupt Maneuver
ARC	Abnormal runway contact
BIRD	Bird
CABIN	Cabin safety events
CFIT	Controlled flight into/towards terrain
CTOL	Collision with obstacles during takeoff and landing
EVAC	Evacuation
F-NI	Fire/smoke (non-impact)
F-POST	Fire/smoke (post-impact)
GCOL	Ground collision
ICE	Icing
LOC-I	Loss of control in-flight
LOC-G	Loss of control-ground
OTHR	Other
RAMP	Ground handling
RE	Runway excursion
SCF-NP	System/component failure (non-powerplant)
SCF-PP	System/component failure (powerplant)
TURB	Turbulence encounter
UNK	Unknown or undetermined
USOS	Undershoot/overshoot
WILD	Wildlife
WSTRW	Wind shear or thunderstorm

ICAO

SAFETY

International Civil Aviation Organization
999 Boulevard Robert-Bourassa
Montréal, QC, Canada
H3C 5H7

Tel.: +1 514-954-8219
Fax: +1 514-954-6077
Email: info@icao.int

Review of Aviation Safety Issues Arising from the COVID-19 Pandemic

An agency of the European Union

Postal address: Postfach 10 12 53
50452 Cologne, Germany
Visiting address: Konrad-Adenauer-Ufer 3
50668 Cologne, Germany

Tel.: +49 221 89990 000
Web: https://www.easa.europa.eu/contact-us
ISO 9001 Certified

1 A Collaborative Approach to Identifying and Managing Risks

European aviation is a complex but very safe system. The COVID-19 pandemic resulted in an extreme reduction in operations that began in late March and has continued through to the end of May 2020. As governments have signalled that restrictions on travel will begin to ease in June, many airlines and airports are once again increasing the level of their activities. A lot has changed in these past few months and it is important that we work together during the recovery to understand the risks and safety issues that are in play and what we, as a community, can do to mitigate against them.

In supporting aviation organisations in safely increasing their service provision, EASA has been working closely with Member State regulators and industry partners to identify the new or emerging safety issues. This took the form of a survey and follow-up virtual meetings with the different stakeholder groups.

The work presented mirrors the collaborative activities that we normally carry out in identifying safety issues and managing risks as part of the European Safety Risk Management (SRM) process. Naturally, the process has been adapted to take account of the new working environment. A summary of EASA's safety risk management process can be found in our Annual Safety Review.

This paper provides the results of the first step in the SRM process in relation to COVID-19 by identifying the relevant safety issues. EASA is now addressing those safety issues to identify appropriate mitigating actions and to support their implementation across the industry. Urgent and higher risk issues are being addressed through the Return to Normal Operations (RNO) project, which has already taken several important actions in consultation with the industry and Member States. Further work on mitigating actions will include material to support oversight and standardisation activities and this information will be published as the work is matured.

2 The Importance of Being Able to Manage Risks Effectively

The survey and follow-up discussions identified many different safety issues across a wide range of operational activities. However, the over-arching theme to all of these safety issues was the need for well-functioning management systems, which ensure that we are able to identify and manage our risks effectively. Whether the issue is a specific problem faced by one domain or a human factors issue that affects all aviation personnel, it is vital that everyone in an organisation is focused on the goal of delivering safe and effective operations.

The shutdown and return to service have led to many changes to the operating environment. These will continue to evolve until we reach a "new normal". This means that organisations need to address the management of change effectively and regulators need to engage with their organisations to ensure that the results are safe and effective.

As the complex aviation system restarts, new hazards will undoubtedly emerge. Additionally, there are currently a substantial number of exemptions, extensions and eroded safety buffers. That means that the aviation system is not the same as that which was operating previously and our perception of what can safely be achieved should be challenged.

It is important to recognise the positive contribution that aviation professionals can make in restarting a complex system. The ICAO Handbook for CAAs on the Management of Aviation Safety Risks related to COVID-19 (Doc 10144) advises the following:

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Postal address: Postfach 10 12 53
50452 Cologne, Germany
Visiting address: Konrad-Adenauer-Ufer 3
50668 Cologne, Germany

Tel.: +49 221 89990 000
Web: https://www.easa.europa.eu/contact-us
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Identifying interfaces and establishing channels for communication provides access to expert opinion, which is valuable in understanding the available information in a dynamic situation. Responding under a crisis situation may require qualitative decision-making using a risk management approach and asking practical questions (e.g. What supporting evidence is available?, What are the consequences of alternative options?, How will delays in decisions impact?, What is the risk tolerability for the specific situation?, What are the available resources?).

3 List of Identified Safety Issues

The list of identified Safety Issues are provided below and have been categorised under the following headings:

Management Systems;

Human Performance;

Training, Checking and Recency;

Outdated Information;

Infrastructure and Equipment;

Financial Impacts on Safety.

The issues are ordered from high to low risk within each heading. However, they have been ordered from an EASA perspective, with reference to all Member States and aviation domains. A local or organisational prioritisation of these safety issues may well be different. The order reflects an evaluation of the priorities based on the known mitigating actions and hence the order is likely to change over time.

Organisations and Member States should evaluate the applicability of the listed safety issues to their own situation and, where applicable, capture them in their SMS.

3.1 Management Systems

3.1.1 Restarting operations risks spreading COVID-19

Restarting operations not only brings passengers closer together and moves them between locations with differing infection levels, it also brings together aviation personnel. Both of these increase the risk of further spreading the virus. Organisations will need to adapt their procedures in order to minimise the risk of infection and to ensure that work areas are regularly and thoroughly cleaned.

3.1.2 Reduced oversight by competent authorities due to lockdown

Competent Authority staff have had to adapt their oversight activities to meet the COVID-19 related restrictions, one key difference being their ability to undertake on-site visits with these having been difficult or impossible to arrange. This means that oversight is not as in-depth and in many cases the time periods between checks has increased.

3.1.3 Reduced focus on, or prioritisation of safety

There are multiple factors that mean that organisations may not be providing safety and safety management with the same level of attention and resources as was previously possible. These include distractions and stress at a personal level, and economic pressures and the practical pressures of returning to service at an

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Postal address: Postfach 10 12 53
50452 Cologne, Germany
Visiting address: Konrad-Adenauer-Ufer 3
50668 Cologne, Germany
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organisational level. Also, focussing too much on returning to service and economic survival may reduce the emphasis on human and organisational factors, to the detriment of safety.

3.1.4 Risk assessments based on previous normal operations are no longer valid

Risk assessments performed by organisations and authorities are made in the context of specific operations and operating environments. The substantially changed and still-changing operating environment and the addition of “new” types of operations mean that most risk assessments are no longer valid.

3.1.5 Restarting a complex system is challenging

The aviation system is highly interconnected, sophisticated and merges people and technology, meaning that the consequences of shut-down and restart are not completely predictable. Organisations will need to prepare good communications and decision-making strategies, using personnel expertise, data, information and good internal and external coordination.

3.1.6 Degraded management systems and loss of experienced nominated persons due to furlough and redundancies

The reduced finances of many organisations means that safety staff may have been made redundant or furloughed, while there is a significant amount of work to do in maintaining and updating their safety management systems.

3.1.7 Application of COVID-19 health control measures may negatively affect operations

COVID-19 control measures, such as PPE and physical distancing will have an effect on certain tasks, introduce new tasks and may hamper personnel performance. Organisations and authorities will need to assess the impact and consider whether tasks, equipment and working environments will need to be adapted.

3.1.8 During reduced operations, new SOPs may be introduced that require risk assessment

The reduced air traffic should normally be managed either through existing standard operating procedures (SOPs) or through organisation’s contingency measures. Where new SOPs are introduced, they will require risk assessment. As air traffic increases, the previous SOPs will need to be reintroduced. Change management principles must be applied.

3.1.9 Reduced availability of aviation medical examiners (AME)

The reduced availability of AMEs implies either a reduction in available personnel, or the need to extend the period of validity of medical certificates. This will require a risk assessment in the context of each type of professional requiring a medical certificate.

3.1.10 Carriage of cargo in the passenger cabin

Carrying cargo in the passenger cabin is not straightforward. It requires the consideration of issues such as weight and balance, smoke/ fire detection, crashworthiness, evacuation procedures and modified loading procedures.

3.1.11 Risk assessment methodology for COVID-19 exemptions and temporary rules

The exemptions and temporary rules put in place to cope with the crisis may not have undergone sufficient risk assessment. A harmonised approach and routine reassessment, as and when the situation changes, may be needed.

3.1.12 Prevention and treatment of unruly passengers in the context of COVID-19

An increase in cases of unruly or disruptive passengers should be expected, either prior to departure or in-flight. Procedures to manage this and associated training need to be developed.

3.2 Human Performance

3.2.1 Personnel may not feel safe and in control about returning to work

Personnel will be returning to duty with a higher than normal psychological stress, potentially reducing staff performance and increasing safety risks. Organisations and authorities need to understand and develop strategies to mitigate against this.

3.2.2 Decreased wellbeing of aviation professionals during shutdown

The pandemic is a significant source of anxiety, stress and uncertainty for almost everyone. Worries about unemployment for aviation staff and their relatives may be exacerbated. During the shutdown, with people working from home and therefore isolated from normal support, the personal wellbeing of professionals is likely to have suffered. For those working, this may lead to task distraction/interruption, workload/task saturation, instructions or requirements not followed. Regardless of whether personnel are working, are employed, furloughed or unemployed, we have a duty of care to support the wellbeing of aviation professionals.

3.2.3 Aviation personnel fatigue

With redundancy and furlough reducing the available number of personnel, those left working may have to work additional hours. The preparation for and eventual return to (new) normal operations will require significant additional effort in comparison with actual normal operations. These may both contribute to rising levels of fatigue.

3.2.4 Flight crew fatigue due to unavailability of rest facilities at destination or extended duty period

At certain destinations, crews are required to stay on board the aircraft and neither hotels nor restaurants are available. Where crews can leave the airport, extended duty periods may occur due to health checks and the need for physical distancing, making leaving/ re-entering the airport a longer process.

3.2.5 Personnel no longer working collaboratively

Significant gaps in working, or working from home, may have reduced people's ability to work collaboratively. This may exacerbate problems with team-working and communication while wearing PPE.

3.2.6 Reduced adherence to procedures in the new working environment

Reduced operations and underload may create a belief that the level of risk within the operating environment has substantially reduced, causing staff to become less sensitive to risk with the possibility that they are less alert/ procedures are not completely followed.

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Postal address: Postfach 10 12 53
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50668 Cologne, Germany
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3.2.7 Roster adaptations to reduce transmission of illness may create different team behaviours

To reduce the risk of virus transmission, some organisations have created rostered groups of personnel who work together, with the different groups never meeting one another. There is a risk that these groups will develop their own dynamics leading to deviations from procedures.

3.3 Training, Checking and Recency

3.3.1 Skills and knowledge degradation due to lack of recent practice

The 90% reduction in traffic means that most aviation professionals are not performing their normal tasks, sometimes they are doing a substantially different job, and sometimes not working at all or at a substantially reduced frequency. Simulator and classroom-based training is also not taking place. Together, this creates a reduction in the skills and knowledge of aviation professionals, and with it associated safety risks.

3.3.2 Backlog in training limiting available personnel

A reduction in the availability of training facilities will lead to a backlog in training. This means that personnel will not have received necessary recurrent/ refresher training, with a consequent effect on performance. The issue may become a limiting factor on capacity during a return to operations or will cause fatigue or overload where there is a reduced number of personnel providing services.

3.3.3 Increased periods between licence/ validation checks

The lack of testing or checking means that it will be difficult to measure or monitor any reduction in the skills and knowledge of aviation personnel. Mitigation measures should be put in place to ensure that currency is maintained in the circumstances.

3.3.4 Ground handling training programmes disruption

In addition to the problems faced by all personnel in not receiving training, ground handling has a high staff turnover, less secure employment, seasonal staff recruitment and seasonal training (such as for winter operations). This exacerbates problems relating to the inability of organisations to conduct training.

3.3.5 Long gap in flying following type-rating training

While it is not unheard of for type-rating training to be followed by a gap before commencing operational flying, the shutdown means that this is now far more widespread and therefore presents a higher risk than it had previously.

3.3.6 Increased use of real aircraft for training instead of simulators (Rotorcraft focus)

The backlog of training checks may drive organisations to use real aircraft for exercises that have more recently been conducted in simulators. In combination with a loss of skills and knowledge due to a lack of recency for instructors/ training captains and students, the risk of training related accidents is raised.

3.4 Outdated Information

3.4.1 Documentation and database updates may not have been applied

Relevant updates of operational procedures and documentation, especially temporary revisions/updates may be missed. This may have a cascading effect on the safety of operations. In addition, aircraft databases

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Postal address: Postfach 10 12 53
50452 Cologne, Germany
Visiting address: Konrad-Adenauer-Ufer 3
50668 Cologne, Germany

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may not have been updated, such as FMS, TAWS, charts, etc. Manufacturers and data service providers may not be able to produce and deliver updates within the necessary timescales.

3.4.2 Outdated or inconsistent information in aeronautical information and flight plans

Aeronautical Information Management (AIM) and data service providers (DAT) are likely to have suffered from a lack of staff during the lockdown period. This reduces their ability to accomplish Aeronautical Information Service (AIS) data publication in a timely manner that meets aeronautical information update needs and to include actual updates within publications.

3.4.3 Incorrect aircraft navigation due to outdated or inconsistent information

Aircraft may deviate from their flight path, assigned flight levels or lose separation as a result of outdated or inconsistent information. This relates not only to difficulties experienced by AIM and DAT providers, but also to the ability of ATCOs, flight operations officers and pilots to receive and absorb up-to-date information, both in advance of and during the return to normal operations.

3.5 Infrastructure and Equipment

3.5.1 Increased presence of wildlife on aerodromes

The reduced level of traffic at aerodromes has increased the presence of wildlife habitation at aerodromes. This increases the risk not only of birds and insects nesting in stored aircraft and equipment, but also the risk of bird strikes to aircraft once airborne.

3.5.2 Operational risks of aircraft storage at aerodromes

Parked aircraft on closed runways and taxiways are at risk from ground damage. Aerodrome surfaces may deteriorate due to long-term static load. Operationally, crews and aerodrome staff may be confused by new taxiway routes and obstructed views of the aerodrome. Parked aircraft have the ability to obstruct signs and markings, infringe the ILS critical/sensitive area and/or the line of sight of the air traffic control, and thus should have been positioned to avoid this. The stationary aircraft may reduce runway through-put if they are parked on a closed runway, increasing the pressure on ATCOs and traffic participants in the manoeuvring area.

3.5.3 Construction / maintenance works on the Movement Area

The prolonged shutdown means that maintenance works may not be appropriately delineated, marked and lit. NOTAMs, AIP supplements and amendments may not have been promulgated. Aerodromes should ensure that such practices are avoided and promulgation notices should be checked for accuracy and the period of validity.

3.5.4 The rapid storage and de-storage of aircraft may lead to technical failures

The number and rate of aircraft entering and then exiting storage has been very high. Examples of associated hazards are: aircraft that have not been adequately protected by covers; fuel contamination; wildlife ingress; and a lack of maintenance. Sufficient time and personnel will need to be made available in order to return these aircraft to service.

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50452 Cologne, Germany
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3.5.5 Postponement of emergency response plan exercises may lead to ineffective handling of emergencies

Full or partial emergency response plan exercises may have been postponed or cancelled due to the lockdown, leading to the ineffective handling of emergencies. This issue may be worsened by a loss of experienced personnel or changes in the operating environment, such as parked aircraft obstructing taxiways.

3.5.6 The impact of maintenance practices during fleet groundings due to COVID-19

The maintenance practices and requirements due to prolonged parking are defined by the TC Holder usually within the Aircraft Maintenance Manual (AMM). Operators (CAMO's), in close relation with the maintenance organisations (AMOs), are required to plan these maintenance tasks at intervals defined in the AMM. These requirements are essential in keeping the aircraft and its engines / systems / components in a functional state and prevent any degradation so that no excessive failure rate is experienced when the aircraft is returned to service. However, reduced manpower may mean that airlines/AMOs may not have the capacity to carry out required maintenance tasks.

3.5.7 Malfunction or failure of communication, navigation and surveillance (CNS) equipment

The period of disuse and potential lack of proper maintenance during the period of shutdown may lead to malfunctions or failures of equipment. Once equipment is used again, ensuring that technical and support staff are available may be difficult. Additionally, planned system changes may not have been implemented, there may be a backlog in required updates and issues may only become identifiable as traffic load increases.

3.5.8 Hazards associated with aerodromes being closed or partially closed for long periods

During closure or partial closure, maintenance of equipment, systems, signage and the cleaning of surfaces may not have taken place. As aerodromes re-open, sufficient personnel and time will be required to return the aerodrome to normal operations.

3.5.9 Ground Service Equipment may malfunction due to long periods of disuse and a lack of maintenance

Ground Service Equipment may have sat inactive for a considerable length of time. This could cause technical problems if the equipment has not properly been maintained during the period of inactivity and may need to be then assessed/serviced to operational condition prior to being returned to service.

3.5.10 Technical issues relating to recommencing use of aircraft fuelling after a long break

Water, sediment and microbiological growth may be present in both hydrant systems and fueller tanks, filters may have dried or become damaged through lack of use, and normal checks may not have been carried out. In addition, any fuel received may have been stored for a longer period than normal elsewhere, creating additional problems with fuel quality.

3.5.11 Disinfection (biocides) effect on aircraft systems and structural components

A high demand for biocide may cause organisations to use materials other than those specified in the AMM. This must be avoided, since the aircraft may be damaged by alternatives.

3.5.12 Management of unpredictable air traffic evolution during the recovery phase

The scale of the likely increase in air traffic levels may make the evolution of air traffic difficult to predict, creating a mismatch in capacity. Differing paces of recovery across the network in terms of available capacity and in air traffic demand may exacerbate the problem.

3.5.13 The impact of fewer aircraft observations on Meteorological modelling

Weather forecasts use data from aircraft (e.g. AMDAR and Mode-S) in the initialisation of numerical weather prediction, and the large decrease in the number of observations available will have an impact on the accuracy of the forecasts produced. Initial analysis suggests that this impact is low, but the data from April, May and June has not yet been analysed.

3.6 Financial Impacts on Safety

3.6.1 Missing suppliers and difficulty liaising with suppliers

The shutdown has already resulted in difficulties for organisations liaising with their suppliers. Further economic constraints may increase problems, making it difficult to maintain the supply chain.

3.6.2 Reduced Available Financial Resources

A reduction in available financial resources may cause the loss of key personnel and corporate knowledge, increase pressure on personnel, and affect decision-making. Long term investment plans may slip or be changed, with consequences manifesting themselves long after traffic levels have begun to recover.

3.6.3 Shortage of operational and technical staff

Organisations' limited finances may limit the number of personnel they employ and movement restrictions resulting from the pandemic may further hamper personnel in remaining in the workplace. Health and national movement restrictions may also cause shortages in personnel and these shortages may be difficult to plan for, with regional or local lockdowns a possibility.

3.6.4 Technical issues related to an ageing fleet

A consideration still open for debate is whether a reduction in financial resources will generate an ageing fleet, with consequent technical issues. However, the reduction in aircraft in use could have the opposite effect – older aircraft are left parked in favour of younger aircraft.

An agency of the European Union
Postal address: Postfach 10 12 53
50452 Cologne, Germany
Visiting address: Konrad-Adenauer-Ufer 3
50668 Cologne, Germany
Tel.: +49 221 89990 000
Web: https://www.easa.europa.eu/contact-us
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PROTOCOLE PORTANT AMENDEMENT DE LA CONVENTION RELATIVE AUX INFRACTIONS ET À CERTAINS AUTRES ACTES SURVENANT À BORD DES AÉRONEFS FAIT À MONTRÉAL LE 4 AVRIL 2014

Entrée en vigueur :	1 janvier 2020 Conformément à l'article XVIII libellé comme suit : « 1. Le présent Protocole entrera en vigueur le premier jour du deuxième mois suivant la date du dépôt du vingt-deuxième instrument de ratification, d'acceptation, d'approbation ou d'adhésion. 2. Pour tout État qui ratifie, accepte ou approuve le présent Protocole, ou qui y adhère, après le dépôt du vingt-deuxième instrument de ratification, d'acceptation, d'approbation ou d'adhésion, le Protocole entrera en vigueur le premier jour du deuxième mois suivant la date du dépôt par cet État de son instrument de ratification, d'acceptation, d'approbation ou d'adhésion. 3. Dès que le présent Protocole entrera en vigueur, il sera enregistré auprès des Nations Unies par le dépositaire. »
Situation :	36 signatures, 11 ratifications, 14 adhésions.
Note :	Le Protocole a été adopté le 4 avril 2014 lors de la Conférence internationale de droit aérien tenue sous les auspices de l'OACI à Montréal du 26 mars au 4 avril 2014. Conformément à son article XVI, le Protocole est ouvert à Montréal le 4 avril 2014 à la signature des États participant à ladite Conférence. Après le 4 avril 2014, le Protocole sera ouvert à la signature de tous les États au siège de l'Organisation de l'aviation civile internationale à Montréal jusqu'à ce qu'il entre en vigueur conformément à l'Article XVIII.

État	Date de signature	Date du dépôt de l'instrument de ratification, d'acceptation (A), d'approbation (AA) ou d'adhésion (a)	Date d'entrée en vigueur
Afrique du Sud	25/9/2019	-	-
Angola	4/4/2014	-	-
Bahreïn		26/2/2016 (a)	1/1/2020
Bénin	12/8/2014	-	-
Brésil	4/4/2014	-	-
Burkina Faso	4/4/2014	-	-
Burundi	4/4/2014	-	-
Cabo Verde	4/4/2014	-	-
Cambodge	23/1/2015	-	-
Chine	4/4/2014	-	-
Congo	4/4/2014	5/2/2015	1/1/2020
Côte d'Ivoire	4/4/2014	31/7/2017	1/1/2020
Cuba		21/10/2020 (a)	1/12/2020
Égypte		19/6/2017 (a)	1/1/2020
Émirats arabes unis	28/11/2018	-	-
Espagne	9/9/2015	-	-
Fidji	4/4/2014	-	-
Finlande	25/9/19	-	-
France	30/5/2016	-	-
Gabon		1/12/2015 (a)	1/1/2020
Ghana		4/6/2018 (a)	1/1/2020
Guyana		10/6/2016 (a)	1/1/2020
Inde	4/4/2014	-	-
Jordanie	4/4/2014	10/6/2016	1/1/2020
Kazakhstan		14/2/2019 (a)	1/1/2020
Koweït	4/4/2014	11/12/2018	1/1/2020
Lesotho	4/4/2014	-	-
Madagascar	4/4/2014	-	-

État	Date de signature	Date du dépôt de l'instrument de ratification, d'acceptation (A), d'approbation (AA) ou d'adhésion (a)	Date d'entrée en vigueur
Malaisie	11/1/2019	7/3/2019	1/1/2020
Mali	4/4/2014	-	-
Malte		26/9/2016 (a)	1/1/2020
Mexique	4/4/2014	-	-
Mozambique		17/8/2016 (a)	1/1/2020
Népal	4/4/2014	-	-
Niger	4/4/2014	-	-
Nigéria	14/1/2015	26/11/2019	1/1/2020
Ouganda		28/11/2017 (a)	1/1/2020
Paraguay	4/4/2014	7/8/2019	1/1/2020
Portugal		24/10/2017 (a)	1/1/2020
Qatar	2/10/19	12/6/2020	1/8/2020
République dominicaine	4/4/2014	21/6/2016	1/1/2020
Roumanie	13/12/19	-	-
Saint-Kitts-et-Nevis		5/10/2020 (a)	1/12/2020
Sénégal	4/4/2014	4/7/2018	1/1/2020
Sierra Leone	4/4/2014	-	-
Singapour		25/9/2018 (a)	1/1/2020
Soudan	4/4/2014	-	-
Togo	4/4/2014	-	-
Turquie	19/8/2014	14/3/2019	1/1/2020
Uruguay		5/6/2019 (a)	1/1/2020

Unmanned Aircraft Systems Traffic Management (UTM) – A Common Framework with Core Principles for Global Harmonization

Edition 3

TABLE OF CONTENTS

Definitions

Note.— The definitions contained herein are used in the context of this document. Except where indicated, they have no official status within ICAO. Where a formally recognized ICAO definition is included for convenience, it is noted with an asterisk (*). Where a term is used differently from a formally recognized ICAO definition, it is noted with the symbol (**).

Aeronautical information service (AIS).* A service established within the defined area of coverage responsible for the provision of aeronautical data and aeronautical information necessary for the safety, regularity and efficiency of air navigation.

Aircraft.* Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Air traffic control service.* A service provided for the purpose of:

- preventing collisions:
  - between aircraft, and
  - on the manoeuvring area between aircraft and obstructions; and
- expediting and maintaining an orderly flow of air traffic.

Air traffic management (ATM).* The dynamic, integrated management of air traffic and airspace (including air traffic services, airspace management and air traffic flow management) – safely, economically and efficiently – through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Air traffic management (ATM) system.* A system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air and ground- and/or space-based communications, navigation and surveillance.

Air traffic service.* A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

C2 Link.* The data link between the remotely piloted aircraft and the remote pilot station for the purposes of managing the flight.

Detect and avoid.* The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action.

Geofence. A virtual three-dimensional perimeter around a geographic point, either fixed or moving, that can be predefined or dynamically generated and that enables software to trigger a response when a device approaches the perimeter (also referred to as geoawareness or geocaging).

Operator.* A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Note.— In the context of unmanned aircraft, an aircraft operation includes the unmanned aircraft system.

Prohibited area.* An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited.

Remain-well-clear. The ability to detect, analyse and manoeuvre in order to ensure that a UA is not being operated in such proximity to other aircraft as to create a collision hazard.

Remote pilot.* A person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time.

Remote pilot-in-command.* The remote pilot designated by the operator as being in command and charged with the safe conduct of the flight.

Remotely piloted aircraft (RPA).* An unmanned aircraft which is piloted from a remote pilot station.

Remotely piloted aircraft system (RPAS).* A remotely piloted aircraft, its associated remote pilot station(s), the required C2 Link and any other components as specified in the type design.

Restricted area.* An airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions.

Segregated airspace.* Airspace of specified dimensions allocated for exclusive use to a specific user(s).

Situational awareness.* The ability to keep track of the prioritized significant events and conditions in the environments of the subject.

Unmanned aircraft system traffic management (UTM). A specific aspect of air traffic management which manages UAS operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions.

Unmanned aircraft system traffic management (UTM) system. A system that provides UTM through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground or space-based communications, navigation and surveillance.

Unmanned aircraft (UA). An aircraft intended to be operated with no pilot on board.

Unmanned aircraft system (UAS). An aircraft and its associated elements which are operated with no pilot on board.

Visual line-of-sight (VLOS) operation.* An operation in which the remote pilot or RPA observer maintains direct unaided visual contact with the remotely piloted aircraft.

Abbreviations

AGL	Above ground level
AIP	Aeronautical information publication
AIRAC	Aeronautical information regulation and control
AIS	Aeronautical information service
AIXM	Aeronautical information exchange model
ANS	Air navigation service
ANSP	Air navigation service provider
API	Application programming interface
ATC	Air traffic control
ATM	Air traffic management
BVLOS	Beyond visual line-of-sight
CAA	Civil aviation authority
CNS	Communications, navigation and surveillance
E-ID	Electronic identification
FIMS	Flight information management system
FIS	Flight information service
FIMS	Flight information management systems
FSS	Fixed satellite service
GIS	Geographic information system
GNSS	Global navigation satellite system
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
ITU	International Telecommunication Union
NOTAM	Notice to airmen
RFI	Request for information
RCP	Required communication performance
RNP	Required navigation performance
RSP	Required surveillance performance
RPA	Remotely piloted aircraft
RPAS	Remotely piloted aircraft system
SDSP	Supplemental Data Service Providers
SWIM	System wide information management
TLS	Target Level of Safety
UA	Unmanned aircraft
UAS	Unmanned aircraft system(s)
UAS-AG	UAS advisory group
USP	UTM service provider
UTM	UAS traffic management
VFR	Visual flight rules
VLOS	Visual line-of-sight
VTOL	Vertical take-off and landing
WRC	World Radiocommunication Conference

Foreword

Over the last ten years, technological development in the unmanned aircraft (UA) industry has disrupted aviation, and introduced enhanced capabilities at an unprecedented pace. As a result, States and regulators have received an increasing number of applications for access to low-level airspace, where the operations of manned aircraft are generally limited or restricted. At the current pace, civil unmanned aircraft system (UAS) operations are expected to surpass the number of manned aircraft operations in the near future. Air navigation service providers (ANSPs) anticipate that such operations will include those that are fully contained in either controlled or uncontrolled airspace, and those that transit across their boundaries.

The pace of technological advancement and the increasing use of off-the-shelf components pose a significant challenge to the timely development of standards. In particular, the lack of stability in aircraft design and equipage as well as the use of non-traditional aviation-related communications and navigation technologies (e.g. artificial intelligence, automation, and robotics) renders any attempt to use traditional methods of certification and operational approval impractical. To meet demand, States and regulators are being innovative and proactive in facilitating and approving such proposals; however, without sufficient international harmonization, this may impact safety, security, the environment, system reliability and economic efficiency.

The UAS traffic management (UTM) concept was first proposed in 2016 by members of State research organizations and industry to support the real-time or near-real-time organization, coordination, and management of UA operations, including the potential for multiple beyond visual line-of-sight (BVLOS) operations.

Through UTM, it is envisaged that civil aviation authorities (CAAs) and ANSPs, to the extent that they are involved, will be able to provide real-time information regarding airspace constraints and the intentions of other aircraft available to UAS operators and their remote pilots directly or through a UTM service provider[1] (USP). The UAS operator would then be responsible for managing its operations safely within these constraints, without receiving positive air traffic control (ATC) services from the ANSP. The primary means of communication and coordination between the ANSP(s), USP, supplementary data service providers (SDSP), UAS operators, remote pilots and other stakeholders may be through a distributed network of highly automated systems via application programming interfaces (APIs), and not between pilots and air traffic controllers via voice communication.

Although some UAS are unable to comply with the *Convention on International Civil Aviation* (Doc 7300), signed at Chicago on 7 December 1944 and amended by the ICAO Assembly, at the 39th Session of the ICAO Assembly, it was requested by States and the aviation industry that ICAO address, as a matter of urgency, the increasing number of UA operating in low-level airspace that might conflict with manned aviation, and develop a global baseline of provisions and guidance material for the proper harmonization of UAS regulations that remained outside the international instrument flight rules (IFR) framework. As a result, ICAO has assembled industry partners, at its annual DRONE ENABLE Symposia, to assist in providing direction and guidance in support of harmonizing UAS regulatory activities across the Member States. Since UTM as a concept is already under development, a common agreement on its framework and principles is essential to ensuring global harmonization and interoperability. To achieve this, ICAO is leading efforts by States, UAS industry leaders, academic institutions, and aviation professionals towards the development of this framework for UTM.

This framework provides the foundations for consistent rules and regulations, facilitates consensus on best practices and standards, and supports the development of common guidance material, consistent with the principles laid out in the Preamble to the Chicago Convention (1944):

> WHEREAS the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world, yet its abuse can become a threat to the general security; and WHEREAS it is desirable to avoid friction and to promote that cooperation

[1] A USP is an entity that would assist UAS operators with meeting UTM operational requirements that enable safe and efficient use of airspace, through the provision of UTM services.

between nations and peoples upon which the peace of the world depends; THEREFORE, the undersigned governments having agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically; Have accordingly concluded this Convention to that end.

Note.— In this guidance material, the term “unmanned aircraft” or “UA” is intended to refer to UA that will primarily operate within the UTM framework. It does not include those UA, including remotely piloted aircraft (RPA), operating within the traditional air traffic management (ATM) system.

Scope

This document is intended to provide a framework and core capabilities of a "typical" UTM system to States that are considering the implementation of a UTM system. Any such UTM system must be able to interact with the air traffic management (ATM) system in the short term and integrate with the ATM system in the long term. The introduction and management of unmanned traffic as well as the development of associated UTM infrastructure should not negatively affect the safety or efficiency of the existing ATM system. A common framework is needed to facilitate the harmonization between UTM systems globally and provide a stepped approach towards integration into the ATM system. This would enable industry, including manufacturers, service providers and end users, to grow safely and efficiently without disrupting the existing manned aviation system. Specifically, this document may be used by States to develop a UTM system that provides the following benefits:

- continued safety of all air traffic, manned and unmanned;
- safety of persons on the ground;
- complex low-level UA operations;
- ongoing support of technological advancements;
- evaluation of security and environmental risks; and
- provision for a global, harmonized framework for low-level UTM.

This framework is not intended to propose or endorse any specific UTM system design or technical solutions to address the UTM challenge; instead, its aim is to provide an overarching framework for such a system. Accordingly, the following sections propose a common set of guiding principles and enabling actions.

Initial assessment parameters include the overall effectiveness, safety and efficiency of the UTM system; registration and identification systems; communications compatibility between UTM, ATC and perhaps manned aircraft; detect and avoid (DAA) capabilities; geofencing-like systems (benefits, constraints, restraints, etc.); interoperability (with other systems and other States); adaptability of the architecture; infrastructure performance requirements (including reliance on existing infrastructure); frequency spectrum (availability, suitability, security, etc.) and cybersecurity. This document will be updated as technological developments occur and system capabilities are further demonstrated.

While this document continues to explore the critical operational aspect of interoperability of certain elements of UTM with ATM, this issue will need to be further addressed in future editions of the framework. There are also several components of a safe and effective UTM system that may not be addressed in this edition, such as, design and certification standards of the UA, integration of UA operations in ATM and potentially stratospheric operations. It should be noted, however, that future editions of this framework may address these issues, building on the foundation established by previous editions of the UTM Framework as well as the information gathered by ICAO through the UTM request for information (RFI) process related to the DRONE ENABLE symposia.

For the purposes of this guidance material, in the immediate/near term UTM is considered a separate system with an interface to ATM, while in the long term integration and potential convergence with ATM is seen as a realistic solution. However, to achieve complete integration, significant standardization issues will have to be addressed.

UTM Principles

The aim of UTM is the safe, economical and efficient management of UAS operations through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions. Like ATM, a UTM system would provide the collaborative integration of humans, information, technology, facilities and services supported by air, ground and/or space-based communications, navigation and surveillance.

ATM is a longstanding and well understood system for the safe and efficient management of airspace and operation of aircraft based on principles of airspace design and cooperative systems between pilots and air traffic controllers with clear roles and responsibilities. The maturing UAS sector offers many opportunities, but to be fully integrated, UA will need to coexist with manned aircraft and existing aviation systems within finite airspace resources. In doing so, safety must be paramount, and both sectors should be able to cooperate for mutual gain while avoiding undue impacts to existing airspace users or capabilities. To achieve this objective, the technology used to support UTM systems must not inadvertently degrade ATM systems (e.g. frequency spectrum saturation or jamming). Other issues are important from a societal acceptance perspective such as privacy, security, reliability, environmental protection and the appropriate use of automation; however these are not addressed in this document. UAS operators must prove compliance with a minimum set of safety standards and be operationally and legally accountable if routine operations are to be accepted by the public. Each of these issues depends on the harmonization of risk- and performance-based regulations and oversight, and should include consideration of emerging technological solutions.

UTM systems are therefore envisaged to be interoperable and consistent with existing ATM systems in order to facilitate safe, efficient and scalable operations. Although system-level requirements for UTM systems have not yet been developed, core principles can be established to guide their development. There are also numerous principles in the current ATM System that are applicable to UTM services. The following principles should be considered:

- Oversight of the service provision, either UTM or ATM, is the responsibility of the regulator.
- Existing policies for aircraft prioritization, such as aircraft emergencies and support to public safety operations, should be applicable, and practices unique to UTM should be compatible with such policies.
- Access to the airspace should remain equitable provided that each aircraft is capable of complying with the appropriate conditions, regulations, equipage/performance requirements and processes defined for the specific airspace in which UTM operations are proposed.
- The UAS operator and/or the remote pilot should be qualified to perform any applicable normal and contingency operating procedures based on the specific class of airspace in which operations are conducted and the UTM services being provided.
- To meet their security and safety oversight obligations, States should have unrestricted, on-demand access to UAS operators, remote pilots and the position, velocity, planned trajectory and performance capabilities of each UA being managed by the UTM system.
- In order to achieve an effective UTM capability, the creation, adoption and maintenance of safety culture among the UTM community is essential.
- The free and open reporting of accidents and incidents should be facilitated for all stakeholders.

Where a State is considering the issuance of an operational approval for a UTM system, it must assess numerous factors, including, inter alia the following safety-significant factors:

- types of UA and their performance characteristics (including navigation capabilities and performance);
- adequacy and complexity of the existing airspace structure;

- spectrum availability and suitability;
- nature of the operation;
- type and density of existing and anticipated traffic (unmanned and manned);
- operational capacity of the UTM system including any airspace constraints;
- levels of and extent of automation capabilities in the UTM system and in the UAS;
- regulatory structure;
- meteorological considerations;
- the requirement for all UA in the UTM airspace volume to be cooperative;
- detection/separation of non-cooperative UA;
- management of aeronautical information service (AIS)/aeronautical data; and
- geographic information systems (GIS) data/additional geospatial data applicable to the UTM airspace.

Enabling/Complementary Activities

In addition to the key enablers of registration and identification, communications and geoawareness/geofencing discussed later in this framework, the safe operation of UAS – and BVLOS operations in particular – in a UTM system will depend on a range of supporting and enabling capabilities. UTM systems are envisaged to provide some of these capabilities but will require enabling policy and regulatory frameworks which take into account emerging technological solutions. These frameworks include, inter alia:

- An approach to regulation that is performance- and risk-based. This implies that appropriate standards are put in place. The UTM regulatory framework should be consistent with the rules for UAS operations and the technical requirements for UAS. Responsibilities of the various actors should be clearly spelled out. Additionally, the risk-based approach should be supported by appropriate risk assessment methodologies, for both the operations and the airspace.

- A requirement for the development of and compliance with standards that address UTM-related data management to ensure that the UTM system meets an acceptable level of reliability, redundancy and fault alerting/monitoring and provides a guaranteed quality of service.

- The ability of the UTM system to accommodate UAS with varied capabilities, performance and operational requirements, based on assessment for the need of UTM, which could include a range of systems from remotely piloted UA to fully automated UA and, potentially, aircraft intended for urban mobility.

- Optimization by CAAs of common and shared airspace and the use of frequency spectrum.

- Application by CAAs or regional safety oversight organizations, of appropriate assurance standards (e.g. cybersecurity or software assurance level), where required.

- Prescribing and promoting by CAAs or regional safety oversight organizations, appropriate education, guidance and usage standards for UAS operators and USPs, where required,

- Emphasizing consistency between national and international developments and deployments of UTM systems in order to ensure interoperability and harmonization. For instance, depending on the type and location of UTM operations, a system might enable operators to submit information about a proposed flight for it to be assessed based on existing traffic demands and airspace restrictions prior to an approval or rejection being given.

- Ensuring when AIS or GIS data are used in a UTM system, that such information must be trusted, accurate and timely.

- The use by the UTM system and UA operated within that system of common horizontal, vertical and temporal reference sources compatible with the accuracy and tolerances needed for UA navigation through the airspace.

Note.— As it is anticipated that UTM and ATM systems will at some point coincide or overlap, the common reference sources used for UTM will need to be compatible with those used in ATM systems.

The evolution of the UTM architecture should meet the demand of the UAS community while maintaining emphasis on the criticality of safety for all airspace users (manned and unmanned) and third parties on the ground by enabling the timely introduction of the appropriate traffic density management capability to accommodate planned operations. Such an architecture would likely be predicated on the interaction and integration of these operations through information-exchange processes, avoiding direct communication with ATC, except when specifically required.

List of Services

The UTM system can be considered as a collection of services, among other features, intended to ensure safe and efficient operations of UA within the UTM-authorized volume of airspace and which is in compliance with regulatory requirements. UAS operations may occur in uncontrolled and controlled airspace, with each type of airspace potentially requiring specific services. If UAS operations were to occur in controlled airspace, UAS operators and/or the remote pilot would be required to follow the procedures and requirements for the airspace, unless an exemption or alternate procedures have been established, relieving those operating in the UTM system from the established airspace rules.

While this document does not specify technologies associated with these services, its purpose is to provide suggested types of services. These services will be based on what is required in a given geographic volume of airspace as well as on the risk of operations and level of resiliency needed. Said services may require compliance with minimum performance requirements/standards. Operational concepts have shown that these services may be provided by third-party USPs, ANSPs or State organizations. As applicable to UAS operations in a UTM environment, these services may include, inter alia, the following:

- Activity reporting service: a service that provides on-demand, periodic or event-driven information on UTM operations occurring within the subscribed airspace volume and time (e.g. density reports, intent information as well as status and monitoring information). Additional filtering may be performed as part of the service.

- AIS: a service that enables the flow of aeronautical information/data necessary for the safety, efficiency, economy and regularity of, in this case, UAS operations.

- Airspace authorization service: a service that provides airspace authorization from the delegated State authority to the UAS operator.

- Discovery service: a service that provides users of the UTM system with information on relevant services of varying levels of capability in a specific geographical volume of airspace (e.g. suppliers of meteorological information).

- Mapping service: a service that provides terrain and obstacle data (e.g. GIS) appropriate and necessary for meeting the safety and mission needs of individual UAS operations or for supporting UTM system needs for the provision of separation or flight planning services.

- Registration service: a service that enables UAS operators to register their UA and provide any required data related to their UAS. The system should also include a query function enabling authorized stakeholders (e.g. regulators or police services) to request registration data. See Appendix A for additional information.

- Restriction management service: a service that manages and disseminates directives (e.g. safety bulletins) and operational and airspace restrictions from the CAA or ANSP to UAS operators and remote pilots, including in the form of NOTAMs.

- Flight planning service: a service that, prior to flight, arranges and optimizes intended operational volumes, routes and trajectories for safety, dynamic airspace management, airspace restrictions and mission needs (this is not intended to refer to the existing manned aircraft flight planning services).

- Conflict management and separation service (Please refer to ICAO Doc 9854 Global ATM Operational Concept), including, inter alia:

    a. Strategic deconfliction service: a service consisting of the arrangement, negotiation and prioritization of intended operational volumes, routes or trajectories of UAS operations to minimize the likelihood of airborne conflicts between operations.

b. Tactical separation with manned aircraft service: a service that provides real-time information about manned aircraft so that UA remain well clear of manned aircraft.

c. Conflict advisory and alert service: a service that provides remote pilots with real-time alerting through suggestive or directive information on UA proximity to other airspace users (manned or unmanned).

d. Conformance monitoring service: a service that provides real-time monitoring and alerting of non-conformance to intended operational volumes, routes or trajectories for a UAS operator or remote pilot.

e. Dynamic reroute service: a real-time service that provides modifications to intended operational volumes, routes or trajectories to minimize the likelihood of airborne conflicts and maximize the likelihood of conforming to airspace restrictions, while enabling completion of the planned flight. This service would include the arrangement, negotiation and prioritization of in-flight operational volumes, routes or trajectories of UA operations while the UA is airborne.

- Identification service: a service that makes it possible to identify an individual UA and the associated nationality and registration information. See Appendix A for additional information.

- Tracking and location service: a service that provides information to the UAS operator and the UTM system about the exact location of UA, in real time. See Appendix A for additional information.

- Meteorological service: a service that provides individual UAS operators/remote pilots or other UTM services with the meteorological information necessary for the performance of their respective functions.

Gaps, Issues and Challenges

This section includes a discussion of the many gaps, issues and challenges that must be addressed to enable safe UAS operations within the UTM and ATM systems.

ANSPs anticipate that UAS operations will encompass everything from operations that are fully contained in airspace where no air traffic control services are provided (e.g. uncontrolled airspace) to those that transit across the boundary between controlled and uncontrolled airspace or that are solely operated within controlled airspace. The safe and efficient integration of UAS, particularly small UA, into existing controlled and uncontrolled airspace presents a variety of issues and novel challenges. Recent studies forecast significant growth of UAS operations, leading to a shift of focus to operations in the low-level environment and above populated areas, with various types of operations and UA. This will likely include:

- *operations at altitudes in the very low-level structure (e.g. below 150 metres or 500 feet above ground level (AGL));*

- *systems with high levels of automation and connectivity;*

- *greater number of operations, which raises questions about the sustainability and scalability of a UTM system and the ability of ATM infrastructure to accommodate these new users;*

- *flights not conducted in accordance with IFR or visual flight rules (VFR) with the potential of establishing UAS-specific flight rules; and*

- *reliance on data links (either non-traditional ground-based links, C2 Links or data links associated with UTM systems), raising new challenges related to frequency spectrum, resilience and cybersecurity.*

Gaps

Many of the gaps addressed below become more significant at the boundaries between UTM and ATM systems and/or when UA transition between these systems.

- *Airspace classification*. The current airspace classification scheme as developed for manned aviation may not effectively support visual line-of-sight (VLOS) or BVLOS operations. This gap includes the potential modification of current classes of airspace or potentially creating new classes of airspace to accommodate the range of needs brought by UAS operations.

- *Airspace access*. The policies, rules and priorities required to support equitable access to airspace must be developed (the European Union, for example, is examining policies on fair access to airspace).

- *Rules of the Air.* Rules of the Air which specify flight rules, right-of-way, altitude above people and obstructions, distance from obstacles and types of flight rules, all of which, as written, are incompatible with the intended operations within UTM systems.

- *Operational procedures*. Procedures specific to the UTM system, including normal, contingency and emergency scenarios, are needed. Such procedures would need to be harmonized with ATM systems whenever UAS operations are planned near the boundary between UTM and ATM or if UA will transit from one system to the other.

- *Liability*. Liability and insurance implications for USPs in relation to UAS operators must be determined.

- *Certificatio*n. Certification of the UTM system, particularly when interacting with an ATM system, and, for UA, meeting the principles of airworthiness, scaled to an appropriate level based on risk(s).

- *Data standards*. Appropriate data standards (e.g. data quality specifications, data protection requirements) and protocols to support UTM safety-related services and the exchange of data between UTM and ATM systems as well as between multiple UTM systems are needed.

- *Positional references*. Common altitude, navigation and temporal references for manned and unmanned operations are needed. Gaps in the use of reference points and equipment providing different levels of accuracy and performance in the measurement of altitude, navigation or time introduce safety concerns which must be resolved. Determining the extent to which traditional aviation standards can be used remains a work in progress. Traditional standards which address the provision of such references should be utilized whenever possible.

- *Interface between UTM and ATM*. There is a need to develop procedures and adequate tools to ensure the sharing of information, the interoperability of the two systems, and to identify roles, responsibilities and limitations.

- *Data recording*. Data-recording policies and capabilities, similar to ATC data retention and aircraft flight recorder requirements, are needed to support accident/incident reporting and investigative requirements.

- *Communications*. Remote pilot interfaces as well as capabilities and performance requirements for communications with the UTM system must be developed. These include the ability to interface/communicate with ATC and pilots of manned aircraft.

- *Alerting systems*. The safety and integrity of the UTM system, failure-alerting and failure management must be addressed. Policies, guidance and procedures will need to be developed to address the degradation or failure of the various UTM components or entire UTM system as well as the restoration of systems after such degradations or failures.

- *Contingency management protocols*. A dynamic operating environment must have operating protocols that account for contingencies both of the UTM system(s) providing multiple services and of the aircraft operating within the UTM system.

Issues

The issue of modification, adaptation or applicability of requirements for airspace and procedure design when considering topics such as navigation performance has yet to be addressed.

To ensure system reliability and safety, frequency spectrum availability and supportability need to be determined based on the UTM system architecture.

The establishment of a UTM service within a volume of airspace may affect the classification of that airspace (e.g. changes from Class G to D airspace).

The UTM and ATM interface, including responsibilities and procedural development, must be addressed to ensure compatibility between manned and unmanned operations.

UTM and ATM systems may have different communications, navigation and surveillance (CNS) requirements for different aircraft. The systems need to exchange data effectively so that each system can manage the aircraft relevant to its responsibilities. CNS requirements in UTM may differ from ATM.

Data sharing protocols will need to consider State data privacy policies.

Further research is required to support the development of the interoperable standards and protocols for the elements of UTM and ATM data exchange.

Challenges

Aircraft participating in the UTM system must be separated from each other and from other hazards (e.g. buildings, terrain or adverse weather). This separation management should include guidance and responsibilities complemented by other tools and procedures to properly address scalability. Separation management may have to be supported by additional standards, policies, capabilities or tools, including:

- a DAA capability to identify/detect and avoid conflicting aircraft and any other hazards;
- methodologies to allow improved or enhanced detectability and conspicuity of UA by manned aviation;
- assignment of responsibility for conflict management and separation provision, particularly in low-level airspace, which may include unique solutions such as separation provision being delegated to the UA or the UTM system;
- development of UA separation standards within the UTM system, which may include the need for safety margins based on elements such as airspeed, weight and UA equipment;
- assessment of existing and future separation standards between UA and manned aircraft whenever they operate in proximity to each other;
- determination of the relevant surveillance capability and performance for the UTM system to support the integration of new or novel aircraft and operations;
- development of policies to address means of compliance or system approval for UTM systems;
- implementation and maintenance of a safety management system as currently required by aviation systems related to manned aviation; and
- achievement of a required data quality (e.g. on accuracy, resolution, integrity, timeliness, completeness, traceability, format) of the system. The standards applied to UTM systems that are intended to interface with the ATM system will need to be compatible and interoperable.
- forecasting and dissemination of micro-weather to address localized weather patterns that may impact low altitude UA operations (e.g. urban canyon phenomenon, windshear, diurnal effects caused by urban structures, etc.).

Summary of Conclusions

As discussed previously in this document, UTM as a concept or capability is still under development. ICAO is continuing its tasks as a global aviation forum to support States, UAS industry leaders and academic and aviation professionals, and is exploring current, state-of-the-art solutions for UTM and using that information to develop the UTM framework and core principles.

This framework is not intended to endorse or propose any specific UTM system design or technical solutions to address the UTM challenge; instead, its aim is to provide an overarching framework for such a system. The intent is for this to be a living document: as new or additional information is gained, the UTM framework will be updated.

The developmental nature of UTM makes it difficult to predict how a follow-on framework will be organized, validated and certified. More participation from industry or future business advocates will be necessary to explore the minimal set of safety issues in product deployment and development, which will potentially lead to global interoperability.

Edition 3 of this framework document contains eight appendices synthesizing information gathered from the submissions to ICAO’s 2017, 2018 and 2019 Requests for Information (RFI) and material provided during the respective ICAO DRONE ENABLE Symposia.

KEY TECHNICAL AREAS

APPENDIX A

REGISTRATION, IDENTIFICATION AND TRACKING

Presentation review (from DRONE ENABLE 1)

Registration, identification and tracking are separate features that provide specific capabilities for different purposes.

Registration makes it possible to identify an individual aircraft and the State in which it is registered. The registration consists of a unique alphanumeric system affixed to the aircraft. Ownership details can be obtained through the State that has registered the aircraft.

Individual aircraft can also be identified from one or more other unique signatures, for example encoded information transmitted via radio or digitally. Hence, identification is a feature that can be made possible via registration (usually visually) and by a wide range of other techniques, many of which may involve technology that facilitates identification from a distance.

Tracking consists of locating and tracing individual aircraft through airspace over a period of time. To do so, specific, unique information is needed to identify the particular aircraft, and techniques are required to determine its location. These location features can be independent of the aircraft (e.g. surveillance systems).

In the context of UAS and UTM, it is necessary, at a minimum, to be able to identify and track each aircraft in order to ensure safety and the efficient management of the airspace. Registration details provide the CAA of the State in which the operation is occurring to identify the nationality of the aircraft, the operator and what person or machine is controlling the aircraft. Registration may also assist non-aviation-related agencies concerned with issues such as security, law enforcement and privacy.

It will therefore be necessary to determine and harmonize common national, regional or international approaches that will define and assign suitable unique registration identities for all UA that will potentially operate in the UTM system. These registration identities will have to be structured and formatted to address visual markings wherever practical and the technical solutions supporting the UTM system as it evolves. It is envisaged that, in a cooperative communications-based UTM framework, greater use of electronically defined and transmitted identification techniques will be necessary along with a range of tools to decode and share this information, whilst respecting the need for security and protection of personal data.

During ICAO's first DRONE ENABLE Symposium, organizations shared several focused views with specific attention on their product offerings. Most organizations focused on methods of sharing identification data using available technology and standards or proprietary systems to facilitate use, acceptability and enforcement. Secondary elements included the use of current security and cybersecurity aspects, but did not address safety implications related to system failures or security breaches.

Overall, ICAO received limited information on solutions for addressing systemic topics and on how to do so in an open and interoperable manner.

ICAO used the knowledge and input from presentations and RFI submissions to gather the information provided below.

Registration

Registration proposals varied from the simple identification of only the aircraft and remote pilot/UAS operator to systems registering everything about the aircraft, UA control station, operator, remote pilot, certificates and any pre-approved flight authorizations. The overarching needs driving such proposals were the need for accountability and enforcement, which have a direct impact on safety and security. Given the anonymous nature of UAS operations (nobody on board and a remote pilot that is not clearly visible), this issue has become critical and may warrant an international minimum standard similar to that for manned aviation. States may determine who has local access to the registration information and how that information is safeguarded. This registration system may be an integral part of the UTM system or simply a plug-in module with the CAA in charge of the registration system.

Identification (ID) and electronic identification (E-ID)

Similar to the registration proposals, proposals on ID and E-ID solutions varied considerably, particularly with regards to the information needed. A common element identified was the requirement for the transmission of the UA ID and UA control station location to enable the rapid identification of a specific UAS. This was primarily for the direct functioning of the UTM system and, additionally, for safety, security and accountability with regards to the integration of UAS within the existing aviation community. Without this capability, it would be difficult to garner public acceptance of routine UAS operations. Again, it was recommended that a minimum international standard should be introduced, with States developing local variations. In addition, many technical and procedural issues that would need to be addressed at both the international and State levels, depending on the system architecture, were identified. These included, inter alia:

- cybersecurity;
- communications and frequency spectrum availability;
- cost and financing;
- compatibility versus interoperability;
- real-time use and updates; and
- required performance standards.

Tracking

Regarding proposals on tracking, it was evident from presentations and submissions that in order for a UTM system to function at a basic level, it must be able to track all UA, participating or not, using a minimum of 4D geospatial data. This was also required for safety, security and accountability within the UTM and manned aviation systems. The secondary need addressed the collection of data to aid in airspace design and management. The ability to track UA within the UTM system was considered a critical service that had implications on system reliability, resilience and redundancy at the manufacturing and operational levels. Other considerations such as system accuracy, real-time information, delay-refresh rates, flight data records and storage of and access to data would need to be resolved in order for a UTM system to function effectively. The last issue identified was related to “ghost operations”, which would involve UA that would have to be managed by the UTM system while masking the identification and position (e.g. for police operations).

KEY TECHNICAL AREAS

APPENDIX B

COMMUNICATIONS SYSTEMS

Presentation review (from DRONE ENABLE 1)

The integration of UAS operations into controlled and uncontrolled airspace presents a variety of issues and novel challenges for information systems.

The primary means of information dissemination and coordination between entities providing UTM services may be a distributed network of highly automated systems via API.

The same architecture may also support multiple service providers, if the operational volume and complexity require. A common protocol must be established to ensure that information systems are safe, secure, reliable and interoperable, and adhere to a performance-based regulatory framework.

UTM system information protocols and interfaces will play a key role in ensuring that the system enables the safe integration of UAS into shared airspace. The development of minimum performance and interoperability standards for communications protocols should be taken into consideration, including, as applicable, those for:

- C2 Link between UA control stations and UA;
- aircraft-to-aircraft communications between UA;
- communications link between UA and other airspace users (e.g. manned aircraft), as necessary; and
- communications between remote pilots and the respective UTM and ATM systems.

Communications solutions

Given the rapid advancement of technology, there will be a variety of possible technological solutions that may support a framework for communications systems. As work progresses, different concepts of UAS communications service provision through entities such as ANSPs, governmental organizations and private third-party suppliers will evolve, similar to those being utilized for ATM systems. Such entities may play a key role in centralizing all communications between UAS and stakeholders (ATC, law enforcement, etc.) and in assisting with strategic deconfliction, situational awareness, flight planning and authorization of UAS operations in the respective airspaces and collaboration between UAS operators and flight information management systems (FIMS).

With the introduction of UTM in the future, it is envisaged that a key emphasis will be placed on aircraft-to-aircraft operations. Direct aircraft-to-aircraft communications enable UAS operators or remote pilots to communicate their flight plan and other relevant information with each other. Various technologies that have been developed for the automobile industry, including dedicated short-range communications (DSRC)[2], are being considered to support such aircraft-to-aircraft operations.

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[2] DSRC is a two-way, short-to-medium-range wireless communications capability that enables very high data transmission for vehicle-to-vehicle and vehicle-to-infrastructure automobile communications under the Intelligent Transportation Systems (ITS) programme of the United States Department of Transportation.

Frequency Spectrum requirements

The International Telecommunication Union (ITU) plays a decisive role in allocating protected frequency spectrum to UAS operations, which may be necessary for safety-critical functions. If the communications link between remote pilots and aircraft is lost or compromised, serious safety-related consequences may arise. For example, a C2 Link between UA and UA control stations is required for the safe operation of UA under VLOS and BVLOS conditions.

A number of frequency bands in the fixed satellite service (FSS) are being considered for the provision of the C2 Link for UAS, albeit with specific conditions pertaining to the governance and usage of those bands imposed by the ITU and ICAO. This might be an option to consider for some UTM operations.

Standards for communications systems will need to cover the relevant safety implications owing to lost C2 Link events, as well as metrics pertaining to the latency, integrity, availability and redundancy of data transmission.

The anticipated operational needs for frequency spectrum usage revolve around four main elements:

- aircraft-to-aircraft communications between UA;
- communications between UA or UAS operators, remote pilots and the respective UTM or ATM systems;
- communications for the C2 Link; and
- communications for the application of DAA.

  In this regard, frequency spectrum sharing will be especially vital for urban areas, where operations will be significantly more congested than in rural or remote areas.

Concerns regarding frequency availability and suitability, as well as challenges relating to the protection of airspace and space-ground frequencies will need to be addressed and closely coordinated with the ITU.

Cybersecurity

There are significant cybersecurity risks and vulnerabilities that must be taken into consideration. A robust security framework must be established to address potentially malicious attacks to communications systems, including C2 Link disruptions, Global Navigation Satellite System (GNSS) jamming or spoofing attacks, and the manipulation of information exchanged between UAS and between UAS and UTM systems, which may result in erroneous advisories, unwanted changes in flight paths and increased risk of collision.

Additional considerations

The presentations and submissions made at the first DRONE ENABLE Symposium provided some indications of the type of communications technology that might support a UTM system as well as some questions that would need to be answered before deciding on the way forward. Subject to validating that the required performance and security requirements can be met, technologies such as Long-Term Evolution (LTE), 3rd Generation Partnership Project (3GPP) technologies or a combination of terrestrial and satellite-based communications were mentioned. For any of these technologies to be selected, issues regarding suitability for urban or rural areas, sufficient availability of bandwidth or capacity, frequency spectrum availability or resilience to interference will need to be addressed.

KEY TECHNICAL AREAS

APPENDIX C

GEOFENCING-LIKE SYSTEMS

Presentation review (from DRONE ENABLE 1)

States may wish to restrict the operation of UA in certain areas due to various reasons. These reasons include, but are not limited to: sensitive or safety-critical infrastructure, military activity, accident and law enforcement activities, public and social gatherings, aircraft landing areas and VIP protection.

When such restrictions are imposed by State or local governments, information on the areas may be published by States or ANSPs in Aeronautical Information Products, dedicated websites or various mobile applications, or may be activated by NOTAM. The data related to these areas must be valid, accurate and issued by a competent or approved agency that is clearly identified. These data may be of a different nature than existing aeronautical information but will have to be harmonized with applicable aeronautical information standards. Additionally, aspects such as the shape of the specific areas may require standardization due to the impacts on the embedded system's performance.

A geofencing function or service includes an airborne piece of equipment (hardware or software, or both) that can currently be found on some small UA; however, no associated performance requirements or standards exist for the development or approval of such systems at all times.

It is envisioned that a geofencing/geoawareness-like system will either prevent UA from entering airspace in which they are not permitted to operate or, alternatively, may be used to prevent UA from leaving specific areas. The system would likely have to be associated with an approved service that provides accurate information on airspace availability and restrictions. This will lead to benefits in terms of safety and security and reduce requirements concerning the competencies of UAS operators and remote pilots. However, consideration must also be given to the potential unintended consequences should UA be prevented from entering airspace when doing so is required to prevent a mid-air collision or for another reason related to the safety of the flight.

Draft UTM concepts include two components of geofencing functions or services:

- static: when the data provided to support the geofencing/geoawareness function or service relies on published, stable data (e.g. AIP, list of restricted airspace); and

- dynamic: when the restricted areas are temporary and may be established with little or no notice (e.g. emergency scene, public event). There should be the capability to permit accredited authorities to create temporary restricted areas on short notice, for example, to protect an area of public safety concern. In such situations, a system for transmitting these restrictions to UA already in flight will be needed.

As currently exists for manned aviation, a common set of standards and processes for airspace restrictions should be developed to address the integration of temporary restrictions, approval of accredited authorities, common requirements for who can establish or validate restricted areas, and the conditions under which these areas may be established. Processes or policies should also be established to avoid having too many restricted areas that may create congestion or safety issues for manned aircraft or UA in flight.

A geofencing capability is envisaged as a service providing the data (static and dynamic) and information on the UA position that are required to alert the remote pilot of when the UA is approaching or crossing a geofenced area, to enable the UA to avoid prohibited areas or to deny access to such areas. A geofencing/geoawareness system could include different layers or buffer zones around the geofenced area that would trigger different types of alerts (e.g. inner, intermediate and outer).

Some considerations on geofencing/geoawareness functions or services include:

- Data integrity. Aeronautical data and additional geospatial data for the UTM system must be quality-assured and provided by a recognized or accredited source.

- Accuracy of the UA position. Positional information must be accurate enough to ensure that the UA does not enter the geofenced area (can be coupled with the use of buffer zones). Current GNSS positioning technology may not provide a sufficient level of accuracy, reliability or redundancy, particularly in areas with limited reception, such as urban canyons. The UAS operator or remote pilot may be required to validate the UA position accuracy prior to flight operations.

- Assessment of whether the UA is about to enter, or has entered, a geofenced area, and alerting the remote pilot and/or UA, which may be able to react automatically.

Geofencing may have to be removed for some operations in some areas (e.g. UA authorized to operate at airports, UA performing inspections at power plants or UA used by public safety agencies). A geofencing function or service provided in UTM may deal with a certain number of these exceptions in an automated way, facilitating the authorization process for specific UAS operators.

Other considerations regarding geofencing that were raised at the first DRONE ENABLE Symposium include:

- Contingencies: how to mitigate fly-aways, lost C2 Link, UA emergency recoveries, etc.

- Geofencing should not replace the need for sufficient knowledge on the part of the remote pilot of airspace structure, airspace constraints and regulations.

- Methods to address or enforce intentional non-compliance with geofencing must be developed.

- Prior to deciding if geofencing/geoawareness should be compulsory for a UTM system, other factors should be assessed:

    a. the availability of alternative methods for ensuring that UA do not violate airspace boundaries, such as: active monitoring of UA flight trajectories, accurate performance of navigation equipment and properly trained remote pilots;
    b. the establishment of performance requirements for UA operating within the UTM system to address issues such as navigation, position and use of common altitude references; and
    c. the availability and quality of airspace data within UTM systems, particularly across States.

- it was recognized that geofencing could mitigate risks arising from the lack of situational awareness and airspace appreciation often found among recreational users of these aircraft and could be a separate requirement outside of the UTM system.

Even if geofencing/geoawareness may not be considered a mandatory requirement for a UTM system, it may provide some mitigation measures and may be used by UAS operators and remote pilots operating in areas where they are not familiar with the airspace (e.g. a foreign country). During the first DRONE ENABLE Symposium, it was indicated that international standards would likely be needed to address the following issues:

- Processes and procedures must be established to provide special authorizations for approved UAS operators (or UA) to override geofencing restrictions and enter specific geofenced areas.

- Anticipated behaviours of a UA when approaching a geofenced area (land, hover, wait for remote pilot instructions, return to home, circumnavigate, etc.) must be identified and system responses developed.

- UA actions under contingency operations (lost C2 Link, fly-aways, emergencies, etc.) and system responses must be developed.

KEY TECHNICAL AREA

APPENDIX D

UTM-ATM BOUNDARIES AND TRANSITION

Presentation review (from DRONE ENABLE 2)

Several DRONE ENABLE 2 presenters expressed views on the topic of UTM-ATM boundaries, with specific attention on the currently available product suites for ATM and potential UTM technology solutions. Most of the solutions have been focused on the products and methods of sharing data using the available technology/standards and provision of services to UAS, many of which are under development by various national and international standardization bodies. Additional discussions considered the use of airspace, but they did not address safety implications related to non-defined boundaries and responsibilities between UTM and ATM.

Airspace, which is currently used by civil aviation for their operations, is managed, with different levels of services, by the established ANSPs. ANSPs are following air traffic management rules set by ICAO (Annex 11 — Air Traffic Services, Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444 and others) and regional/national regulations. Flight information service (FIS) is provided either by a flight information center or by an air traffic control unit (according to ICAO PANS-ATM) and includes information which is intended to enhance safety.

Aviation, including ATM, has a long history during which a high level of safety has been developed and is maintained. A notable characteristic of ATM is that it functions with a well-established and proven safety management system, however its procedures and structures may not allow for quick developments and implementations. By contrast, UTM is innovative and fast, but its level of safety and robustness has not been defined and validated. Accordingly, a high degree of complexity emerges from efforts to integrate these two systems.

The establishment of boundaries has not only operational and technical elements, but also legal elements. As UTM is implemented, the fact that the airspace will be shared between manned aircraft and UA creates a need to identify and confirm the roles of UTM and ATM related to airspace and traffic management responsibilities and functions. Several DRONE ENABLE 2 presenters noted that interoperability is a key requirement for UTM-ATM interface.

Several DRONE ENABLE 2 presenters also outlined the complex gap between responsibilities of UTM and ATM. The gap has materialized from the fact that the process for designation of UTM service suppliers, their certification, and how they should demonstrate a minimum level of safety and quality of service has not been defined. On the other hand, established ANSPs are regulated and follow well established procedures.

Besides the gaps which are complicating the establishment of UTM-ATM boundaries, it is hard to achieve the development of UTM in isolation from the existing ATM system and its services.

Some of the UTM services presented during DRONE ENABLE 2 have similarities with ATM services; therefore coordination with ATM is vital. Other UTM services are complementary to ATM as services are expanded to airspace users in volumes of airspace where ANSPs currently provide limited or no services (e.g. FIS). Although it is likely that these services will need to interact, there must be no overlap of conflicting or incompatible services or areas of responsibility. As a consequence, presenters expressed the view that UTM services may, in fact, be shared between UTM and ATM.

Several presentations were offered at DRONE ENABLE 2, addressing UA capabilities for operating in all types of airspace and at all altitudes/levels. Discussion topics included scenarios where manned aircraft and UA will be required to cross the boundary between UTM and ATM, whereas in other situations they will only operate in close proximity to that boundary. In both scenarios, an aircraft being managed by one system (UTM or ATM) may be at increased risk of becoming a hazard to aircraft being managed by the other system.

Introduction

This Appendix addresses practical issues and future implementation considerations of a UTM operational architecture in airspace where existing ATM services and protocols are generally provided for many, if not most, volumes of airspace within a State's jurisdiction. Notwithstanding the same objectives of UTM and ATM (i.e., to prevent collisions and enable safe and efficient operations in the airspace) there are significant differences between the means by which UTM and ATM may achieve this end. It is, accordingly, important to provide States with material that speaks to the unique circumstance of airspace in which aircraft under either UTM or ATM may be operating in or transitioning between UTM and ATM.

In accordance with PANS-ATM, the ATM system provides air traffic management through the collaborative integration of humans, information, technology, facilities, and services, supported by air, ground, and/or space-based CNS. The same definition should also apply to UTM. It is, however, important to recognize the difference between the two systems from an operational perspective.

For the purpose of the ICAO UTM Framework, the use of the term "boundary" with regard to UTM and ATM is intended to address the applicable delineation between UTM and ATM systems. To this end, the UTM-ATM boundary should be understood as any physical boundary, or a combination of boundaries, as set by airspace design, a service boundary defined by distinct sets of services provided by an ANSP and USP, and/or a system boundary defined by the technical CNS/ATM system.

Accordingly, at the outset, the exercise of addressing UTM-ATM boundaries focuses primarily on UTM itself as notionally defined by airspace. Many concepts of UTM services are currently projected to support low-altitude operations where there is limited need for active traffic control. As additional automated capabilities are added to future developments of aircraft, however, it is possible that UTM and ATM services (and even systems) will not be as neatly identified by particular classes of airspace, or even types of aircraft operations.

In the near-term, airspace segregation is likely to be the most commonly deployed solution. However, as operations develop, it seems appropriate for the States to identify where the course of operational, airspace, and technology elements might require additional planning (e.g., appropriate rules, policies, and procedures) for the integration of aircraft operating under different traffic management systems, albeit in the same airspace. This Appendix therefore draws on assumptions about the nature of operations that may be more likely conducted in the medium-term, rather than the near-term.

The Issue of Boundaries

At the outset, it was recognized that safety is paramount to the use of airspace, regardless of the class of airspace or operation being conducted. Transitioning between UTM and ATM should not compromise safety of operations. As integration increases, operations will overlap but these operations should not diminish the level of safety.

Responsibilities for flow management, separation and collision avoidance should be considered by States in developing procedures and rules for UTM-ATM boundaries. Although the activities may be different in the two systems, the responsibility to ensure safety remains with the relevant service provider, as regulated by the State. There are established ATM processes for assigning or delegating airspace service provision; for UTM the same processes should be used. The safe separation of aircraft is a set responsibility to be fulfilled by the ATM service provider. However, given that UTM will not provide the same separation service as ATM, the established criteria may not be appropriate for these operations and may require a different set of standards for UTM operations. UTM and ATM users are thus responsible for awareness of the level of services provided.

Interoperability is also an essential requirement. There will be a need to share operational information between both ATM and UTM providers. ATM and UTM information must be accessible to relevant stake holders (airspace users, service providers, states, etc.). Architecture may permit coincident (overlapped) ATM and UTM operations, but at a minimum, the exchange of essential information at the boundary must be ensured for safe and efficient operations.

ICAO Annex 11 - *Air Traffic Services*, Chapter 3, paragraphs 3.5.and 3.6 detail the requirements applicable to *Responsibility for Control* and *Transfer of Responsibility for Control*. These same principles are equally applicable to the transfer of responsibility between USPs and to transfers between USPs and ATS units. In the case of the ATS unit, this may not involve control of the UA, however, the information applicable to the flight of the UA will need to be exchanged for purposes such as the issuance of traffic advisories.

(*See* Appendix E, Essential Information Exchange between UTM and ATM Systems for more information on information exchange suggestions.

A phased approach is suggested in order to integrate unmanned and manned aircraft, when flight paths are adjacent to, or within, the same volume of airspace. The guidance in this Appendix is irrespective of the performance capabilities of aircraft that seek to access any volume of airspace, including at UTM-ATM boundaries. The subsequent paragraphs describe questions and considerations to be addressed when integrating operations between UTM and ATM.

Key Considerations in Establishing Operations at Boundaries.

The Determination of Boundaries

- UTM operations may require new ways of managing airspace categories and volumes, based on future concepts, which may affect the criteria followed in designing the interactions between UTM and ATM.

- Performance capabilities of UA and their operator or remote pilots (e.g., aircraft characteristics of speed, size and maneuverability) should be considered when designing the size and shape of UTM - ATM boundaries.

- The airspace design should be relative to the type and performance characteristics of the UA and other aircraft operating in or adjacent to the volume of airspace.

Phased Integration of Boundaries

- Limitations in how airspace is managed between UTM and ATM drive the need to address how the two management approaches can be integrated.

- As additional concepts are tested and made available, these differences in management approaches will begin to diminish. To reach integration between UTM and ATM testing will likely need to be implemented in a phased approach.

- In order for the crossing of boundaries between the UTM and ATM systems to become seamless, airspace users and ATM/UTM personnel will need to understand the operational requirements of both systems.

Common Elements of Operations at the Boundary

UTM-ATM boundaries require considerations of operational, airspace and technical elements at a minimum. These elements should address issues pertaining to transition between UTM and ATM or adjacent operations.

Operational considerations

It is understood that the current flight rules (VFR, IFR) are insufficient to accommodate UAS operations. Any changes to the flight rules will need to be consistent and complementary to the ones defined for manned aviation. States will need to decide how to apply the flight rules at the boundaries between UTM and ATM.

It is also expected that a reference system for the vertical position of aircraft, common to UTM and ATM systems, will be necessary to accurately and consistently provide appropriate vertical separation.

States should consider several key operational aspects, while establishing boundaries between UTM-ATM areas of responsibilities. These include, inter alia:

- Identification of roles and responsibilities of UTM and ATM systems in terms of level of service provided and service responsibility should the two overlap.

- Development of operational procedures and coordination processes:

    - for transitioning between UTM and ATM;
    - to allow traffic under UTM control to operate in an ATM environment and vice-versa; and
    - for operations in close proximity to adjacent airspaces

- Establishing separation standards between UA and between manned aircraft and UA.

- Establishing the prioritization of operations (e.g. in-flight emergency or medical operations having priority over other aircraft).

Airspace considerations

The current airspace classification scheme and the requirements associated with specific airspaces may not accommodate UAS operation as envisioned under UTM given the highly automated nature of UTM operations. Analysis of such gaps will be needed to determine if changes to the airspace classification scheme will be required. Such changes could address user responsibilities, types and levels of services to be expected, equipage requirements for airspace access, and airspace authorization requirements.

Any such airspace changes would require the completion of an SMS assessment to ensure levels of safety are maintained.

Technology considerations

States should consider several technological aspects, while establishing boundaries between UTM and ATM areas of responsibilities. These include, inter alia:

- technology to support collision avoidance;

- automation to support traffic management and transitions between UTM to ATM;

- information exchange capabilities between UTM and ATM systems for operations planning purposes and to enable situational awareness; and

- capabilities to meet performance requirements needed to achieve interoperability (e.g. CNS requirements).

KEY TECHNICAL AREAS

APPENDIX E

ESSENTIAL INFORMATION EXCHANGE BETWEEN UTM AND ATM SYSTEMS

Presentation review (from DRONE ENABLE 2)

Conference attendees provided information on content of essential information that might have to be exchanged between UTM and ATM systems, as well as the challenges encountered during the information exchange process.

UTM may involve new types of information that is not included in current ATM information. The relevance of this new information to the ATM system will have to be examined to determine if such information needs to be exchagned.

Introduction

This appendix aims to provide guidance to States, regulators and industry on specific elements that need to be considered for the exchange of essential information. These considerations are irrespective of the direction of the flow of information. Due to the uncertainty of how airspace will be organized and what the actual system requirements will be, the list of elements can neither be exhaustive nor will it be suitable for all possible scenarios.

It is currently assumed that each airspace user will be managed by only one entity at a time, either the UTM or ATM system. However, an airspace user may receive information from several UTM or ATM sources.

Currently, the ATM system is a 'human centric' system whereas UTM is envisioned as digitally based. The information exchange requirements between these two systems will therefore have a significant impact on human factors, the consequences of which will require extensive consideration.

UTM/ATM Interoperability Considerations

System wide information management (SWIM) principles should be applied to support information exchanges between UTM and ATM. For this to occur:

- UTM solutions should leverage and remain consistent with the work of ICAO regard to services, information, technical infrastructure and IP-based connectivity, when appropriate; and

- current aviation connections, through SWIM, will need to be extended to new airspace users, who will also need to use information services and data exchange models.

Current references such as the ICAO ATM Information Reference Model (AIRM) and global information exchange models such as the Aeronautical Information Exchange Model (AIXM), the Flight Information Exchange Model (FIXM) or ICAO's Weather Information Exchange Model (IWXXM) should constitute the primary baseline for UTM-ATM information exchanges.

There are a number of requirements and associated risks for data sharing. These include, inter alia, data quality requirements, data exchange protocols, cybersecurity standards as well as system interoperability and system performance requirements. It is also necessary for States to define quality requirements for the services supporting UTM-ATM information exchanges. Additionally appropriate service management systems should be established. It will also be important for the system interface to include a process for identifying and verifying the source of the data. The ICAO *Manual on System-Wide Information Management (SWIM)* Concept (Doc 10039), may be beneficial when addressing SWIM related issues.

Elements of Information Exchange

<u>Service Provider Considerations</u>

- Airspace

  Airspace is usually defined and classified by States, with boundaries relating to geographic coordinates and vertical levels; it can either be permanent or temporary. The exchange of aeronautical information provides information on defined airspace dimensions either in advance or real-time, as the need allows. An agreement between serivce providers may be needed to exchange information on changes in airspace structure, either by using the established aeronautical information regulation and control (AIRAC) cycle, NOTAMs or perhaps an alternative means of providing real-time updates.

  Future information exchange such as dynamic geo-fencing may necessitate a more direct exchange of airspace information between UTM and ATM systems.

  Aeronautical data will need to be enriched with any new airspace structures, and UA-specific information such as: geofencing, UA navaids, UA corridors or airways, UAS procedures, UA airports and landing areas, etc.

  When airspace data is exchanged and used, the format and scale used will need to be defined for the exchange that is fit for purpose taking into consideration system and user needs. All data should meet a minimum level of quality, be delivered in the time frames required, and be validated/certified.

  The entity responsible to create airspace definitions should be clearly identified.

  The system requirements for authenticating the information source will need to be established.

- Strategic coordination between UTM and ATM:

  Information associated with capacity management, similar to air traffic flow management procedures for manned aviation, should be developed and communicated between systems for the safe and efficient flow of all air traffic. Such information may need to be coordinated with UAS operators or remtoe pilots (e.g. to alleviate the effects of limited energy (fuel) levels of certain UA and negative impacts on the overall traffic flow).

  Strategic coordination agreements between UTM and ATM may be required, similar to letters of agreement between air traffic control units today. This may help in facilitating standardized processes to approve/clear aircraft between the two systems. These processes and data would also enable strategic de-confliction of aircraft between UTM and ATM.

- Tactical coordination and de-confliction:

  Although there was no discussion within the RFI papers on this topic, this is an area that requires further analysis and consideration.

  When required, the provisions for de-confliction or separation requirements for aircraft can be included in the data exchange. Systems would need to exchange information to support any required separation standards,once developed.

  Real-time management of emergency and contingency situations may require tactical data exchange.

<u>Considerations for information exchange between systems</u>

This section introduces some UTM and ATM information exchange considerations that States may need to address when approving a UTM system to interact with an ATM system.

- ability to verify and authenticate the identity of the entities exchanging information;

- confirmation of the integrity of the information being exchanged;

- conformity of system connectivity to agreed system requirements, including the quality of the services supporting the UTM-ATM information exchanges, to include: availability, confidentiality, integrity, latency, recoverability and reliability; and

- monitoring of the technical infrastructure for health, faults and performance degradations, to ensure information exchanges according to agreed requirements.

Aircraft User Information Elements

As UTM concepts mature, the set of information exchanged between UTM and ATM systems will become better defined. The information listed here provides an example of the type of information that may be exchanged. The type of information will determine if it supports strategic coordination, tactical coordination or both.

There are different levels of information, including some that might be relevant to the immediate operation, some for management of the systems, and some that address other requirements. The types of data that may need to be exchanged include, inter alia:

- aircraft identification and registration information (some of this information may be regulated by the State)
  i. Electronic identification
  ii. Ownership information
  iii. Operator contact information
  iv. Remote pilot contact information
  v. State of Registry and State of Operator
  vi. Aircraft type
  vii. Aircraft category (e.g. aircraft, rotorcraft, glider, vertical take-off and landing (VTOL), hang-glider).
  viii. Wake turbulence considerations
  ix. Aircraft surveillance capability (e.g. ADS-B, Mode A/C or S)

- UA method of control (e.g. RPAS, automated, or other);

- irrespective of the method of control (RPAS, automated, or other), does the aircraft carry people;

- UA position – 4D geospatial information to required standard;

- source of position data for both lateral and vertical position information (e.g. certified/non-certified, validation, reliability, accuracy, barometric altitude/GNSS altitude);

- flight plan, including flight notification;

- flight plan conformance information;

- current flight trajectory (i.e. the immediate intent of the UA rather than its flight plan route);

- flight rules the UA is operating under;

- airspace access and authorizations;

- UA performance capabilities (e.g. minimum or maximum speed, climb rates, max. altitude);

- UA system performance (e.g. the UTM established required communication performance (RCP), required surveillance performance (RSP), required navigating performance (RNP) to which the UA must comply);

- ACAS or DAA capability - requirements have yet to be determined depending on separation standards;

- emergency or contingency status - information about existing emergency/contingency status either initiated by the aircraft or by the system/ATC;

- contingency procedures - this could include a proposed flight path, procedures during lost C2 Link state or contingency landing sites;

- fly away / lost C2 Link routings;

- emergency considerations - including data relevant to search and rescue (e.g. maximum endurance, humans on board, dangerous goods on board);

- C2 Link type or service provision - how is the UA linked to the remote pilot station;
- C2 Link state - quality and status of C2 Link (e.g. lost C2 Link, partial loss);
- ATC communication link type (e.g. VHF, telephone, data link);
- ATC communication link status;
- priority status (e.g. aircraft in distress, medical);
- information to facilitate charging of service fees - this may originate through the ID and registration or other source; and
- additional information.

Other information that may be shared

Other information may be collected regarding conditions within the airspace which are impacting the ability to utilize the airspace. This information may be collected by the UA and shared with the UTM system or from other sources. This is not related to failures or shortcomings of the UTM and ATM systems, but rather impacted by external forces (e.g. local weather, airspace hazards, other aeronautical information). There was no clarification made regarding the validation of the information, and how to assess the potential for error and the impact on the system.

For example, weather information may be collected from external providers or sensors on a UA and shared. This may differ from the current practice where meteorological information is provided by certified providers. Other examples of shared information could include geospatial information, which may differ between UTM and ATM.

Where a UTM system is established within a volume of airspace that does not require manned aircraft to be cooperative (e.g. using a transponder or ADS-B Out), this could result in no data being exchanged in relation to that aircraft. Alternatively, the manned aircraft may be cooperative, but there may be no flight plan information available. In such cases, States should consider what alternative requirements are necessary to enable the safe integration of manned aircraft and UA.

KEY TECHNICAL AREAS

APPENDIX F

UTM SERVICE PROVIDERS (USP) ORGANIZATIONAL CONSTRUCT AND APPROVAL PROCESSES

Presentation review (from DRONE ENABLE 3)

Presentations clearly demonstrated that States do not all share a common vision of how to organize and manage UTM Service Providers (USP), or even if or how to enable multiple USPs to operate together in the same airspace. All agreed that CAAs have the responsibility to oversee the provision of services provided by third-party service providers, whether there is one or many USPs.

States are already providing UTM solutions with various levels of service (e.g. registration, identification and environment data), but the full capabilities, responsibilities and roles still need to be clarified and harmonized.

Presenters showed a number of perspectives on the development and ownership of supporting infrastructure.

Technology development is rapid, and any overall systems design should therefore be performance-based, with safety provided through appropriate oversight.

Introduction

This appendix aims to provide guidance to States, regulators and industry on specific elements that need to be considered to enable safe and effective UTM service provision by one or more USPs. Due to the uncertainty of how USPs will be organized and what the overarching governance structure will be, the list of elements cannot be exhaustive or suitable to all possible scenarios.

Recognizing the possible alternative approaches to organizing USPs, this document makes no assumptions about a preferred architecture, governance model or business model. To achieve this, the document is structured as follows:

- The first section looks at high-level concepts that should be common to all USPs, regardless of which UTM service-provision implementation model is preferred, enabling USPs to operate in a consistent and interoperable manner.

- The second section goes more deeply into the different architectural options, linking the differences to the concepts raised in the first section.

- The third and final section looks briefly into the future, suggesting how initial implementations should evolve in the interest of greater global harmonization.

Common High-Level Concepts

This section introduces concepts that should be common to all possible implementations of UTM service provision, and covers the following three aspects:

- Criticality of services;

- Approval and oversight; and

- Interoperability.

<u>Criticality of services</u>

Operational experience from both ATM and UTM show that some services have a greater degree of criticality than others. For example, safety-critical services will have a higher degree of criticality than some supplemental services, such as meteorological data. It was widely agreed that services with a high degree of criticality would need a greater degree of oversight and that such services may need to be provided centrally. Nevertheless, not all presenters agreed on which services should be categorized as ‘critical’, or on the mechanism for performing such assessment.

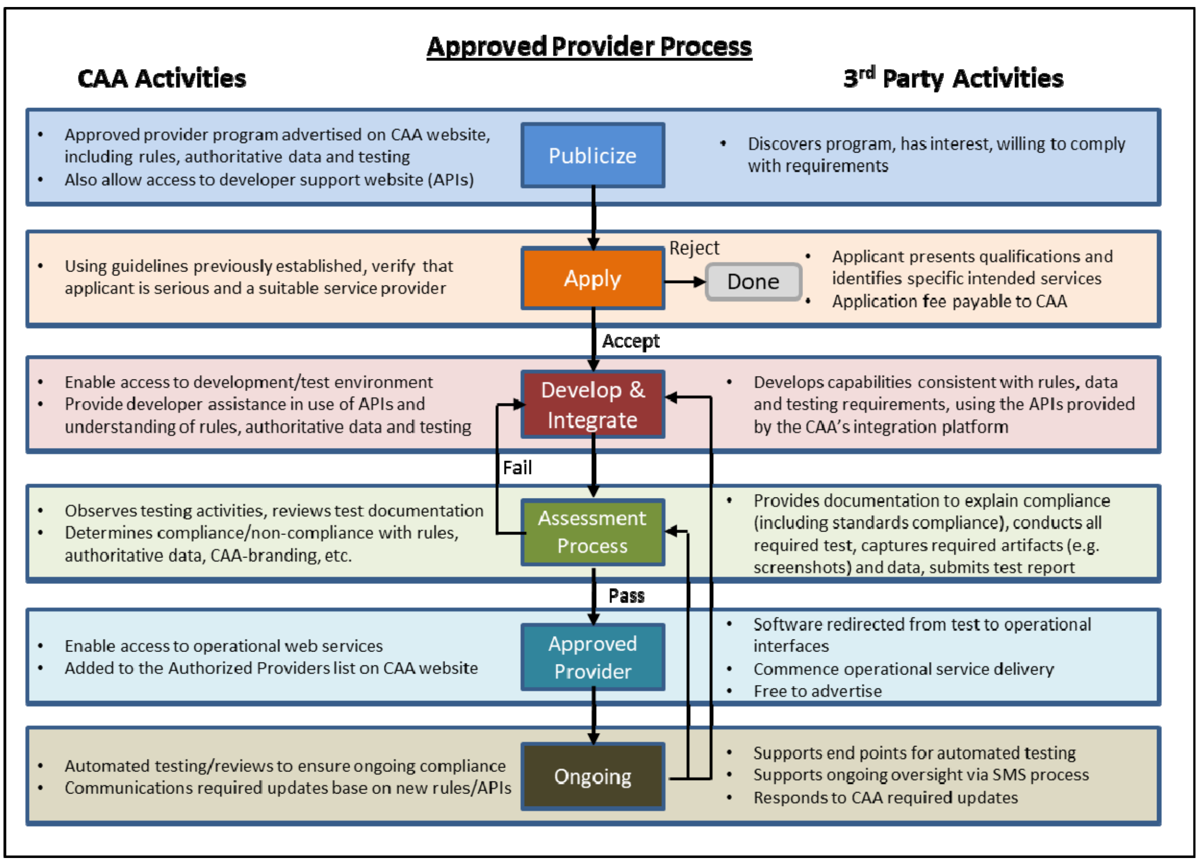
It is therefore proposed that each State perform an analysis to determine the criticality of the various UTM services that are intended to be delivered in that State, and to specify those services that must, according to that State, be provided centrally, if any. UTM services could be allowed to be provided by one or more USPs in the same airspace volume, under the oversight of the State regulator. This analysis should also determine which services are considered to be mandatory, that is those services that must be provided in order for effective UTM service provision.

Safety should be the principal consideration to identify critical services, such as those that provide for safe cooperation with manned aviation, but other factors may also be considered as important, such as security. Individual States may apply their own criteria to identify critical and non-critical services.

<u>Approval and oversight</u>

The regulator retains the ultimate responsibility for its oversight role, although this could be done by delegating certain tasks to appropriately-approved bodies. The regulatory structure should enable the effective cooperation with manned aviation, showing how UTM service provision affects and supports both manned and unmanned operations. Regulations should also clearly show how airspace is to be managed, leaving no ambiguity about what kinds of UTM service can be provided where, and detailing any conditions for UTM service-provision in any given class of airspace.

Policies need to be produced that clearly show who is responsible for each UTM service, whether centrally provided or not, and how each service should be provided. This should include performance-based requirements for USPs that enable an effective USP approval and accreditation process to be implemented. As far as possible, the mechanism for approving USPs should be harmonized, allowing recognition of USP certification between authorities, thus promoting consistent application of UTM service provision and reducing costs and complexity. The figure below shows an example flow-chart of a process for approving and monitoring a USP.



The needs of the military and security communities must be taken fully into consideration, by both regulator and service provider, with clearly defined mechanisms for ensuring the delivery of UTM services that assure the safe management of UA operations alongside manned and unmanned military and security aviation. This should include mechanisms for determining and applying prioritization, depending on the circumstances. Such prioritization should address both conflicts between UA and between unmanned and manned aircraft. The existing priority mechanisms, used in manned aviation including medical and emergency situation should be considered as a starting point.

Processes for the approval of UA flights are complex and involve more than just aviation stakeholders. Regulations should also cover interfaces between USPs and non-aviation stakeholders, such as city authorities.

Some data used in the provision of UTM services could be business or mission critical, and may therefore be highly confidential. Regulation, system specifications and processes should ensure the respect of that confidentiality by USPs.

<u>Interoperability</u>

As far as possible, implementation of UTM should be based on standards produced and agreed by international standardization bodies. These standards should only be prescriptive where essential; performance and risk-based standards allow for the introduction of new technologies and promote innovation while supporting safety and interoperability.

In order to ensure a consistent level of performance of service provision, service-level agreements (SLA) will need to be established between UAS operators and USPs. Although many such SLAs will be commercial, there will be some that relate to the delivery of certain non-critical services. For these services, the minimum level of performance could be defined through SLA, rather than through more prescriptive standards or other more formal specifications.

The key mechanism for ensuring interoperability between USPs is through effective data exchange. USPs will process an extensive range of data from many different sources, and the quality requirement for each type of data should be specified and standardized. Detailed considerations for data exchange between UTM and ATM can be found at Appendix E, and many of these apply equally to exchange between USPs, including the adoption of SWIM principles and data-exchange models (AIXM, FIXM and IWXXM). Where additional data-exchange requirements are identified between USPs, the same principles as those described in Appendix E will largely apply. However, for some non-critical exchanges between USPs, the level of quality assurance needs to be commensurate with the level of criticality in order to reduce costs and to simplify the oversight processes; this determination will need to form part of the definition of each affected service.

The industry approach to enabling multiple USPs or/and SDSP into a UTM ecosystem has mostly taken the form of APIs. The case for interoperability however goes beyond APIs to include a common communication language and requirements on the core information to be shared within the UTM ecosystem. Initial considerations for establishing a common communication language (or data model) include, *inter alia*, the type of information to be shared, the quantity of data that would be transmitted across the ecosystem, acceptable latencies involved, immutability of the data and the constraints of current and future technologies for processing this data (transmission and translation). To establish specific requirements related to these considerations, there is a need to establish what information is exchanged and how it would be used, and the mechanism(s) by which it would be exchanged, including whether human intervention is necessary or whether it is fully automated.

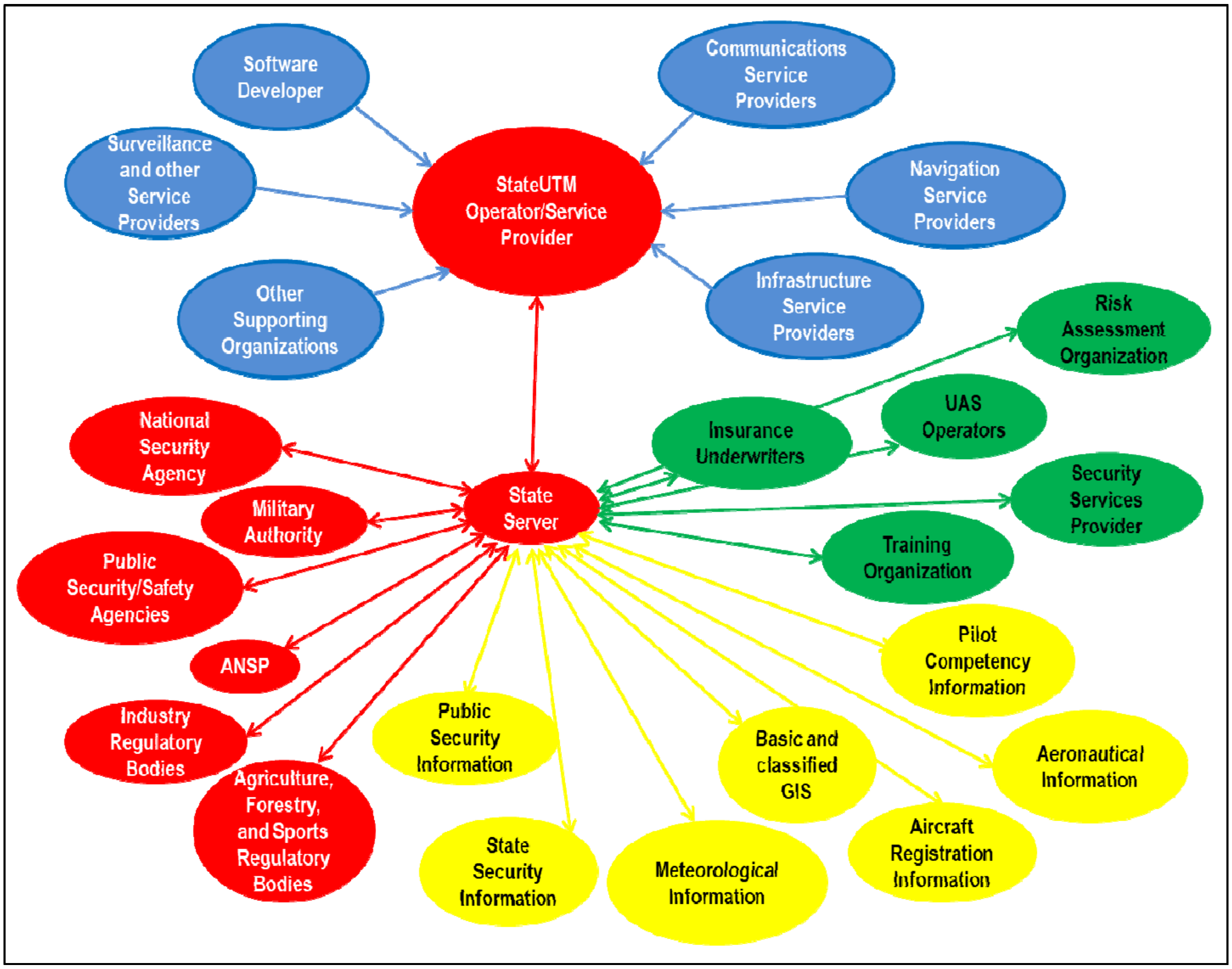
One of the historical issues found in the manned aviation environment stems from the use of point-to-point data connections and third-party equipment for enabling connections between two systems supported by hardware-specific APIs. This has provided a level of security but has reduced the ability for data-sharing beyond those systems and introduced cumbersome software maintenance needs; in some instances, it has inhibited the ability of service providers to integrate new systems or services. The opportunity for the UTM-ecosystem is to develop a network-centric information-sharing environment where information can be shared with multiple entities in a timely manner, and for new USPs or SDSPs to be more readily connected, removed or replaced.

Different approaches to implementation

It is not the intention of this Appendix to dictate any particular architecture, but it is clear that different architectures will lead to some differences in implementation. In order to promote consistent application of the principles described above, this section describes two models currently being implemented and considers their application within each model. Although only two architectural models are considered here, there are several others, but this illustration should allow applicability to other models to be determined.

The two example architectural models are shown below in diagrammatic form, and these diagrams are the same as those previously shown in Appendix D of previous versions of this Framework; as a consequence, Appendix D has been deleted. The two example architectures are: centralized service provision and federated services provision.

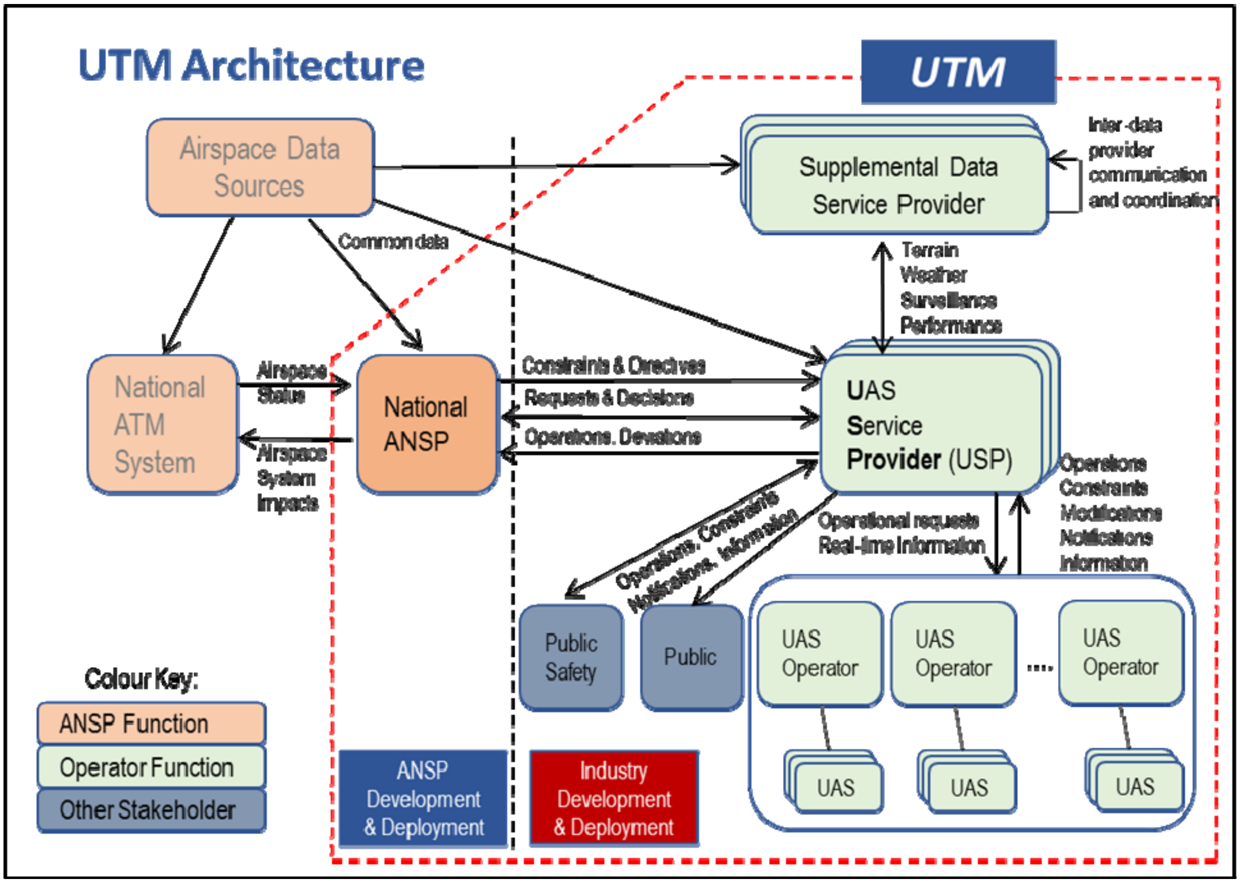
Centralized service provision



In a centralized architecture, a central agency can be responsible for all aspects of service provision, either through direct provision of services, or through coordinating the actions of other service providers. In this case, the 'State Server' represents the authority to which all other stakeholders report. This is usually the CAA, undertaking its role as regulator. One of the many links is shown as being to the ANSP, which is regulated in the traditional manner.

In the upper part of the diagram, a link is shown to the 'State UTM Operator / Service Provider', which then links to other providers involved in the delivery of UTM services. This model shows a reproduction of the traditional ATM structure in UTM, with a single, State USP responsible for delivery of UTM services, although it could be supported by SDSPs. It should be noted that, in its purest form, in a centralized architecture there will be one SDSP for each service provided.

Federated service provision



In this example of a federated architecture, there is still one central regulator, functionally the same as for the centralized model. Similarly, in this example, there is also a single State ANSP. The difference comes in the relationship between the regulator, the ANSP and the USPs.

In a federated architecture, a USP provides UTM services, but is no longer a State entity, and nor is any USP unique. All USPs are regulated by the State regulator and have clearly defined responsibilities with regard to the ANSP. In line with this Appendix, there is also the need for the relationship between USPs to be precisely defined.

Under this model, different USPs could provide dissimilar sets of UTM services depending on their business model, so the interfaces between them may be different. However, the requirements for each UTM service should be applied consistently and in accordance with the standards and regulations.

Future evolutions

With the current state of development, future evolution is set to be rapid, and it will follow paths as yet undefined by stakeholders. In order to support this continued evolution while encouraging innovation, moving from today's assumptions to tomorrow's reality will require:

- Safety assurance for manned aviation, UA and people and property on the ground. This will require a partnership between regulator, service provider(s) and UAS operator, as well as stakeholders new to the aviation domain, such as city authorities, law enforcement agencies, telecommunications providers and suppliers of non-aviation data.

- Flexibility in system architecture and UTM service definition to enable UTM systems to react to developments in technology and business applications. This can only be achieved by making regulations prescriptive only where necessary, while allowing performance and risk-based standards to be used as the mechanism for defining how UTM is implemented.

- Increase in efficiency in UTM service provision, especially as numbers of UA increase, and this will be dependent on a significant increase in automation. This may include the introduction of artificial intelligence and/or machine-learning, both of which would require entirely new mechanisms for standardization and governance. Such development could also benefit the wider aviation community.

- Ongoing harmonization of standards and regulations that support various implementation options. Whilst different States may envisage different implementations, following the principles within this document will promote consistent and interoperable UTM service provision.

- Automatic and continuous validation of UTM systems. This may require the development of a new mechanism for performing such validation, but the pace of development in UTM is such that existing aviation mechanisms may not be able to keep pace. Moreover, it was considered that ANSPs and even existing aviation regulators may not yet have the experience and capability to define such a dynamic validation mechanism. As such it may be necessary to learn from non-aviation domains, and to determine if alternative mechanisms are suitable for aviation purposes.

- New and amended economic and cost recovery models for both the services provided and potentially the regulatory oversight aspects may need to be developed.

Conclusions

Each USP can make use of services supplied by multiple SDSPs, but not necessarily the same ones. Competition may result in there being multiple service providers providing identical services to different customers, both UAS operators and other USPs, all of whom would need to follow the same standards and regulations and be approved to do so by the regulator.

It should be noted that, at a functional level, the two architectures could be considered to be very similar:

- One regulator;

- One ANSP;

- USP governed by the regulator according to regulations, standards and procedures;

- SDSPs providing services to USPs; and

- Defined links between all stakeholders

This being the case, the principles described within this document are equally applicable to all possible architectures, with differences arising solely due to implementation choices. By following the principles of this Appendix, a centralized implementation could start to introduce additional USPs at a later date, should that be desired by a particular State.

KEY TECHNICAL AREAS

APPENDIX G

DECONFLICTION AND SEPARATION MANAGEMENT

Presentation review (from DRONE ENABLE 3)

A key element of any safe separation provision in a UTM will be the definition of a safe distance or a safe time between aircraft. A number of presenters at DRONE ENABLE 3 gave their views on Deconfliction and Separation Management, with the key consideration being how manned aviation principles could be applied to UA and what new principles would need to be developed. This included how to define a target level of safety for UA, and the different dependencies that need to be taken into consideration.

While it is anticipated that deconfliction and separation will be managed through an automated system using algorithms, many fundamental questions are still to be decided. In this process the effects on all stakeholders and the operating environment need to be taken into account. Among others, careful airspace planning and flight route optimization will enable strategic deconfliction solutions. On the other hand, tactical deconfliction solutions will increase complexity and the need for resources of the system, especially with the anticipated high numbers of UA. It was also noted during various presentations that effective separation and deconfliction requires traffic to be cooperative. The issue of non-cooperative traffic was not addressed during these sessions.

As aircraft equipage is a fundamental element of any target level of safety definition, special care must be taken to select the right choices of equipment and system requirements. These requirements can range from traditional communication, navigation and surveillance to assessing new parameters.

Introduction

States and industry are seeking an integrated operating environment in which manned and unmanned aviation can operate in a safe and efficient manner. Previous UAS operations have been generally intended to be segregated from manned aviation, through the use of restricted airspace, or advice to other aircraft through notifications such as NOTAM of the location of unmanned operations. Whilst segregated airspace has been an initial solution to accommodate a safe operating environment it does not enable future integration of manned and unmanned aviation, nor does it enable high density UAS operations.

The *Global Air Traffic Management Operational Concept* (ICAO Doc 9854) states that conflict management will consist of three layers: strategic deconfliction, separation provision (tactical deconfliction) and collision avoidance. These principles from manned aviation can be applied to UA deconfliction and separation management. However, not all will be applicable to unmanned aviation in the same way, and there is a need for the consideration of new methods for managing air traffic. Different technology is likely to be required to manage the large volume of UA traffic predicted, particularly in urban environments. The appropriate methods of conflict management need to be determined between both manned and unmanned aircraft, as well as between unmanned aircraft.

Target Level of Safety (TLS)

Target levels of safety are being applied in manned aviation conflict management and these vary depending on a number of factors including the specific operation. Likewise, appropriate target levels of safety will need to be determined for unmanned aviation which will take into consideration the airspace and the mix of traffic in that airspace. The level of safety can be impacted by a number of variables, including e.g. type and density of traffic, aircraft and system performance, equipage, aircraft speed, type of operation and human and machine interventions available. Depending on the various factors, a safe distance or safe time between aircraft must then be determined to reach the desired TLS. In addition to those factor listed above, there are other factors that should be considered when determining the overall TLS of a UTM operation (e.g. pre-flight planning, weather, etc.).

Strategic Deconfliction

Strategic deconfliction is seen as a fundamental UTM service required to enable unmanned aircraft flights. It is the most predictable layer of conflict management and is usually applied in the pre-flight and pre-tactical phase of operations. Through dynamic airspace management, UA may also be affected on a tactical level.

Airspace organization is the primary method of providing strategic deconfliction. ICAO airspace classifications for different volumes of airspace take into consideration density of air traffic, types of operations and requirements for aircraft equipage. It is envisaged that similar principles may be applied in a UTM environment. This could determine if the remote pilot-in-command, or potentially the UAS operator, is responsible for deconfliction, or if a deconfliction or separation service is provided.

One solution presented is to divide the airspace into low, medium and high-risk volumes and this then determines the service required. However, managing the airspace design will be much more complex than that of ICAO airspace classes. Airspace (re)classification for UAS operation may not be directly compatible with the current ICAO airspace classification. This could lead to a situation where the same volume of airspace is managed by an ANSP and a USP(s) simultaneously. Each service provider would serve its respective clientele. This may require both manned and unmanned aircraft to have certain equipage to comply with ATM and UTM requirements, or unmanned aircraft to satisfy manned aviation airspace requirements. With appropriately defined ATM-UTM boundaries and integration, it is anticipated that manned aviation equipage requirements for ATM will also meet the UTM requirements.

Several presentations identified the need for demand and capacity balancing, which is usually achieved by analysing filed or predicted flight plans and adapting them. In a UTM environment this will typically be achieved by an automated function. Strategic deconfliction through (re) routing or careful definition of airspace volumes might increase flight time. It may also be dependent on other factors such a signal coverage, dynamic or permanent airspace restrictions, mission type, weather and energy available.

Proactive conflict management using the above-mentioned principles might require less computing and communication resources and result in more regular traffic patterns with high reliability, balancing improved safety with decreased flexibility.

Manned aviation works on the principle of barometric pressure measurement for altimeter indication, whereas UAS often rely on GNSS height or altitude or a barometric altitude measurement above a certain reference point (e.g. take-off position or position of the remote pilot station). Altitude and height discrepancies between manned and unmanned aircraft resulting from different reference points, methods of measurement as well as altimeter inaccuracies increase the risk of collision. Consequently, mitigations such as a common reference system or an automatic altitude correction method need to be considered.

Tactical Deconfliction and Collision Avoidance

Tactical deconfliction, the provision of a safe distance or safe time between aircraft in flight, can be achieved by a UTM service, the remote pilot and/or an automated remain-well-clear function on board the UA. This will depend on the actual airspace requirements and the combination of the three aforementioned elements.

The above is not to be confused with collision avoidance function of the UA, as a last safety barrier. This collision avoidance function is not considered for the calculated level of safety.

The provision of a tactical deconfliction service by the UTM system, which is reactive conflict management, may require sophisticated technology and a high amount of computing and communication resources, especially in high density traffic situations and in complex traffic patterns. This could lead to lower predictability and reliability of flight paths while allowing for a higher flexibility in operations.

	Demands for computation resource	Demands for Communication resource	Resulting traffic pattern	Reliability	Flexibility
Reactive	High	High	Highly complex, unpredictable	Low	High
Proactive	Low	Low	Regular, predictable	High	Low

To facilitate the provision of these services, aircraft tracking, traffic monitoring and information sharing must be available.

It can be assumed that certain parts of the airspace with a low density of traffic will require less rigorous aircraft and UTM system performance requirements. UA may be permitted to self-separate using on-board detect-and-avoid technology or alternatively remote pilots may navigate according to information received by the UTM or visual acquisition.

While manned aircraft are provided with a certain amount of separation in the vertical, lateral, longitudinal and temporal dimensions depending on flight rules and airspace, this has not been defined for all categories of UAS yet. It can be expected that the safe distance or safe time between two aircraft will depend on the performance requirements and abilities of the aircraft and the UTM system, with the amount of separation also dependant on flight rules and airspace. This could then be incorporated into the operational volume of the UA.

Separation standards are calculated using extensive collision risk modelling based on assumed and real data and use cases. The collection of sufficient and usable operational data for UAS operations is required to support ongoing risk modelling. Once the target levels of safety for UAS operations or airspace are developed, it will be important to monitor the actual performance of aircraft to ensure that the TLS is in fact achieved.

It cannot be expected that manned aircraft pilots will be able to efficiently separate themselves from UA. It is therefore critical to ensure that the UAS and/or the UTM system have awareness of the surrounding traffic, including both manned and unmanned. How this awareness is accomplished can be different for the UAS and the UTM system where the UAS maintains awareness of surrounding traffic at that instant while the UTM system may offer that as well as intent.

A careful assessment of the necessary balance between the needs for strategic and tactical deconfliction must be made in order to get the best outcome in terms of system requirements and user needs, maintaining the desired TLS.

Gaps, Issues and Challenges

The deconfliction concepts presented raise a number of gaps, issues and challenges which include, but are not limited to:

- Priorities: how is access to airspace regulated and who receives priority? The concepts of “first come, first served” or “best equipped, best served” may not be the most appropriate ways of prioritizing aircraft. Other variables such as the mission of aircraft and whether people are on board may be a factor.

- Impact on flight route: what change in route will be acceptable to successfully accomplish the mission? Is there a negotiation process between the UAS operator and the USP and how is it resolved?

- Safety buffers: what buffers are required to the airspace or route? What is the impact of the mission, aircraft type, performance, equipage, etc. on these buffers?

- Applicable time requirements: are there specific time requirements for when strategic deconfliction processes need to be initiated and/or completed?

- Do the same requirements that apply to manned aircraft regarding when strategic deconfliction changes to tactical deconfliction apply to UA?

KEY TECHNICAL AREAS

APPENDIX H

UTM RISK ASSESSMENT AND CONTINGENCY PLANNING

<u>Presentation review (From DRONE ENABLE 3)</u>

DRONE ENABLE 3 participants provided information on various risk assessment activities and contingency planning operations. The materials presented mainly came from Exploratory Research & Development projects. Initiatives on UTM, including risk assessment, are numerous ranging from industry partnership enterprises to State initiatives. Activities involving CAAs and global organizations have allowed safe and successful UAS operations in non-segregated airspace on an ad-hoc basis. Currently, these projects are mainly running in a demonstration mode in selected environments and conditions. These projects are key contributors to the development of risk assessment methods, best practices or recommendations.

Several presentations introduced different risk assessment methodologies available focusing on various types of risks, for example on air risk, ground risk, minimizing probability of mid-air collision, probabilistic approach (taking into account several different risk factors). Each risk assessment focuses on several risks, but almost all of them are more UA-centric. Other presentations highlighted the need for more encompassing risk assessment methods including other traffic or the environment.

A couple of presentations explained the different nature of contingencies, whether they are UA or UTM related failures. A Contingency Management Algorithm was proposed to help identify, evaluate, mitigate and resolve contingencies related to UTM failures.

Introduction

At the outset, it is recognized that safety is paramount to the use of airspace, regardless of the class of airspace or operation being conducted. The achievability of a certain target level of safety for different airspaces or types of operations are demonstrated by the application of safety methodologies, which include exhaustive risk assessment. It should be noted that the risk assessment process presented in this appendix is not intended to address security risks linked to UTM. However, it must be recognized that cyber security threats could pose risks to the UTM system and traffic within the system, and should be contemplated in a risk assessment (e.g. fake or non-identified UA).

One of the results of the risk assessment is the identification of contingency planning to mitigate the residual risks during possible eventualities.

While UTM services are maturing, in order to achieve integration of unmanned aircraft into non-segregated airspace, the creation and adoption of a safety culture among the UTM community is required.

UTM Risk Assessment Objectives

The objective of a UTM risk assessment is to evaluate the consequences of different types of degradations or failures (of one or several UTM services, systems or processes) in order to validate/verify the desired safety levels and ultimately decrease the risk of an incident or accident. This evaluation will be used to define UTM safety requirements and to develop mitigation procedures at UTM operational, design and implementation levels. In addition, the objective of the UTM risk assessment is to ensure safe integration of UA operations into airspace.

There is a consensus to consider that some UTM services and capabilities are safety critical. These services likely include, but are not limited to, those in charge of managing ground and air risks: geofencing, strategic deconfliction, tactical separation and conflict advisory, alert service and interface with ATC.

Safety-critical services require a thorough risk analysis to identify effective mitigations in normal, abnormal and faulted conditions. Non safety-critical services may also require a risk assessment, but it may not lead to the identification of a mitigation strategy. Nevertheless, the risk assessment is performed in conjunction with taking into account all kind of services which could influence each other’s performance.

In the UTM risk assessment, the hazards originated from multiple UA operations should be addressed, but also other external hazards such as weather (e.g. micro-weather effects), electromagnetic interferences or GNSS failure or malfunction.

The UTM risk assessment has a holistic approach to analyze multiple UA operations and UTM services. The UTM risk assessment encompasses more than a single UA operation risk assessment. It does not focus on a particular operation and takes into account all possible traffic in an area where UTM services are deployed. Therefore, in order to have a thorough risk assessment, both a UTM and single UA operation risk assessment need to be performed.

In ATM, the human is the key factor in risk mitigation. Such a strategy is not directly applicable to UTM and there is a need to propose new procedures and processes. UTM risk assessment methodology should provide a level of safety equivalent to or the same as the current level of safety in manned aviation when UTM operations are integrating with ATM. In parallel to the UTM risk assessment, it is necessary to develop mitigation measures, including contingency planning.

UTM Risk Assessment Challenges

In order to identify challenges associated with risk assessment processes, it was assumed that a combination of regulatory measures, led by States mindful of technological developments, will provide a sufficiently robust framework to enable effective risk assessment. It is assumed that much of the initial risk should be mitigated by the regulatory processes in place while those areas that are not addressed by the regulations would be addressed through the UTM risk assessment process.

As a result of the need to consider both a UTM-centric and a single UA operation view as part of a thorough risk assessment, ensuring that all operations and risks intended to be addressed by a given UTM system can be challenging. Identifying risk assessment methodologies for UA operations and UTM systems is complex at best. Any proposed risk assessment approach must consider both the operations and the environment in which the operations are taking place. Whichever process is used, it is important to ensure that the assessment consider both ground risk as well as air risk. In addition, it is important to identify touchpoints and common elements from the UA risk assessment which could facilitate a UTM-centric risk assessment and vice versa.

All risk analyses have common impediments. Service quality parameters are essential in completing a UTM-centric or a single UA operation risk assessment. Currently service quality parameters have not been clearly defined, making a meaningful full risk assessment challenging. Lack of historical UTM and UA data or data quality will provide a challenge to risk assessments potentially leading to different mitigations. As more UTM and UA data is collected, optimization of mitigations will become easier. The lack of a defined UTM infrastructure is another factor that makes defining metrics for use in risk analysis difficult. As infrastructure is developed and deployed, metrics that can be used in risk analyses will solidify, however, initial risk analyses will need to be robust despite the lack of metrics.

UTM stakeholders play a key role in the UTM risk assessment. In the current situation, UTM stakeholders need to be identified on a case-by-case basis, as a standard list of stakeholders involved has not yet been clearly defined.

As UTM may use a number of functions and services which are automated, this may create an additional challenge during the risk assessment implementation. Automation may also play an important role in future risk assessments.

UTM Risk Assessment Considerations

A UTM risk assessment process should identify which stakeholders need to be involved in each stage of the risk assessment.

A UTM risk assessment should be performed (possibly in limited form) when any change to a UTM system is made (e.g. system updates, introduction of new technologies or services).

A UTM risk assessment needs to be performed for each service (as listed in the main body of the text) that is provided by the UTM system. All elements of the service (e.g. data exchange, business rules) should be included in the risk assessment.

A UTM risk assessment should also address UTM component interfaces. Each interface within a UTM system or between UTM system component(s) and an external service component (e.g. ATM components) should be included in a risk assessment.

A UTM risk assessment should be based on up-to-date data and documented inputs; if any variables or inputs have been changed, the risk assessment should be reviewed.

A UTM risk assessment should be reviewed periodically to determine efficiency of the mitigations and necessary corrective actions should be initiated, if required.

It should be noted that the result of a risk assessment is highly dependent on the environment in which UTM operations are being conducted. For example, the same type of operation in an urban environment will necessarily have a different set of risks than if that operation is taking place in a rural environment.

UTM Contingency Planning

UTM providers should define and implement contingency plans in the event of disruption, or potential disruption, of the UTM system or related supporting services. The objective of contingency planning is to assist in providing for the safe and orderly flow of UA traffic in the event of disruptions of the UTM system and related supporting services. Contingency planning is an important means to mitigate risks.

Contingencies can be UTM-failure related and UA-failure related. This appendix only addresses the UTM aspect. While it is possible that a UTM contingency procedure may affect UA operations, a UA contingency or emergency should not trigger a specific contingency procedure for the UTM system.

States should require USPs to develop a UTM contingency plan. Regulatory and procedural guidance in case of contingency should be developed and made available to all stakeholders.

It should be noted that some differences between UTM and ATM impact how the contingency procedures can be defined. In UTM, there is much less human intervention compared to the ATM system. For example, instead of a human-in-the-loop, automated systems may address localization and isolation of the problems. Therefore new ways to mitigate the risks need to be defined. ATM and UTM may experience some common failures for which similar mitigations might apply (for example an electrical failure).

The number and nature of services provided by UTM impact the content of contingency procedures, the failure of which may also affect ATM (e.g. tactical separation). In these cases, the contingency procedures should be coordinated with ATM.

UTM contingency management may require some overarching management of the entire eco-system. For example, when more than one USP is providing services in a given airspace, could they provide redundancy for each other?.

Each contingency plan is unique and tailored to address the anticipated failures of the specific services provided by the USP. Contingency plans should contain procedures addressing all failures identified by the risk assessment.

A contingency plan could contain all or some of the following elements:

- Purpose and use;
- Policy inputs;
- Legal requirements;
- Roles and responsibilities;
- Contingency principles (safety, continuity);
- Contingency key events (i.e. foreseen contingency situations) and related risks;
- Review of other contingency plans (e.g. ATM);
- Contingency procedures;
- Description of the contingency environment; and
- Summary of the operational impacts and analysis of changes.

USPs may want to use the following process for managing contingencies:

- Recognize the failure;
- Identify the appropriate procedure within the overall contingency plan;
- Initiate measures as per the contingency plan procedure;
- Resume normal operations;
- Assess the effectiveness of the contingency procedure; and
- Update the contingency plan as necessary.

Additional Considerations

The implementation of a safety management system by each UTM stakeholder would help establish and promote the necessary UA safety culture, in line with policies set forth in ICAO Annex 19 — *Safety Management*. ICAO Doc 9859, *Safety Management Manual*, provides guidance material intended to assist in managing aviation safety risks and may provide useful information when establishing UTM risk assessment processes.

There are several risk assessment methodologies available, these include: JARUS SORA[3], CORUS MEDUSA[4], Airbus Altiscope, Safety risk management in conformance with European Commission Implementing Regulation (EU) 2017/373, and (SAE) ARP4761 *Guidelines and Methods for Conducting the Safety Assessment Process on Civil Airborne Systems and Equipment*, etc. It should be noted, however, that existing processes and methodologies may need to be modified or tailored to suit the UTM environment.

Currently the safety occurrence reporting requirements are minimal in a UTM environment. States should implement processes to ensure reporting in order to improve safety, refine risk assessment and build better contingency plans based on real data and feedback.

— END —

[3] Joint Authority for Rulemaking on Unmanned Systems - Specific Operational Risk Assessment (JARUS SORA)
[4] Concept of Operations for European UTM Systems - Method for the U-Space Assessment (CORUS MEDUSA)

NAT OPS BULLETIN CHECKLIST

NAT OPS Bulletin Checklist		Issued: **23 February 2021**
Serial N°	**Subject**	**Effective date**
2020_002	Surveillance Service in the NAT / Flight Crew Operating Procedures	08 July 2020
2020_001	ACARS Data Link Oceanic Clearance Flight	06 April 2020
2019_003	Data Link performance improvement options- **Revision 2**	08 July 2020
2019_001	Operations Without an Assigned Fixed Speed in the NAT (OWAFS) Special Emphasis Items (SEI)	09 July 2019
2018_005	Special Procedures For In-Flight Contingencies in Oceanic Airspace **Revision 1**	28 March 2019
2018_004	Implementation of Performance Based Separation Minima-Expanded Publication of PBCS OTS	28 March 2019
2018_003	Waypoint Insertion / Verification Special Emphasis Items – **Revision 1**	23 February 2021
2018_002	CPDLC Uplink Message Latency Monitor Function – **Revision 1**	04 June 2018
2017_005	Revised Sample Oceanic Checklists	07 December 2017
2017_004	NAT Data Link Special Emphasis Items – **Revision 1**	23 February 2021
2017_002	Oceanic Errors - **Revision 03**	29 January 2021
2017_001	NAT common DLM AIC – **Revision 4**	09 July 2019
2013_005	New Service Notification for Gander Oceanic Control Area	21 November 2013
2013_002	Publication of “Track Wise – Targeting Risk within the Shanwick OCA” – updated 29 April 2013	29 April 2013

Air Ops Risk Review for the Year 2020

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together 4safety

The aviation sector was massively disrupted.....

As a result of the COVID-19 pandemic, civil aviation in 2020 was reduced to a fraction of its normal activities. Given the level of disruption, it will take some time before the consequences are fully understood. Some organisations have been forced to cease operations and many others are asking how they will survive until traffic picks up again.

To address this challenge, **EASA has set up a task force with representatives of national authorities and aviation stakeholders to prepare for the Return to Normal Operations** (RNO). **The Agency, working with the European Centre for Disease Prevention and Control (ECDC), established the Aviation Health Safety Protocol**, which sets out coherent health safety measures to protect both passengers and aviation industry staff. With the support of national authorities a monitoring process has been put in place by EASA to assess the implementation of this protocol by airports, airlines and passengers. Data shows that air travel does not increase the risk of catching COVID-19.

.....leading to a new safety landscape

Prior to the crisis, the safety landscape was stable and known. **We are now faced with a totally new situation where new risks have emerged.** In conjunction with its safety partners and in particular the National Aviation Authorities of the EU Member States, EASA has identified and captured these new risks in the Agency's safety risk registers. These risks include dealing with the rapid storage and de-storage of aircraft, management of wildlife hazards due to the reduced amount of aviation activity, and the degradation of skills and knowledge of aviation personnel caused by their reduced activity. Supported by EASA's collaborative approach, EASA established a COVID-19 Safety Risk Portfolio that listed the identified risks together with appropriate mitigations.

The Agency has worked relentlessly and collectively to ensure that safety has not been compromised, despite the most brutal crisis ever experienced by aviation. This has highlighted the resilience of the EASA Safety Risk Management process. Over 20 different guidelines have been provided to the industry, covering important topics including crew training and checking, the carrying of cargo in passenger compartments and the carriage of vaccines. Additionally, in these different times, a virtual annual EASA Safety Conference took place, which brought our external partners together to further strengthen the recovery process.

The rise of cyber-security and security threats impacting safety...

As a mechanical effect of its digital transformation, the **aviation sector is subject to an ever-growing number of cyber-attacks**. This year has seen a significant increase in cyber-events impacting some of Europe's major aviation organisations, thereby exposing systemic vulnerabilities in this area. **Conflict zones is also a growing concern**, as tragically illustrated by the downing of a B737 in Iran in January 2020.

.... is calling for an integrated risk management approach

These considerable challenges have highlighted the importance of integrated management, thereby underscoring **why the Agency has been devoting significant resources to physical and cyber-security risk management, where it impacts safety**. This will lead to the development of a total system approach in terms of risk intelligence, i.e. our capacity to identify and mitigate risks from safety or security origins.

The Agency has now to federate the European initiatives in order to ensure cyber-security resilience of the aviation system. Similarly for the conflict zones the Agency, in collaboration with the European Commission and the Member States, has decided to set up an **operational platform** that will provide quick alerts to air space users of situations requiring high attention and or action, thereby helping to reduce risks in almost real-time.

Preparing for 2021

In 2021, EASA will continue to work with its safety partners to evolve the safety system and look to the future by further developing the Data4Safety Programme. This programme makes use of the most advanced technologies of big data and data science to collect, aggregate and analyse aviation data in one platform in order to identify and assess systemic safety risks in aviation in Europe. This will significantly augment our current techniques and enable improved detection of potential risks.

In June 2021, the SAFE 360 conference will enable the 360° industry-wide review of the most critical safety issues that are currently impeding recovery. An important objective for the Agency will be to further work on integrating safety, security and cyber-security risks to ensure a total system risk management approach. Such a consolidation of safety activities and intelligence capabilities will greatly enhance the European Aviation Community's reactiveness to aviation risks. There are also a wide range of safety actions planned in the European Plan for Aviation Safety (EPAS) that will further strengthen the aviation system as we return to normal operations.

Accident Statistics in 2020

Commercial Aviation Safety Worldwide

With reference to worldwide safety data, in 2020 there were 10 fatal accidents involving commercial air transport large aeroplanes and 327 fatalities. These preliminary figures are in line with those of the past 10 years, despite the significant downturn in traffic in 2020.

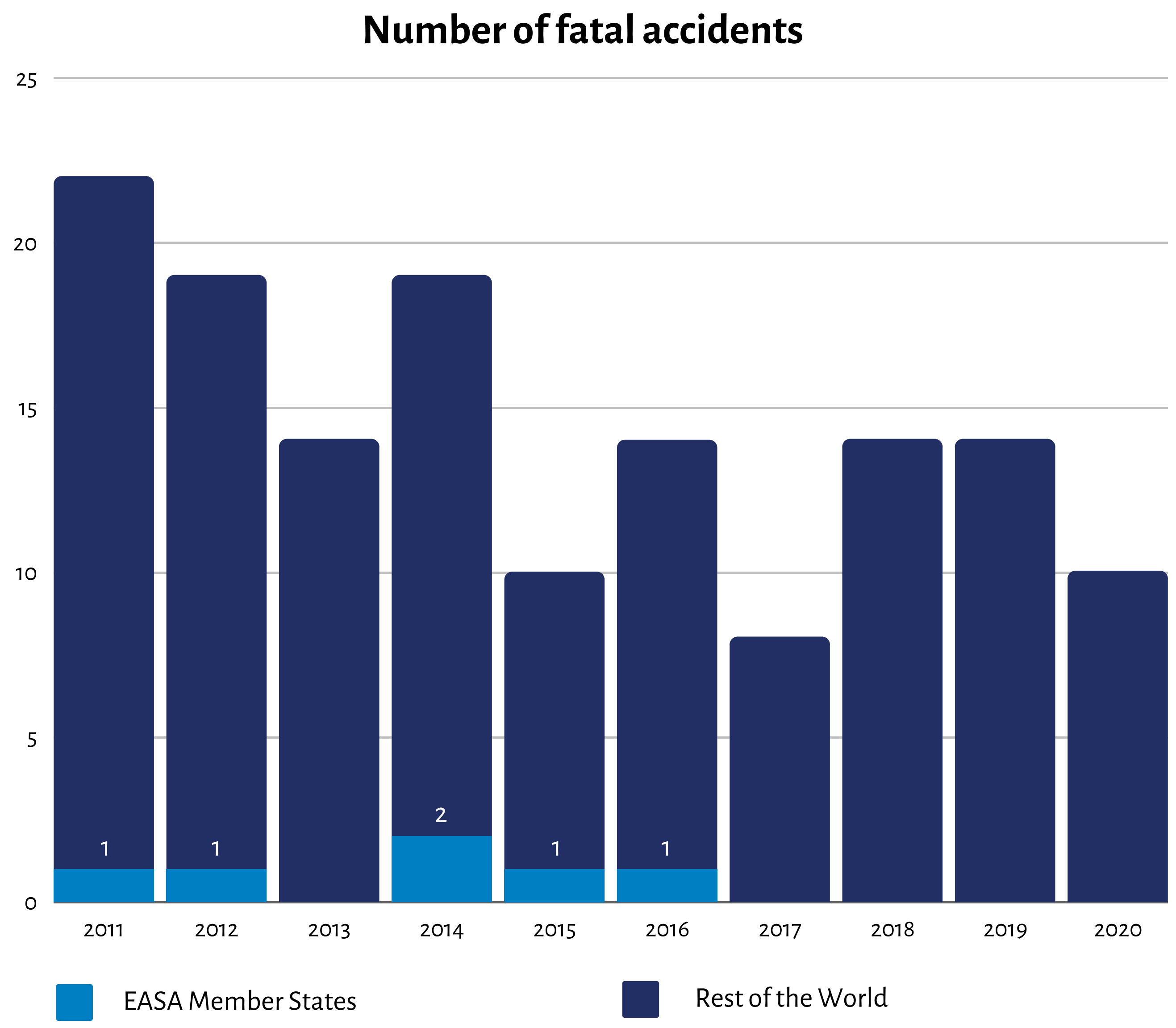
There was a 51% reduction of seats offered by airlines overall in 2020, (source ICAO): the number of accidents is the same as 2015 and the number of fatalities is close to those in 2016.

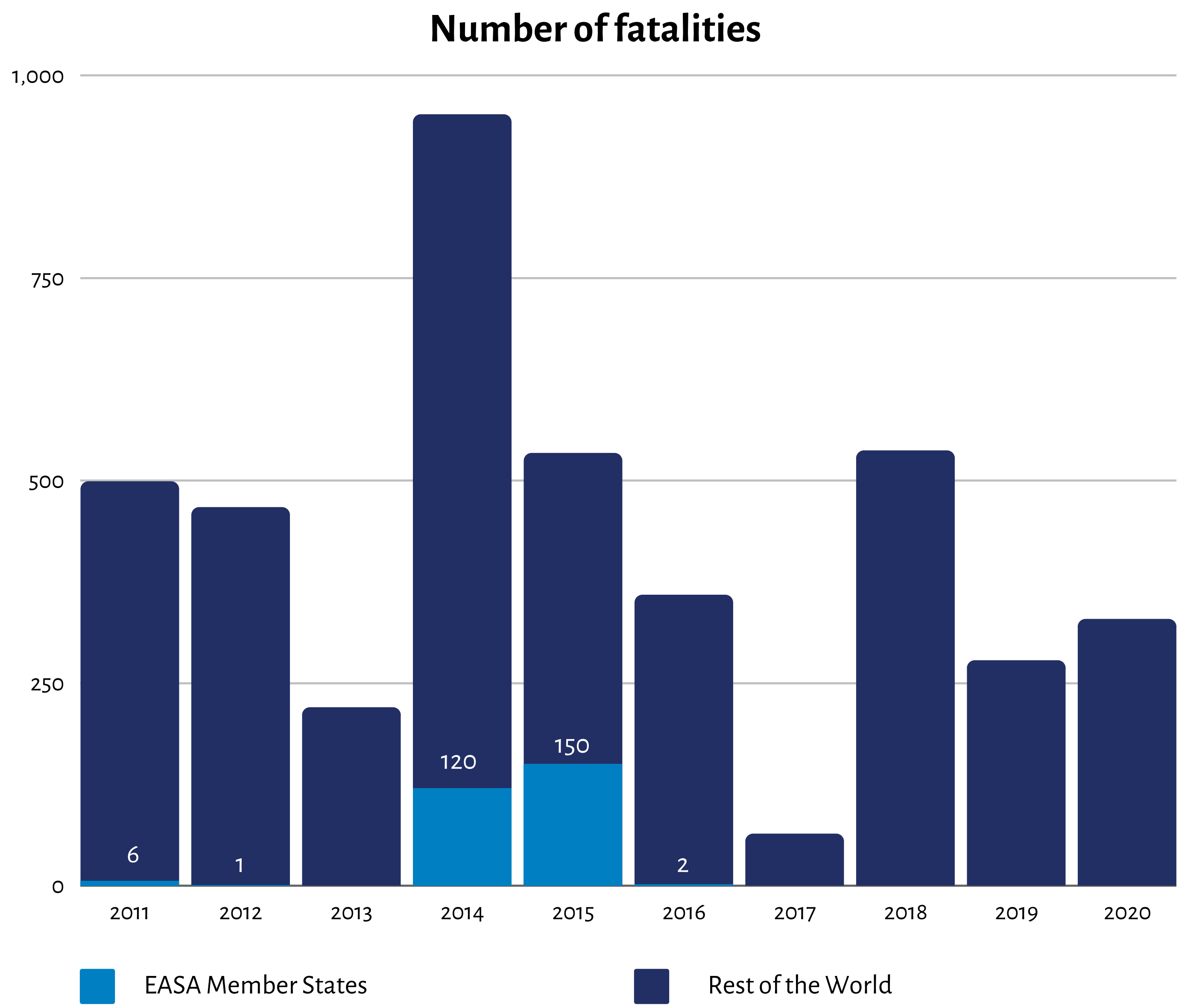
EASA Member States' operators did not contribute to the number of global fatal accidents and fatalities in 2020, however worldwide it has been quite a difficult year for aviation safety.

Of the 327 total fatalities recorded in 2020, just over half that number resulted from the accidental shooting down of the Ukraine International Airlines B737 over Iran on 8 January 2020, killing 176 passengers and crew. This accident happened before the COVID-19 pandemic had impacted the worldwide commercial aviation system.

Aviation Safety in the EASA Member States

There were no fatal accidents in commercial airline operations involving an EASA Member State operator in 2020.





Fatal Accidents in 2020

According to our preliminary data, the following fatal accidents occurred during 2020

- **8 January** – B737 crashed shortly after take-off from Tehran, Iran, with 176 fatalities.
- **5 February** – B737 overran the runway while landing in poor weather at Istanbul, Turkey, with 3 fatalities.
- **29 March** – IAI Westwind crashed on take-off from Manila-Ninoy Aquino Airport, Philippines, with 8 fatalities.
- **4 May** – EMB120 medical supply flight crashed on approach to Bardale, Somalia, with 6 fatalities.
- **5 May** – Learjet 35A crashed on approach to Esquel Airport, Argentina, with 3 fatalities.
- **8 May** – B737 collided with a person on landing at Austin-Bergstrom International Airport, USA, with 1 fatality to the person on the ground.
- **22 May** – A320 crashed during its second approach to land at Karachi-Jinnah International Airport, Pakistan, with 98 fatalities including one person on the ground.
- **7 August** – B737 crashed during its second approach to land at Kozhikode-Calicut Airport, India, with 21 fatalities.
- **13 August** – L410 crashed in Kahuzi-Biega National Park while en route to Bukavu-Kavumu Airport, Democratic Republic of the Congo, with 4 fatalities.
- **22 August** – An26 crashed shortly after take-off from Juba Airport, South Sudan, with 7 fatalities.

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Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis

Montréal, Canada
10 February 2021
Economic Development – Air Transport Bureau

Contents

Executive Summary: Economic Impact in Brief

Figures and estimates herein are **subject to substantial changes**, and will be updated with the situation evolving and more information available.

Year 2020 results: World total passenger traffic

The estimated COVID-19 impact on world scheduled passenger traffic for year 2020, compared to 2019 levels:

- Overall reduction of **50% of seats offered by airlines**
- Overall reduction of **2,699 million passengers (-60%)**
- Approx. **USD 371 billion loss** of gross passenger operating revenues of airlines

International passenger traffic

- Overall reduction of **66% of seats offered by airlines**
- Overall reduction of **1,376 million passengers (-74%)**
- Approx. **USD 250 billion loss** of gross operating revenues of airlines

Domestic passenger traffic

- Overall reduction of **38% of seats offered by airlines**
- Overall reduction of **1,323 million passengers (-50%)**
- Approx. **USD 120 billion loss** of gross operating revenues of airlines

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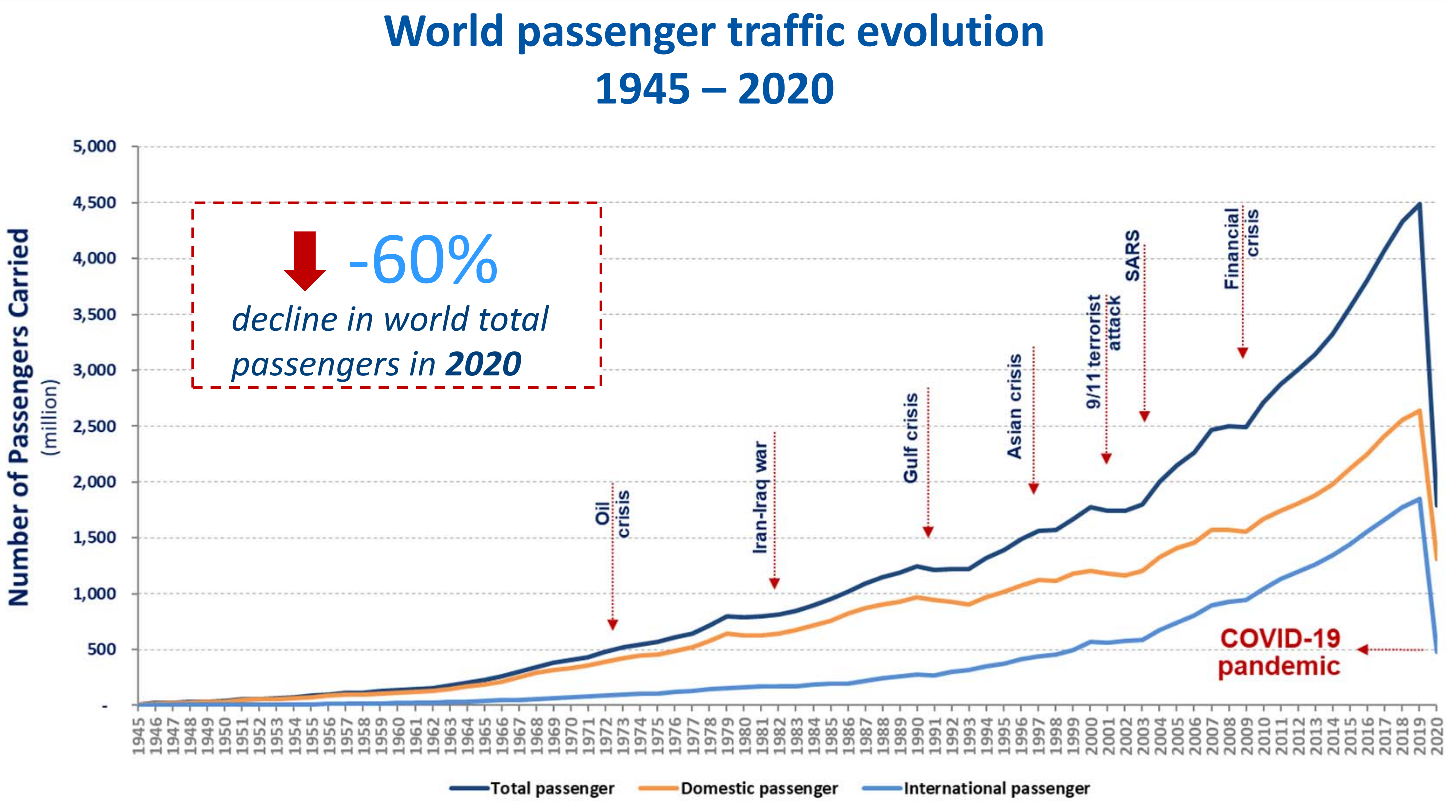
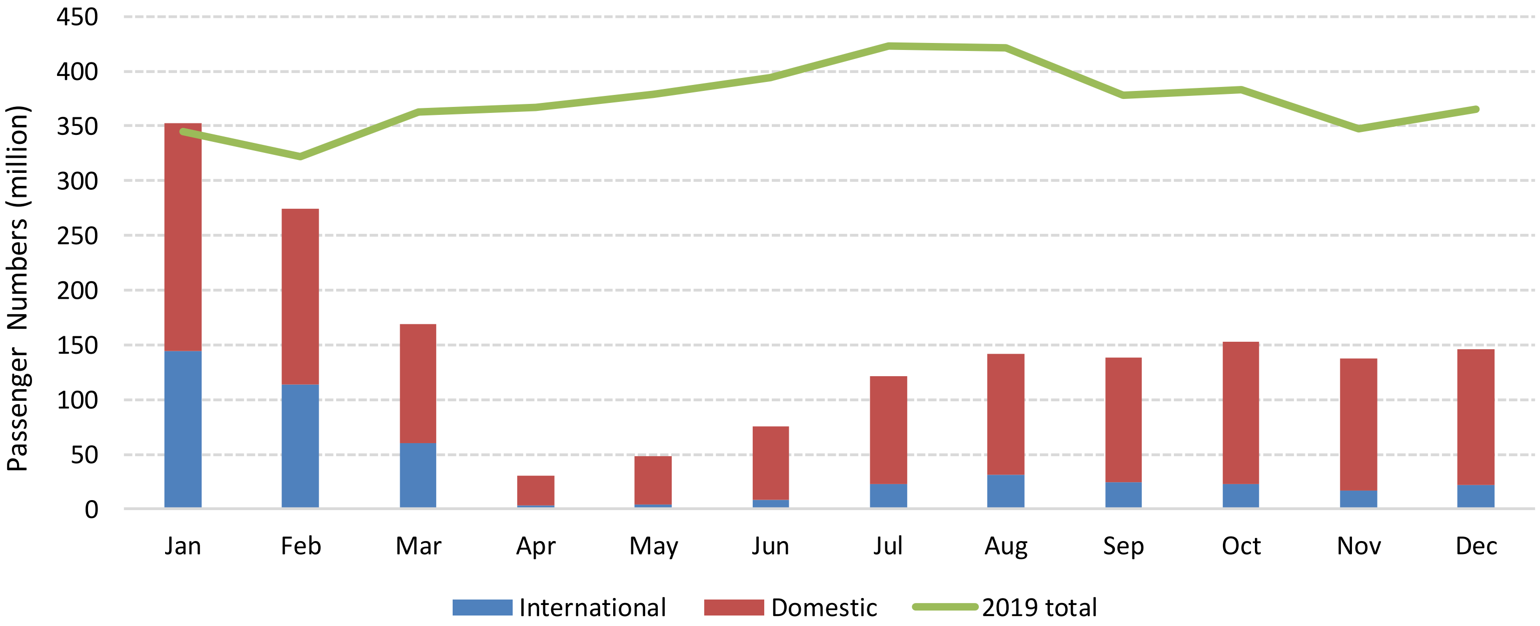
World passenger traffic collapses with unprecedented decline in history



Source: ICAO Air Transport Reporting Form A and A-S plus ICAO estimates.

Moderate recovery in domestic travel while international travel remained stagnant

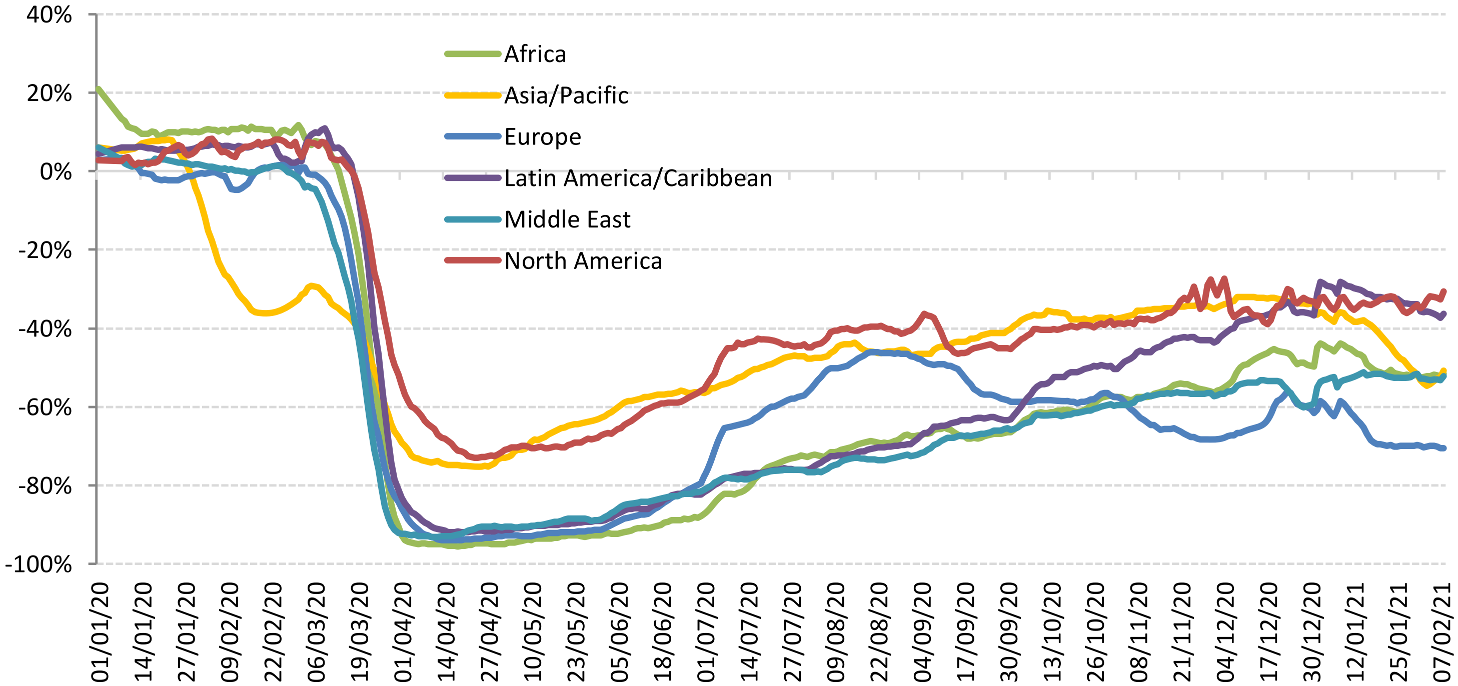
Monthly passenger numbers in 2020 vs. 2019



Source: ICAO estimates

Regional difference in resilience and speed of recovery

Comparison of total seat capacity by region (7-day average, YoY compared to 2019)



Source: ICAO ADS-B

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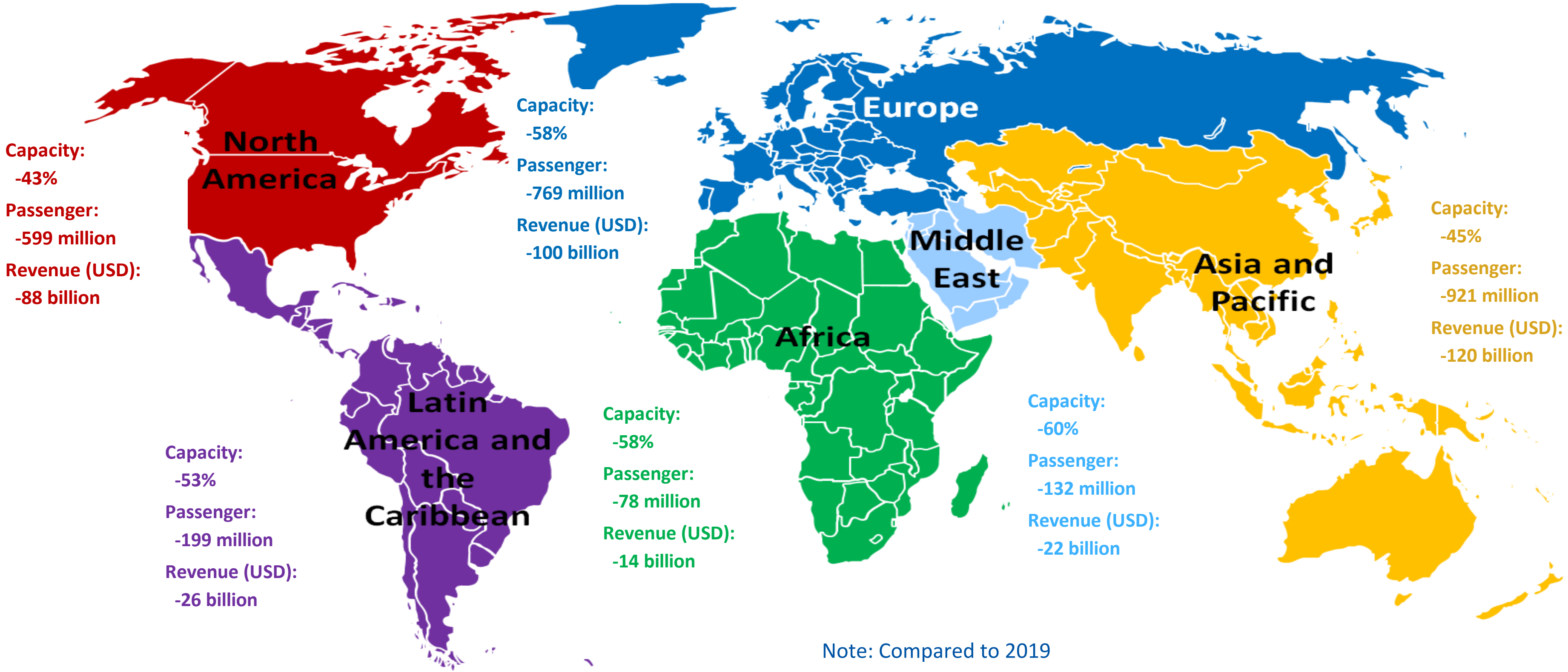
Estimated impact on passenger traffic and revenues by region for 2020



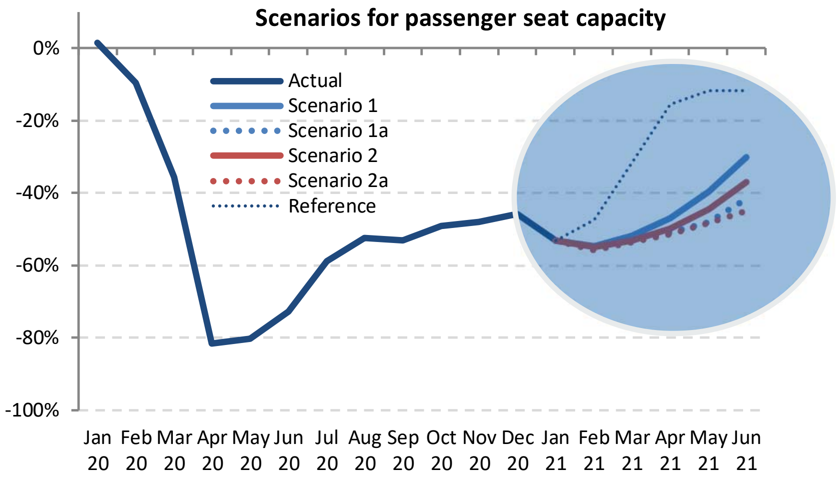
Note: Compared to 2019

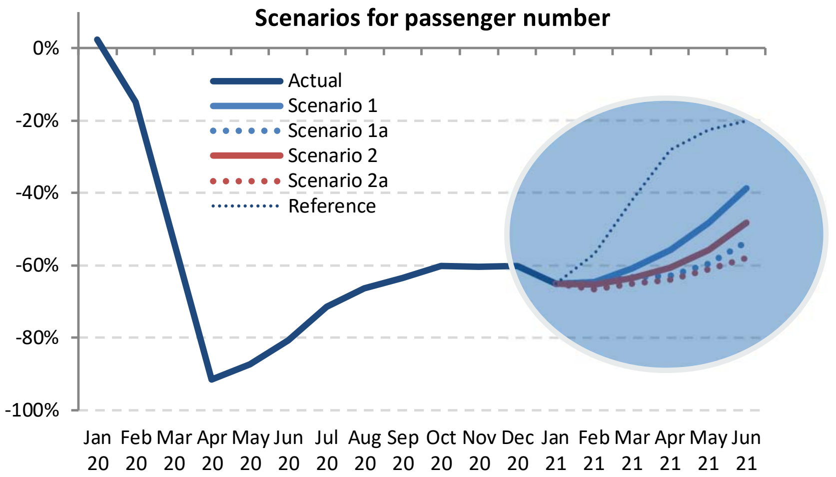
Source: ICAO estimates

Global impact of COVID-19 on aviation, tourism, trade and economy in 2020

- **Air passenger traffic:** An overall reduction of air passengers (both international and domestic) ranging from 60% in 2020 compared to 2019 (by **ICAO**)
- **Airports**: An estimated loss of approximately 64.2% of passenger traffic and 65% or over USD 111.8 billion airport revenues in 2020 compared to business as usual (by **ACI**)
- **Airlines**: A 65.9% decline of revenue passenger kilometres (RPKs, both international and domestic) in 2020 compared to 2019 (by **IATA**)
- **Tourism**: A decline in international tourism receipts of between USD 910 to 1,170 billion in 2020, compared to the USD 1.5 trillion generated in 2019, with 100% of worldwide destinations having travel restrictions (by **UNWTO**)
- **Trade**: A fall of global merchandise trade volume by 9.2% in 2020 compared to 2019 (by **WTO**)
- **Global economy**: A projected -3.5% to -4.3% contraction in world GDP in 2020, far worse than during the 2008–09 financial crisis (by **IMF and World Bank**)

Near-term outlook:
Due to uncertainty, consider 4 different paths



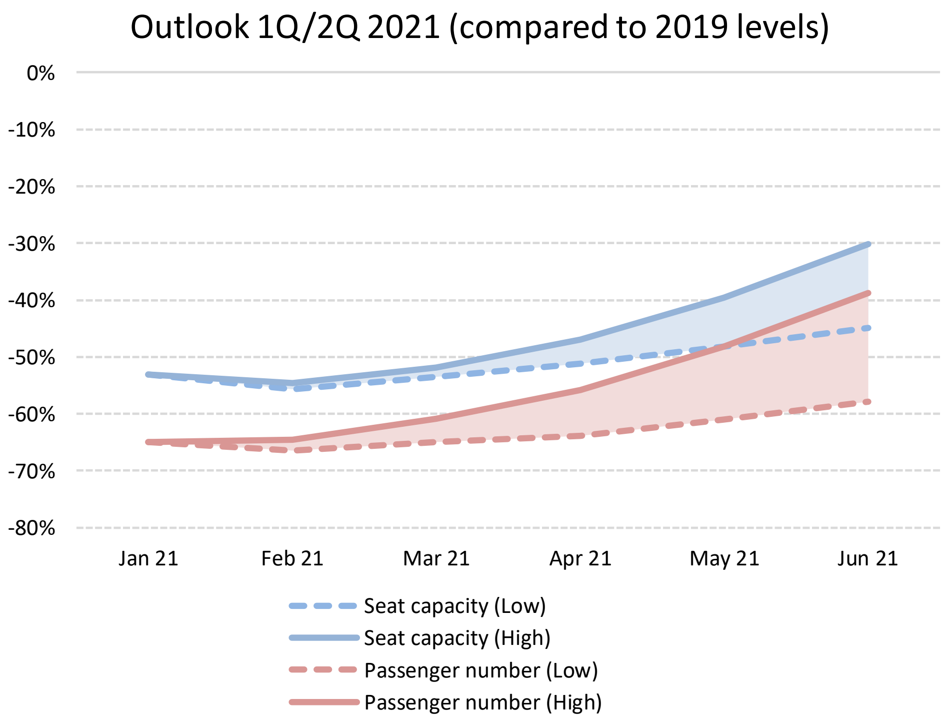


The actual impacts will depend on duration and magnitude of the outbreak and containment measures, the degree of consumer confidence for air travel, and economic conditions, etc.

Near-term outlook: World total passenger traffic

The estimated COVID-19 impact on world scheduled passenger traffic for the first half of year 2021 (January to June 2021), compared to 2019 levels:

- Overall reduction ranging from **46% to 51% of seats offered by airlines**
- Overall reduction of **1,193 to 1,367 million passengers (-55% to -63%)**
- Approx. **USD 166 to 190 billion loss** of gross passenger operating revenues of airlines



Scenario Building

Scope of analysis

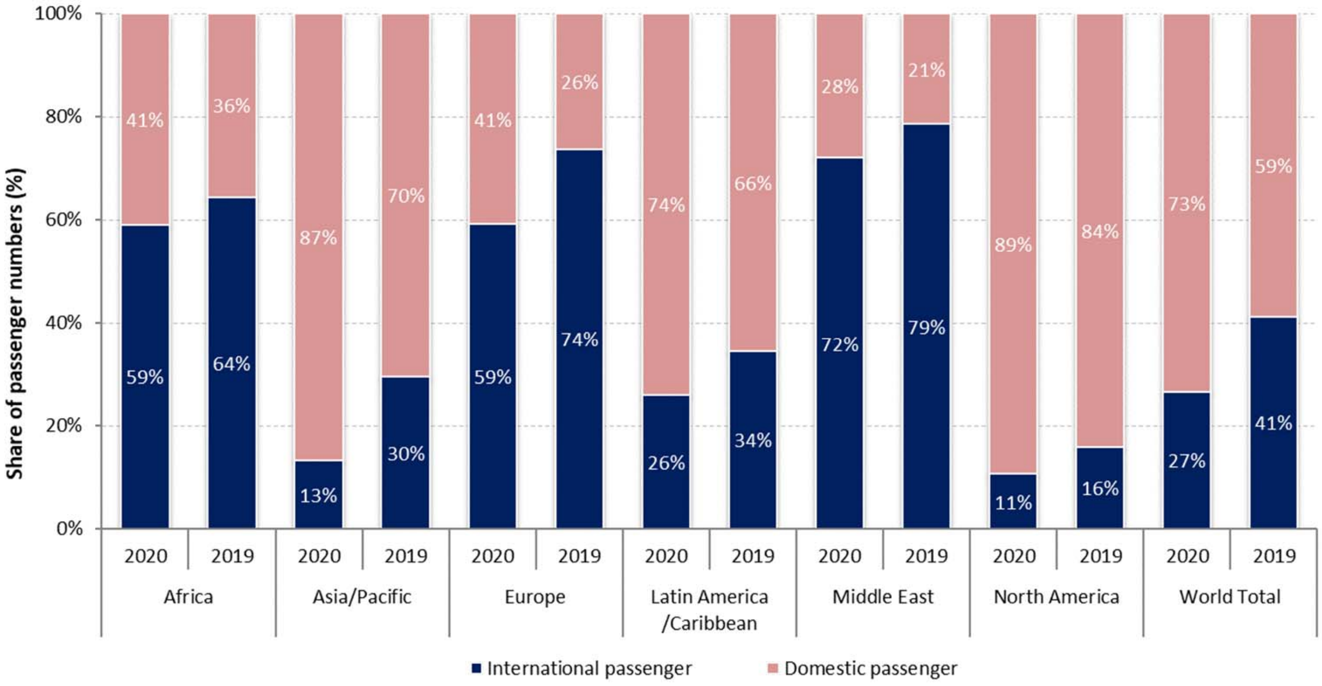
- Analysis focuses on simultaneous supply shock and drop in demand
  - in a near-term, i.e. monthly profile **from January 2020 to June 2021**
  - in terms of scheduled **passenger traffic** globally
- Taking into account the heterogeneity, distinction is made:
  - between international and domestic
  - by month (seasonality)
  - by six (6) geographical region and/or 50 route groups used in ICAO's long-term traffic forecasts (LTF)
- Analysis is based on forward-looking scenarios, which will be continuously adjusted and updated

Analytical Consideration

- Geographical disparity of international-domestic passenger traffic mix
- Difference in market size among regions
- Potential difference in resilience and speed of recovery
- Outbreak timing that impacts when traffic would bottom out
- Gap between what is scheduled and actual operations

International share of passenger traffic decreased in all regions in 2020 vs. 2019

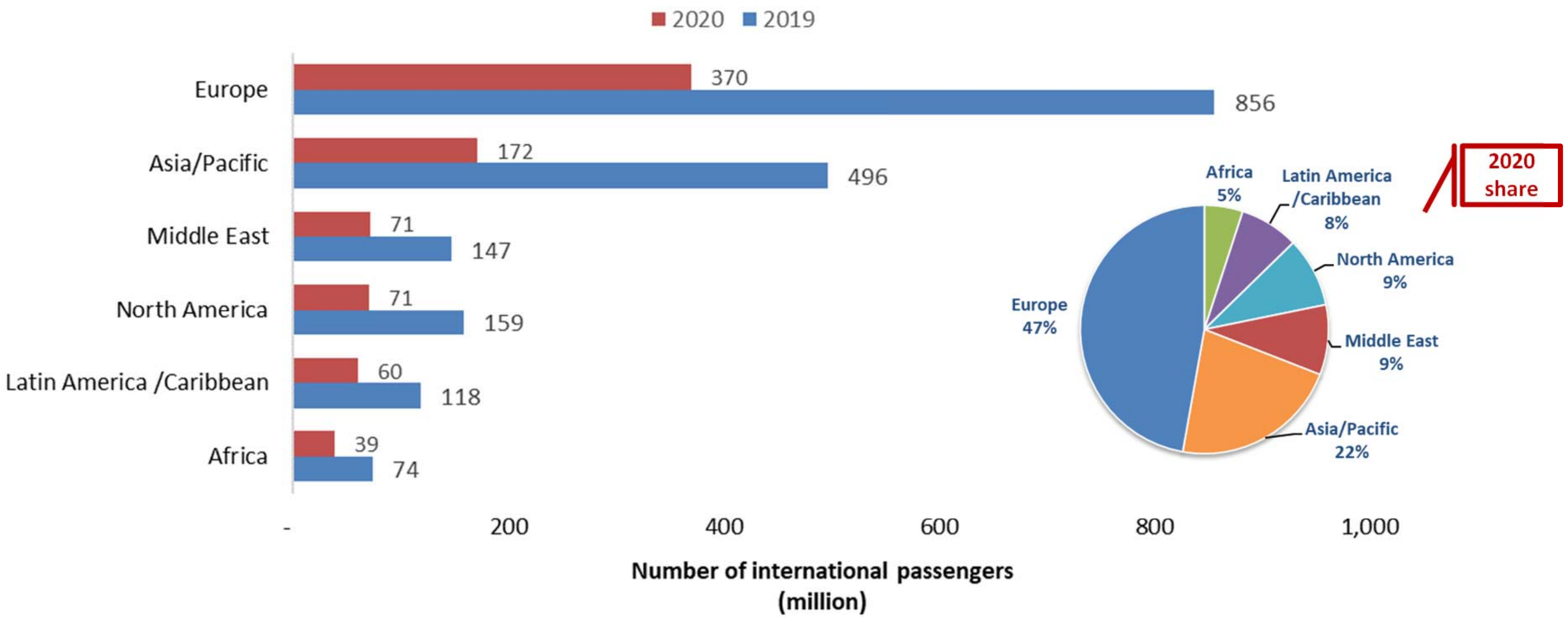
Share of international-domestic passenger traffic by region (2020 vs. 2019, based on from/to State)



Source: ICAO long-term traffic forecasts, ADS-B and estimates

Europe and Asia/Pacific accounted for around 70% of the world international traffic in 2020

Number of international passengers by region (2020 vs. 2019, based on from/to State)



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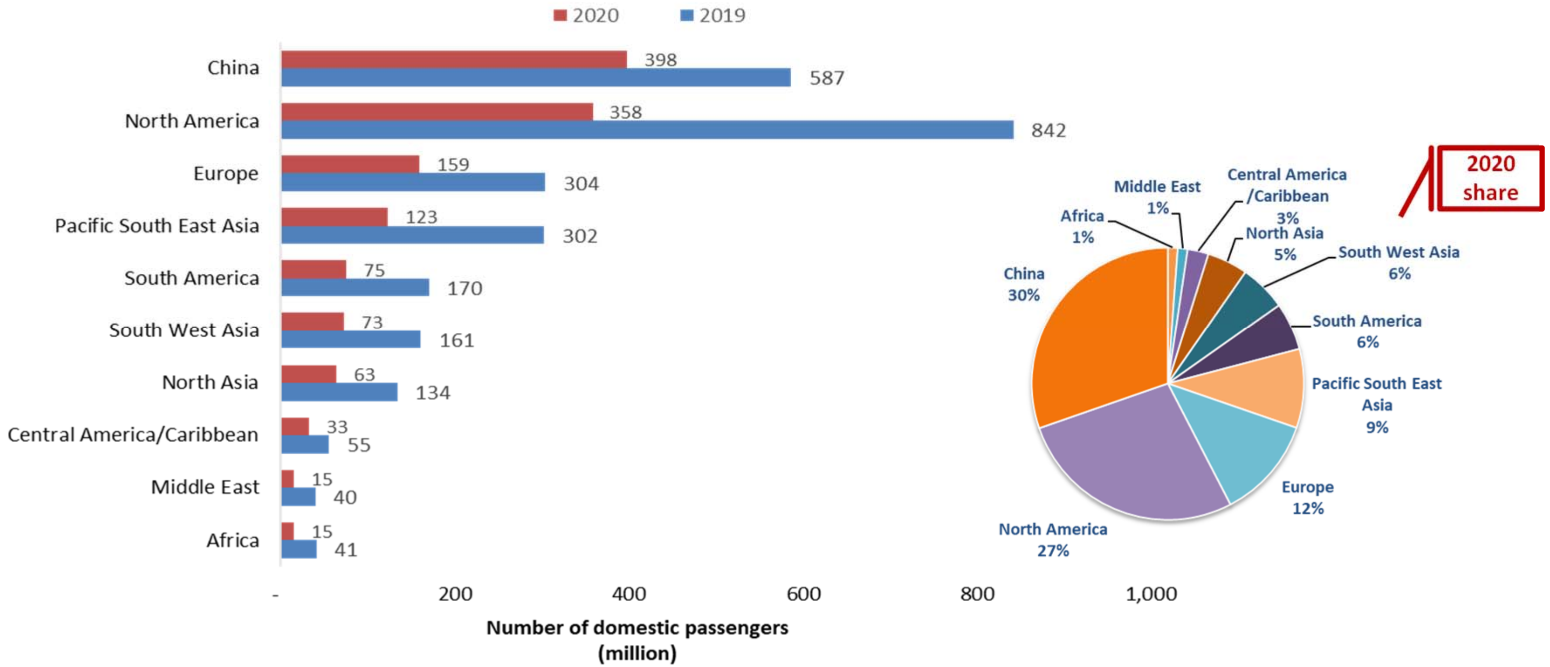
China overtook North America with 30% of world domestic passengers in 2020

Number of domestic passengers by Route Group (2020 vs. 2019)

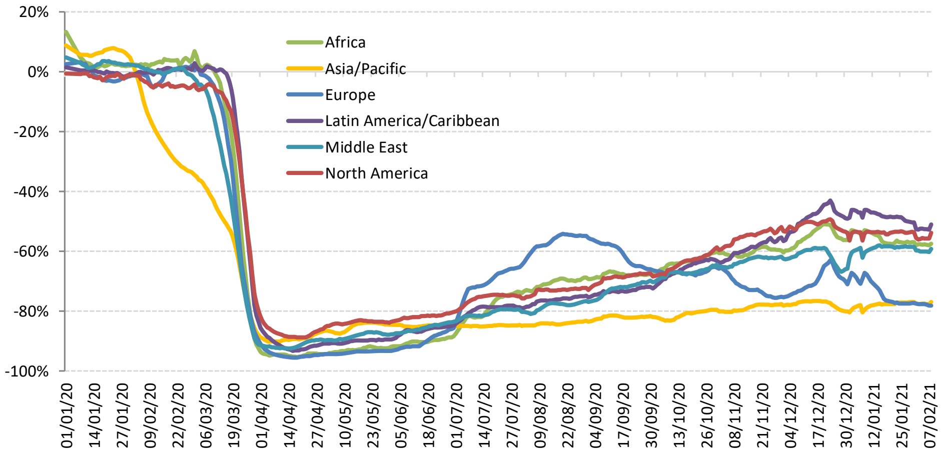


Source: ICAO long-term traffic forecasts, ADS-B and estimates

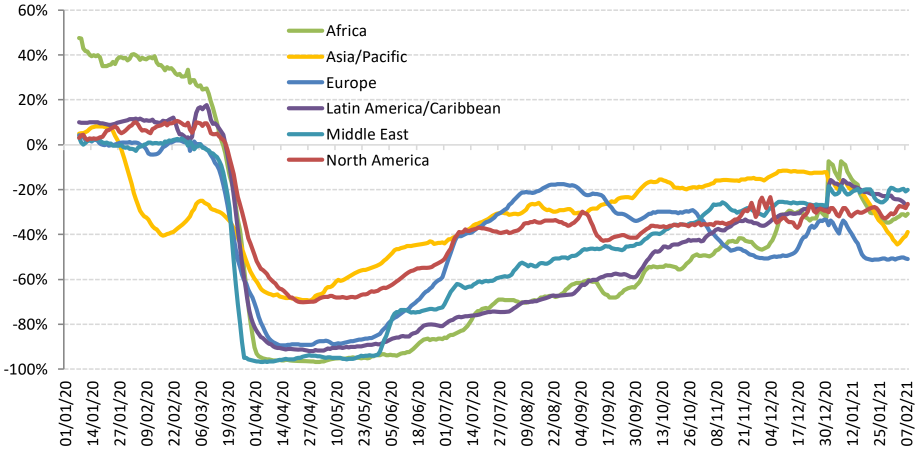
Domestic passenger traffic often exhibits more resilience than international

Asia/Pacific and North America have experienced 20% to 25% less decline in domestic passenger traffic than international

International seat capacity reduction (7-day average, YoY compared to 2019)



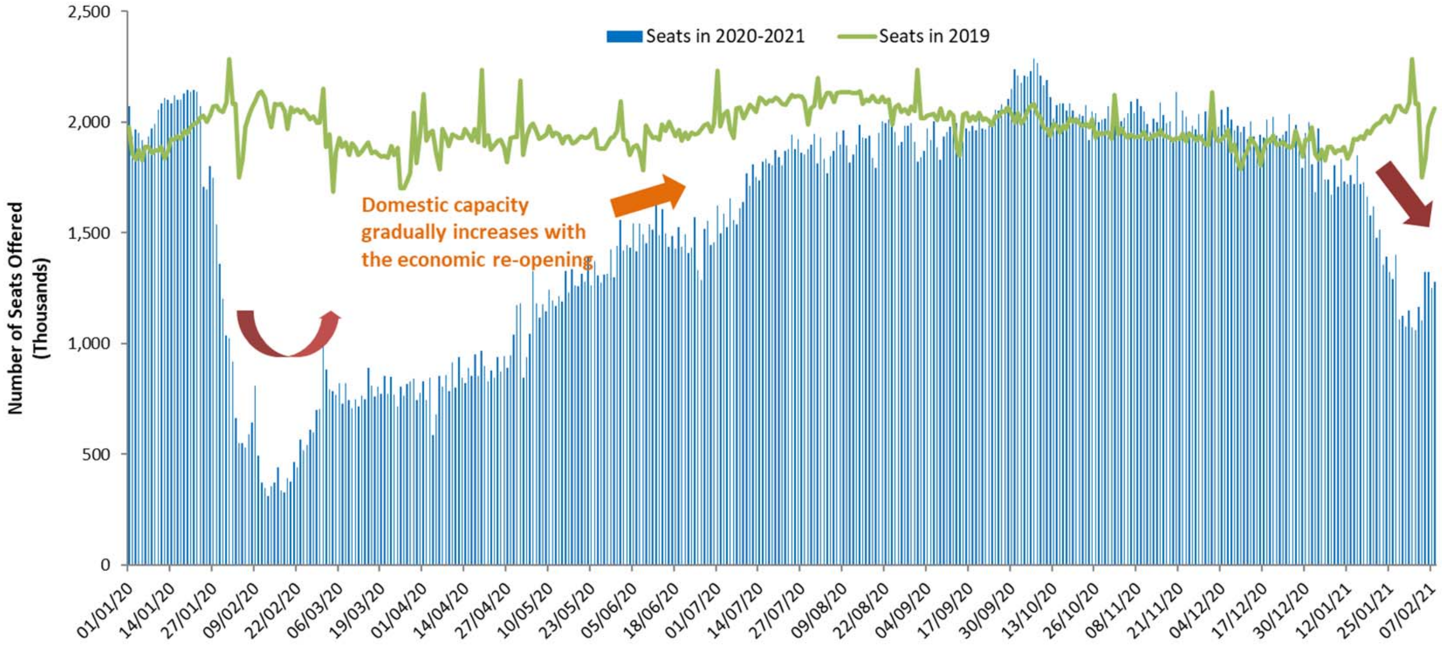
Domestic seat capacity reduction (7-day average, YoY compared to 2019)



Source: ICAO ADS-B operation data

Domestic passenger traffic is recovering ahead of international

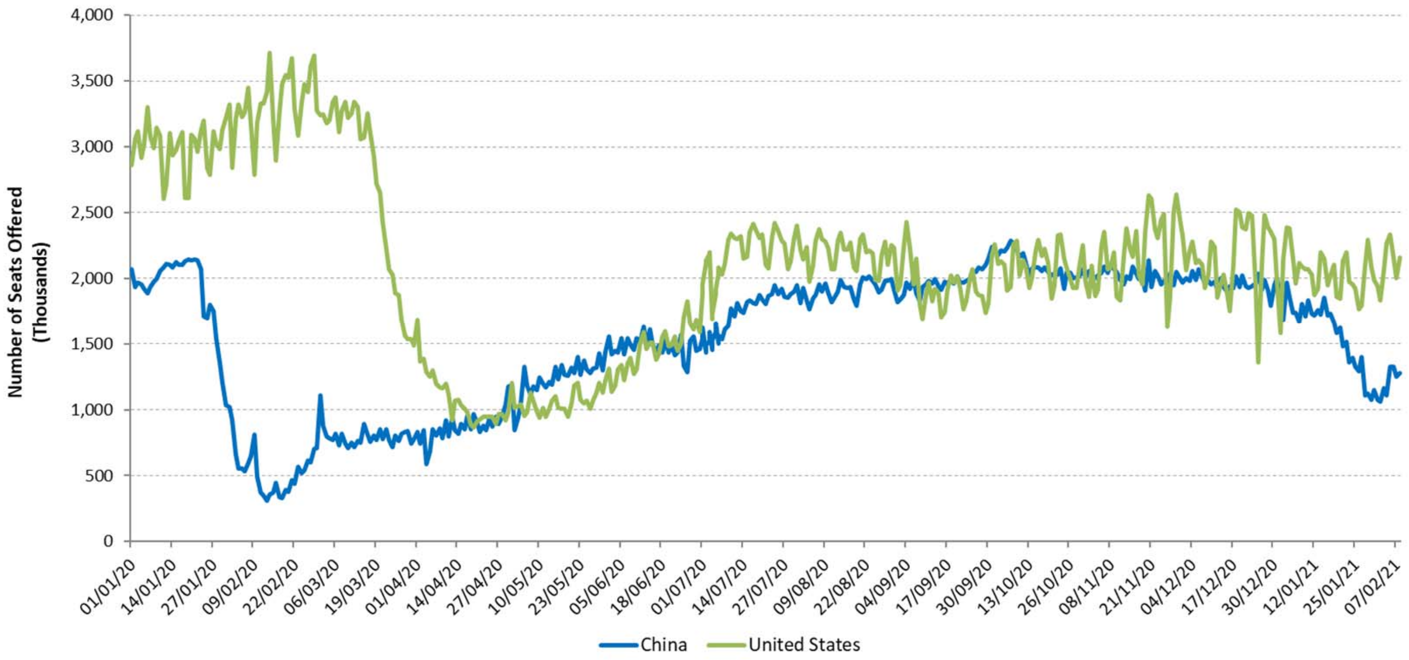
Domestic passenger traffic in China exceeded 2019 level from Autumn 2020 but slowed down significantly in January 2021



Source: ICAO ADS-B operation data

The outbreak timing impacts when domestic traffic bottoms out in each region

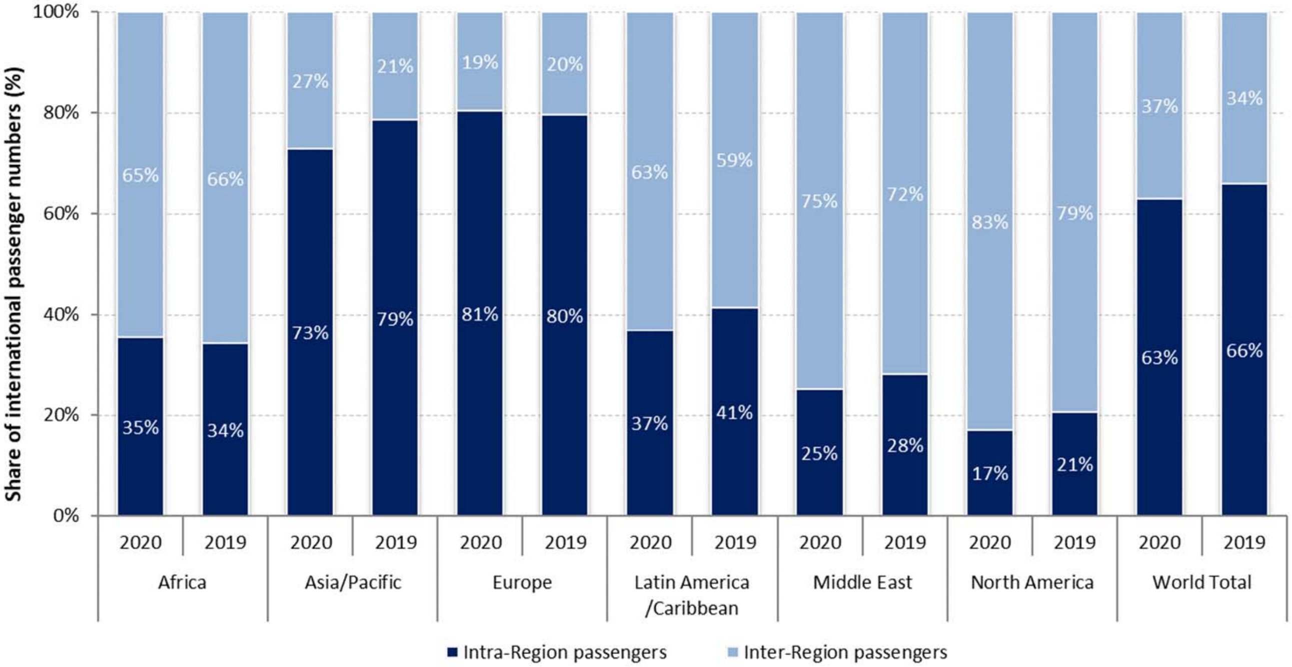
Capacity evolution of two largest domestic markets China and United States since January 2020



Source: ICAO ADS-B operation data

For international passenger traffic, share of Intra-Region traffic decreased in 2020

Share of Intra-Region and Inter-Region passenger traffic by region (2020 vs. 2019, based on from/to State, share of international traffic)

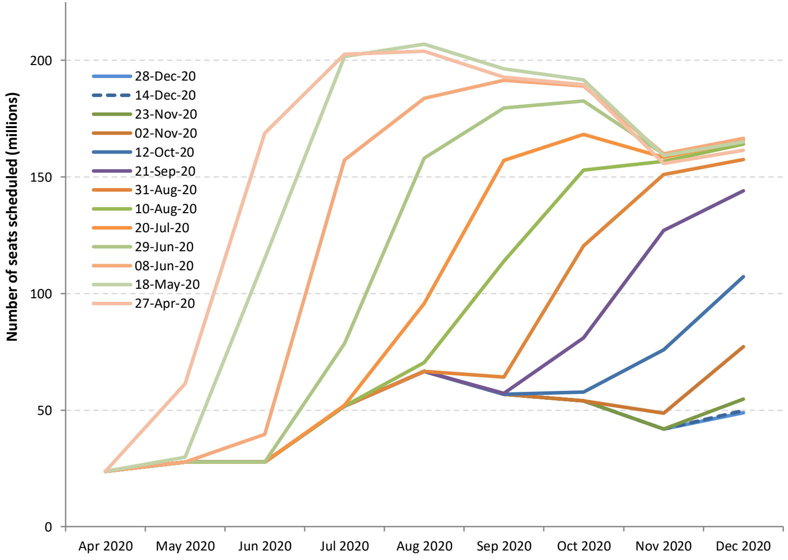


Source: ICAO long-term traffic forecasts, ADS-B and estimates

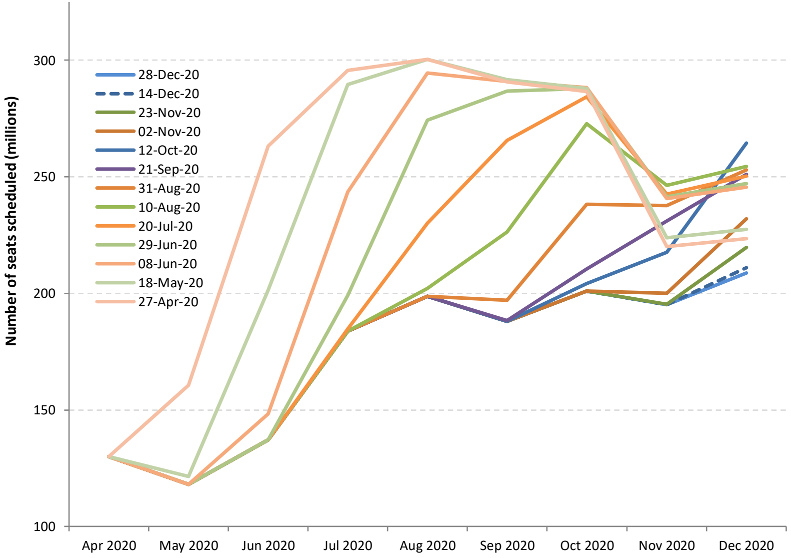
A large gap exists between what is scheduled and actual operations

Airlines announced/planned resumption of flights, however, over half of which were subsequently withdrawn

International schedules



Domestic schedules



Source: OAG

Shapes of Economic Recession and Recovery

Informal classification to describe different types of recessions:

- **V-shaped**: normal shape for recession, a brief period of sharp economic decline followed by quick/smooth recovery
- **U-shaped**: prolonged contraction and muted recovery to trend line growth
- **L-shaped (depression)**: long-term downturn in economic activity, steep drop followed by a flat line with possibility of not returning to trend line growth
- **W-shaped**: a double-dip recession, “down up down up” pattern before full recovery
- **“Nike swoosh”-shaped***: bounce back sharply but blunt quickly (* Brookings Institution/WEF)

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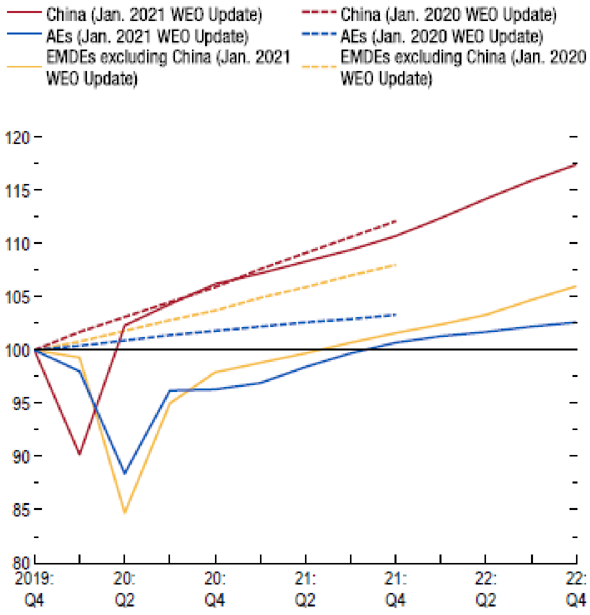
What "recession shape" can be assumed given uncertainties surrounding the outlook?

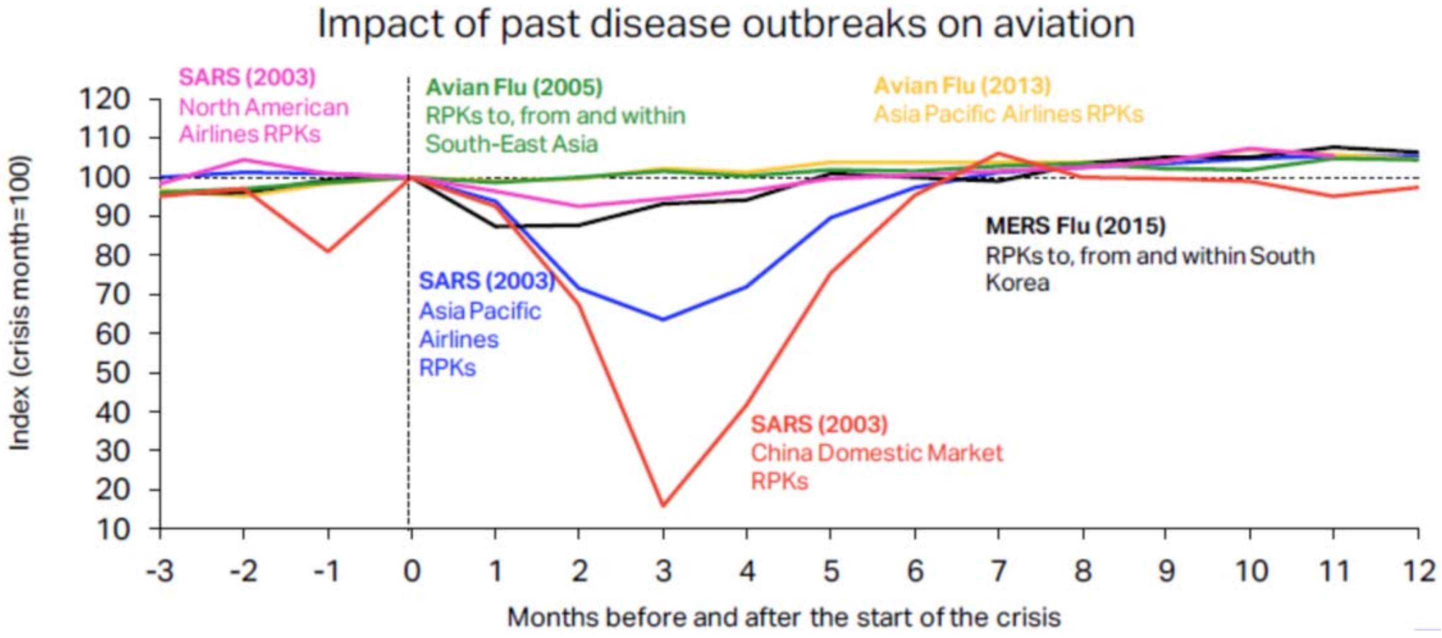
World's GDP Projections (by IMF)



Source: IMF staff estimates.
Note: AEs = advanced economies; EMDEs = emerging market and developing economies; WEO = World Economic Outlook.

- How long will the pandemic last and what will be the severity levels?
- How deep and how long will the global recession be?
- How long will lockdowns and travel restrictions continue?
- How fast will consumer confidence in air travel be restored?
- Will there be a structural shift in industry and consumers' behaviors?
- How long can the air transport industry withstand the financial adversity?

Previous outbreaks/pandemics had a V-shaped impact on air transport in Asia/Pacific



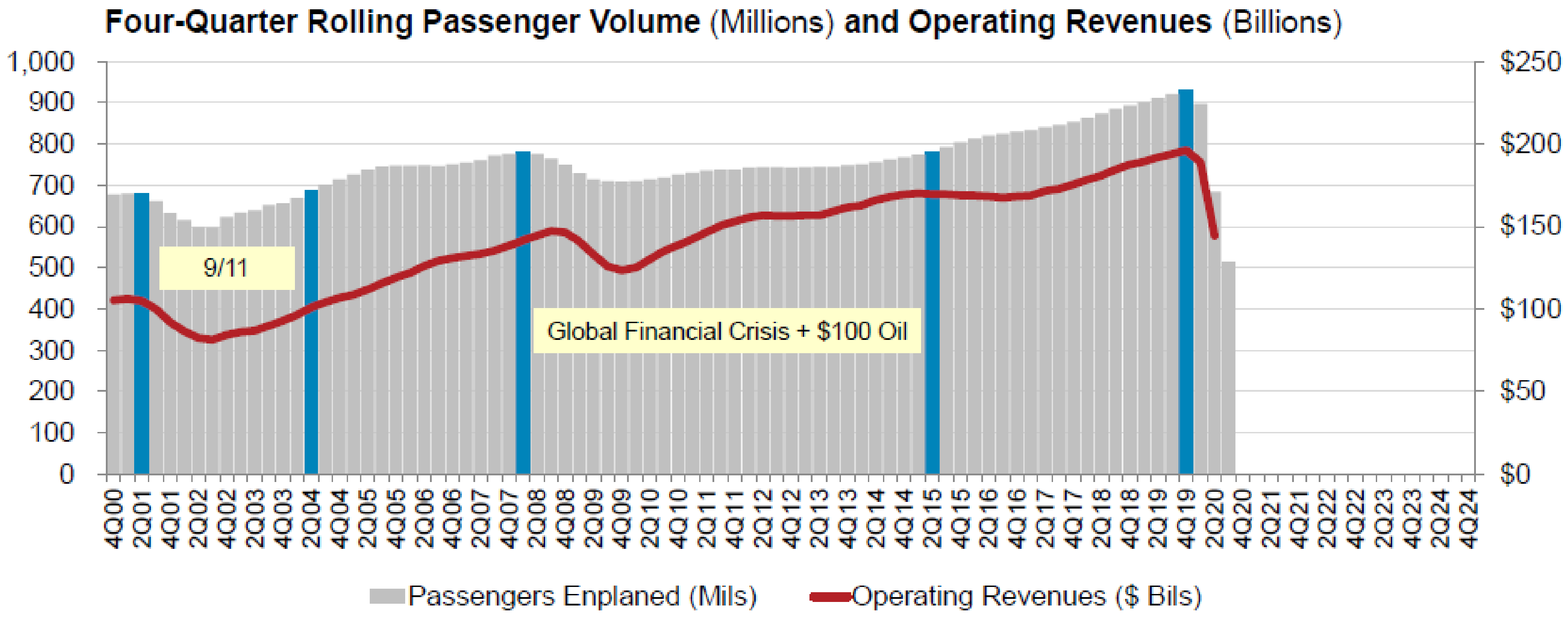
Source: IATA Economics using data from IATA Statistics

The impact of COVID-19 has already surpassed the 2003 SARS outbreak which had resulted in reduction of annual RPKs by 8% and USD 6 billion revenues for Asia/Pacific airlines. **The 6-month recovery path of SARS might not apply to today's situation.**

https://www.iata.org/en/iata-repository/publications/economic-reports/third-impact-assessment/

Source: IATA COVID-19 Updated Impact Assessment (dated 24 March 2020)

9/11 and global financial crisis had a U/L-shaped impact on air transport in United States



* Passengers enplaned systemwide on U.S. airlines in scheduled and nonscheduled services

Source: A4A Passenger Airline Cost Index and Bureau of Transportation Statistics (Form 41 Schedule T1)

https://www.airlines.org/dataset/impact-of-covid19-data-updates/

Indicative Scenarios and Paths Forward

As overall severity and duration of the COVID-19 pandemic are still uncertain, four (4) different recovery paths under two (2) indicative scenarios are developed:

- **Baseline**: counterfactual scenario, in which the COVID-19 pandemic does not occur, that is, **originally-planned** or **business as usual**
- **Scenario 1**: two (2) different paths (similar to **Nike swoosh- and W-shaped**)
- **Scenario 2**: two (2) different paths (similar to **U- and L-shaped**)
- **Reference**: information only, based on latest airline schedules (similar to **V-shaped**)

What does Scenario mean?

- Notwithstanding the elevated uncertainty surrounding the outlook, a scenario analysis could help gauge potential economic implications of the pandemic
- Scenarios are **not forecasts** of what is most likely to happen. Given rapidly changing circumstances, they are merely indicative of **possible paths or consequential outcomes out of many**
- The exact path (depth, length and shape) will depend upon various factors, inter alia, duration and magnitude of the outbreak and containment measures, availability of government assistance, consumer confidence, and economic conditions
- With the situation evolving and more information available, scenarios will be adjusted as necessary

Key assumptions

- International and domestic passenger traffic has separate scenarios/paths
- Scenarios/paths are differentiated in terms of supply and demand, i.e.
  - Scale of output or seat capacity change
  - Degree of consumer confidence that can be translated into demand or load factor as a proxy
- Supply and demand are influenced by:
  - Different timing and speed of recovery by region, international/domestic, and intra-/inter-region
  - Global economic contraction
- No consideration is made to social distancing requirements on aircraft, etc.
- Detailed scenario assumptions are summarized in **Appendix B**

Baseline & Reference

- **Baseline: originally-planned or business as usual**
  - Counterfactual hypothesis that are expected to occur in the absence of COVID-19 pandemic
  - Supply: airlines' originally-planned schedules supplemented by trend line growth
  - Demand: trend line growth of demand from 2019 (pre-COVID-19) level

- **Reference: V-shaped**
  - Information-only scenario that reflects airlines' most recent expectation or a "signal" of airlines' plan to the market (not necessarily realistic)
  - Supply: based on latest update of airline schedules filed, which are adjusted weekly by airlines according to the expectation of the evolving situation (quite often managing capacity for a short period due to the uncertainties)
  - Demand: quickly returning to Baseline level

Scenarios 1 & 2

Scenario 1: Nike swoosh- and W-shaped

- International
  - **Path 1**: Smooth capacity recovery by picking up pent-up demand but at a diminishing rate of growth
  - **Path 1a**: Capacity to start with smooth recovery but then turn back down due to over-capacity
- Domestic
  - **Path 1**: Swift capacity rebound pushed by pent-up demand but at a diminishing rate of growth
  - **Path 1a**: Capacity to start with smooth recovery but then turn back down due to over-capacity

Scenario 2: U- and L-shaped

- International
  - **Path 2**: Accelerating the return to trend growth after slow progression of capacity recovery
  - **Path 2a**: Capacity recovery at diminishing speed due to respite and continuous demand slump
- Domestic
  - **Path 2**: Gradual capacity recovery, followed by the acceleration of growth
  - **Path 2a**: Capacity recovery at diminishing speed due to sluggish demand growth

In the following analysis, international and domestic scenarios having the same path number are linked with each other, although different combination of scenarios/paths would be possible

Estimated 2020 Results and Near-term Outlook: Global

Figures and estimates herein reflect the latest operational data and schedules filed by airlines but are **subject to substantial changes**, and will be updated with the situation evolving and more information available.

Three (3) key impact indictors

- Three (3) key impact indicators under four (4) paths of two (2) scenarios:
  - Change of passenger seat capacity (supply, %)
  - Change of passenger numbers (demand)
  - Change of gross passenger operating revenues of airlines
- Comparison to:
  - Baseline scenario
  - 2019 level
  - 2020 level (for 2021 estimates)
- Break-down by:
  - International and domestic
  - Month, quarter and year

Estimation based on actual results of January to December 2020 are used for the key impact indicators.

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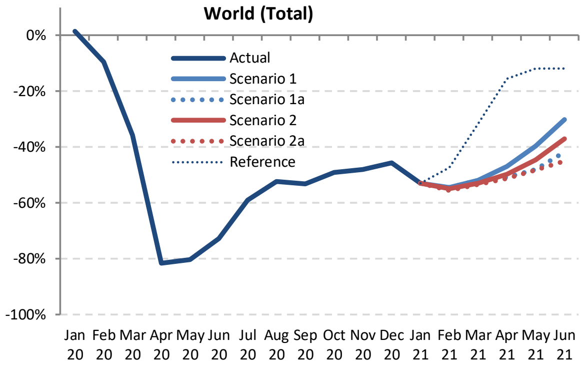
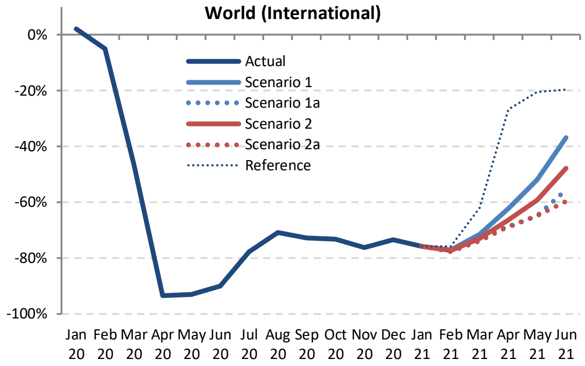
Estimated impacts compared to 2019 & Baseline

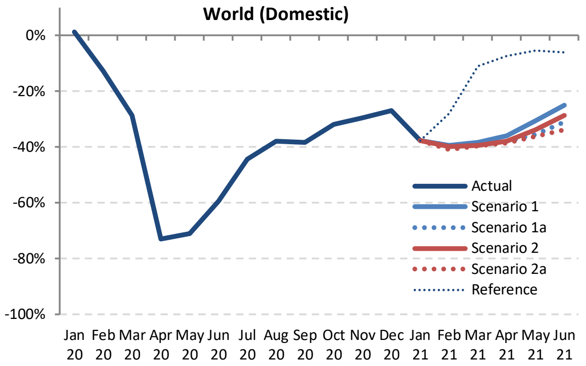
Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-14.8%	-16.9%	-13.4%	-233,909	-22.7%	-89,922	-22.0%	-143,987	-23.2%	-29,389	-16,538	-12,852
2Q 2020	-78.1%	-92.1%	-67.8%	-984,447	-86.4%	-460,226	-96.6%	-524,221	-79.1%	-129,747	-81,993	-47,753
3Q 2020	-54.8%	-73.9%	-40.2%	-821,282	-67.2%	-449,405	-85.2%	-371,877	-53.5%	-115,838	-82,002	-33,835
4Q 2020	-47.6%	-74.3%	-29.4%	-659,012	-60.2%	-376,110	-86.0%	-282,902	-43.0%	-95,635	-69,608	-26,028
Total 2020	**-49.5%**	**-65.7%**	**-37.9%**	**-2,699**	**-60.2%**	**-1,375,663**	**-74.4%**	**-1,322,987**	**-50.2%**	**-370,609**	**-250,141**	**-120,468**
1Q 2021	-54.0% to -53.1%	-75.7% to -74.7%	-39.4% to -38.5%	-674,128 to -653,039	-65.5% to -63.4%	-348,963 to -342,468	-85.4% to -83.8%	-325,165 to -310,571	-52.4% to -50.0%	-94,650 to -92,000	-64,962 to -63,719	-29,688 to -28,281
2Q 2021	-48.1% to -38.8%	-64.3% to -50.0%	-36.1% to -30.5%	-693,335 to -539,670	-60.9% to -47.4%	-367,586 to -290,501	-77.2% to -61.0%	-325,749 to -249,169	-49.1% to -37.6%	-94,921 to -73,887	-65,133 to -51,502	-29,789 to -22,386
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-50.9% to -45.7%**	**-69.6% to -61.6%**	**-37.7% to -34.4%**	**-1,367,463 to -1,192,710**	**-63.1% to -55.0%**	**-716,549 to -632,970**	**-81.0% to -71.5%**	**-650,914 to -559,740**	**-50.7% to -43.6%**	**-189,571 to -165,887**	**-130,094 to -115,221**	**-59,477 to -50,666**

Compared to Baseline	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-18.0%	-20.0%	-16.7%	-279,916	-26.0%	-108,095	-25.3%	-171,821	-26.5%	-35,029	-19,759	-15,269
2Q 2020	-78.8%	-92.4%	-68.7%	-1,024,753	-86.9%	-478,427	-96.8%	-546,326	-79.8%	-135,050	-85,225	-49,825
3Q 2020	-56.2%	-74.6%	-42.1%	-865,057	-68.3%	-468,004	-85.7%	-397,053	-55.2%	-121,503	-85,312	-36,191
4Q 2020	-48.8%	-74.9%	-30.9%	-689,747	-61.2%	-388,876	-86.3%	-300,871	-44.5%	-99,808	-72,094	-27,715
Total 2020	**-51.1%**	**-66.8%**	**-39.7%**	**-2,859,472**	**-61.5%**	**-1,443,402**	**-75.3%**	**-1,416,070**	**-51.9%**	**-391,390**	**-262,390**	**-129,000**
1Q 2021	-56.7% to -55.8%	-77.0% to -76.1%	-43.0% to -42.1%	-745,547 to -724,458	-67.7% to -65.8%	-374,808 to -368,313	-86.3% to -84.8%	-370,739 to -356,145	-55.6% to -53.4%	-103,431 to -100,781	-69,596 to -68,354	-33,835 to -32,427
2Q 2021	-51.0% to -42.2%	-66.5% to -53.1%	-39.3% to -34.0%	-767,554 to -613,890	-63.3% to -50.6%	-400,331 to -323,247	-78.7% to -63.5%	-367,223 to -290,643	-52.1% to -41.3%	-104,852 to -83,818	-71,173 to -57,541	-33,679 to -26,276
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-53.7% to -48.8%**	**-71.4% to -63.9%**	**-41.1% to -38.0%**	**-1,513,101 to -1,338,348**	**-65.4% to -57.8%**	**-775,139 to -691,559**	**-82.2% to -73.3%**	**-737,962 to -646,788**	**-53.8% to -47.2%**	**-208,283 to -184,598**	**-140,769 to -125,895**	**-67,514 to -58,703**

Seat capacity







Seat Capacity (thousand) - World Total International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**438,945**	452,937	**445,904**	6,960	1.6%	-7,033	-1.6%	464,620	**206,100**	**206,100**	**206,100**	**206,100**	**206,100**	-232,845	-53.0%	-239,805	-53.8%	-258,520	-55.6%
February	**401,031**	423,848	**362,643**	-38,388	-9.6%	-61,205	-14.4%	433,495	**182,182**	**182,182**	**180,947**	**177,924**	**211,481**	-223,106 to -218,849	-55.6% to -54.6%	-184,719 to -180,461	-50.9% to -49.8%	-255,571 to -251,314	-59.0% to -58.0%
March	**444,244**	458,040	**285,487**	-158,757	-35.7%	-172,553	-37.7%	465,168	**214,042**	**214,042**	**208,614**	**206,575**	**304,012**	-237,668 to -230,202	-53.5% to -51.8%	-78,911 to -71,445	-27.6% to -25.0%	-258,592 to -251,126	-55.6% to -54.0%
April	**445,271**	457,572	**81,987**	-363,283	-81.6%	-375,584	-82.1%	469,717	**236,190**	**218,795**	**223,829**	**217,084**	**376,048**	-228,186 to -209,081	-51.2% to -47.0%	135,097 to 154,203	164.8% to 188.1%	-252,633 to -233,527	-53.8% to -49.7%
May	**464,948**	478,703	**91,502**	-373,447	-80.3%	-387,202	-80.9%	491,057	**280,770**	**242,084**	**258,185**	**240,674**	**410,122**	-224,274 to -184,178	-48.2% to -39.6%	149,173 to 189,269	163.0% to 206.8%	-250,383 to -210,287	-51.0% to -42.8%
June	**470,011**	485,904	**128,457**	-341,554	-72.7%	-357,447	-73.6%	500,376	**328,136**	**274,137**	**296,350**	**258,675**	**414,412**	-211,336 to -141,875	-45.0% to -30.2%	130,218 to 199,678	101.4% to 155.4%	-241,700 to -172,240	-48.3% to -34.4%
July	**498,340**	515,107	**204,703**	-293,638	-58.9%	-310,404	-60.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	**497,416**	510,834	**237,039**	-260,377	-52.3%	-273,795	-53.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	**466,668**	481,357	**218,612**	-248,056	-53.2%	-262,745	-54.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**469,535**	478,702	**239,029**	-230,505	-49.1%	-239,673	-50.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**431,197**	439,257	**223,993**	-207,204	-48.1%	-215,264	-49.0%	-	-	-	-	-	-	-	-	-	-	-	-
December	**448,324**	462,155	**243,440**	-204,885	-45.7%	-218,715	-47.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**1,284,219**	1,334,824	**1,094,034**	-190,185	-14.8%	-240,790	-18.0%	1,363,282	**602,323**	**602,323**	**595,661**	**590,599**	**721,593**	-693,620 to -681,896	-54.0% to -53.1%	-503,435 to -491,711	-46.0% to -44.9%	-772,683 to -760,960	-56.7% to -55.8%
2Q	**1,380,230**	1,422,179	**301,946**	-1,078,284	-78.1%	-1,120,233	-78.8%	1,461,150	**845,096**	**735,017**	**778,364**	**716,434**	**1,200,582**	-663,796 to -535,134	-48.1% to -38.8%	414,488 to 543,150	137.3% to 179.9%	-744,716 to -616,054	-51.0% to -42.2%
3Q	**1,462,425**	1,507,298	**660,353**	-802,072	-54.8%	-846,944	-56.2%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**1,349,056**	1,380,114	**706,462**	-642,595	-47.6%	-673,652	-48.8%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**5,475,930**	5,644,415	**2,762,796**	-2,713,135	-49.5%	-2,881,619	-51.1%	2,824,433	**1,447,419**	**1,337,340**	**1,374,025**	**1,307,033**	**1,922,175**	-1,357,416 to -1,217,030	-50.9% to -45.7%	-88,947 to 51,439	-6.4% to 3.7%	-1,517,400 to -1,377,014	-53.7% to -48.8%

Source: ICAO estimates

ICAO UNITING AVIATION

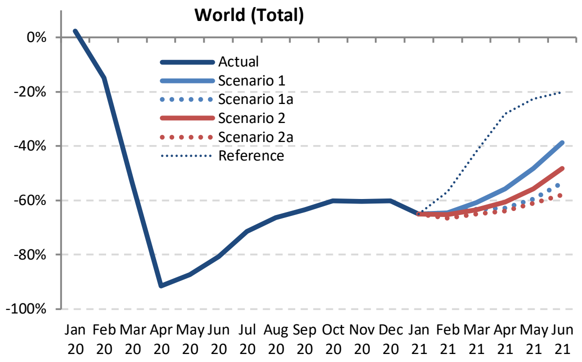
Seat capacity

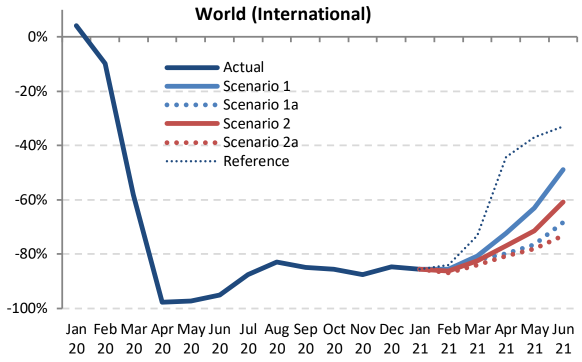
Seat Capacity (thousand) - World Total International																				
Year	**2019**	**2020**							**2021**											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**176,978**	182,100	**180,601**	3,623	2.0%	-1,499	-0.8%	185,913	**42,942**	**42,942**	**42,942**	**42,942**	**42,942**	-134,036	-75.7%	-137,659	-76.2%	-142,970	-76.9%
February	**161,254**	170,721	**153,407**	-7,847	-4.9%	-17,314	-10.1%	174,489	**37,048**	**37,048**	**36,596**	**35,984**	**39,020**	-125,270 to -124,206	-77.7% to -77.0%	-117,423 to -116,359	-76.5% to -75.9%	-138,505 to -137,442	-79.4% to -78.8%
March	**180,012**	185,993	**96,871**	-83,141	-46.2%	-89,121	-47.9%	188,739	**51,202**	**51,202**	**48,586**	**47,256**	**68,555**	-132,755 to -128,810	-73.7% to -71.6%	-49,615 to -45,670	-51.2% to -47.1%	-141,483 to -137,538	-75.0% to -72.9%
April	**186,932**	193,072	**12,235**	-174,698	-93.5%	-180,837	-93.7%	199,119	**70,537**	**58,251**	**63,155**	**58,462**	**136,864**	-128,681 to -116,395	-68.8% to -62.3%	46,016 to 58,303	376.1% to 476.5%	-140,868 to -128,582	-70.7% to -64.6%
May	**196,406**	202,540	**13,634**	-182,772	-93.1%	-188,907	-93.3%	207,749	**94,591**	**69,177**	**80,249**	**68,987**	**156,247**	-127,419 to -101,816	-64.9% to -51.8%	55,354 to 80,957	406.0% to 593.8%	-138,761 to -113,158	-66.8% to -54.5%
June	**203,503**	210,916	**20,373**	-183,131	-90.0%	-190,544	-90.3%	218,921	**128,368**	**90,252**	**106,105**	**82,286**	**163,731**	-121,217 to -75,135	-59.6% to -36.9%	61,914 to 107,996	303.9% to 530.1%	-136,634 to -90,552	-62.4% to -41.4%
July	**216,729**	223,515	**48,106**	-168,623	-77.8%	-175,409	-78.5%	-	-	-	-	-	-	-	-	-	-	-	-
August	**217,510**	224,145	**63,311**	-154,199	-70.9%	-160,834	-71.8%	-	-	-	-	-	-	-	-	-	-	-	-
September	**200,919**	206,601	**54,611**	-146,308	-72.8%	-151,990	-73.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**195,761**	199,203	**52,395**	-143,366	-73.2%	-146,808	-73.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	**171,168**	174,618	**40,601**	-130,567	-76.3%	-134,017	-76.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**180,939**	187,587	**48,010**	-132,929	-73.5%	-139,576	-74.4%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**518,244**	538,814	**430,879**	-87,365	-16.9%	-107,935	-20.0%	549,141	**131,192**	**131,192**	**128,123**	**126,183**	**150,517**	-392,061 to -387,052	-75.7% to -74.7%	-304,696 to -299,688	-70.7% to -69.6%	-422,958 to -417,949	-77.0% to -76.1%
2Q	**586,842**	606,529	**46,241**	-540,601	-92.1%	-560,288	-92.4%	625,788	**293,496**	**217,680**	**249,510**	**209,736**	**456,841**	-377,317 to -293,346	-64.3% to -50.0%	163,284 to 247,255	353.1% to 534.7%	-416,264 to -332,292	-66.5% to -53.1%
3Q	**635,158**	654,261	**166,028**	-469,130	-73.9%	-488,233	-74.6%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**547,868**	561,408	**141,006**	-406,861	-74.3%	-420,402	-74.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2,288,112**	2,361,012	**784,155**	-1,503,957	-65.7%	-1,576,857	-66.8%	1,174,930	**424,688**	**348,872**	**377,633**	**335,919**	**607,358**	-769,378 to -680,398	-69.6% to -61.6%	-141,413 to -52,433	-29.6% to -11.0%	-839,222 to -750,242	-71.4% to -63.9%

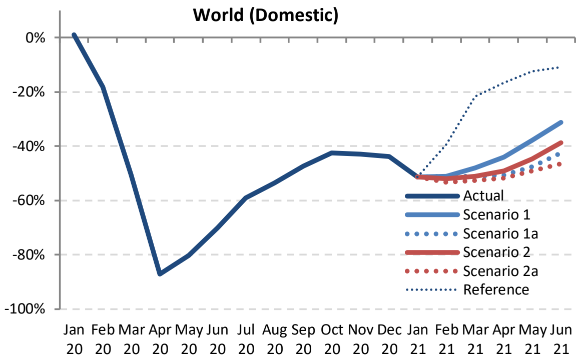
Seat Capacity (thousand) - World Total Domestic																				
Year	**2019**	**2020**							**2021**											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**261,967**	270,837	**265,303**	3,337	1.3%	-5,534	-2.0%	278,707	**163,157**	**163,157**	**163,157**	**163,157**	**163,157**	-98,809	-37.7%	-102,146	-38.5%	-115,550	-41.5%
February	**239,777**	253,127	**209,236**	-30,541	-12.7%	-43,890	-17.3%	259,006	**145,134**	**145,134**	**144,352**	**141,940**	**172,461**	-97,837 to -94,643	-40.8% to -39.5%	-67,296 to -64,102	-32.2% to -30.6%	-117,066 to -113,872	-45.2% to -44.0%
March	**264,232**	272,047	**188,615**	-75,616	-28.6%	-83,432	-30.7%	276,428	**162,840**	**162,840**	**160,029**	**159,319**	**235,457**	-104,913 to -101,392	-39.7% to -38.4%	-29,296 to -25,775	-15.5% to -13.7%	-117,109 to -113,588	-42.4% to -41.1%
April	**258,338**	264,499	**69,753**	-188,585	-73.0%	-194,747	-73.6%	270,598	**165,653**	**160,544**	**160,674**	**158,622**	**239,185**	-99,716 to -92,685	-38.6% to -35.9%	88,870 to 95,900	127.4% to 137.5%	-111,976 to -104,945	-41.4% to -38.8%
May	**268,542**	276,163	**77,868**	-190,674	-71.0%	-198,295	-71.8%	283,309	**186,179**	**172,907**	**177,935**	**171,687**	**253,875**	-96,855 to -82,362	-36.1% to -30.7%	93,819 to 108,312	120.5% to 139.1%	-111,622 to -97,129	-39.4% to -34.3%
June	**266,508**	274,988	**108,085**	-158,423	-59.4%	-166,903	-60.7%	281,455	**199,767**	**183,886**	**190,244**	**176,389**	**250,681**	-90,119 to -66,740	-33.8% to -25.0%	68,304 to 91,683	63.2% to 84.8%	-105,066 to -81,688	-37.3% to -29.0%
July	**281,611**	291,592	**156,596**	-125,015	-44.4%	-134,996	-46.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	**279,906**	286,688	**173,728**	-106,178	-37.9%	-112,961	-39.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**265,750**	274,756	**164,001**	-101,749	-38.3%	-110,755	-40.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**273,774**	279,499	**186,635**	-87,139	-31.8%	-92,865	-33.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**260,029**	264,639	**183,392**	-76,638	-29.5%	-81,247	-30.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**267,385**	274,568	**195,429**	-71,956	-26.9%	-79,139	-28.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**765,975**	796,011	**663,155**	-102,820	-13.4%	-132,856	-16.7%	814,141	**471,131**	**471,131**	**467,537**	**464,416**	**571,076**	-301,559 to -294,844	-39.4% to -38.5%	-198,739 to -192,023	-30.0% to -29.0%	-349,725 to -343,010	-43.0% to -42.1%
2Q	**793,388**	815,650	**255,705**	-537,683	-67.8%	-559,945	-68.7%	835,362	**551,600**	**517,337**	**528,854**	**506,698**	**743,741**	-286,690 to -241,788	-36.1% to -30.5%	250,993 to 295,895	98.2% to 115.7%	-328,664 to -283,762	-39.3% to -34.0%
3Q	**827,267**	853,036	**494,325**	-332,942	-40.2%	-358,711	-42.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**801,189**	818,706	**565,456**	-235,733	-29.4%	-253,250	-30.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**3,187,818**	3,283,402	**1,978,640**	-1,209,178	-37.9%	-1,304,762	-39.7%	1,649,503	**1,022,731**	**988,468**	**996,391**	**971,115**	**1,314,817**	-588,248 to -536,632	-37.7% to -34.4%	52,255 to 103,871	5.7% to 11.3%	-678,389 to -626,772	-41.1% to -38.0%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - World Total International + Domestic

Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**344,758**	357,606	**352,761**	8,004	2.3%	-4,844	-1.4%	367,727	**120,559**	**120,559**	**120,559**	**120,559**	**120,559**	-224,199	-65.0%	-232,203	-65.8%	-247,168	-67.2%
February	**321,873**	341,949	**274,172**	-47,701	-14.8%	-67,777	-19.8%	350,577	**114,032**	**114,032**	**111,526**	**107,915**	**138,657**	-213,958 to -207,841	-66.5% to -64.6%	-166,257 to -160,140	-60.6% to -58.4%	-242,662 to -236,545	-69.2% to -67.5%
March	**362,867**	375,950	**168,655**	-194,212	-53.5%	-207,295	-55.1%	382,613	**141,868**	**133,338**	**132,432**	**126,896**	**210,203**	-235,971 to -220,999	-65.0% to -60.9%	-41,759 to -26,787	-24.8% to -15.9%	-255,717 to -240,745	-66.8% to -62.9%
April	**366,705**	378,697	**30,811**	-335,893	-91.6%	-347,886	-91.9%	389,357	**162,100**	**136,143**	**144,244**	**132,654**	**263,441**	-234,051 to -204,605	-63.8% to -55.8%	101,842 to 131,288	330.5% to 426.1%	-256,704 to -227,257	-65.9% to -58.4%
May	**378,595**	391,491	**48,036**	-330,560	-87.3%	-343,455	-87.7%	402,087	**196,083**	**153,348**	**167,903**	**147,444**	**293,393**	-231,152 to -182,512	-61.1% to -48.2%	99,408 to 148,047	206.9% to 308.2%	-254,644 to -206,004	-63.3% to -51.2%
June	**393,796**	409,214	**75,802**	-317,994	-80.8%	-333,412	-81.5%	421,871	**241,243**	**183,286**	**203,932**	**165,665**	**314,220**	-228,132 to -152,553	-57.9% to -38.7%	89,862 to 165,441	118.5% to 218.3%	-256,207 to -180,628	-60.7% to -42.8%
July	**422,791**	439,319	**121,072**	-301,719	-71.4%	-318,247	-72.4%	-	-	-	-	-	-	-	-	-	-	-	-
August	**421,189**	434,582	**141,555**	-279,634	-66.4%	-293,028	-67.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**378,248**	392,101	**138,319**	-239,929	-63.4%	-253,782	-64.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	**382,832**	392,206	**152,726**	-230,106	-60.1%	-239,480	-61.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**347,003**	355,209	**137,802**	-209,201	-60.3%	-217,407	-61.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	**365,554**	378,710	**145,850**	-219,705	-60.1%	-232,860	-61.5%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**1,029,498**	1,075,505	**795,589**	-233,909	-22.7%	-279,916	-26.0%	1,100,917	**376,459**	**367,928**	**364,517**	**355,370**	**469,419**	-674,128 to -653,039	-65.5% to -63.4%	-440,219 to -419,130	-55.3% to -52.7%	-745,547 to -724,458	-67.7% to -65.8%
2Q	**1,139,096**	1,179,403	**154,649**	-984,447	-86.4%	-1,024,753	-86.9%	1,213,316	**599,426**	**472,777**	**516,078**	**445,762**	**871,053**	-693,335 to -539,670	-60.9% to -47.4%	291,112 to 444,776	188.2% to 287.6%	-767,554 to -613,890	-63.3% to -50.6%
3Q	**1,222,228**	1,266,003	**400,946**	-821,282	-67.2%	-865,057	-68.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**1,095,390**	1,126,124	**436,378**	-659,012	-60.2%	-689,747	-61.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**4,486,212**	4,647,034	**1,787,562**	-2,698,650	-60.2%	-2,859,472	-61.5%	2,314,232	**975,885**	**840,706**	**880,595**	**801,131**	**1,340,472**	-1,367,463 to -1,192,710	-63.1% to -55.0%	-149,107 to 25,646	-15.7% to 2.7%	-1,513,101 to -1,338,348	-65.4% to -57.8%

Passenger number

Passenger Number (thousand) - World Total International

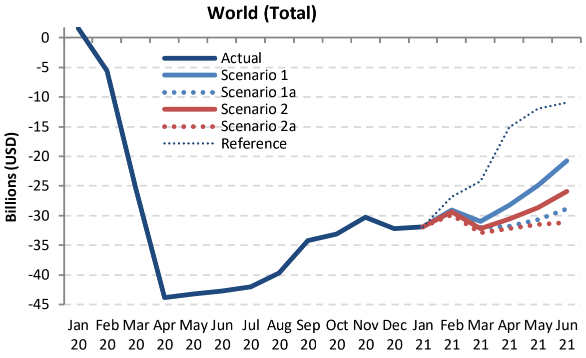
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**138,869**	143,559	**144,651**	5,782	4.2%	1,092	0.8%	146,430	**20,119**	**20,119**	**20,119**	**20,119**	**20,119**	-118,750	-85.5%	-124,532	-86.1%	-126,311	-86.3%
February	**126,274**	134,312	**113,965**	-12,309	-9.7%	-20,347	-15.1%	137,129	**18,241**	**18,241**	**17,458**	**16,618**	**20,032**	-109,656 to -108,033	-86.8% to -85.6%	-97,347 to -95,724	-85.4% to -84.0%	-120,511 to -118,888	-87.9% to -86.7%
March	**143,342**	148,787	**59,947**	-83,396	-58.2%	-88,841	-59.7%	150,771	**27,657**	**25,764**	**24,979**	**22,785**	**38,540**	-120,557 to -115,685	-84.1% to -80.7%	-37,162 to -32,290	-62.0% to -53.9%	-127,986 to -123,114	-84.9% to -81.7%
April	**152,775**	158,563	**3,455**	-149,319	-97.7%	-155,108	-97.8%	163,234	**42,347**	**30,658**	**35,162**	**29,566**	**85,245**	-123,209 to -110,427	-80.6% to -72.3%	26,110 to 38,892	755.7% to 1125.6%	-133,668 to -120,886	-81.9% to -74.1%
May	**155,717**	161,145	**4,251**	-151,466	-97.3%	-156,894	-97.4%	164,792	**57,530**	**36,682**	**44,592**	**34,245**	**98,267**	-121,472 to -98,187	-78.0% to -63.1%	29,994 to 53,280	705.6% to 1253.4%	-130,547 to -107,262	-79.2% to -65.1%
June	**167,747**	174,732	**8,306**	-159,440	-95.0%	-166,425	-95.2%	180,958	**85,859**	**53,253**	**65,622**	**44,842**	**112,592**	-122,905 to -81,887	-73.3% to -48.8%	36,536 to 77,553	439.8% to 933.7%	-136,116 to -95,098	-75.2% to -52.6%
July	**182,234**	188,889	**22,578**	-159,657	-87.6%	-166,311	-88.0%	-	-	-	-	-	-	-	-	-	-	-	-
August	**183,824**	190,357	**31,247**	-152,577	-83.0%	-159,111	-83.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	**161,695**	167,106	**24,523**	-137,171	-84.8%	-142,582	-85.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**156,574**	160,000	**22,468**	-134,106	-85.7%	-137,531	-86.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	**135,195**	138,497	**16,686**	-118,509	-87.7%	-121,812	-88.0%	-	-	-	-	-	-	-	-	-	-	-	-
December	**145,817**	151,856	**22,323**	-123,494	-84.7%	-129,533	-85.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**408,486**	426,658	**318,563**	-89,922	-22.0%	-108,095	-25.3%	434,330	**66,017**	**64,124**	**62,557**	**59,522**	**78,691**	-348,963 to -342,468	-85.4% to -83.8%	-259,041 to -252,546	-81.3% to -79.3%	-374,808 to -368,313	-86.3% to -84.8%
2Q	**476,238**	494,440	**16,012**	-460,226	-96.6%	-478,427	-96.8%	508,984	**185,737**	**120,593**	**145,376**	**108,653**	**296,104**	-367,586 to -290,501	-77.2% to -61.0%	92,640 to 169,725	578.6% to 1060.0%	-400,331 to -323,247	-78.7% to -63.5%
3Q	**527,753**	546,352	**78,348**	-449,405	-85.2%	-468,004	-85.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**437,587**	450,353	**61,477**	-376,110	-86.0%	-388,876	-86.3%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,850,064**	1,917,803	**474,401**	-1,375,663	-74.4%	-1,443,402	-75.3%	943,314	**251,754**	**184,717**	**207,933**	**168,175**	**374,795**	-716,549 to -632,970	-81.0% to -71.5%	-166,401 to -82,821	-49.7% to -24.8%	-775,139 to -691,559	-82.2% to -73.3%

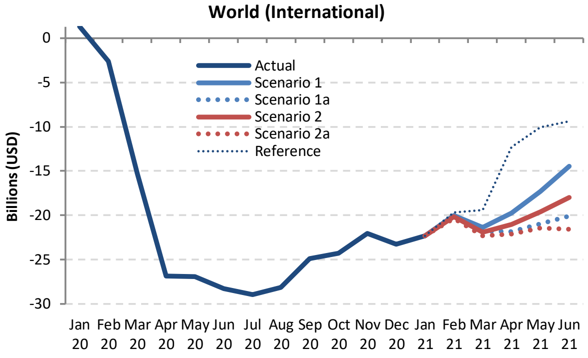
Passenger Number (thousand) - World Total Domestic

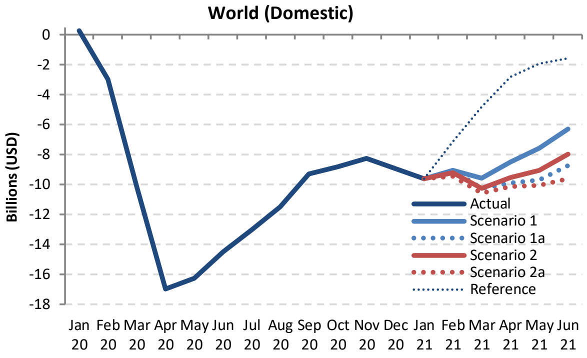
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**205,889**	214,047	**208,110**	2,222	1.1%	-5,937	-2.8%	221,296	**100,440**	**100,440**	**100,440**	**100,440**	**100,440**	-105,449	-51.2%	-107,671	-51.7%	-120,857	-54.6%
February	**195,599**	207,637	**160,207**	-35,392	-18.1%	-47,430	-22.8%	213,448	**95,791**	**95,791**	**94,068**	**91,297**	**118,625**	-104,302 to -99,808	-53.3% to -51.0%	-68,910 to -64,416	-43.0% to -40.2%	-122,151 to -117,657	-57.2% to -55.1%
March	**219,524**	227,163	**108,708**	-110,816	-50.5%	-118,454	-52.1%	231,842	**114,211**	**107,574**	**107,452**	**104,111**	**171,663**	-115,413 to -105,314	-52.6% to -48.0%	-4,597 to 5,503	-4.2% to 5.1%	-127,731 to -117,631	-55.1% to -50.7%
April	**213,930**	220,134	**27,356**	-186,574	-87.2%	-192,778	-87.6%	226,123	**119,752**	**105,485**	**109,082**	**103,088**	**178,196**	-110,842 to -94,178	-51.8% to -44.0%	75,732 to 92,396	276.8% to 337.8%	-123,036 to -106,371	-54.4% to -47.0%
May	**222,878**	230,346	**43,785**	-179,094	-80.4%	-186,561	-81.0%	237,295	**138,553**	**116,666**	**123,311**	**113,199**	**195,126**	-109,680 to -84,326	-49.2% to -37.8%	69,414 to 94,768	158.5% to 216.4%	-124,096 to -98,742	-52.3% to -41.6%
June	**226,049**	234,483	**67,496**	-158,553	-70.1%	-166,987	-71.2%	240,914	**155,384**	**130,033**	**138,309**	**120,823**	**201,628**	-105,227 to -70,666	-46.6% to -31.3%	53,327 to 87,888	79.0% to 130.2%	-120,091 to -85,530	-49.8% to -35.5%
July	**240,556**	250,431	**98,494**	-142,062	-59.1%	-151,936	-60.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**237,365**	244,225	**110,308**	-127,057	-53.5%	-133,917	-54.8%	-	-	-	-	-	-	-	-	-	-	-	-
September	**216,553**	224,995	**113,796**	-102,758	-47.5%	-111,200	-49.4%	-	-	-	-	-	-	-	-	-	-	-	-
October	**226,258**	232,206	**130,257**	-96,000	-42.4%	-101,949	-43.9%	-	-	-	-	-	-	-	-	-	-	-	-
November	**211,808**	216,711	**121,116**	-90,691	-42.8%	-95,595	-44.1%	-	-	-	-	-	-	-	-	-	-	-	-
December	**219,737**	226,854	**123,527**	-96,210	-43.8%	-103,327	-45.5%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**621,012**	648,846	**477,025**	-143,987	-23.2%	-171,821	-26.5%	666,586	**310,441**	**303,804**	**301,960**	**295,847**	**390,728**	-325,165 to -310,571	-52.4% to -50.0%	-181,178 to -166,584	-38.0% to -34.9%	-370,739 to -356,145	-55.6% to -53.4%
2Q	**662,858**	684,963	**138,637**	-524,221	-79.1%	-546,326	-79.8%	704,332	**413,689**	**352,184**	**370,702**	**337,109**	**574,950**	-325,749 to -249,169	-49.1% to -37.6%	198,472 to 275,052	143.2% to 198.4%	-367,223 to -290,643	-52.1% to -41.3%
3Q	**694,475**	719,651	**322,598**	-371,877	-53.5%	-397,053	-55.2%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**657,803**	675,772	**374,901**	-282,902	-43.0%	-300,871	-44.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2,636,148**	2,729,232	**1,313,161**	-1,322,987	-50.2%	-1,416,070	-51.9%	1,370,919	**724,130**	**655,988**	**672,662**	**632,956**	**965,677**	-650,914 to -559,740	-50.7% to -43.6%	17,294 to 108,468	2.8% to 17.6%	-737,962 to -646,788	-53.8% to -47.2%

Source: ICAO estimates

Passenger revenue







Passenger revenue (USD, million) - World Total International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**44,644**	46,283	**46,210**	1,566	3.5%	-72	-0.2%	47,585	**12,712**	**12,712**	**12,712**	**12,712**	**12,712**	-31,932	-71.5%	-33,498	-72.5%	-34,873	-73.3%
February	**41,141**	43,681	**35,562**	-5,579	-13.6%	-8,119	-18.6%	44,699	**12,067**	**12,067**	**11,747**	**11,325**	**14,351**	-29,816 to -29,074	-72.5% to -70.7%	-24,237 to -23,495	-68.2% to -66.1%	-33,374 to -32,631	-74.7% to -73.0%
March	**46,611**	48,073	**21,235**	-25,376	-54.4%	-26,838	-55.8%	48,894	**15,617**	**14,605**	**14,455**	**13,709**	**22,408**	-32,902 to -30,994	-70.6% to -66.5%	-7,525 to -5,618	-35.4% to -26.5%	-35,184 to -33,276	-72.0% to -68.1%
April	**47,003**	48,564	**3,172**	-43,831	-93.3%	-45,392	-93.5%	50,020	**18,748**	**15,253**	**16,403**	**14,789**	**31,869**	-32,214 to -28,255	-68.5% to -60.1%	11,617 to 15,576	366.2% to 491.0%	-35,231 to -31,272	-70.4% to -62.5%
May	**48,047**	49,834	**4,877**	-43,170	-89.8%	-44,956	-90.2%	51,311	**23,186**	**17,391**	**19,400**	**16,565**	**36,047**	-31,483 to -24,862	-65.5% to -51.7%	11,688 to 18,308	239.6% to 375.4%	-34,747 to -28,126	-67.7% to -54.8%
June	**50,345**	52,301	**7,599**	-42,746	-84.9%	-44,702	-85.5%	53,994	**29,574**	**21,520**	**24,432**	**19,121**	**39,371**	-31,225 to -20,771	-62.0% to -41.3%	11,521 to 21,975	151.6% to 289.2%	-34,874 to -24,420	-64.6% to -45.2%
July	**54,203**	56,322	**12,219**	-41,984	-77.5%	-44,103	-78.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	**54,161**	55,982	**14,485**	-39,675	-73.3%	-41,496	-74.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	**48,119**	49,844	**13,940**	-34,179	-71.0%	-35,904	-72.0%	-	-	-	-	-	-	-	-	-	-	-	-
October	**48,461**	49,728	**15,354**	-33,107	-68.3%	-34,374	-69.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**44,163**	45,283	**13,861**	-30,302	-68.6%	-31,422	-69.4%	-	-	-	-	-	-	-	-	-	-	-	-
December	**47,339**	49,126	**15,113**	-32,226	-68.1%	-34,013	-69.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**132,397**	138,036	**103,007**	-29,389	-22.2%	-35,029	-25.4%	141,177	**40,397**	**39,385**	**38,914**	**37,747**	**49,471**	-94,650 to -92,000	-71.5% to -69.5%	-65,261 to -62,611	-63.4% to -60.8%	-103,431 to -100,781	-73.3% to -71.4%
2Q	**145,395**	150,698	**15,649**	-129,747	-89.2%	-135,050	-89.6%	155,326	**71,508**	**54,165**	**60,235**	**50,474**	**107,288**	-94,921 to -73,887	-65.3% to -50.8%	34,825 to 55,860	222.5% to 357.0%	-104,852 to -83,818	-67.5% to -54.0%
3Q	**156,483**	162,148	**40,645**	-115,838	-74.0%	-121,503	-74.9%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**139,964**	144,137	**44,328**	-95,635	-68.3%	-99,808	-69.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**574,238**	595,019	**203,629**	-370,609	-64.5%	-391,390	-65.8%	296,503	**111,905**	**93,549**	**99,149**	**88,221**	**156,759**	-189,571 to -165,887	-68.2% to -59.7%	-30,435 to -6,751	-25.7% to -5.7%	-208,283 to -184,598	-70.2% to -62.3%

Passenger revenue

Passenger revenue (USD, million) - World Total International																			
Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	26,170	27,114	27,464	1,294	4.9%	350	1.3%	27,730	3,868	3,868	3,868	3,868	3,868	-22,302	-85.2%	-23,596	-85.9%	-23,862	-86.0%
February	23,567	25,037	20,977	-2,590	-11.0%	-4,060	-16.2%	25,499	3,548	3,548	3,393	3,227	3,913	-20,340 to -20,019	-86.3% to -84.9%	-17,750 to -17,430	-84.6% to -83.1%	-22,273 to -21,952	-87.3% to -86.1%
March	26,649	27,457	11,407	-15,242	-57.2%	-16,049	-58.5%	27,791	5,251	4,883	4,748	4,330	7,246	-22,320 to -21,398	-83.8% to -80.3%	-7,078 to -6,156	-62.0% to -54.0%	-23,461 to -22,540	-84.4% to -81.1%
April	27,581	28,574	722	-26,859	-97.4%	-27,852	-97.5%	29,462	7,829	5,711	6,522	5,492	15,265	-22,089 to -19,752	-80.1% to -71.6%	4,770 to 7,107	661.0% to 984.9%	-23,970 to -21,633	-81.4% to -73.4%
May	27,736	28,837	842	-26,894	-97.0%	-27,995	-97.1%	29,655	10,455	6,761	8,153	6,291	17,676	-21,445 to -17,281	-77.3% to -62.3%	5,449 to 9,614	647.5% to 1142.2%	-23,365 to -19,200	-78.8% to -64.7%
June	29,710	30,847	1,470	-28,240	-95.1%	-29,378	-95.2%	31,949	15,241	9,610	11,755	8,111	20,301	-21,599 to -14,469	-72.7% to -48.7%	6,641 to 13,771	452.0% to 937.1%	-23,838 to -16,709	-74.6% to -52.3%
July	32,311	33,472	3,343	-28,968	-89.7%	-30,130	-90.0%	-	-	-	-	-	-	-	-	-	-	-	-
August	32,648	33,853	4,483	-28,164	-86.3%	-29,369	-86.8%	-	-	-	-	-	-	-	-	-	-	-	-
September	28,633	29,576	3,763	-24,869	-86.9%	-25,813	-87.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	28,049	28,741	3,752	-24,297	-86.6%	-24,989	-86.9%	-	-	-	-	-	-	-	-	-	-	-	-
November	25,200	25,884	3,166	-22,033	-87.4%	-22,717	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	27,503	28,613	4,226	-23,277	-84.6%	-24,387	-85.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	76,386	79,608	59,849	-16,538	-21.7%	-19,759	-24.8%	81,021	12,667	12,299	12,010	11,425	15,027	-64,962 to -63,719	-85.0% to -83.4%	-48,424 to -47,181	-80.9% to -78.8%	-69,596 to -68,354	-85.9% to -84.4%
2Q	85,026	88,258	3,033	-81,993	-96.4%	-85,225	-96.6%	91,066	33,525	22,082	26,430	19,894	53,242	-65,133 to -51,502	-76.6% to -60.6%	16,861 to 30,492	556.0% to 1005.4%	-71,173 to -57,541	-78.2% to -63.2%
3Q	93,592	96,901	11,589	-82,002	-87.6%	-85,312	-88.0%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	80,753	83,238	11,145	-69,608	-86.2%	-72,094	-86.6%	-	-	-	-	-	-	-	-	-	-	-	-
Total	335,757	348,005	85,615	-250,141	-74.5%	-262,390	-75.4%	172,087	46,192	34,382	38,440	31,318	68,269	-130,094 to -115,221	-80.6% to -71.4%	-31,563 to -16,689	-50.2% to -26.5%	-140,769 to -125,895	-81.8% to -73.2%

Passenger revenue (USD, million) - World Total Domestic																			
Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	18,474	19,168	18,746	272	1.5%	-422	-2.2%	19,855	8,844	8,844	8,844	8,844	8,844	-9,630	-52.1%	-9,902	-52.8%	-11,011	-55.5%
February	17,574	18,644	14,585	-2,989	-17.0%	-4,059	-21.8%	19,199	8,520	8,520	8,353	8,098	10,438	-9,476 to -9,055	-53.9% to -51.5%	-6,487 to -6,065	-44.5% to -41.6%	-11,101 to -10,679	-57.8% to -55.6%
March	19,962	20,616	9,828	-10,134	-50.8%	-10,789	-52.3%	21,103	10,366	9,722	9,707	9,380	15,162	-10,582 to -9,596	-53.0% to -48.1%	-448 to 538	-4.6% to 5.5%	-11,723 to -10,737	-55.6% to -50.9%
April	19,422	19,990	2,450	-16,971	-87.4%	-17,540	-87.7%	20,559	10,919	9,542	9,880	9,297	16,605	-10,125 to -8,503	-52.1% to -43.8%	6,846 to 8,469	279.4% to 345.6%	-11,262 to -9,639	-54.8% to -46.9%
May	20,312	20,997	4,036	-16,276	-80.1%	-16,961	-80.8%	21,656	12,730	10,630	11,248	10,274	18,371	-10,038 to -7,581	-49.4% to -37.3%	6,238 to 8,695	154.6% to 215.4%	-11,382 to -8,926	-52.6% to -41.2%
June	20,635	21,454	6,130	-14,506	-70.3%	-15,324	-71.4%	22,045	14,334	11,910	12,677	11,010	19,070	-9,626 to -6,302	-46.6% to -30.5%	4,880 to 8,204	79.6% to 133.8%	-11,036 to -7,711	-50.1% to -35.0%
July	21,892	22,850	8,876	-13,016	-59.5%	-13,974	-61.2%	-	-	-	-	-	-	-	-	-	-	-	-
August	21,513	22,129	10,002	-11,511	-53.5%	-12,127	-54.8%	-	-	-	-	-	-	-	-	-	-	-	-
September	19,486	20,267	10,177	-9,309	-47.8%	-10,090	-49.8%	-	-	-	-	-	-	-	-	-	-	-	-
October	20,412	20,987	11,602	-8,810	-43.2%	-9,385	-44.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	18,963	19,399	10,695	-8,269	-43.6%	-8,704	-44.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	19,836	20,513	10,887	-8,949	-45.1%	-9,625	-46.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	56,010	58,428	43,159	-12,852	-22.9%	-15,269	-26.1%	60,157	27,730	27,085	26,904	26,322	34,444	-29,688 to -28,281	-53.0% to -50.5%	-16,837 to -15,429	-39.0% to -35.7%	-33,835 to -32,427	-56.2% to -53.9%
2Q	60,369	62,441	12,616	-47,753	-79.1%	-49,825	-79.8%	64,260	37,983	32,082	33,805	30,580	54,046	-29,789 to -22,386	-49.3% to -37.1%	17,965 to 25,368	142.4% to 201.1%	-33,679 to -26,276	-52.4% to -40.9%
3Q	62,891	65,247	29,056	-33,835	-53.8%	-36,191	-55.5%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	59,211	60,899	33,184	-26,028	-44.0%	-27,715	-45.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	238,482	247,014	118,014	-120,468	-50.5%	-129,000	-52.2%	124,416	65,713	59,168	60,709	56,902	88,490	-59,477 to -50,666	-51.1% to -43.5%	1,128 to 9,938	2.0% to 17.8%	-67,514 to -58,703	-54.3% to -47.2%

Source: ICAO estimates

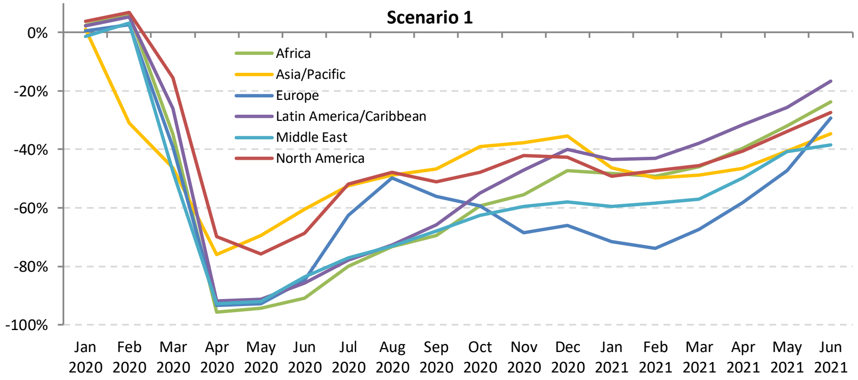
Estimated 2020 Results and Near-term Outlook: Region Breakdown

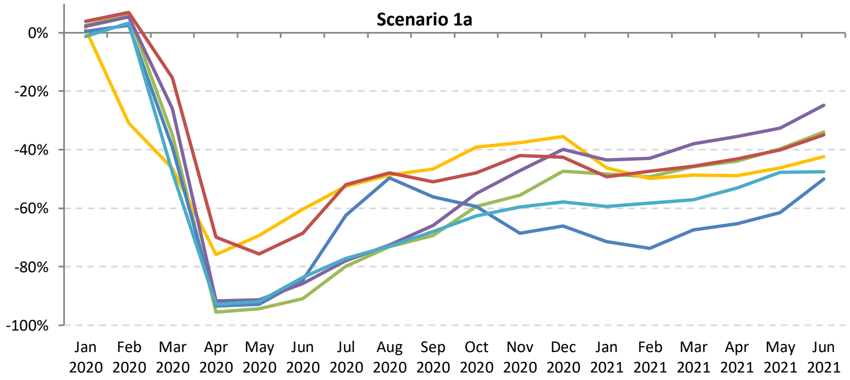
Figures and estimates herein reflect the latest operational data and schedules filed by airlines but are **subject to substantial changes**, and will be updated with the situation evolving and more information available.

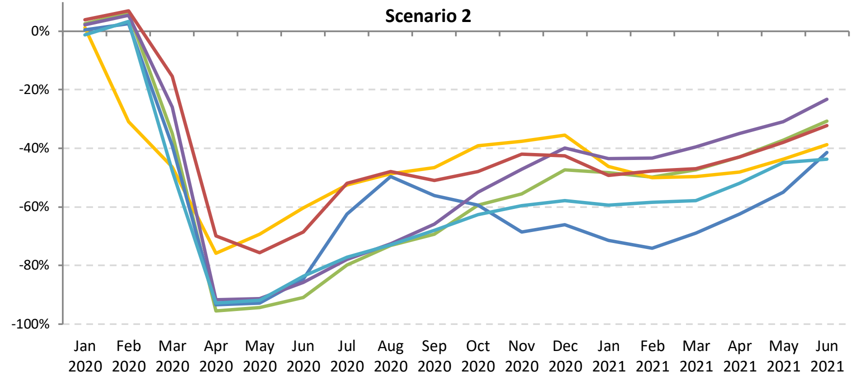
Breakdown by ICAO statistical region

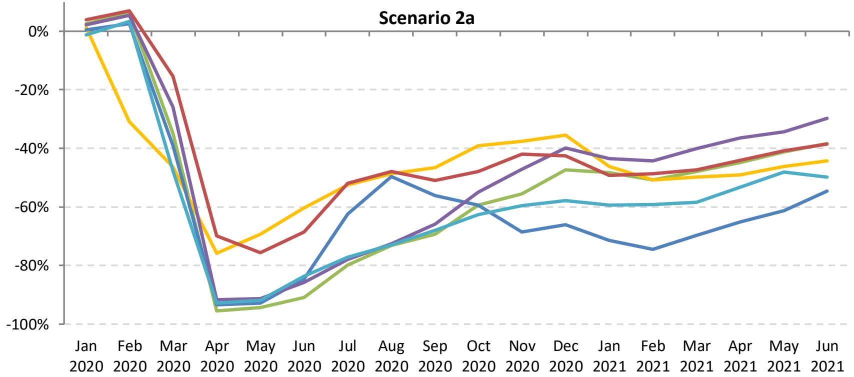
- Regional breakdown follows ICAO's six (6) statistical regions (Doc 9060)
- The same key impact indicators are presented under four (4) paths of two (2) scenarios, in comparison to Baseline scenario, 2019 level and 2020 level, and by international and domestic, as well as month, quarter and year
- To avoid double counting:
  - Number of "international" passengers departing <u>from</u> each country and territory are aggregated in each region
  - Gross passenger operating revenues of all airlines serving "international" routes <u>from</u> each country and territory are aggregated at regional level
- **Appendix C** presents actual results from January to November 2020 by route group (40 international and 10 domestic route groups)

Seat capacity change compared to 2019: International + Domestic



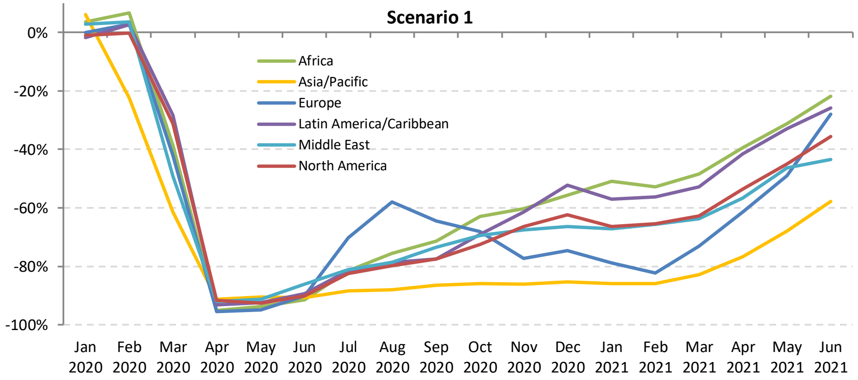


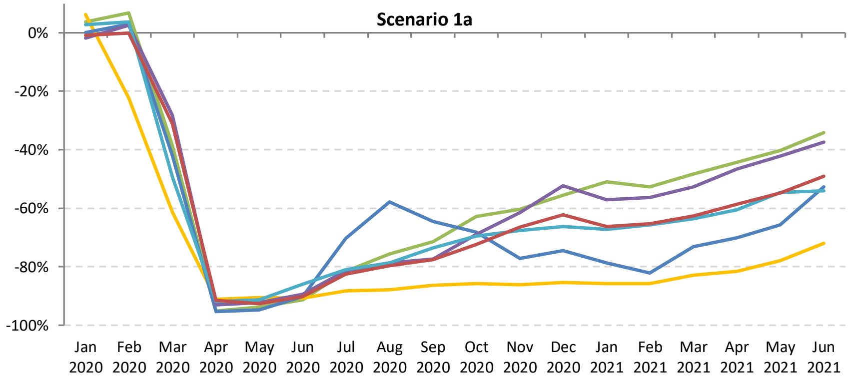


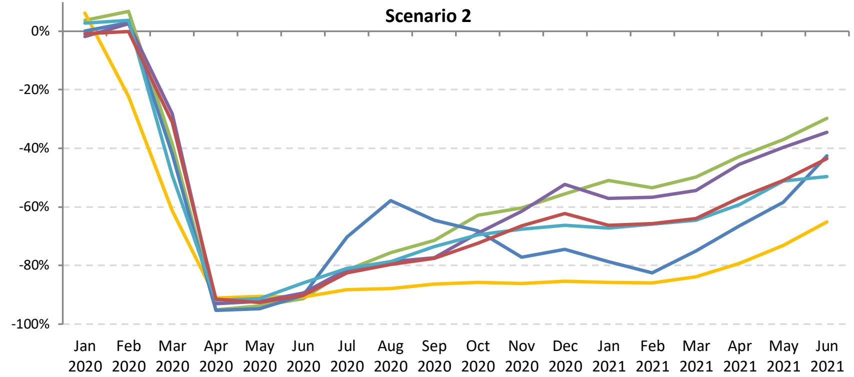


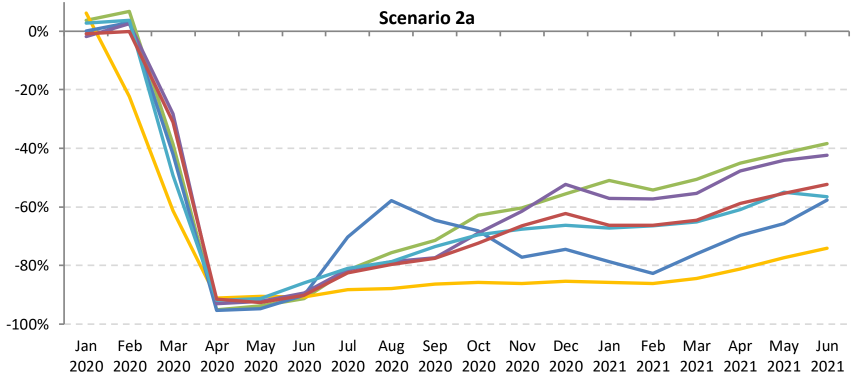
Source: ICAO estimates based on ICAO ADS-B, OAG, Routes Online and airline websites

Seat capacity change compared to 2019: International



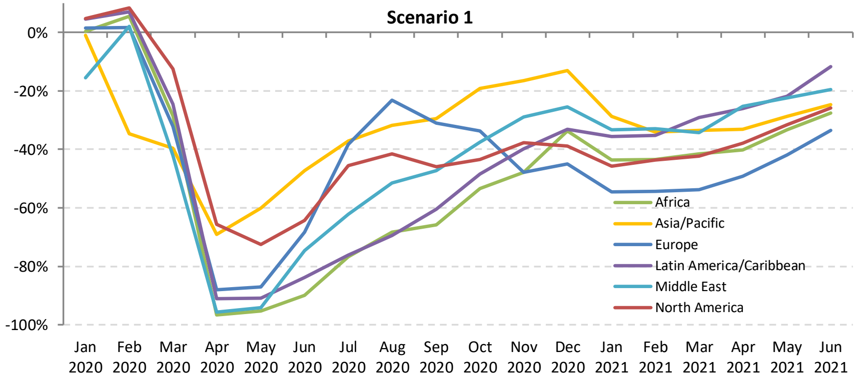


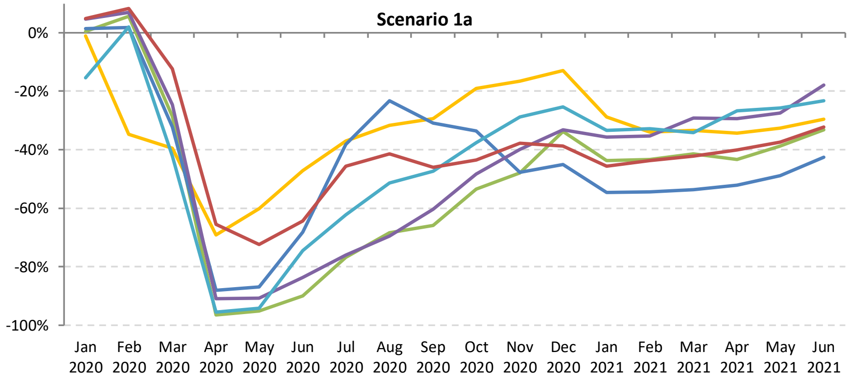


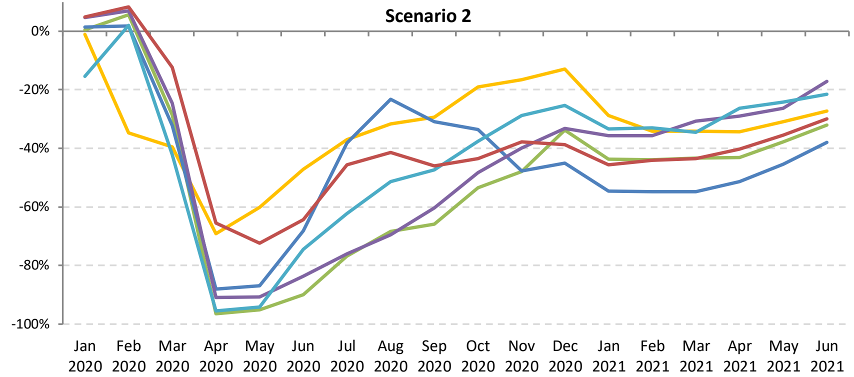


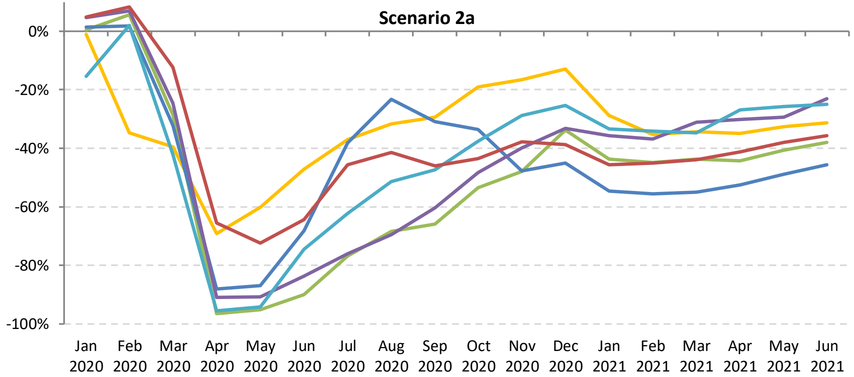
Source: ICAO estimates based on ICAO ADS-B, OAG, Routes Online and airline websites

Seat capacity change compared to 2019: Domestic



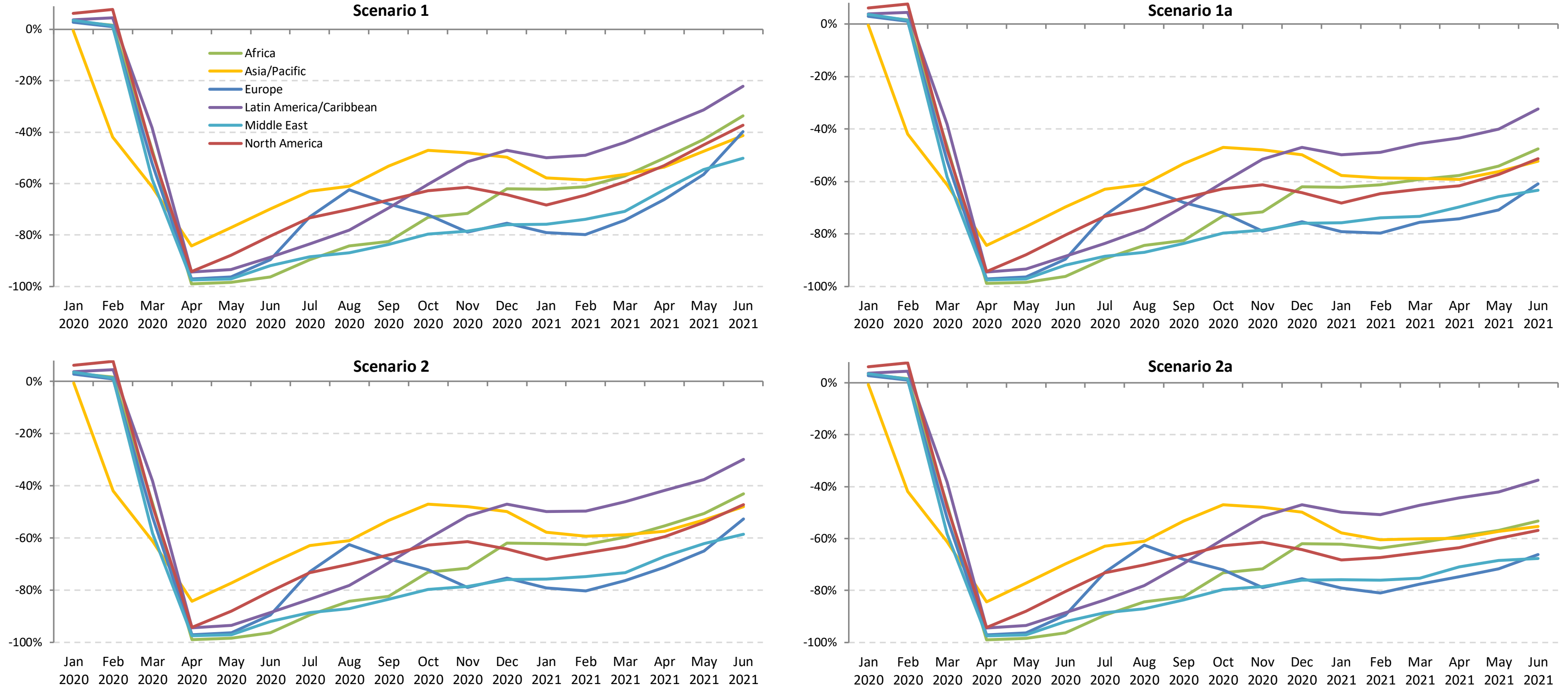






Source: ICAO estimates based on ICAO ADS-B, OAG, Routes Online and airline websites

Passenger number change compared to 2019: International + Domestic



Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO LTF, ICAO Statistical Reporting, IATA Economics, and IMF/World Bank Economic Outlook

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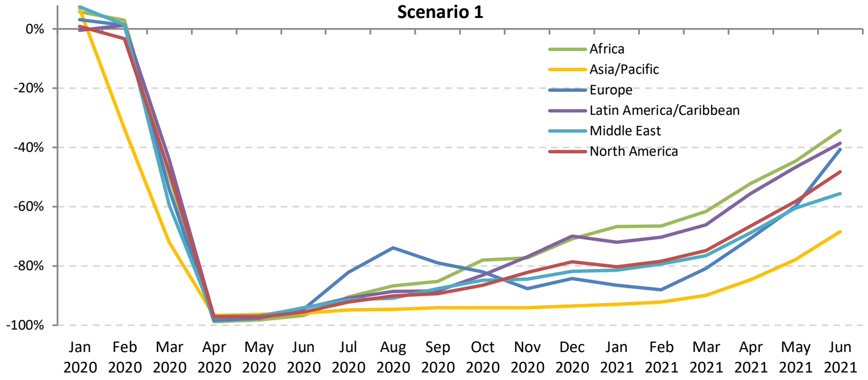
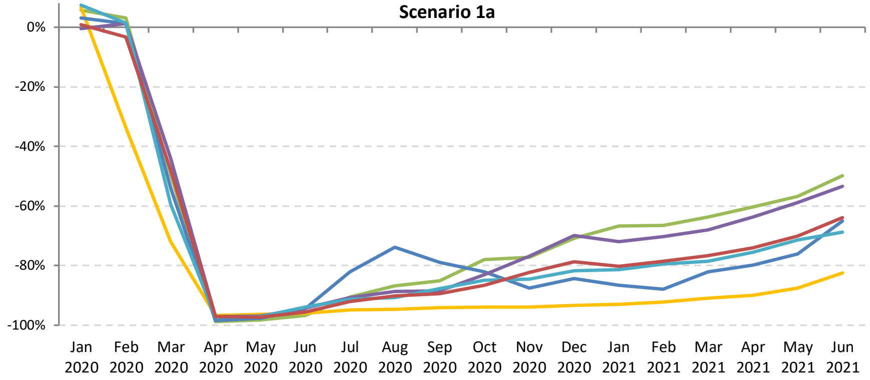
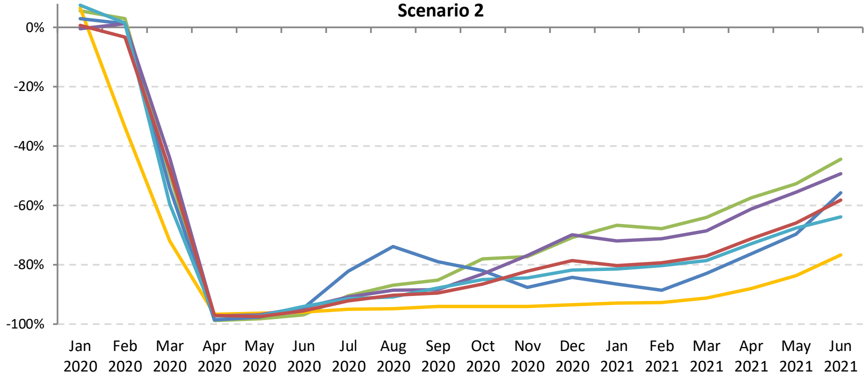
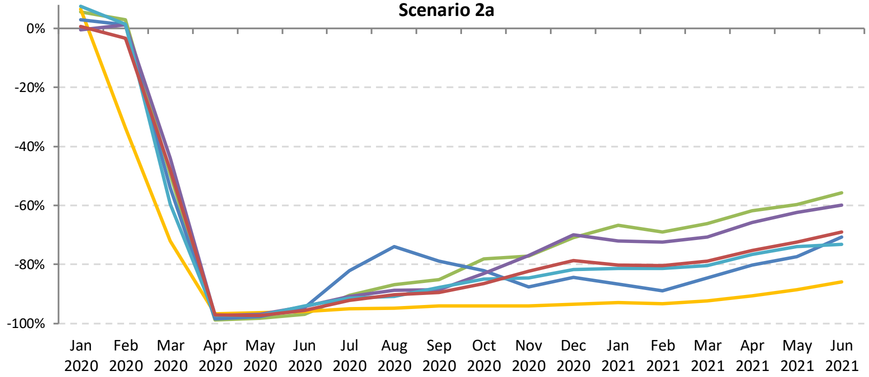
Passenger number change compared to 2019: International









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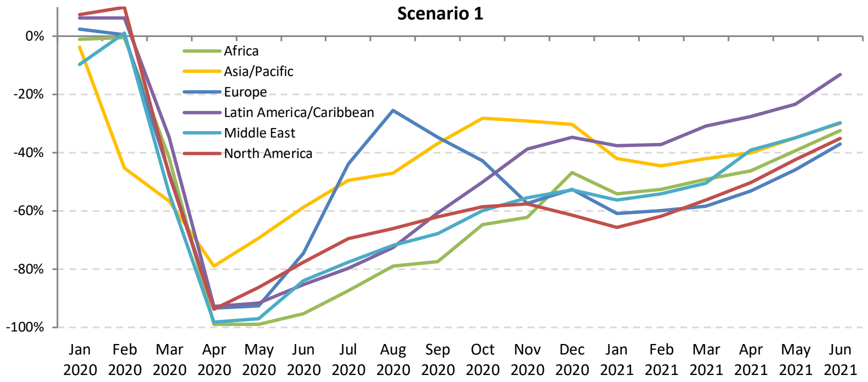
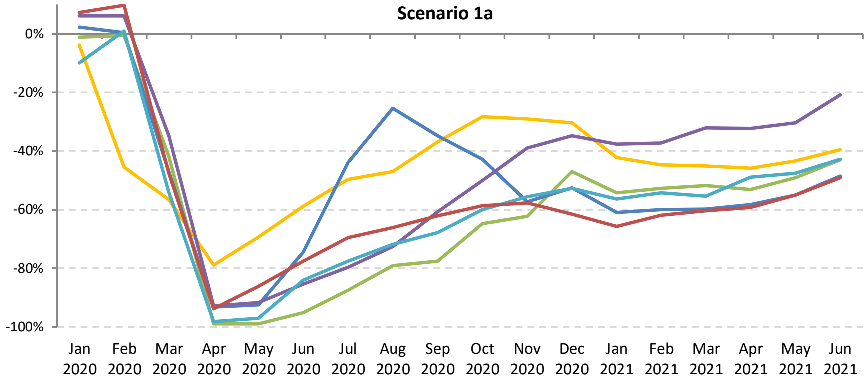
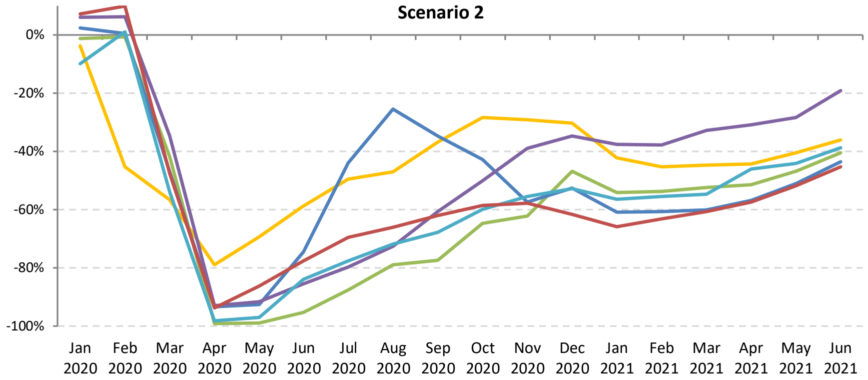
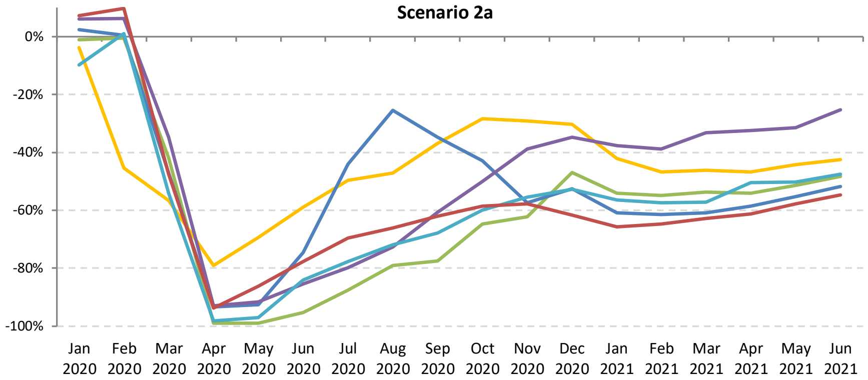
Passenger number change compared to 2019: Domestic





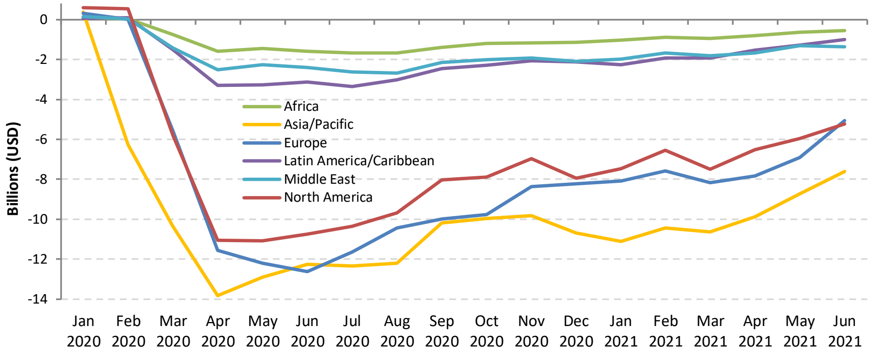




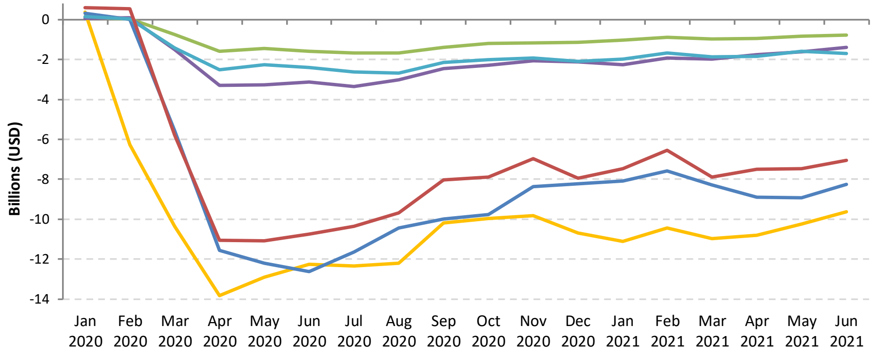
Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO LTF, ICAO Statistical Reporting, IATA Economics, and IMF/World Bank Economic Outlook

Passenger revenue change compared to 2019: International + Domestic

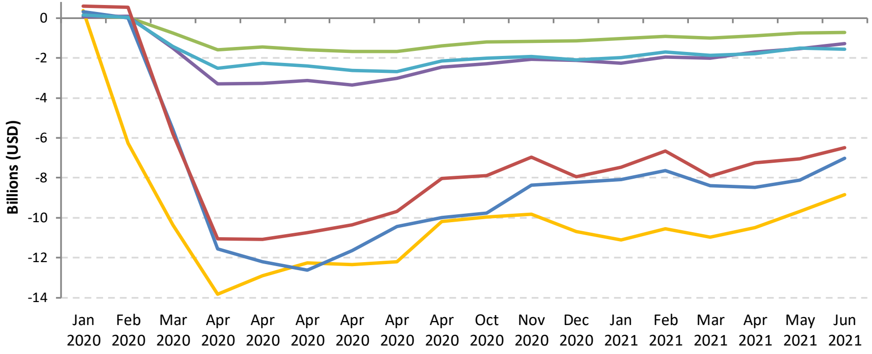
Scenario 1



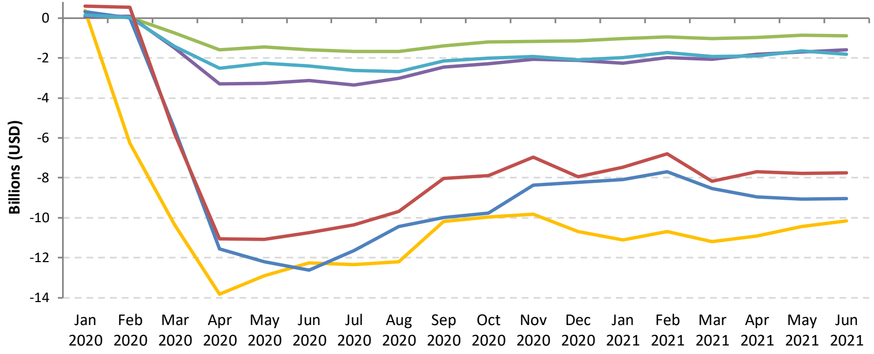
Scenario 1a



Scenario 2



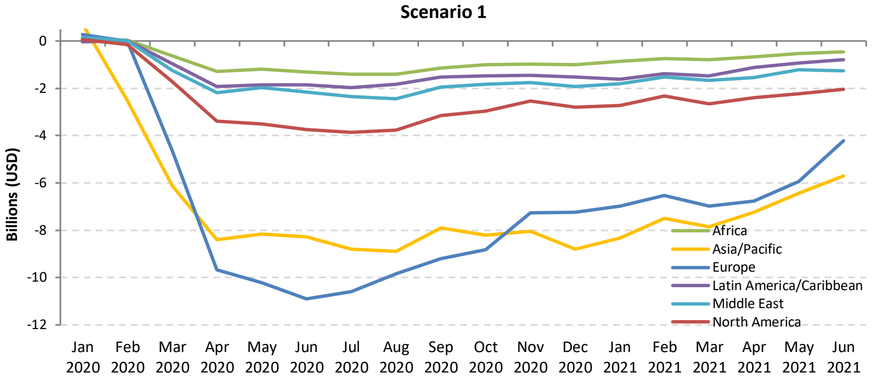
Scenario 2a

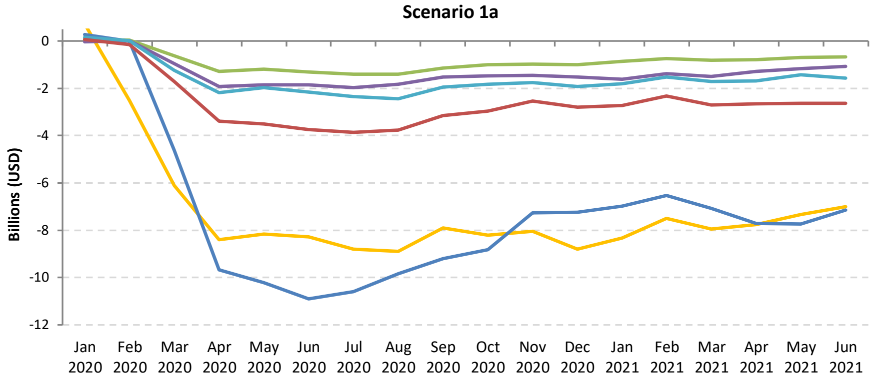


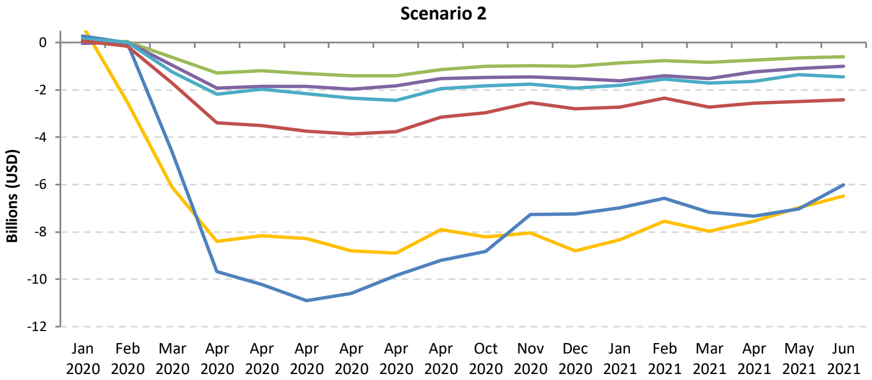
Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO RCA, IATA Economics, and IMF/World Bank Economic Outlook

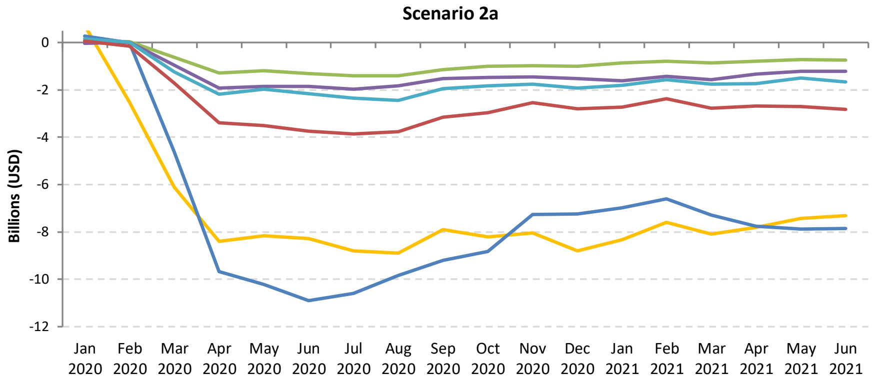
ICAO UNITING AVIATION

Passenger revenue change compared to 2019: International



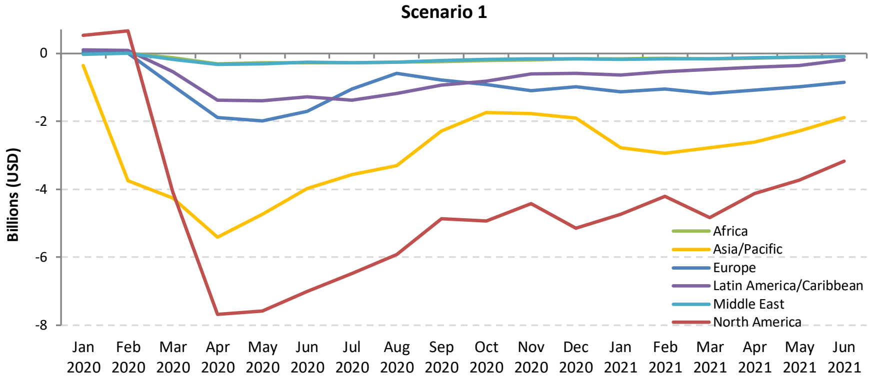


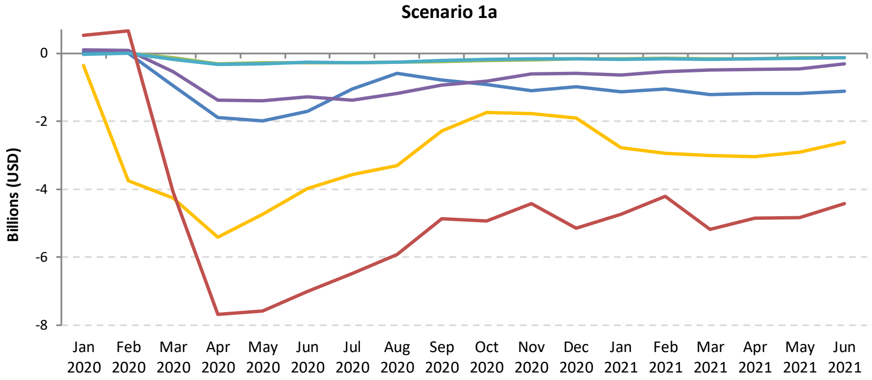


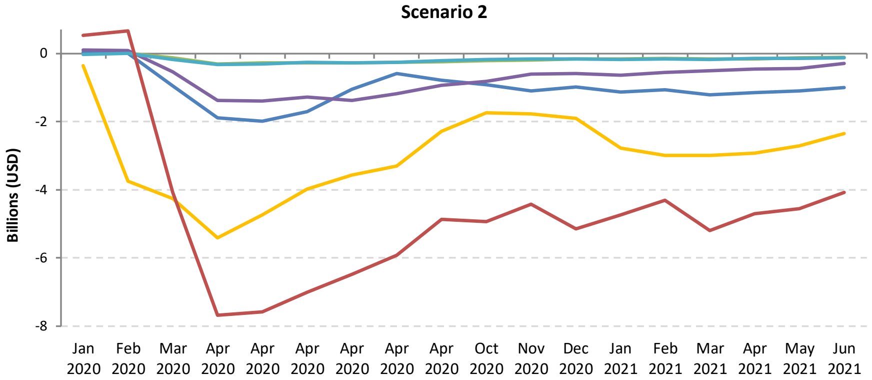


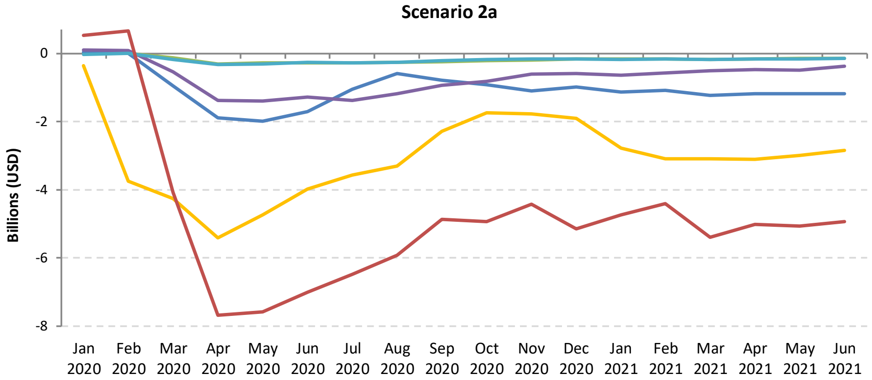
Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO RCA, IATA Economics, and IMF/World Bank Economic Outlook

Passenger revenue change compared to 2019: Domestic







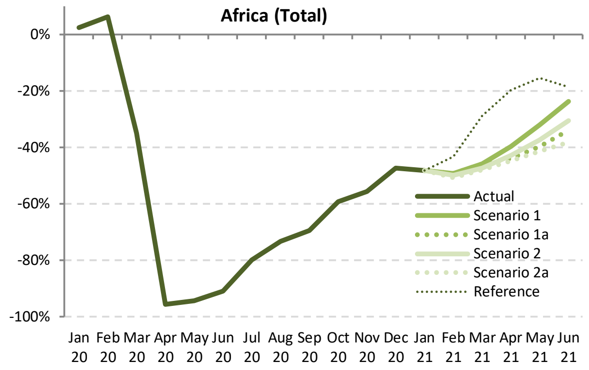


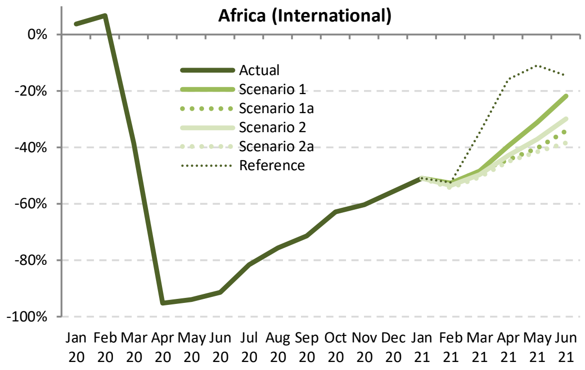
Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO RCA, IATA Economics, and IMF/World Bank Economic Outlook

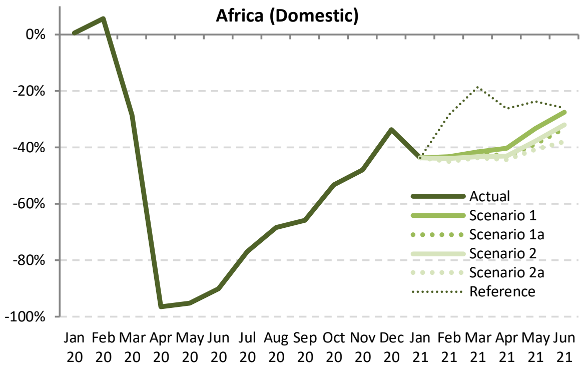
Africa

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-9.2%	-10.0%	-7.9%	-3,972	-14.7%	-2,446	-14.4%	-1,526	-15.2%	-639	-501	-138
2Q 2020	-93.6%	-93.4%	-93.9%	-27,060	-97.9%	-17,663	-97.9%	-9,396	-97.8%	-4,633	-3,781	-852
3Q 2020	-74.3%	-76.3%	-70.3%	-27,056	-85.5%	-18,436	-87.6%	-8,620	-81.3%	-4,719	-3,938	-781
4Q 2020	-54.0%	-59.6%	-44.9%	-19,819	-68.7%	-13,604	-75.3%	-6,215	-57.7%	-3,528	-2,964	-563
Total 2020	**-58.3%**	**-60.8%**	**-53.7%**	**-77,907**	**-67.7%**	**-52,150**	**-70.4%**	**-25,757**	**-62.8%**	**-13,519**	**-11,184**	**-2,335**
1Q 2021	-48.9% to -47.7%	-51.8% to -50.6%	-44.1% to -42.8%	-16,854 to -16,219	-62.4% to -60.1%	-11,399 to -10,998	-67.3% to -64.9%	-5,454 to -5,220	-54.3% to -52.0%	-2,983 to -2,874	-2,489 to -2,401	-494 to -473
2Q 2021	-41.4% to -31.8%	-41.6% to -30.7%	-41.1% to -33.7%	-15,589 to -11,650	-56.4% to -42.1%	-10,652 to -7,848	-59.1% to -43.5%	-4,937 to -3,802	-51.4% to -39.6%	-2,710 to -2,003	-2,263 to -1,658	-448 to -345
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-45.2% to -39.7%**	**-46.6% to -40.4%**	**-42.6% to -38.4%**	**-32,443 to -27,869**	**-59.4% to -51.0%**	**-22,051 to -18,846**	**-63.0% to -53.9%**	**-10,391 to -9,023**	**-52.9% to -45.9%**	**-5,694 to -4,877**	**-4,752 to -4,059**	**-942 to -818**

Seat capacity







Seat Capacity (thousand) - Africa International + Domestic

Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**13,048**	13,971	**13,368**	320	2.5%	-603	-4.3%	14,486	**6,754**	**6,754**	**6,754**	**6,754**	**6,754**	-6,294	-48.2%	-6,614	-49.5%	-7,732	-53.4%
February	**11,569**	12,824	**12,294**	725	6.3%	-529	-4.1%	13,282	**5,875**	**5,875**	**5,795**	**5,698**	**6,548**	-5,871 to -5,693	-50.7% to -49.2%	-6,596 to -6,419	-53.7% to -52.2%	-7,584 to -7,407	-57.1% to -55.8%
March	**12,882**	13,758	**8,384**	-4,497	-34.9%	-5,374	-39.1%	14,009	**6,976**	**6,976**	**6,776**	**6,695**	**9,163**	-6,186 to -5,905	-48.0% to -45.8%	-1,689 to -1,408	-20.1% to -16.8%	-7,314 to -7,033	-52.2% to -50.2%
April	**12,589**	13,368	**550**	-12,039	-95.6%	-12,818	-95.9%	13,896	**7,593**	**7,056**	**7,178**	**6,947**	**10,112**	-5,642 to -4,996	-44.8% to -39.7%	6,398 to 7,043	1163.2% to 1280.6%	-6,948 to -6,303	-50.0% to -45.4%
May	**12,387**	13,285	**704**	-11,684	-94.3%	-12,581	-94.7%	13,918	**8,421**	**7,462**	**7,765**	**7,272**	**10,460**	-5,115 to -3,966	-41.3% to -32.0%	6,568 to 7,717	933.3% to 1096.6%	-6,646 to -5,497	-47.8% to -39.5%
June	**12,962**	13,923	**1,175**	-11,787	-90.9%	-12,748	-91.6%	14,701	**9,872**	**8,568**	**8,990**	**7,998**	**10,551**	-4,963 to -3,089	-38.3% to -23.8%	6,823 to 8,697	580.8% to 740.3%	-6,703 to -4,829	-45.6% to -32.8%
July	**14,134**	14,843	**2,838**	-11,296	-79.9%	-12,005	-80.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	**14,479**	15,014	**3,881**	-10,598	-73.2%	-11,134	-74.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	**13,374**	14,050	**4,086**	-9,287	-69.4%	-9,964	-70.9%	-	-	-	-	-	-	-	-	-	-	-	-
October	**13,313**	13,964	**5,413**	-7,900	-59.3%	-8,550	-61.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**12,870**	13,666	**5,721**	-7,149	-55.5%	-7,944	-58.1%	-	-	-	-	-	-	-	-	-	-	-	-
December	**13,763**	14,829	**7,245**	-6,518	-47.4%	-7,583	-51.1%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**37,498**	40,553	**34,047**	-3,452	-9.2%	-6,507	-16.0%	41,777	**19,605**	**19,605**	**19,325**	**19,147**	**22,465**	-18,351 to -17,893	-48.9% to -47.7%	-14,900 to -14,441	-43.8% to -42.4%	-22,630 to -22,172	-54.2% to -53.1%
2Q	**37,938**	40,575	**2,429**	-35,510	-93.6%	-38,147	-94.0%	42,515	**25,886**	**23,085**	**23,933**	**22,218**	**31,122**	-15,720 to -12,052	-41.4% to -31.8%	19,789 to 23,458	814.8% to 965.9%	-20,297 to -16,628	-47.7% to -39.1%
3Q	**41,986**	43,907	**10,805**	-31,181	-74.3%	-33,102	-75.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**39,946**	42,458	**18,380**	-21,567	-54.0%	-24,078	-56.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**157,369**	167,493	**65,660**	-91,709	-58.3%	-101,833	-60.8%	84,292	**45,492**	**42,690**	**43,258**	**41,365**	**53,587**	-34,072 to -29,945	-45.2% to -39.7%	4,890 to 9,016	13.4% to 24.7%	-42,927 to -38,800	-50.9% to -46.0%

Source: ICAO estimates

Seat capacity

Seat Capacity (thousand) - Africa International

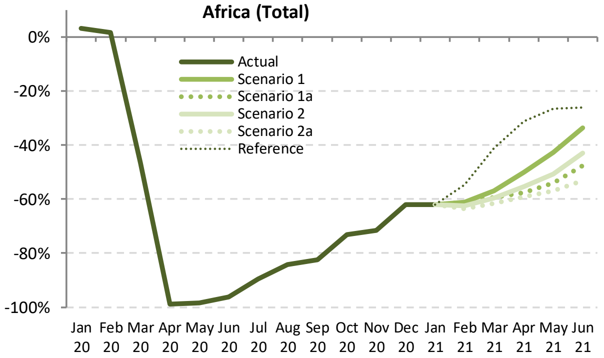
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	8,171	8,853	8,471	300	3.7%	-382	-4.3%	9,075	4,005	4,005	4,005	4,005	4,005	-4,166	-51.0%	-4,465	-52.7%	-5,070	-55.9%
February	7,203	8,142	7,688	485	6.7%	-454	-5.6%	8,400	3,404	3,404	3,348	3,292	3,428	-3,911 to -3,799	-54.3% to -52.7%	-4,396 to -4,284	-57.2% to -55.7%	-5,108 to -4,996	-60.8% to -59.5%
March	8,114	8,793	4,981	-3,133	-38.6%	-3,812	-43.3%	8,903	4,189	4,189	4,075	4,012	5,282	-4,102 to -3,926	-50.6% to -48.4%	-969 to -793	-19.5% to -15.9%	-4,890 to -4,714	-54.9% to -53.0%
April	8,048	8,741	393	-7,655	-95.1%	-8,348	-95.5%	9,245	4,879	4,482	4,598	4,422	6,762	-3,626 to -3,169	-45.1% to -39.4%	4,029 to 4,486	1025.3% to 1141.6%	-4,823 to -4,366	-52.2% to -47.2%
May	7,984	8,719	495	-7,489	-93.8%	-8,224	-94.3%	9,285	5,487	4,767	5,026	4,661	7,103	-3,322 to -2,497	-41.6% to -31.3%	4,167 to 4,992	842.2% to 1009.0%	-4,624 to -3,798	-49.8% to -40.9%
June	8,495	9,291	727	-7,768	-91.4%	-8,564	-92.2%	9,964	6,634	5,588	5,959	5,232	7,249	-3,263 to -1,861	-38.4% to -21.9%	4,505 to 5,907	619.8% to 812.7%	-4,732 to -3,329	-47.5% to -33.4%
July	9,364	9,969	1,731	-7,634	-81.5%	-8,238	-82.6%	-	-	-	-	-	-	-	-	-	-	-	-
August	9,643	10,171	2,349	-7,294	-75.6%	-7,822	-76.9%	-	-	-	-	-	-	-	-	-	-	-	-
September	8,574	9,168	2,448	-6,126	-71.5%	-6,721	-73.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	8,296	8,800	3,075	-5,221	-62.9%	-5,725	-65.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	7,916	8,486	3,140	-4,776	-60.3%	-5,346	-63.0%	-	-	-	-	-	-	-	-	-	-	-	-
December	8,562	9,275	3,799	-4,762	-55.6%	-5,476	-59.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	23,488	25,788	21,140	-2,348	-10.0%	-4,648	-18.0%	26,378	11,598	11,598	11,428	11,310	12,715	-12,178 to -11,890	-51.8% to -50.6%	-9,830 to -9,542	-46.5% to -45.1%	-15,068 to -14,780	-57.1% to -56.0%
2Q	24,527	26,751	1,615	-22,913	-93.4%	-25,137	-94.0%	28,493	17,000	14,837	15,583	14,315	21,114	-10,212 to -7,527	-41.6% to -30.7%	12,701 to 15,386	786.6% to 952.9%	-14,178 to -11,493	-49.8% to -40.3%
3Q	27,581	29,308	6,527	-21,054	-76.3%	-22,781	-77.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	24,774	26,561	10,015	-14,759	-59.6%	-16,547	-62.3%	-	-	-	-	-	-	-	-	-	-	-	-
Total	100,370	108,409	39,296	-61,074	-60.8%	-69,113	-63.8%	54,871	28,598	26,435	27,011	25,625	33,830	-22,390 to -19,417	-46.6% to -40.4%	2,871 to 5,844	12.6% to 25.7%	-29,246 to -26,273	-53.3% to -47.9%

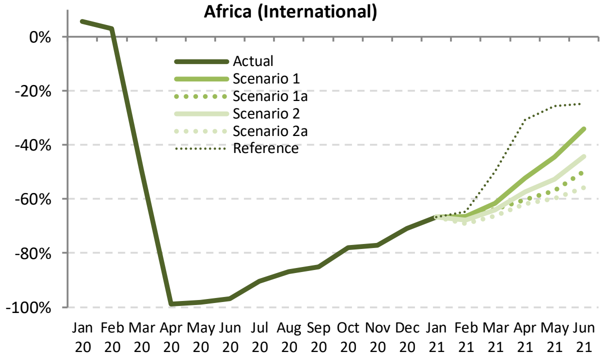
Seat Capacity (thousand) - Africa Domestic

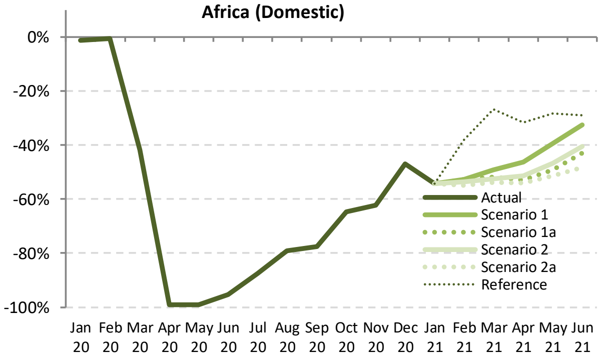
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	4,877	5,119	4,897	21	0.4%	-221	-4.3%	5,411	2,748	2,748	2,748	2,748	2,748	-2,128	-43.6%	-2,149	-43.9%	-2,662	-49.2%
February	4,366	4,682	4,606	240	5.5%	-75	-1.6%	4,882	2,471	2,471	2,446	2,406	3,120	-1,960 to -1,895	-44.9% to -43.4%	-2,201 to -2,135	-47.8% to -46.4%	-2,476 to -2,411	-50.7% to -49.4%
March	4,767	4,965	3,403	-1,364	-28.6%	-1,562	-31.5%	5,106	2,787	2,787	2,702	2,683	3,881	-2,084 to -1,980	-43.7% to -41.5%	-720 to -616	-21.2% to -18.1%	-2,424 to -2,319	-47.5% to -45.4%
April	4,541	4,627	157	-4,384	-96.5%	-4,469	-96.6%	4,651	2,714	2,574	2,580	2,526	3,350	-2,015 to -1,827	-44.4% to -40.2%	2,369 to 2,557	1508.3% to 1628.2%	-2,125 to -1,937	-45.7% to -41.6%
May	4,404	4,566	209	-4,195	-95.3%	-4,357	-95.4%	4,633	2,934	2,695	2,739	2,611	3,356	-1,793 to -1,470	-40.7% to -33.4%	2,402 to 2,725	1149.2% to 1303.9%	-2,022 to -1,699	-43.7% to -36.7%
June	4,466	4,632	448	-4,018	-90.0%	-4,184	-90.3%	4,737	3,238	2,980	3,031	2,766	3,302	-1,700 to -1,228	-38.1% to -27.5%	2,318 to 2,790	517.5% to 622.8%	-1,971 to -1,499	-41.6% to -31.6%
July	4,770	4,874	1,107	-3,663	-76.8%	-3,767	-77.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	4,836	4,843	1,532	-3,304	-68.3%	-3,311	-68.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	4,800	4,881	1,639	-3,161	-65.9%	-3,243	-66.4%	-	-	-	-	-	-	-	-	-	-	-	-
October	5,017	5,163	2,338	-2,679	-53.4%	-2,825	-54.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	4,954	5,180	2,581	-2,373	-47.9%	-2,598	-50.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	5,202	5,554	3,446	-1,756	-33.8%	-2,108	-38.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	14,010	14,765	12,907	-1,103	-7.9%	-1,859	-12.6%	15,399	8,007	8,007	7,896	7,837	9,750	-6,173 to -6,003	-44.1% to -42.8%	-5,070 to -4,899	-39.3% to -38.0%	-7,562 to -7,392	-49.1% to -48.0%
2Q	13,411	13,824	814	-12,597	-93.9%	-13,010	-94.1%	14,021	8,886	8,248	8,350	7,903	10,008	-5,508 to -4,525	-41.1% to -33.7%	7,089 to 8,072	870.8% to 991.6%	-6,119 to -5,135	-43.6% to -36.6%
3Q	14,405	14,599	4,278	-10,128	-70.3%	-10,321	-70.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	15,172	15,896	8,365	-6,807	-44.9%	-7,531	-47.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	56,999	59,084	26,364	-30,635	-53.7%	-32,721	-55.4%	29,420	16,893	16,255	16,246	15,739	19,758	-11,681 to -10,527	-42.6% to -38.4%	2,019 to 3,173	14.7% to 23.1%	-13,681 to -12,527	-46.5% to -42.6%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - Africa International + Domestic

Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**9,279**	9,958	**9,573**	294	3.2%	-385	-3.9%	10,346	**3,513**	**3,513**	**3,513**	**3,513**	**3,513**	-5,766	-62.1%	-6,060	-63.3%	-6,833	-66.0%
February	**8,290**	9,203	**8,427**	137	1.6%	-777	-8.4%	9,555	**3,210**	**3,210**	**3,113**	**3,008**	**3,754**	-5,282 to -5,080	-63.7% to -61.3%	-5,418 to -5,216	-64.3% to -61.9%	-6,547 to -6,345	-68.5% to -66.4%
March	**9,427**	10,078	**5,025**	-4,403	-46.7%	-5,054	-50.1%	10,284	**4,054**	**3,838**	**3,798**	**3,621**	**5,540**	-5,806 to -5,373	-61.6% to -57.0%	-1,403 to -970	-27.9% to -19.3%	-6,662 to -6,229	-64.8% to -60.6%
April	**9,492**	10,114	**103**	-9,389	-98.9%	-10,011	-99.0%	10,564	**4,735**	**4,014**	**4,243**	**3,885**	**6,538**	-5,608 to -4,757	-59.1% to -50.1%	3,782 to 4,633	3682.9% to 4511.5%	-6,679 to -5,828	-63.2% to -55.2%
May	**8,653**	9,291	**130**	-8,524	-98.5%	-9,162	-98.6%	9,754	**4,954**	**3,966**	**4,271**	**3,731**	**6,354**	-4,923 to -3,699	-56.9% to -42.7%	3,601 to 4,824	2772.7% to 3714.8%	-6,024 to -4,800	-61.8% to -49.2%
June	**9,498**	10,250	**352**	-9,146	-96.3%	-9,898	-96.6%	10,895	**6,304**	**4,978**	**5,407**	**4,440**	**7,012**	-5,059 to -3,194	-53.3% to -33.6%	4,088 to 5,952	1162.5% to 1692.7%	-6,456 to -4,592	-59.3% to -42.1%
July	**10,663**	11,233	**1,117**	-9,547	-89.5%	-10,116	-90.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	**11,167**	11,618	**1,752**	-9,415	-84.3%	-9,866	-84.9%	-	-	-	-	-	-	-	-	-	-	-	-
September	**9,818**	10,345	**1,723**	-8,095	-82.4%	-8,621	-83.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**9,519**	9,998	**2,556**	-6,962	-73.1%	-7,442	-74.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	**9,222**	9,805	**2,622**	-6,601	-71.6%	-7,183	-73.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**10,098**	10,898	**3,842**	-6,256	-61.9%	-7,056	-64.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**26,996**	29,240	**23,024**	-3,972	-14.7%	-6,216	-21.3%	30,184	**10,778**	**10,561**	**10,424**	**10,143**	**12,808**	-16,854 to -16,219	-62.4% to -60.1%	-12,882 to -12,247	-55.9% to -53.2%	-20,042 to -19,407	-66.4% to -64.3%
2Q	**27,644**	29,655	**584**	-27,060	-97.9%	-29,071	-98.0%	31,213	**15,993**	**12,959**	**13,921**	**12,055**	**19,904**	-15,589 to -11,650	-56.4% to -42.1%	11,471 to 15,409	1963.5% to 2637.7%	-19,158 to -15,220	-61.4% to -48.8%
3Q	**31,649**	33,196	**4,592**	-27,056	-85.5%	-28,603	-86.2%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**28,839**	30,701	**9,020**	-19,819	-68.7%	-21,680	-70.6%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**115,128**	122,792	**37,221**	-77,907	-67.7%	-85,571	-69.7%	61,398	**26,771**	**23,520**	**24,345**	**22,197**	**32,711**	-32,443 to -27,869	-59.4% to -51.0%	-1,411 to 3,163	-6.0% to 13.4%	-39,200 to -34,627	-63.8% to -56.4%

Passenger number

Passenger Number (thousand) - Africa International

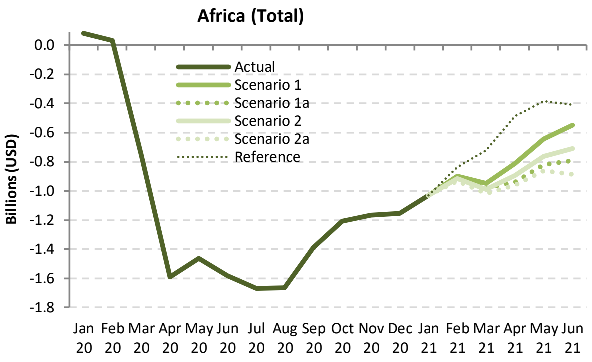
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	5,871	6,378	6,206	335	5.7%	-172	-2.7%	6,558	1,953	1,953	1,953	1,953	1,953	-3,919	-66.7%	-4,253	-68.5%	-4,605	-70.2%
February	5,149	5,832	5,305	156	3.0%	-527	-9.0%	6,037	1,725	1,725	1,658	1,593	1,813	-3,556 to -3,425	-69.1% to -66.5%	-3,712 to -3,581	-70.0% to -67.5%	-4,444 to -4,312	-73.6% to -71.4%
March	5,929	6,432	2,992	-2,937	-49.5%	-3,440	-53.5%	6,530	2,274	2,150	2,133	2,005	2,980	-3,925 to -3,655	-66.2% to -61.6%	-988 to -718	-33.0% to -24.0%	-4,526 to -4,256	-69.3% to -65.2%
April	6,091	6,646	71	-6,020	-98.8%	-6,574	-98.9%	7,074	2,910	2,416	2,593	2,324	4,214	-3,767 to -3,180	-61.8% to -52.2%	2,253 to 2,839	3165.8% to 3989.8%	-4,750 to -4,163	-67.1% to -58.9%
May	5,633	6,157	100	-5,533	-98.2%	-6,057	-98.4%	6,571	3,123	2,430	2,665	2,266	4,188	-3,368 to -2,511	-59.8% to -44.6%	2,165 to 3,022	2159.8% to 3014.7%	-4,306 to -3,449	-65.5% to -52.5%
June	6,311	6,941	200	-6,111	-96.8%	-6,741	-97.1%	7,509	4,154	3,163	3,509	2,793	4,750	-3,517 to -2,157	-55.7% to -34.2%	2,593 to 3,954	1295.1% to 1974.7%	-4,715 to -3,354	-62.8% to -44.7%
July	7,156	7,645	679	-6,477	-90.5%	-6,966	-91.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	7,547	7,989	994	-6,553	-86.8%	-6,996	-87.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	6,349	6,814	943	-5,406	-85.1%	-5,871	-86.2%	-	-	-	-	-	-	-	-	-	-	-	-
October	6,002	6,376	1,318	-4,684	-78.0%	-5,058	-79.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	5,733	6,153	1,305	-4,428	-77.2%	-4,847	-78.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	6,340	6,882	1,848	-4,493	-70.9%	-5,035	-73.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	16,949	18,642	14,503	-2,446	-14.4%	-4,139	-22.2%	19,125	5,951	5,827	5,744	5,550	6,745	-11,399 to -10,998	-67.3% to -64.9%	-8,953 to -8,552	-61.7% to -59.0%	-13,575 to -13,174	-71.0% to -68.9%
2Q	18,035	19,745	372	-17,663	-97.9%	-19,373	-98.1%	21,154	10,187	8,009	8,767	7,383	13,152	-10,652 to -7,848	-59.1% to -43.5%	7,011 to 9,815	1886.6% to 2641.1%	-13,771 to -10,967	-65.1% to -51.8%
3Q	21,052	22,448	2,616	-18,436	-87.6%	-19,833	-88.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	18,075	19,411	4,471	-13,604	-75.3%	-14,940	-77.0%	-	-	-	-	-	-	-	-	-	-	-	-
Total	74,111	80,246	21,961	-52,150	-70.4%	-58,284	-72.6%	40,278	16,138	13,835	14,511	12,933	19,897	-22,051 to -18,846	-63.0% to -53.9%	-1,942 to 1,263	-13.1% to 8.5%	-27,345 to -24,140	-67.9% to -59.9%

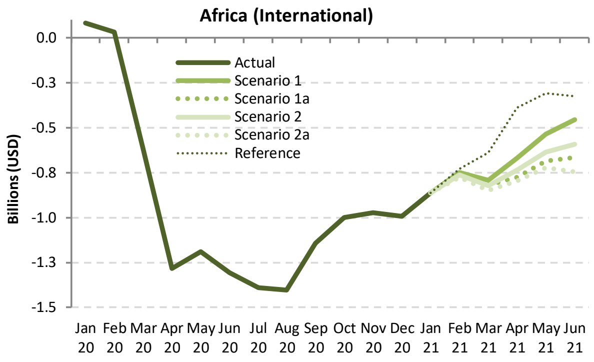
Passenger Number (thousand) - Africa Domestic

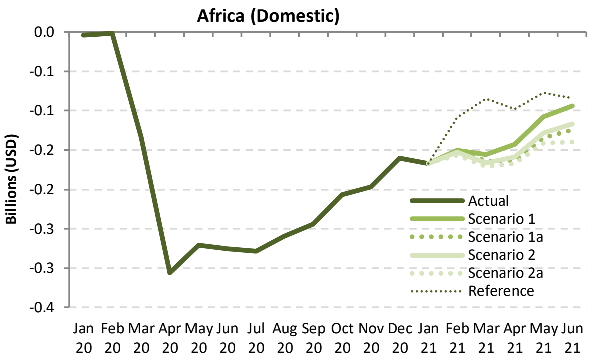
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	3,408	3,580	3,367	-41	-1.2%	-213	-6.0%	3,788	1,561	1,561	1,561	1,561	1,561	-1,847	-54.2%	-1,807	-53.7%	-2,227	-58.8%
February	3,141	3,371	3,121	-19	-0.6%	-250	-7.4%	3,518	1,486	1,486	1,455	1,415	1,942	-1,726 to -1,655	-54.9% to -52.7%	-1,706 to -1,636	-54.7% to -52.4%	-2,103 to -2,033	-59.8% to -57.8%
March	3,498	3,646	2,032	-1,466	-41.9%	-1,614	-44.3%	3,753	1,780	1,688	1,665	1,617	2,561	-1,881 to -1,718	-53.8% to -49.1%	-416 to -252	-20.5% to -12.4%	-2,137 to -1,973	-56.9% to -52.6%
April	3,401	3,469	32	-3,370	-99.1%	-3,437	-99.1%	3,490	1,825	1,598	1,650	1,561	2,324	-1,841 to -1,576	-54.1% to -46.3%	1,529 to 1,794	4849.9% to 5689.2%	-1,929 to -1,665	-55.3% to -47.7%
May	3,020	3,134	30	-2,990	-99.0%	-3,104	-99.1%	3,183	1,832	1,537	1,606	1,465	2,166	-1,555 to -1,188	-51.5% to -39.4%	1,436 to 1,802	4847.3% to 6084.4%	-1,718 to -1,351	-54.0% to -42.5%
June	3,187	3,308	151	-3,036	-95.2%	-3,157	-95.4%	3,387	2,150	1,816	1,898	1,646	2,262	-1,541 to -1,038	-48.4% to -32.6%	1,495 to 1,998	987.2% to 1319.7%	-1,741 to -1,237	-51.4% to -36.5%
July	3,508	3,588	438	-3,070	-87.5%	-3,150	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	3,620	3,629	758	-2,862	-79.0%	-2,871	-79.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	3,469	3,531	780	-2,688	-77.5%	-2,750	-77.9%	-	-	-	-	-	-	-	-	-	-	-	-
October	3,517	3,622	1,238	-2,278	-64.8%	-2,384	-65.8%	-	-	-	-	-	-	-	-	-	-	-	-
November	3,490	3,652	1,317	-2,173	-62.3%	-2,335	-63.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	3,758	4,016	1,995	-1,763	-46.9%	-2,021	-50.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	10,047	10,598	8,521	-1,526	-15.2%	-2,077	-19.6%	11,060	4,827	4,734	4,680	4,592	6,063	-5,454 to -5,220	-54.3% to -52.0%	-3,928 to -3,694	-46.1% to -43.4%	-6,467 to -6,233	-58.5% to -56.4%
2Q	9,609	9,911	213	-9,396	-97.8%	-9,698	-97.9%	10,060	5,806	4,951	5,154	4,672	6,751	-4,937 to -3,802	-51.4% to -39.6%	4,459 to 5,594	2097.9% to 2631.6%	-5,388 to -4,253	-53.6% to -42.3%
3Q	10,597	10,748	1,977	-8,620	-81.3%	-8,771	-81.6%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	10,764	11,290	4,550	-6,215	-57.7%	-6,741	-59.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	41,016	42,546	15,260	-25,757	-62.8%	-27,286	-64.1%	21,119	10,633	9,685	9,834	9,264	12,814	-10,391 to -9,023	-52.9% to -45.9%	531 to 1,900	6.1% to 21.7%	-11,855 to -10,486	-56.1% to -49.7%

Source: ICAO estimates

Passenger revenue







Passenger revenue (USD, million) - Africa International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**1,599**	1,716	**1,678**	80	5.0%	-37	-2.2%	1,763	**568**	**568**	**568**	**568**	**568**	-1,030	-64.5%	-1,110	-66.1%	-1,194	-67.8%
February	**1,409**	1,573	**1,441**	32	2.3%	-132	-8.4%	1,616	**512**	**512**	**495**	**477**	**572**	-933 to -898	-66.2% to -63.7%	-965 to -929	-66.9% to -64.5%	-1,139 to -1,104	-70.5% to -68.3%
March	**1,605**	1,721	**854**	-750	-46.8%	-866	-50.4%	1,740	**658**	**623**	**617**	**585**	**881**	-1,020 to -946	-63.6% to -59.0%	-270 to -196	-31.6% to -22.9%	-1,155 to -1,081	-66.4% to -62.2%
April	**1,611**	1,720	**21**	-1,589	-98.7%	-1,699	-98.8%	1,802	**800**	**672**	**715**	**649**	**1,124**	-962 to -811	-59.7% to -50.4%	627 to 778	2919.9% to 3622.8%	-1,153 to -1,002	-64.0% to -55.6%
May	**1,489**	1,605	**27**	-1,462	-98.2%	-1,577	-98.3%	1,687	**846**	**669**	**726**	**627**	**1,104**	-862 to -644	-57.9% to -43.2%	600 to 818	2188.1% to 2985.6%	-1,060 to -841	-62.8% to -49.9%
June	**1,644**	1,769	**62**	-1,582	-96.2%	-1,706	-96.5%	1,880	**1,096**	**853**	**935**	**758**	**1,235**	-886 to -548	-53.9% to -33.3%	696 to 1,034	1113.3% to 1654.8%	-1,122 to -784	-59.7% to -41.7%
July	**1,857**	1,949	**188**	-1,669	-89.9%	-1,762	-90.4%	-	-	-	-	-	-	-	-	-	-	-	-
August	**1,948**	2,025	**286**	-1,663	-85.3%	-1,740	-85.9%	-	-	-	-	-	-	-	-	-	-	-	-
September	**1,673**	1,766	**286**	-1,388	-82.9%	-1,481	-83.8%	-	-	-	-	-	-	-	-	-	-	-	-
October	**1,615**	1,691	**408**	-1,207	-74.8%	-1,284	-75.9%	-	-	-	-	-	-	-	-	-	-	-	-
November	**1,574**	1,664	**406**	-1,168	-74.2%	-1,258	-75.6%	-	-	-	-	-	-	-	-	-	-	-	-
December	**1,738**	1,867	**585**	-1,153	-66.3%	-1,282	-68.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**4,613**	5,009	**3,974**	-639	-13.8%	-1,036	-20.7%	5,118	**1,738**	**1,703**	**1,680**	**1,630**	**2,022**	-2,983 to -2,874	-64.7% to -62.3%	-2,344 to -2,236	-59.0% to -56.3%	-3,488 to -3,380	-68.2% to -66.0%
2Q	**4,744**	5,094	**111**	-4,633	-97.7%	-4,983	-97.8%	5,368	**2,742**	**2,195**	**2,377**	**2,034**	**3,464**	-2,710 to -2,003	-57.1% to -42.2%	1,922 to 2,630	1726.3% to 2361.9%	-3,335 to -2,627	-62.1% to -48.9%
3Q	**5,478**	5,741	**759**	-4,719	-86.1%	-4,982	-86.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**4,926**	5,223	**1,398**	-3,528	-71.6%	-3,824	-73.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**19,762**	21,067	**6,243**	-13,519	-68.4%	-14,824	-70.4%	10,486	**4,480**	**3,898**	**4,057**	**3,664**	**5,486**	-5,694 to -4,877	-60.8% to -52.1%	-422 to 395	-10.3% to 9.7%	-6,823 to -6,006	-65.1% to -57.3%

Passenger revenue

Passenger revenue (USD, million) - Africa International																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	1,290	1,391	1,373	83	6.5%	-18	-1.3%	1,419	427	427	427	427	427	-863	-66.9%	-946	-68.9%	-992	-69.9%
February	1,125	1,267	1,158	34	3.0%	-109	-8.6%	1,297	377	377	363	349	396	-776 to -748	-69.0% to -66.5%	-810 to -781	-69.9% to -67.4%	-948 to -920	-73.1% to -70.9%
March	1,288	1,390	670	-618	-48.0%	-720	-51.8%	1,399	497	470	466	438	649	-849 to -791	-66.0% to -61.4%	-232 to -173	-34.6% to -25.9%	-961 to -903	-68.7% to -64.5%
April	1,303	1,406	19	-1,284	-98.6%	-1,387	-98.7%	1,485	634	528	566	507	914	-795 to -668	-61.1% to -51.3%	489 to 616	2623.7% to 3305.8%	-978 to -851	-65.8% to -57.3%
May	1,215	1,321	25	-1,191	-98.0%	-1,296	-98.1%	1,398	680	530	581	494	907	-721 to -536	-59.3% to -44.1%	470 to 655	1899.3% to 2649.1%	-904 to -719	-64.6% to -51.4%
June	1,355	1,469	49	-1,307	-96.4%	-1,420	-96.7%	1,573	902	689	763	609	1,030	-746 to -454	-55.1% to -33.5%	560 to 853	1148.8% to 1749.2%	-964 to -672	-61.3% to -42.7%
July	1,539	1,624	148	-1,391	-90.4%	-1,476	-90.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	1,620	1,696	217	-1,403	-86.6%	-1,479	-87.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	1,359	1,446	215	-1,144	-84.2%	-1,231	-85.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	1,296	1,363	295	-1,001	-77.2%	-1,068	-78.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	1,258	1,333	287	-971	-77.2%	-1,047	-78.5%	-	-	-	-	-	-	-	-	-	-	-	-
December	1,397	1,503	404	-993	-71.1%	-1,099	-73.1%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	3,702	4,049	3,202	-501	-13.5%	-847	-20.9%	4,115	1,301	1,274	1,256	1,213	1,473	-2,489 to -2,401	-67.2% to -64.9%	-1,988 to -1,901	-62.1% to -59.4%	-2,902 to -2,815	-70.5% to -68.4%
2Q	3,873	4,196	92	-3,781	-97.6%	-4,104	-97.8%	4,457	2,215	1,746	1,909	1,610	2,852	-2,263 to -1,658	-58.4% to -42.8%	1,518 to 2,123	1648.5% to 2305.5%	-2,846 to -2,241	-63.9% to -50.3%
3Q	4,518	4,767	580	-3,938	-87.2%	-4,187	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	3,950	4,199	986	-2,964	-75.0%	-3,213	-76.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	16,044	17,210	4,860	-11,184	-69.7%	-12,351	-71.8%	8,572	3,516	3,020	3,165	2,824	4,324	-4,752 to -4,059	-62.7% to -53.6%	-470 to 223	-14.3% to 6.8%	-5,748 to -5,056	-67.1% to -59.0%

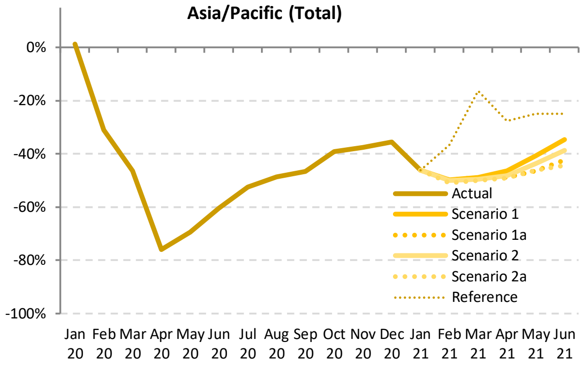
Passenger revenue (USD, million) - Africa Domestic																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	309	325	305	-4	-1.2%	-19	-6.0%	343	141	141	141	141	141	-167	-54.2%	-164	-53.7%	-202	-58.8%
February	285	306	283	-2	-0.6%	-23	-7.4%	319	135	135	132	128	176	-156 to -150	-54.9% to -52.7%	-155 to -148	-54.7% to -52.4%	-191 to -184	-59.8% to -57.8%
March	317	331	184	-133	-41.9%	-146	-44.3%	340	161	153	151	147	232	-171 to -156	-53.8% to -49.1%	-38 to -23	-20.5% to -12.4%	-194 to -179	-56.9% to -52.6%
April	308	314	3	-305	-99.1%	-312	-99.1%	316	165	145	150	141	211	-167 to -143	-54.1% to -46.3%	139 to 163	4849.9% to 5689.2%	-175 to -151	-55.3% to -47.7%
May	274	284	3	-271	-99.0%	-281	-99.1%	289	166	139	146	133	196	-141 to -108	-51.5% to -39.4%	130 to 163	4847.3% to 6084.4%	-156 to -122	-54.0% to -42.5%
June	289	300	14	-275	-95.2%	-286	-95.4%	307	195	165	172	149	205	-140 to -94	-48.4% to -32.6%	135 to 181	987.2% to 1319.7%	-158 to -112	-51.4% to -36.5%
July	318	325	40	-278	-87.5%	-286	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	328	329	69	-259	-79.0%	-260	-79.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	314	320	71	-244	-77.5%	-249	-77.9%	-	-	-	-	-	-	-	-	-	-	-	-
October	319	328	112	-207	-64.8%	-216	-65.8%	-	-	-	-	-	-	-	-	-	-	-	-
November	316	331	119	-197	-62.3%	-212	-63.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	341	364	181	-160	-46.9%	-183	-50.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	911	961	772	-138	-15.2%	-188	-19.6%	1,003	438	429	424	416	550	-494 to -473	-54.3% to -52.0%	-356 to -335	-46.1% to -43.4%	-586 to -565	-58.5% to -56.4%
2Q	871	898	19	-852	-97.8%	-879	-97.9%	912	526	449	467	423	612	-448 to -345	-51.4% to -39.6%	404 to 507	2097.9% to 2631.6%	-488 to -386	-53.6% to -42.3%
3Q	961	974	179	-781	-81.3%	-795	-81.6%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	976	1,023	412	-563	-57.7%	-611	-59.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	3,718	3,857	1,383	-2,335	-62.8%	-2,473	-64.1%	1,914	964	878	891	840	1,162	-942 to -818	-52.9% to -45.9%	48 to 172	6.1% to 21.7%	-1,075 to -951	-56.1% to -49.7%

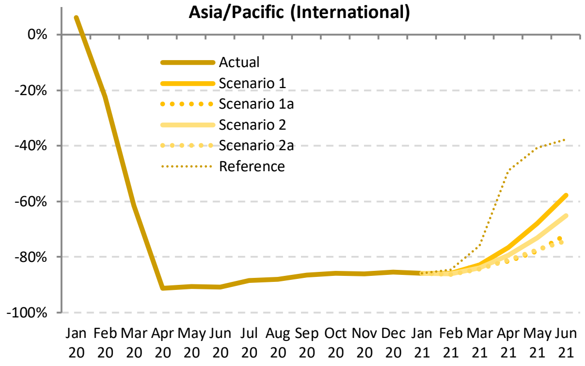
Source: ICAO estimates

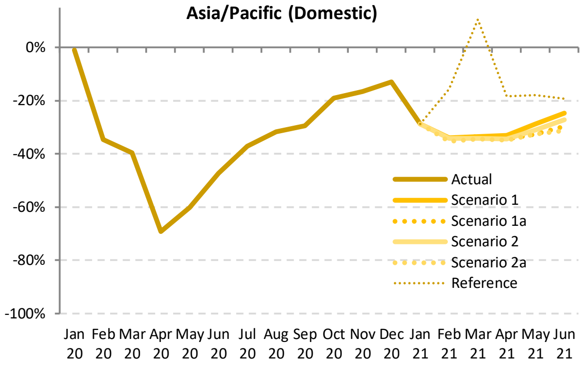
Asia/Pacific

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-25.1%	-25.9%	-24.7%	-140,680	-34.5%	-40,003	-32.7%	-100,677	-35.3%	-16,257	-7,891	-8,366
2Q 2020	-68.5%	-90.8%	-58.8%	-317,235	-77.1%	-117,222	-96.4%	-200,013	-69.0%	-38,970	-24,855	-14,114
3Q 2020	-49.3%	-87.6%	-32.8%	-258,676	-59.3%	-120,561	-94.6%	-138,115	-44.7%	-34,739	-25,585	-9,154
4Q 2020	-37.4%	-85.8%	-16.2%	-204,867	-48.3%	-117,220	-93.8%	-87,648	-29.3%	-30,488	-25,068	-5,420
Total 2020	**-45.1%**	**-72.7%**	**-33.0%**	**-921,458**	**-54.8%**	**-395,005**	**-79.6%**	**-526,453**	**-44.5%**	**-120,453**	**-83,400**	**-37,053**
1Q 2021	-49.0% to -48.2%	-85.5% to -84.9%	-32.8% to -32.0%	-242,265 to -234,885	-59.4% to -57.6%	-113,700 to -112,358	-92.9% to -91.8%	-128,565 to -122,527	-45.0% to -42.9%	-32,975 to -32,190	-24,004 to -23,691	-8,971 to -8,498
2Q 2021	-46.6% to -40.6%	-77.9% to -67.5%	-33.0% to -28.9%	-236,554 to -195,002	-57.5% to -47.4%	-107,513 to -93,660	-88.4% to -77.0%	-129,041 to -101,342	-44.5% to -35.0%	-31,508 to -26,199	-22,560 to -19,396	-8,948 to -6,803
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-47.8% to -44.4%**	**-81.7% to -76.2%**	**-32.9% to -30.4%**	**-478,819 to -429,887**	**-58.4% to -52.5%**	**-221,213 to -206,018**	**-90.6% to -84.4%**	**-257,606 to -223,870**	**-44.8% to -38.9%**	**-64,483 to -58,388**	**-46,564 to -43,087**	**-17,919 to -15,301**

Seat capacity







Seat Capacity (thousand) - Asia/Pacific International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**173,887**	184,761	**175,876**	1,990	1.1%	-8,885	-4.8%	192,546	**93,455**	**93,455**	**93,455**	**93,455**	**93,455**	-80,431	-46.3%	-82,421	-46.9%	-99,091	-51.5%
February	**160,779**	172,412	**111,041**	-49,737	-30.9%	-61,371	-35.6%	177,025	**80,636**	**80,636**	**80,318**	**78,976**	**101,783**	-81,803 to -80,143	-50.9% to -49.8%	-32,065 to -30,406	-28.9% to -27.4%	-98,049 to -96,390	-55.4% to -54.4%
March	**170,186**	177,838	**91,338**	-78,848	-46.3%	-86,500	-48.6%	181,273	**87,189**	**87,189**	**85,785**	**85,246**	**142,502**	-84,940 to -82,997	-49.9% to -48.8%	-6,092 to -4,149	-6.7% to -4.5%	-96,028 to -94,084	-53.0% to -51.9%
April	**167,437**	171,006	**40,368**	-127,070	-75.9%	-130,638	-76.4%	175,130	**89,642**	**85,639**	**86,743**	**85,170**	**121,057**	-82,267 to -77,796	-49.1% to -46.5%	44,803 to 49,274	111.0% to 122.1%	-89,960 to -85,489	-51.4% to -48.8%
May	**171,640**	176,452	**52,578**	-119,062	-69.4%	-123,873	-70.2%	181,668	**101,828**	**92,175**	**96,604**	**92,256**	**128,999**	-79,465 to -69,812	-46.3% to -40.7%	39,597 to 49,250	75.3% to 93.7%	-89,493 to -79,840	-49.3% to -43.9%
June	**169,062**	172,795	**66,910**	-102,152	-60.4%	-105,885	-61.3%	177,572	**110,356**	**97,389**	**103,620**	**94,210**	**126,916**	-74,852 to -58,706	-44.3% to -34.7%	27,299 to 43,445	40.8% to 64.9%	-83,363 to -67,216	-46.9% to -37.9%
July	**179,966**	184,680	**85,490**	-94,476	-52.5%	-99,190	-53.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**179,709**	185,192	**92,170**	-87,539	-48.7%	-93,022	-50.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	**170,896**	175,627	**91,244**	-79,653	-46.6%	-84,384	-48.0%	-	-	-	-	-	-	-	-	-	-	-	-
October	**176,402**	182,262	**107,481**	-68,922	-39.1%	-74,781	-41.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	**169,922**	176,029	**105,951**	-63,972	-37.6%	-70,079	-39.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	**176,471**	183,713	**113,870**	-62,601	-35.5%	-69,843	-38.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**504,851**	535,012	**378,256**	-126,595	-25.1%	-156,756	-29.3%	550,845	**261,280**	**261,280**	**259,558**	**257,677**	**337,741**	-247,174 to -243,571	-49.0% to -48.2%	-120,578 to -116,976	-31.9% to -30.9%	-293,168 to -289,565	-53.2% to -52.6%
2Q	**508,140**	520,253	**159,856**	-348,283	-68.5%	-360,397	-69.3%	534,370	**301,826**	**275,203**	**286,967**	**271,636**	**376,972**	-236,584 to -206,314	-46.6% to -40.6%	111,699 to 141,970	69.9% to 88.8%	-262,815 to -232,545	-49.2% to -43.5%
3Q	**530,571**	545,500	**268,904**	-261,668	-49.3%	-276,596	-50.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**522,796**	542,005	**327,302**	-195,494	-37.4%	-214,703	-39.6%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**2,066,358**	2,142,769	**1,134,318**	-932,040	-45.1%	-1,008,451	-47.1%	1,085,216	**563,106**	**536,484**	**546,525**	**529,313**	**714,713**	-483,758 to -449,885	-47.8% to -44.4%	-8,879 to 24,994	-1.7% to 4.6%	-555,983 to -522,110	-51.2% to -48.1%

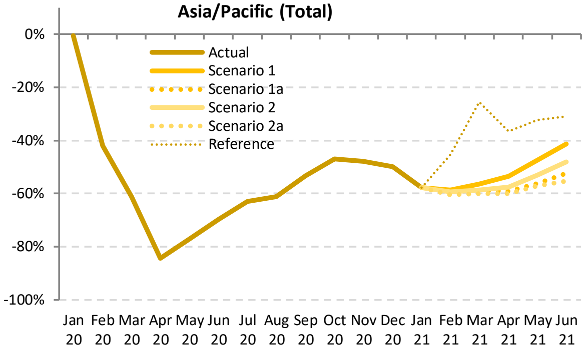
Seat capacity

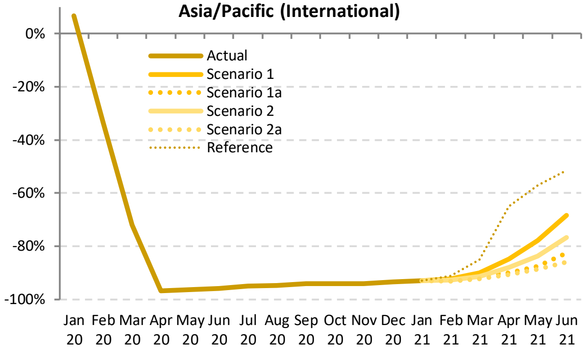
Seat Capacity (thousand) - Asia/Pacific International																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**53,178**	57,177	**56,416**	3,238	6.1%	-761	-1.3%	59,993	**7,500**	**7,500**	**7,500**	**7,500**	**7,500**	-45,678	-85.9%	-48,916	-86.7%	-52,493	-87.5%
February	**49,160**	52,616	**38,157**	-11,003	-22.4%	-14,459	-27.5%	54,323	**6,977**	**6,977**	**6,884**	**6,769**	**7,587**	-42,390 to -42,182	-86.2% to -85.8%	-31,387 to -31,179	-82.3% to -81.7%	-47,553 to -47,345	-87.5% to -87.2%
March	**52,782**	55,037	**20,383**	-32,399	-61.4%	-34,654	-63.0%	56,939	**9,019**	**9,019**	**8,490**	**8,226**	**12,739**	-44,556 to -43,763	-84.4% to -82.9%	-12,157 to -11,364	-59.6% to -55.8%	-48,713 to -47,919	-85.6% to -84.2%
April	**51,335**	52,996	**4,531**	-46,804	-91.2%	-48,465	-91.5%	54,593	**11,987**	**9,483**	**10,577**	**9,670**	**26,258**	-41,852 to -39,347	-81.5% to -76.6%	4,952 to 7,457	109.3% to 164.6%	-45,111 to -42,606	-82.6% to -78.0%
May	**52,030**	54,297	**4,918**	-47,112	-90.5%	-49,380	-90.9%	56,289	**16,657**	**11,499**	**13,997**	**11,723**	**30,855**	-40,531 to -35,372	-77.9% to -68.0%	6,581 to 11,740	133.8% to 238.7%	-44,790 to -39,631	-79.6% to -70.4%
June	**51,160**	53,047	**4,720**	-46,440	-90.8%	-48,326	-91.1%	54,880	**21,635**	**14,354**	**17,869**	**13,234**	**31,875**	-37,926 to -29,525	-74.1% to -57.7%	8,514 to 16,915	180.4% to 358.3%	-41,646 to -33,245	-75.9% to -60.6%
July	**54,007**	55,893	**6,277**	-47,730	-88.4%	-49,616	-88.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	**54,403**	57,005	**6,575**	-47,828	-87.9%	-50,431	-88.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	**51,417**	52,963	**6,976**	-44,441	-86.4%	-45,987	-86.8%	-	-	-	-	-	-	-	-	-	-	-	-
October	**52,753**	55,530	**7,441**	-45,312	-85.9%	-48,089	-86.6%	-	-	-	-	-	-	-	-	-	-	-	-
November	**51,509**	54,649	**7,151**	-44,358	-86.1%	-47,497	-86.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	**54,864**	58,266	**8,034**	-46,830	-85.4%	-50,232	-86.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**155,120**	164,829	**114,956**	-40,164	-25.9%	-49,874	-30.3%	171,254	**23,497**	**23,497**	**22,874**	**22,496**	**27,826**	-132,624 to -131,623	-85.5% to -84.9%	-92,460 to -91,459	-80.4% to -79.6%	-148,759 to -147,758	-86.9% to -86.3%
2Q	**154,525**	160,340	**14,169**	-140,356	-90.8%	-146,172	-91.2%	165,762	**50,280**	**35,335**	**42,443**	**34,627**	**88,988**	-120,309 to -104,245	-77.9% to -67.5%	20,047 to 36,111	141.5% to 254.9%	-131,546 to -115,482	-79.4% to -69.7%
3Q	**159,828**	165,862	**19,828**	-139,999	-87.6%	-146,033	-88.0%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**159,126**	168,445	**22,627**	-136,500	-85.8%	-145,818	-86.6%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**628,598**	659,477	**171,580**	-457,019	-72.7%	-487,897	-74.0%	337,016	**73,777**	**58,832**	**65,318**	**57,123**	**116,814**	-252,933 to -235,868	-81.7% to -76.2%	-72,414 to -55,348	-56.1% to -42.9%	-280,305 to -263,240	-83.2% to -78.1%

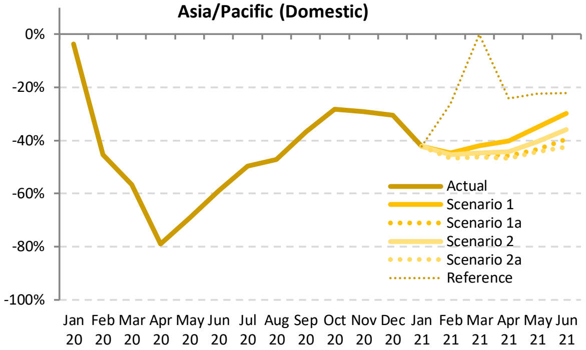
Seat Capacity (thousand) - Asia/Pacific Domestic																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**120,709**	127,584	**119,460**	-1,248	-1.0%	-8,124	-6.4%	132,553	**85,955**	**85,955**	**85,955**	**85,955**	**85,955**	-34,754	-28.8%	-33,505	-28.0%	-46,598	-35.2%
February	**111,619**	119,796	**72,885**	-38,734	-34.7%	-46,912	-39.2%	122,703	**73,658**	**73,658**	**73,433**	**72,207**	**94,197**	-39,412 to -37,961	-35.3% to -34.0%	-678 to 774	-0.9% to 1.1%	-50,496 to -49,044	-41.2% to -40.0%
March	**117,404**	122,802	**70,955**	-46,449	-39.6%	-51,847	-42.2%	124,335	**78,170**	**78,170**	**77,296**	**77,020**	**129,763**	-40,384 to -39,234	-34.4% to -33.4%	6,065 to 7,215	8.5% to 10.2%	-47,315 to -46,165	-38.1% to -37.1%
April	**116,103**	118,010	**35,837**	-80,266	-69.1%	-82,173	-69.6%	120,537	**77,654**	**76,157**	**76,166**	**75,500**	**94,799**	-40,603 to -38,449	-35.0% to -33.1%	39,663 to 41,817	110.7% to 116.7%	-45,037 to -42,883	-37.4% to -35.6%
May	**119,611**	122,154	**47,661**	-71,950	-60.2%	-74,493	-61.0%	125,379	**85,171**	**80,676**	**82,607**	**80,534**	**98,144**	-39,077 to -34,440	-32.7% to -28.8%	32,873 to 37,510	69.0% to 78.7%	-44,846 to -40,208	-35.8% to -32.1%
June	**117,902**	119,749	**62,190**	-55,712	-47.3%	-57,559	-48.1%	122,692	**88,721**	**83,035**	**85,751**	**80,976**	**95,042**	-36,926 to -29,181	-31.3% to -24.8%	18,786 to 26,531	30.2% to 42.7%	-41,716 to -33,971	-34.0% to -27.7%
July	**125,958**	128,787	**79,213**	-46,745	-37.1%	-49,574	-38.5%	-	-	-	-	-	-	-	-	-	-	-	-
August	**125,307**	128,187	**85,595**	-39,711	-31.7%	-42,591	-33.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	**119,479**	122,664	**84,267**	-35,212	-29.5%	-38,397	-31.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**123,649**	126,732	**100,039**	-23,610	-19.1%	-26,693	-21.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**118,413**	121,381	**98,799**	-19,614	-16.6%	-22,581	-18.6%	-	-	-	-	-	-	-	-	-	-	-	-
December	**121,607**	125,447	**105,836**	-15,771	-13.0%	-19,611	-15.6%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**349,732**	370,182	**263,300**	-86,432	-24.7%	-106,882	-28.9%	379,591	**237,784**	**237,784**	**236,684**	**235,182**	**309,915**	-114,550 to -111,948	-32.8% to -32.0%	-28,118 to -25,516	-10.7% to -9.7%	-144,409 to -141,807	-38.0% to -37.4%
2Q	**353,615**	359,913	**145,687**	-207,928	-58.8%	-214,225	-59.5%	368,608	**251,546**	**239,868**	**244,523**	**237,009**	**287,984**	-116,606 to -102,069	-33.0% to -28.9%	91,322 to 105,858	62.7% to 72.7%	-131,599 to -117,063	-35.7% to -31.8%
3Q	**370,744**	379,638	**249,075**	-121,668	-32.8%	-130,563	-34.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**363,669**	373,559	**304,675**	-58,994	-16.2%	-68,885	-18.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,437,760**	1,483,292	**962,738**	-475,022	-33.0%	-520,554	-35.1%	748,199	**489,329**	**477,652**	**481,208**	**472,191**	**597,899**	-231,156 to -214,017	-32.9% to -30.4%	63,204 to 80,342	15.5% to 19.6%	-276,008 to -258,870	-36.9% to -34.6%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - Asia/Pacific International + Domestic

Year	2019	2020						2021
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline
	a	b	c	c-a	c/a-1	c-b	c/b-1	d
January	**137,870**	147,276	**137,106**	-764	-0.6%	-10,171	-6.9%	154,196
February	**131,703**	141,935	**76,476**	-55,227	-41.9%	-65,459	-46.1%	146,423
March	**138,285**	145,229	**53,596**	-84,689	-61.2%	-91,633	-63.1%	148,631
April	**136,254**	139,805	**21,365**	-114,889	-84.3%	-118,440	-84.7%	143,719
May	**137,483**	141,889	**31,391**	-106,093	-77.2%	-110,499	-77.9%	146,600
June	**137,863**	141,528	**41,611**	-96,253	-69.8%	-99,917	-70.6%	145,982
July	**148,603**	153,217	**55,070**	-93,533	-62.9%	-98,147	-64.1%	-
August	**150,491**	155,704	**58,521**	-91,969	-61.1%	-97,182	-62.4%	-
September	**137,334**	141,809	**64,160**	-73,174	-53.3%	-77,649	-54.8%	-
October	**143,446**	148,902	**75,995**	-67,451	-47.0%	-72,908	-49.0%	-
November	**138,331**	143,968	**72,009**	-66,322	-47.9%	-71,959	-50.0%	-
December	**142,703**	149,309	**71,609**	-71,094	-49.8%	-77,700	-52.0%	-
1Q	**407,857**	434,441	**267,178**	-140,680	-34.5%	-167,263	-38.5%	449,250
2Q	**411,601**	423,222	**94,366**	-317,235	-77.1%	-328,856	-77.7%	436,301
3Q	**436,428**	450,729	**177,752**	-258,676	-59.3%	-272,978	-60.6%	-
4Q	**424,481**	442,179	**219,613**	-204,867	-48.3%	-222,566	-50.3%	-
Total	**1,680,367**	1,750,571	**758,909**	-921,458	-54.8%	-991,663	-56.6%	885,551

Year	2021										
Month	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**58,229**	**58,229**	**58,229**	**58,229**	**58,229**	-79,641	-57.8%	-78,877	-57.5%	-95,967	-62.2%
February	**54,491**	**54,491**	**53,622**	**52,066**	**72,043**	-79,637 to -77,212	-60.5% to -58.6%	-24,410 to -21,985	-31.9% to -28.7%	-94,357 to -91,932	-64.4% to -62.8%
March	**60,252**	**57,016**	**57,123**	**55,298**	**103,014**	-82,987 to -78,032	-60.0% to -56.4%	1,702 to 6,657	3.2% to 12.4%	-93,333 to -88,378	-62.8% to -59.5%
April	**63,243**	**55,596**	**57,974**	**54,590**	**86,545**	-81,664 to -73,011	-59.9% to -53.6%	33,225 to 41,878	155.5% to 196.0%	-89,129 to -80,476	-62.0% to -56.0%
May	**72,369**	**60,317**	**64,539**	**58,842**	**92,984**	-78,641 to -65,115	-57.2% to -47.4%	27,451 to 40,978	87.5% to 130.5%	-87,758 to -74,231	-59.9% to -50.6%
June	**80,987**	**65,831**	**71,653**	**61,615**	**95,319**	-76,248 to -56,877	-55.3% to -41.3%	20,004 to 39,376	48.1% to 94.6%	-84,367 to -64,995	-57.8% to -44.5%
July	-	-	-	-	-	-	-	-	-	-	-
August	-	-	-	-	-	-	-	-	-	-	-
September	-	-	-	-	-	-	-	-	-	-	-
October	-	-	-	-	-	-	-	-	-	-	-
November	-	-	-	-	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-	-
1Q	**172,972**	**169,736**	**168,974**	**165,592**	**233,285**	-242,265 to -234,885	-59.4% to -57.6%	-101,585 to -94,205	-38.0% to -35.3%	-283,657 to -276,278	-63.1% to -61.5%
2Q	**216,599**	**181,744**	**194,165**	**175,047**	**274,849**	-236,554 to -195,002	-57.5% to -47.4%	80,681 to 122,232	85.5% to 129.5%	-261,254 to -219,702	-59.9% to -50.4%
3Q	-	-	-	-	-	-	-	-	-	-	-
4Q	-	-	-	-	-	-	-	-	-	-	-
Total	**389,571**	**351,480**	**363,139**	**340,639**	**508,134**	-478,819 to -429,887	-58.4% to -52.5%	-20,904 to 28,027	-5.8% to 7.8%	-544,911 to -495,980	-61.5% to -56.0%

Passenger number

Passenger Number (thousand) - Asia/Pacific International

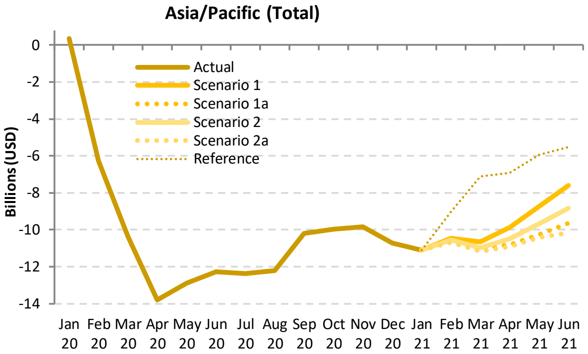
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	42,372	45,737	45,192	2,820	6.7%	-546	-1.2%	48,117	2,973	2,973	2,973	2,973	2,973	-39,398	-93.0%	-42,218	-93.4%	-45,144	-93.8%
February	38,698	41,573	25,691	-13,007	-33.6%	-15,882	-38.2%	43,040	2,976	2,976	2,800	2,619	3,423	-36,079 to -35,721	-93.2% to -92.3%	-23,072 to -22,715	-89.8% to -88.4%	-40,421 to -40,064	-93.9% to -93.1%
March	41,378	43,296	11,563	-29,816	-72.1%	-31,734	-73.3%	44,909	4,140	3,730	3,611	3,156	6,158	-38,223 to -37,238	-92.4% to -90.0%	-8,407 to -7,422	-72.7% to -64.2%	-41,753 to -40,768	-93.0% to -90.8%
April	41,000	42,478	1,342	-39,658	-96.7%	-41,136	-96.8%	43,865	6,257	4,061	4,920	3,852	14,346	-37,148 to -34,743	-90.6% to -84.7%	2,510 to 4,915	187.0% to 366.3%	-40,013 to -37,608	-91.2% to -85.7%
May	39,963	41,839	1,457	-38,506	-96.4%	-40,382	-96.5%	43,476	8,870	4,996	6,505	4,545	17,167	-35,419 to -31,093	-88.6% to -77.8%	3,088 to 7,413	211.9% to 508.8%	-38,931 to -34,606	-89.5% to -79.6%
June	40,683	42,329	1,626	-39,057	-96.0%	-40,703	-96.2%	43,899	12,860	7,098	9,461	5,738	19,718	-34,946 to -27,824	-85.9% to -68.4%	4,111 to 11,233	252.8% to 690.7%	-38,161 to -31,039	-86.9% to -70.7%
July	43,780	45,477	2,218	-41,562	-94.9%	-43,259	-95.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	44,296	46,589	2,331	-41,965	-94.7%	-44,258	-95.0%	-	-	-	-	-	-	-	-	-	-	-	-
September	39,365	40,698	2,331	-37,034	-94.1%	-38,367	-94.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	40,850	43,162	2,440	-38,410	-94.0%	-40,723	-94.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	40,110	42,716	2,391	-37,719	-94.0%	-40,325	-94.4%	-	-	-	-	-	-	-	-	-	-	-	-
December	43,970	46,875	2,880	-41,090	-93.5%	-43,995	-93.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	122,448	130,606	82,445	-40,003	-32.7%	-48,161	-36.9%	136,066	10,090	9,679	9,384	8,748	12,555	-113,700 to -112,358	-92.9% to -91.8%	-73,697 to -72,355	-89.4% to -87.8%	-127,318 to -125,976	-93.6% to -92.6%
2Q	121,647	126,647	4,425	-117,222	-96.4%	-122,221	-96.5%	131,240	27,987	16,155	20,886	14,134	51,231	-107,513 to -93,660	-88.4% to -77.0%	9,709 to 23,562	219.4% to 532.4%	-117,106 to -103,253	-89.2% to -78.7%
3Q	127,441	132,763	6,879	-120,561	-94.6%	-125,884	-94.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	124,930	132,753	7,711	-117,220	-93.8%	-125,042	-94.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	496,466	522,769	101,461	-395,005	-79.6%	-421,308	-80.6%	267,306	38,077	25,834	30,270	22,882	63,785	-221,213 to -206,018	-90.6% to -84.4%	-63,988 to -48,794	-73.7% to -56.2%	-244,424 to -229,229	-91.4% to -85.8%

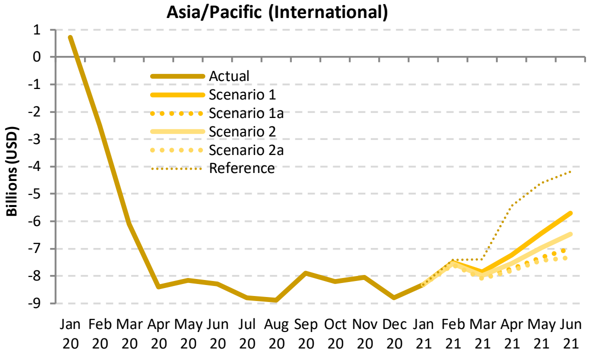
Passenger Number (thousand) - Asia/Pacific Domestic

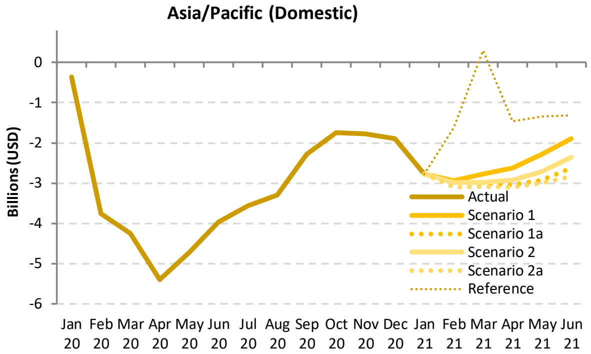
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	95,498	101,539	91,914	-3,584	-3.8%	-9,625	-9.5%	106,078	55,255	55,255	55,255	55,255	55,255	-40,243	-42.1%	-36,659	-39.9%	-50,823	-47.9%
February	93,005	100,363	50,785	-42,220	-45.4%	-49,577	-49.4%	103,383	51,515	51,515	50,823	49,447	68,620	-43,558 to -41,490	-46.8% to -44.6%	-1,338 to 730	-2.6% to 1.4%	-53,936 to -51,868	-52.2% to -50.2%
March	96,906	101,933	42,033	-54,873	-56.6%	-59,900	-58.8%	103,722	56,112	53,286	53,512	52,142	96,856	-44,764 to -40,794	-46.2% to -42.1%	10,109 to 14,079	24.1% to 33.5%	-51,580 to -47,610	-49.7% to -45.9%
April	95,254	97,326	20,023	-75,231	-79.0%	-77,303	-79.4%	99,854	56,986	51,536	53,054	50,738	72,200	-44,516 to -38,268	-46.7% to -40.2%	30,715 to 36,963	153.4% to 184.6%	-49,116 to -42,868	-49.2% to -42.9%
May	97,520	100,050	29,934	-67,586	-69.3%	-70,116	-70.1%	103,124	63,499	55,321	58,033	54,297	75,818	-43,223 to -34,021	-44.3% to -34.9%	24,364 to 33,565	81.4% to 112.1%	-48,827 to -39,625	-47.3% to -38.4%
June	97,180	99,199	39,984	-57,196	-58.9%	-59,215	-59.7%	102,083	68,127	58,733	62,192	55,877	75,601	-41,303 to -29,053	-42.5% to -29.9%	15,893 to 28,143	39.7% to 70.4%	-46,206 to -33,956	-45.3% to -33.3%
July	104,823	107,740	52,852	-51,971	-49.6%	-54,888	-50.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	106,195	109,115	56,191	-50,004	-47.1%	-52,924	-48.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	97,970	101,111	61,829	-36,140	-36.9%	-39,282	-38.8%	-	-	-	-	-	-	-	-	-	-	-	-
October	102,596	105,740	73,555	-29,041	-28.3%	-32,185	-30.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	98,221	101,252	69,618	-28,603	-29.1%	-31,634	-31.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	98,733	102,434	68,730	-30,003	-30.4%	-33,705	-32.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	285,410	303,835	184,732	-100,677	-35.3%	-119,102	-39.2%	313,184	162,882	160,057	159,590	156,845	220,731	-128,565 to -122,527	-45.0% to -42.9%	-27,888 to -21,850	-15.1% to -11.8%	-156,339 to -150,301	-49.9% to -48.0%
2Q	289,954	296,575	89,941	-200,013	-69.0%	-206,635	-69.7%	305,061	188,612	165,589	173,279	160,913	223,618	-129,041 to -101,342	-44.5% to -35.0%	70,972 to 98,671	78.9% to 109.7%	-144,148 to -116,449	-47.3% to -38.2%
3Q	308,988	317,966	170,872	-138,115	-44.7%	-147,094	-46.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	299,550	309,427	211,903	-87,648	-29.3%	-97,524	-31.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	1,183,901	1,227,803	657,448	-526,453	-44.5%	-570,354	-46.5%	618,244	351,494	325,646	332,869	317,757	444,349	-257,606 to -223,870	-44.8% to -38.9%	43,084 to 76,821	15.7% to 28.0%	-300,487 to -266,751	-48.6% to -43.1%

ICAO UNITING AVIATION

Passenger revenue







Passenger revenue (USD, million) - Asia/Pacific International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**16,143**	17,369	**16,509**	367	2.3%	-859	-4.9%	18,283	**5,043**	**5,043**	**5,043**	**5,043**	**5,043**	-11,100	-68.8%	-11,466	-69.5%	-13,241	-72.4%
February	**15,204**	16,436	**8,944**	-6,260	-41.2%	-7,493	-45.6%	17,010	**4,756**	**4,756**	**4,661**	**4,511**	**6,174**	-10,693 to -10,448	-70.3% to -68.7%	-4,432 to -4,187	-49.6% to -46.8%	-12,498 to -12,254	-73.5% to -72.0%
March	**16,025**	16,822	**5,662**	-10,363	-64.7%	-11,160	-66.3%	17,297	**5,383**	**5,064**	**5,056**	**4,842**	**8,920**	-11,183 to -10,642	-69.8% to -66.4%	-820 to -279	-14.5% to -4.9%	-12,455 to -11,914	-72.0% to -68.9%
April	**15,803**	16,216	**1,991**	-13,812	-87.4%	-14,225	-87.7%	16,714	**5,935**	**5,002**	**5,320**	**4,890**	**8,900**	-10,912 to -9,868	-69.1% to -62.4%	2,899 to 3,944	145.6% to 198.1%	-11,823 to -10,779	-70.7% to -64.5%
May	**15,757**	16,277	**2,857**	-12,900	-81.9%	-13,420	-82.4%	16,834	**7,030**	**5,512**	**6,066**	**5,325**	**9,807**	-10,432 to -8,727	-66.2% to -55.4%	2,468 to 4,174	86.4% to 146.1%	-11,509 to -9,804	-68.4% to -58.2%
June	**15,883**	16,321	**3,625**	-12,257	-77.2%	-12,696	-77.8%	16,885	**8,279**	**6,253**	**7,053**	**5,719**	**10,361**	-10,164 to -7,604	-64.0% to -47.9%	2,094 to 4,653	57.8% to 128.4%	-11,166 to -8,607	-66.1% to -51.0%
July	**17,124**	17,639	**4,768**	-12,356	-72.2%	-12,872	-73.0%	-	-	-	-	-	-	-	-	-	-	-	-
August	**17,364**	18,020	**5,169**	-12,195	-70.2%	-12,851	-71.3%	-	-	-	-	-	-	-	-	-	-	-	-
September	**15,725**	16,161	**5,536**	-10,189	-64.8%	-10,625	-65.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	**16,389**	17,166	**6,429**	-9,960	-60.8%	-10,737	-62.5%	-	-	-	-	-	-	-	-	-	-	-	-
November	**15,837**	16,655	**6,008**	-9,829	-62.1%	-10,647	-63.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	**16,741**	17,703	**6,041**	-10,699	-63.9%	-11,661	-65.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**47,371**	50,627	**31,115**	-16,257	-34.3%	-19,512	-38.5%	52,590	**15,182**	**14,863**	**14,760**	**14,396**	**20,136**	-32,975 to -32,190	-69.6% to -68.0%	-16,718 to -15,933	-53.7% to -51.2%	-38,194 to -37,408	-72.6% to -71.1%
2Q	**47,442**	48,814	**8,473**	-38,970	-82.1%	-40,341	-82.6%	50,433	**21,243**	**16,767**	**18,439**	**15,934**	**29,067**	-31,508 to -26,199	-66.4% to -55.2%	7,462 to 12,771	88.1% to 150.7%	-34,499 to -29,190	-68.4% to -57.9%
3Q	**50,212**	51,821	**15,473**	-34,739	-69.2%	-36,348	-70.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**48,966**	51,524	**18,479**	-30,488	-62.3%	-33,046	-64.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**193,992**	202,786	**73,539**	-120,453	-62.1%	-129,247	-63.7%	103,023	**36,425**	**31,630**	**33,199**	**30,331**	**49,203**	-64,483 to -58,388	-68.0% to -61.6%	-9,257 to -3,162	-23.4% to -8.0%	-72,693 to -66,598	-70.6% to -64.6%

Passenger revenue

Passenger revenue (USD, million) - Asia/Pacific International

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	9,018	9,778	9,744	726	8.0%	-34	-0.3%	10,303	698	698	698	698	698	-8,320	-92.3%	-9,046	-92.8%	-9,605	-93.2%
February	8,209	8,877	5,701	-2,508	-30.6%	-3,176	-35.8%	9,185	699	699	658	615	803	-7,594 to -7,511	-92.5% to -91.5%	-5,086 to -5,002	-89.2% to -87.7%	-8,570 to -8,486	-93.3% to -92.4%
March	8,830	9,243	2,721	-6,109	-69.2%	-6,522	-70.6%	9,545	969	873	846	740	1,433	-8,090 to -7,860	-91.6% to -89.0%	-1,981 to -1,752	-72.8% to -64.4%	-8,805 to -8,575	-92.2% to -89.8%
April	8,704	8,993	298	-8,405	-96.6%	-8,695	-96.7%	9,301	1,457	949	1,148	900	3,262	-7,803 to -7,247	-89.7% to -83.3%	602 to 1,159	202.0% to 388.7%	-8,401 to -7,845	-90.3% to -84.3%
May	8,493	8,864	326	-8,167	-96.2%	-8,538	-96.3%	9,196	2,050	1,165	1,510	1,059	3,885	-7,434 to -6,442	-87.5% to -75.9%	733 to 1,725	225.1% to 529.4%	-8,137 to -7,145	-88.5% to -77.7%
June	8,656	8,976	373	-8,283	-95.7%	-8,603	-95.8%	9,319	2,949	1,646	2,182	1,333	4,454	-7,323 to -5,707	-84.6% to -65.9%	960 to 2,576	257.5% to 690.7%	-7,986 to -6,370	-85.7% to -68.4%
July	9,302	9,644	510	-8,792	-94.5%	-9,134	-94.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	9,441	9,923	550	-8,891	-94.2%	-9,372	-94.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	8,448	8,696	546	-7,902	-93.5%	-8,150	-93.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	8,781	9,295	570	-8,211	-93.5%	-8,725	-93.9%	-	-	-	-	-	-	-	-	-	-	-	-
November	8,618	9,206	561	-8,057	-93.5%	-8,645	-93.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	9,475	10,148	676	-8,800	-92.9%	-9,472	-93.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	26,058	27,897	18,167	-7,891	-30.3%	-9,731	-34.9%	29,033	2,367	2,271	2,202	2,053	2,934	-24,004 to -23,691	-92.1% to -90.9%	-16,113 to -15,800	-88.7% to -87.0%	-26,980 to -26,666	-92.9% to -91.8%
2Q	25,852	26,832	997	-24,855	-96.1%	-25,836	-96.3%	27,816	6,456	3,760	4,840	3,292	11,601	-22,560 to -19,396	-87.3% to -75.0%	2,296 to 5,459	230.3% to 547.7%	-24,523 to -21,360	-88.2% to -76.8%
3Q	27,191	28,263	1,606	-25,585	-94.1%	-26,657	-94.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	26,875	28,648	1,806	-25,068	-93.3%	-26,842	-93.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	105,975	111,641	22,576	-83,400	-78.7%	-89,065	-79.8%	56,849	8,822	6,031	7,042	5,346	14,536	-46,564 to -43,087	-89.7% to -83.0%	-13,818 to -10,341	-72.1% to -54.0%	-51,503 to -48,026	-90.6% to -84.5%

Passenger revenue (USD, million) - Asia/Pacific Domestic

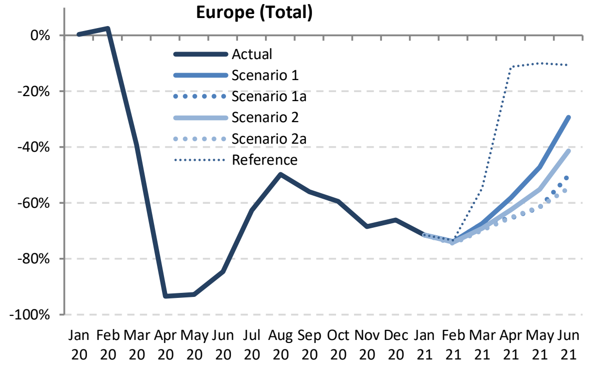
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	7,124	7,591	6,765	-359	-5.0%	-826	-10.9%	7,980	4,344	4,344	4,344	4,344	4,344	-2,780	-39.0%	-2,420	-35.8%	-3,636	-45.6%
February	6,995	7,560	3,242	-3,752	-53.6%	-4,317	-57.1%	7,825	4,058	4,058	4,003	3,896	5,371	-3,098 to -2,937	-44.3% to -42.0%	654 to 815	20.2% to 25.1%	-3,929 to -3,767	-50.2% to -48.1%
March	7,195	7,579	2,941	-4,254	-59.1%	-4,638	-61.2%	7,752	4,413	4,191	4,210	4,102	7,487	-3,093 to -2,782	-43.0% to -38.7%	1,161 to 1,472	39.5% to 50.1%	-3,649 to -3,338	-47.1% to -43.1%
April	7,099	7,223	1,693	-5,406	-76.2%	-5,530	-76.6%	7,412	4,478	4,053	4,172	3,990	5,638	-3,109 to -2,621	-43.8% to -36.9%	2,297 to 2,785	135.7% to 164.5%	-3,422 to -2,934	-46.2% to -39.6%
May	7,264	7,413	2,531	-4,733	-65.2%	-4,882	-65.9%	7,639	4,980	4,347	4,556	4,266	5,921	-2,998 to -2,285	-41.3% to -31.4%	1,735 to 2,449	68.6% to 96.8%	-3,373 to -2,659	-44.2% to -34.8%
June	7,227	7,345	3,252	-3,974	-55.0%	-4,093	-55.7%	7,566	5,330	4,607	4,872	4,386	5,907	-2,841 to -1,897	-39.3% to -26.2%	1,133 to 2,078	34.9% to 63.9%	-3,181 to -2,236	-42.0% to -29.6%
July	7,822	7,995	4,258	-3,564	-45.6%	-3,737	-46.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	7,922	8,098	4,619	-3,303	-41.7%	-3,479	-43.0%	-	-	-	-	-	-	-	-	-	-	-	-
September	7,277	7,465	4,990	-2,287	-31.4%	-2,475	-33.2%	-	-	-	-	-	-	-	-	-	-	-	-
October	7,608	7,872	5,859	-1,748	-23.0%	-2,013	-25.6%	-	-	-	-	-	-	-	-	-	-	-	-
November	7,219	7,450	5,447	-1,772	-24.5%	-2,002	-26.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	7,265	7,555	5,366	-1,899	-26.1%	-2,189	-29.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	21,313	22,730	12,948	-8,366	-39.3%	-9,782	-43.0%	23,557	12,815	12,593	12,558	12,343	17,202	-8,971 to -8,498	-42.1% to -39.9%	-605 to -133	-4.7% to -1.0%	-11,214 to -10,742	-47.6% to -45.6%
2Q	21,590	21,981	7,476	-14,114	-65.4%	-14,505	-66.0%	22,618	14,788	13,006	13,599	12,642	17,466	-8,948 to -6,803	-41.4% to -31.5%	5,166 to 7,312	69.1% to 97.8%	-9,975 to -7,830	-44.1% to -34.6%
3Q	23,021	23,558	13,867	-9,154	-39.8%	-9,691	-41.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	22,092	22,876	16,672	-5,420	-24.5%	-6,204	-27.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	88,016	91,145	50,963	-37,053	-42.1%	-40,182	-44.1%	46,175	27,603	25,599	26,157	24,985	34,668	-17,919 to -15,301	-41.8% to -35.7%	4,561 to 7,179	22.3% to 35.1%	-21,190 to -18,572	-45.9% to -40.2%

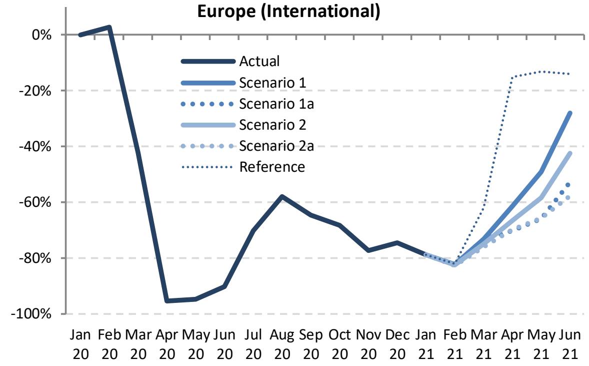
Source: ICAO estimates

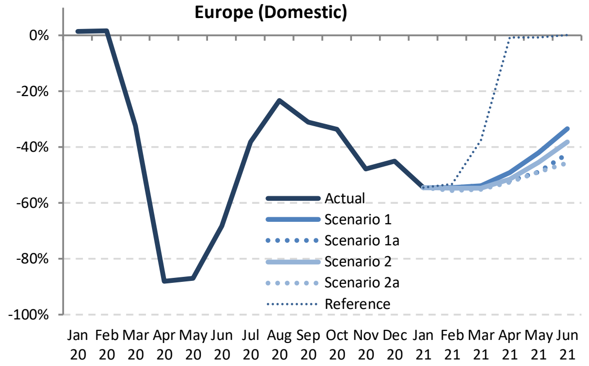
Europe

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-12.8%	-14.0%	-10.2%	-41,006	-17.5%	-30,007	-18.1%	-10,999	-16.0%	-5,254	-4,350	-904
2Q 2020	-90.1%	-93.3%	-80.9%	-291,115	-94.2%	-223,363	-96.8%	-67,752	-86.4%	-36,388	-30,818	-5,570
3Q 2020	-56.1%	-64.2%	-30.8%	-237,528	-67.8%	-208,114	-78.3%	-29,413	-34.8%	-32,076	-29,658	-2,418
4Q 2020	-64.3%	-72.8%	-41.9%	-199,738	-75.2%	-163,060	-84.4%	-36,679	-50.6%	-26,348	-23,332	-3,016
Total 2020	**-57.9%**	**-63.9%**	**-41.4%**	**-769,388**	**-66.4%**	**-624,545**	**-73.0%**	**-144,843**	**-47.6%**	**-100,066**	**-88,158**	**-11,908**
1Q 2021	-71.9% to -70.8%	-79.0% to -77.8%	-55.0% to -54.2%	-185,499 to -181,880	-79.1% to -77.6%	-143,596 to -140,952	-86.6% to -85.0%	-41,903 to -40,928	-61.1% to -59.7%	-24,329 to -23,850	-20,884 to -20,485	-3,445 to -3,365
2Q 2021	-60.3% to -44.2%	-64.2% to -45.3%	-48.9% to -41.3%	-218,192 to -165,117	-70.6% to -53.4%	-174,975 to -129,792	-75.8% to -56.3%	-43,217 to -35,325	-55.1% to -45.1%	-27,045 to -19,824	-23,492 to -16,919	-3,553 to -2,904
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-65.4% to -56.0%**	**-70.5% to -59.2%**	**-51.8% to -47.5%**	**-403,691 to -346,997**	**-74.3% to -63.8%**	**-318,570 to -270,744**	**-80.3% to -68.3%**	**-85,121 to -76,254**	**-57.9% to -51.9%**	**-51,374 to -43,674**	**-44,376 to -37,405**	**-6,998 to -6,269**

Seat capacity







Seat Capacity (thousand) - Europe International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**99,253**	99,375	**99,726**	473	0.5%	351	0.4%	100,036	**28,287**	**28,287**	**28,287**	**28,287**	**28,287**	-70,966	-71.5%	-71,439	-71.6%	-71,748	-71.7%
February	**91,124**	94,787	**93,460**	2,336	2.6%	-1,327	-1.4%	97,338	**23,828**	**23,828**	**23,556**	**23,162**	**24,250**	-67,961 to -67,296	-74.6% to -73.9%	-70,297 to -69,632	-75.2% to -74.5%	-74,175 to -73,510	-76.2% to -75.5%
March	**103,536**	106,115	**62,972**	-40,564	-39.2%	-43,143	-40.7%	107,071	**33,748**	**33,748**	**32,070**	**31,277**	**46,821**	-72,258 to -69,788	-69.8% to -67.4%	-31,694 to -29,224	-50.3% to -46.4%	-75,794 to -73,324	-70.8% to -68.5%
April	**114,022**	116,283	**7,473**	-106,550	-93.4%	-108,810	-93.6%	119,174	**47,728**	**39,492**	**42,780**	**39,690**	**101,172**	-74,530 to -66,294	-65.4% to -58.1%	32,020 to 40,256	428.5% to 538.7%	-79,682 to -71,446	-66.9% to -60.0%
May	**125,466**	125,962	**9,002**	-116,464	-92.8%	-116,960	-92.9%	127,206	**66,196**	**48,324**	**56,364**	**48,453**	**113,055**	-77,142 to -59,270	-61.5% to -47.2%	39,322 to 57,194	436.8% to 635.4%	-78,882 to -61,010	-62.0% to -48.0%
June	**131,250**	134,506	**20,086**	-111,164	-84.7%	-114,420	-85.1%	139,176	**92,808**	**65,477**	**76,903**	**59,507**	**117,493**	-71,744 to -38,442	-54.7% to -29.3%	39,420 to 72,722	196.3% to 362.1%	-79,670 to -46,368	-57.2% to -33.3%
July	**138,193**	141,020	**51,734**	-86,459	-62.6%	-89,285	-63.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	**138,574**	140,740	**69,746**	-68,828	-49.7%	-70,994	-50.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**131,857**	133,819	**57,919**	-73,938	-56.1%	-75,901	-56.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	**124,268**	123,908	**50,535**	-73,733	-59.3%	-73,373	-59.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**99,741**	99,324	**31,359**	-68,383	-68.6%	-67,965	-68.4%	-	-	-	-	-	-	-	-	-	-	-	-
December	**100,677**	102,476	**34,178**	-66,499	-66.1%	-68,299	-66.6%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**293,912**	300,277	**256,158**	-37,755	-12.8%	-44,119	-14.7%	304,445	**85,863**	**85,863**	**83,913**	**82,727**	**99,359**	-211,185 to -208,050	-71.9% to -70.8%	-173,431 to -170,295	-67.7% to -66.5%	-221,718 to -218,582	-72.8% to -71.8%
2Q	**370,739**	376,751	**36,561**	-334,178	-90.1%	-340,191	-90.3%	385,556	**206,733**	**153,294**	**176,047**	**147,650**	**331,720**	-223,416 to -164,006	-60.3% to -44.2%	110,762 to 170,172	303.0% to 465.5%	-238,234 to -178,824	-61.8% to -46.4%
3Q	**408,624**	415,579	**179,399**	-229,225	-56.1%	-236,180	-56.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**324,686**	325,708	**116,072**	-208,614	-64.3%	-209,636	-64.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,397,961**	1,418,315	**588,189**	-809,772	-57.9%	-830,126	-58.5%	690,001	**292,595**	**239,156**	**259,960**	**230,377**	**431,079**	-434,601 to -372,056	-65.4% to -56.0%	-62,668 to -123	-21.4% to 0.0%	-459,952 to -397,406	-66.7% to -57.6%

Source: ICAO estimates

Seat capacity

Seat Capacity (thousand) - Europe International

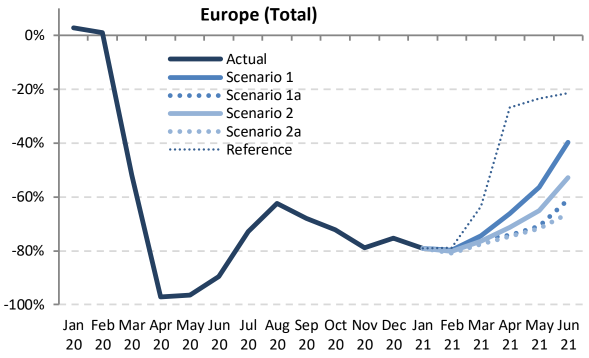
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**69,546**	70,173	**69,578**	33	0.0%	-594	-0.8%	71,125	**14,785**	**14,785**	**14,785**	**14,785**	**14,785**	-54,761	-78.7%	-54,794	-78.8%	-56,340	-79.2%
February	**63,796**	67,633	**65,647**	1,851	2.9%	-1,986	-2.9%	69,524	**11,369**	**11,369**	**11,190**	**11,003**	**11,447**	-52,793 to -52,427	-82.8% to -82.2%	-54,644 to -54,278	-83.2% to -82.7%	-58,521 to -58,155	-84.2% to -83.6%
March	**72,868**	76,030	**42,188**	-30,680	-42.1%	-33,842	-44.5%	77,348	**19,567**	**19,567**	**18,200**	**17,488**	**27,655**	-55,381 to -53,301	-76.0% to -73.1%	-24,701 to -22,621	-58.5% to -53.6%	-59,861 to -57,781	-77.4% to -74.7%
April	**83,899**	86,297	**3,879**	-80,020	-95.4%	-82,418	-95.5%	89,399	**32,406**	**25,063**	**28,137**	**25,366**	**71,216**	-58,836 to -51,493	-70.1% to -61.4%	21,184 to 28,526	546.1% to 735.3%	-64,335 to -56,993	-72.0% to -63.8%
May	**93,237**	93,961	**4,820**	-88,417	-94.8%	-89,141	-94.9%	95,137	**47,488**	**31,881**	**38,785**	**31,965**	**81,039**	-61,356 to -45,749	-65.8% to -49.1%	27,061 to 42,668	561.4% to 885.1%	-63,255 to -47,648	-66.5% to -50.1%
June	**98,521**	102,007	**9,702**	-88,819	-90.2%	-92,306	-90.5%	106,619	**71,019**	**46,658**	**56,639**	**41,710**	**84,707**	-56,811 to -27,502	-57.7% to -27.9%	32,008 to 61,317	329.9% to 632.0%	-64,909 to -35,600	-60.9% to -33.4%
July	**105,080**	108,140	**31,270**	-73,810	-70.2%	-76,870	-71.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	**105,456**	107,856	**44,327**	-61,129	-58.0%	-63,529	-58.9%	-	-	-	-	-	-	-	-	-	-	-	-
September	**98,705**	100,901	**35,050**	-63,655	-64.5%	-65,851	-65.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**92,377**	92,558	**29,384**	-62,994	-68.2%	-63,175	-68.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**70,369**	70,451	**16,025**	-54,344	-77.2%	-54,426	-77.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**71,715**	74,164	**18,267**	-53,449	-74.5%	-55,898	-75.4%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**206,210**	213,835	**177,414**	-28,796	-14.0%	-36,422	-17.0%	217,997	**45,721**	**45,721**	**44,175**	**43,275**	**53,887**	-162,934 to -160,489	-79.0% to -77.8%	-134,138 to -131,693	-75.6% to -74.2%	-174,722 to -172,276	-80.1% to -79.0%
2Q	**275,657**	282,266	**18,401**	-257,256	-93.3%	-263,864	-93.5%	291,154	**150,913**	**103,602**	**123,561**	**99,041**	**236,963**	-177,003 to -124,744	-64.2% to -45.3%	80,253 to 132,512	436.1% to 720.1%	-192,500 to -140,241	-66.1% to -48.2%
3Q	**309,241**	316,897	**110,647**	-198,594	-64.2%	-206,250	-65.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**234,461**	237,173	**63,675**	-170,787	-72.8%	-173,499	-73.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,025,570**	1,050,171	**370,136**	-655,433	-63.9%	-680,035	-64.8%	509,151	**196,634**	**149,323**	**167,736**	**142,316**	**290,850**	-339,937 to -285,233	-70.5% to -59.2%	-53,885 to 819	-27.5% to 0.4%	-367,221 to -312,517	-72.1% to -61.4%

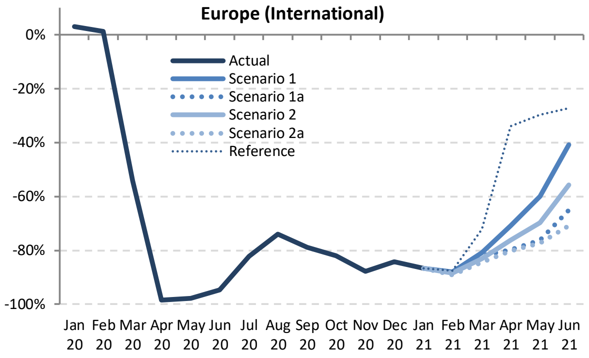
Seat Capacity (thousand) - Europe Domestic

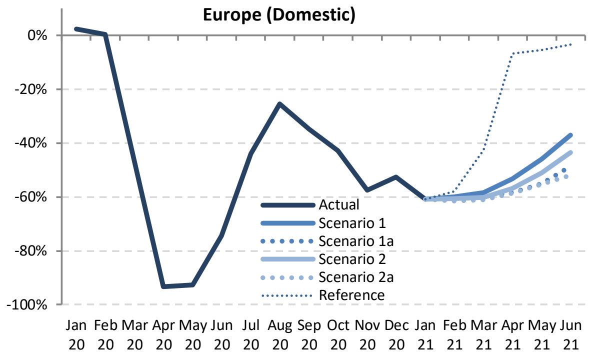
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**29,708**	29,203	**30,148**	440	1.5%	945	3.2%	28,911	**13,502**	**13,502**	**13,502**	**13,502**	**13,502**	-16,205	-54.5%	-16,645	-55.2%	-15,408	-53.3%
February	**27,328**	27,154	**27,813**	485	1.8%	659	2.4%	27,814	**12,459**	**12,459**	**12,366**	**12,160**	**12,803**	-15,168 to -14,869	-55.5% to -54.4%	-15,653 to -15,355	-56.3% to -55.2%	-15,654 to -15,355	-56.3% to -55.2%
March	**30,667**	30,085	**20,783**	-9,884	-32.2%	-9,301	-30.9%	29,723	**14,180**	**14,180**	**13,870**	**13,790**	**19,166**	-16,878 to -16,487	-55.0% to -53.8%	-6,994 to -6,603	-33.7% to -31.8%	-15,933 to -15,543	-53.6% to -52.3%
April	**30,123**	29,986	**3,593**	-26,530	-88.1%	-26,393	-88.0%	29,776	**15,323**	**14,429**	**14,643**	**14,324**	**29,955**	-15,799 to -14,800	-52.4% to -49.1%	10,731 to 11,729	298.6% to 326.4%	-15,452 to -14,453	-51.9% to -48.5%
May	**32,229**	32,001	**4,181**	-28,047	-87.0%	-27,820	-86.9%	32,069	**18,708**	**16,443**	**17,579**	**16,488**	**32,016**	-15,786 to -13,521	-49.0% to -42.0%	12,261 to 14,526	293.2% to 347.4%	-15,627 to -13,361	-48.7% to -41.7%
June	**32,730**	32,499	**10,385**	-22,345	-68.3%	-22,114	-68.0%	32,558	**21,789**	**18,820**	**20,264**	**17,797**	**32,786**	-14,933 to -10,941	-45.6% to -33.4%	7,412 to 11,405	71.4% to 109.8%	-14,761 to -10,768	-45.3% to -33.1%
July	**33,114**	32,880	**20,465**	-12,649	-38.2%	-12,415	-37.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	**33,118**	32,884	**25,419**	-7,699	-23.2%	-7,465	-22.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	**33,152**	32,918	**22,869**	-10,283	-31.0%	-10,049	-30.5%	-	-	-	-	-	-	-	-	-	-	-	-
October	**31,891**	31,349	**21,152**	-10,739	-33.7%	-10,198	-32.5%	-	-	-	-	-	-	-	-	-	-	-	-
November	**29,373**	28,874	**15,334**	-14,038	-47.8%	-13,539	-46.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	**28,961**	28,312	**15,911**	-13,050	-45.1%	-12,401	-43.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**87,703**	86,441	**78,744**	-8,959	-10.2%	-7,698	-8.9%	86,448	**40,142**	**40,142**	**39,739**	**39,452**	**45,472**	-48,251 to -47,561	-55.0% to -54.2%	-39,292 to -38,602	-49.9% to -49.0%	-46,996 to -46,306	-54.4% to -53.6%
2Q	**95,081**	94,486	**18,159**	-76,922	-80.9%	-76,327	-80.8%	94,403	**55,820**	**49,691**	**52,486**	**48,609**	**94,757**	-46,518 to -39,262	-48.9% to -41.3%	30,404 to 37,660	167.4% to 207.4%	-45,839 to -38,583	-48.6% to -40.9%
3Q	**99,383**	98,682	**68,752**	-30,631	-30.8%	-29,929	-30.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**90,225**	88,535	**52,397**	-37,828	-41.9%	-36,138	-40.8%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**372,392**	368,144	**218,053**	-154,339	-41.4%	-150,091	-40.8%	180,850	**95,961**	**89,833**	**92,224**	**88,060**	**140,229**	-94,769 to -86,823	-51.8% to -47.5%	-8,888 to -942	-9.2% to -1.0%	-92,835 to -84,889	-51.3% to -46.9%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - Europe International + Domestic

Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**77,394**	78,008	**79,596**	2,201	2.8%	1,588	2.0%	78,168	**16,176**	**16,176**	**16,176**	**16,176**	**16,176**	-61,218	-79.1%	-63,420	-79.7%	-61,992	-79.3%
February	**72,562**	76,002	**73,287**	724	1.0%	-2,716	-3.6%	77,678	**14,679**	**14,679**	**14,304**	**13,853**	**15,372**	-58,709 to -57,883	-80.9% to -79.8%	-59,434 to -58,607	-81.1% to -80.0%	-63,825 to -62,999	-82.2% to -81.1%
March	**84,453**	87,165	**40,521**	-43,932	-52.0%	-46,644	-53.5%	87,532	**21,675**	**20,610**	**19,989**	**18,883**	**30,829**	-65,571 to -62,779	-77.6% to -74.3%	-21,639 to -18,847	-53.4% to -46.5%	-68,649 to -65,857	-78.4% to -75.2%
April	**94,970**	97,515	**2,689**	-92,280	-97.2%	-94,825	-97.2%	99,440	**32,057**	**24,415**	**27,355**	**24,053**	**69,492**	-70,917 to -62,912	-74.7% to -66.2%	21,363 to 29,368	794.3% to 1092.0%	-75,387 to -67,383	-75.8% to -67.8%
May	**102,335**	103,397	**3,673**	-98,662	-96.4%	-99,724	-96.4%	103,841	**44,627**	**29,908**	**35,835**	**28,943**	**78,216**	-73,391 to -57,708	-71.7% to -56.4%	25,270 to 40,954	688.0% to 1115.0%	-74,898 to -59,214	-72.1% to -57.0%
June	**111,802**	115,361	**11,629**	-100,173	-89.6%	-103,733	-89.9%	118,715	**67,305**	**43,653**	**52,842**	**37,918**	**87,877**	-73,884 to -44,496	-66.1% to -39.8%	26,289 to 55,676	226.1% to 478.8%	-80,797 to -51,409	-68.1% to -43.3%
July	**119,918**	123,184	**32,423**	-87,495	-73.0%	-90,761	-73.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**120,268**	122,977	**45,122**	-75,146	-62.5%	-77,855	-63.3%	-	-	-	-	-	-	-	-	-	-	-	-
September	**110,196**	112,612	**35,310**	-74,887	-68.0%	-77,303	-68.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**103,161**	103,539	**28,800**	-74,361	-72.1%	-74,739	-72.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**80,792**	80,979	**17,045**	-63,747	-78.9%	-63,934	-79.0%	-	-	-	-	-	-	-	-	-	-	-	-
December	**81,724**	83,766	**20,094**	-61,630	-75.4%	-63,672	-76.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**234,410**	241,175	**193,404**	-41,006	-17.5%	-47,771	-19.8%	243,378	**52,530**	**51,465**	**50,469**	**48,912**	**62,377**	-185,499 to -181,880	-79.1% to -77.6%	-144,492 to -140,874	-74.7% to -72.8%	-194,467 to -190,848	-79.9% to -78.4%
2Q	**309,106**	316,273	**17,991**	-291,115	-94.2%	-298,282	-94.3%	321,996	**143,989**	**97,975**	**116,032**	**90,914**	**235,584**	-218,192 to -165,117	-70.6% to -53.4%	72,923 to 125,998	405.3% to 700.3%	-231,082 to -178,006	-71.8% to -55.3%
3Q	**350,382**	358,774	**112,854**	-237,528	-67.8%	-245,920	-68.5%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**265,677**	268,284	**65,939**	-199,738	-75.2%	-202,346	-75.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,159,575**	1,184,506	**390,188**	-769,388	-66.4%	-794,318	-67.1%	565,374	**196,519**	**149,440**	**166,500**	**139,825**	**297,962**	-403,691 to -346,997	-74.3% to -63.8%	-71,570 to -14,876	-33.9% to -7.0%	-425,548 to -368,854	-75.3% to -65.2%

Source: ICAO estimates

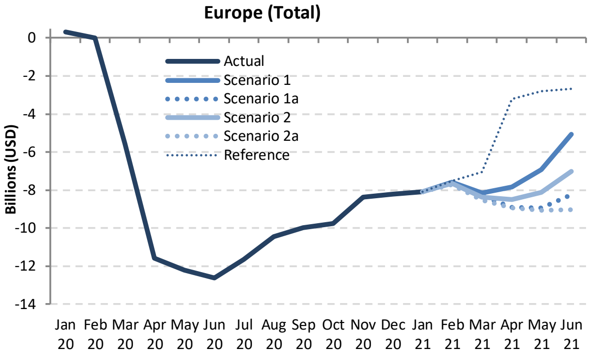
Passenger number

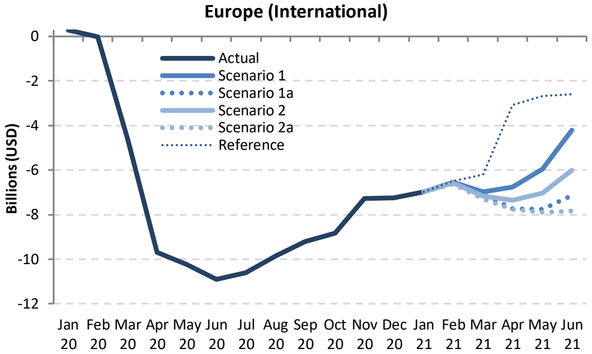
Passenger Number (thousand) - Europe International																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	54,881	55,743	56,557	1,676	3.1%	814	1.5%	56,110	7,370	7,370	7,370	7,370	7,370	-47,511	-86.6%	-49,187	-87.0%	-48,740	-86.9%
February	51,178	54,626	51,816	639	1.2%	-2,810	-5.1%	55,766	6,131	6,131	5,878	5,626	6,397	-45,552 to -45,047	-89.0% to -88.0%	-46,190 to -45,686	-89.1% to -88.2%	-50,139 to -49,635	-89.9% to -89.0%
March	59,791	62,825	27,468	-32,322	-54.1%	-35,357	-56.3%	63,466	11,397	10,713	10,169	9,258	16,650	-50,533 to -48,394	-84.5% to -80.9%	-18,210 to -16,072	-66.3% to -58.5%	-54,209 to -52,070	-85.4% to -82.0%
April	70,397	72,906	1,054	-69,343	-98.5%	-71,853	-98.6%	74,986	20,566	14,180	16,731	13,892	46,573	-56,505 to -49,831	-80.3% to -70.8%	12,838 to 19,512	1218.6% to 1852.1%	-61,094 to -54,420	-81.5% to -72.6%
May	76,311	77,402	1,741	-74,570	-97.7%	-75,661	-97.8%	77,771	30,542	18,222	23,097	17,303	53,631	-59,008 to -45,769	-77.3% to -60.0%	15,562 to 28,801	893.9% to 1654.4%	-60,468 to -47,228	-77.8% to -60.7%
June	83,994	87,585	4,545	-79,449	-94.6%	-83,040	-94.8%	90,866	49,803	29,332	37,133	24,532	61,039	-59,462 to -34,191	-70.8% to -40.7%	19,987 to 45,258	439.8% to 995.8%	-66,334 to -41,063	-73.0% to -45.2%
July	91,067	94,366	16,270	-74,797	-82.1%	-78,096	-82.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	91,837	94,578	23,925	-67,912	-73.9%	-70,652	-74.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	82,874	85,320	17,468	-65,406	-78.9%	-67,852	-79.5%	-	-	-	-	-	-	-	-	-	-	-	-
October	76,950	77,619	13,812	-63,138	-82.1%	-63,808	-82.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	57,404	57,850	7,084	-50,319	-87.7%	-50,765	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	58,838	61,260	9,236	-49,602	-84.3%	-52,023	-84.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	165,849	173,194	135,842	-30,007	-18.1%	-37,352	-21.6%	175,342	24,897	24,214	23,416	22,254	30,416	-143,596 to -140,952	-86.6% to -85.0%	-113,588 to -110,945	-83.6% to -81.7%	-153,088 to -150,445	-87.3% to -85.8%
2Q	230,702	237,893	7,339	-223,363	-96.8%	-230,553	-96.9%	243,622	100,911	61,734	76,961	55,727	161,242	-174,975 to -129,792	-75.8% to -56.3%	48,388 to 93,571	659.3% to 1274.9%	-187,895 to -142,712	-77.1% to -58.6%
3Q	265,778	274,263	57,663	-208,114	-78.3%	-216,600	-79.0%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	193,192	196,728	30,132	-163,060	-84.4%	-166,596	-84.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	855,522	882,079	230,977	-624,545	-73.0%	-651,102	-73.8%	418,964	125,808	85,948	100,377	77,981	191,658	-318,570 to -270,744	-80.3% to -68.3%	-65,200 to -17,373	-45.5% to -12.1%	-340,983 to -293,157	-81.4% to -70.0%

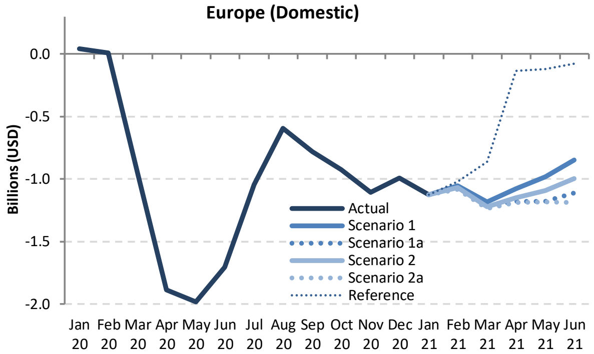
Passenger Number (thousand) - Europe Domestic																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	22,514	22,265	23,039	525	2.3%	774	3.5%	22,058	8,806	8,806	8,806	8,806	8,806	-13,707	-60.9%	-14,233	-61.8%	-13,252	-60.1%
February	21,385	21,376	21,470	86	0.4%	94	0.4%	21,912	8,549	8,549	8,426	8,227	8,975	-13,158 to -12,836	-61.5% to -60.0%	-13,244 to -12,922	-61.7% to -60.2%	-13,686 to -13,364	-62.5% to -61.0%
March	24,663	24,340	13,053	-11,610	-47.1%	-11,287	-46.4%	24,065	10,278	9,896	9,820	9,625	14,180	-15,038 to -14,385	-61.0% to -58.3%	-3,428 to -2,775	-26.3% to -21.3%	-14,441 to -13,787	-60.0% to -57.3%
April	24,573	24,608	1,636	-22,937	-93.3%	-22,972	-93.4%	24,455	11,492	10,235	10,624	10,161	22,919	-14,412 to -13,081	-58.7% to -53.2%	8,525 to 9,856	521.1% to 602.5%	-14,294 to -12,963	-58.4% to -53.0%
May	26,023	25,995	1,932	-24,091	-92.6%	-24,063	-92.6%	26,070	14,084	11,686	12,737	11,640	24,585	-14,383 to -11,939	-55.3% to -45.9%	9,708 to 12,152	502.5% to 629.0%	-14,430 to -11,986	-55.4% to -46.0%
June	27,807	27,777	7,084	-20,723	-74.5%	-20,693	-74.5%	27,849	17,503	14,321	15,710	13,385	26,838	-14,422 to -10,305	-51.9% to -37.1%	6,301 to 10,419	89.0% to 147.1%	-14,463 to -10,346	-51.9% to -37.2%
July	28,851	28,819	16,153	-12,698	-44.0%	-12,666	-43.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	28,431	28,399	21,196	-7,234	-25.4%	-7,203	-25.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	27,322	27,293	17,841	-9,481	-34.7%	-9,451	-34.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	26,211	25,920	14,989	-11,222	-42.8%	-10,932	-42.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	23,388	23,129	9,960	-13,428	-57.4%	-13,169	-56.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	22,886	22,506	10,857	-12,028	-52.6%	-11,649	-51.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	68,561	67,981	57,562	-10,999	-16.0%	-10,419	-15.3%	68,036	27,633	27,252	27,053	26,658	31,961	-41,903 to -40,928	-61.1% to -59.7%	-30,904 to -29,929	-53.7% to -52.0%	-41,378 to -40,403	-60.8% to -59.4%
2Q	78,404	78,380	10,652	-67,752	-86.4%	-67,729	-86.4%	78,373	43,079	36,241	39,071	35,187	74,342	-43,217 to -35,325	-55.1% to -45.1%	24,535 to 32,427	230.3% to 304.4%	-43,187 to -35,295	-55.1% to -45.0%
3Q	84,604	84,510	55,191	-29,413	-34.8%	-29,320	-34.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	72,485	71,556	35,806	-36,679	-50.6%	-35,750	-50.0%	-	-	-	-	-	-	-	-	-	-	-	-
Total	304,054	302,427	159,211	-144,843	-47.6%	-143,217	-47.4%	146,409	70,712	63,493	66,123	61,844	106,303	-85,121 to -76,254	-57.9% to -51.9%	-6,370 to 2,498	-9.3% to 3.7%	-84,565 to -75,698	-57.8% to -51.7%

Source: ICAO estimates

Passenger revenue







Passenger revenue (USD, million) - Europe International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**9,945**	10,029	**10,260**	315	3.2%	231	2.3%	10,053	**1,846**	**1,846**	**1,846**	**1,846**	**1,846**	-8,099	-81.4%	-8,414	-82.0%	-8,207	-81.6%
February	**9,229**	9,670	**9,225**	-4	0.0%	-445	-4.6%	9,821	**1,638**	**1,638**	**1,590**	**1,535**	**1,714**	-7,694 to -7,591	-83.4% to -82.2%	-7,690 to -7,587	-83.4% to -82.2%	-8,286 to -8,183	-84.4% to -83.3%
March	**10,734**	11,005	**5,169**	-5,565	-51.8%	-5,836	-53.0%	11,035	**2,574**	**2,439**	**2,352**	**2,198**	**3,675**	-8,536 to -8,160	-79.5% to -76.0%	-2,971 to -2,595	-57.5% to -50.2%	-8,837 to -8,461	-80.1% to -76.7%
April	**11,885**	12,215	**314**	-11,570	-97.4%	-11,901	-97.4%	12,511	**4,039**	**2,988**	**3,399**	**2,937**	**8,684**	-8,948 to -7,846	-75.3% to -66.0%	2,623 to 3,724	834.3% to 1184.8%	-9,574 to -8,472	-76.5% to -67.7%
May	**12,629**	12,839	**427**	-12,203	-96.6%	-12,412	-96.7%	12,986	**5,707**	**3,708**	**4,509**	**3,564**	**9,832**	-9,065 to -6,922	-71.8% to -54.8%	3,137 to 5,280	735.6% to 1238.0%	-9,422 to -7,279	-72.6% to -56.1%
June	**13,810**	14,251	**1,194**	-12,616	-91.4%	-13,057	-91.6%	14,714	**8,755**	**5,557**	**6,797**	**4,778**	**11,128**	-9,032 to -5,055	-65.4% to -36.6%	3,583 to 7,560	300.0% to 633.0%	-9,936 to -5,959	-67.5% to -40.5%
July	**14,914**	15,360	**3,268**	-11,646	-78.1%	-12,092	-78.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**15,004**	15,380	**4,563**	-10,441	-69.6%	-10,817	-70.3%	-	-	-	-	-	-	-	-	-	-	-	-
September	**13,601**	13,929	**3,611**	-9,990	-73.5%	-10,318	-74.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**12,796**	12,889	**3,039**	-9,756	-76.2%	-9,850	-76.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	**10,261**	10,317	**1,892**	-8,369	-81.6%	-8,425	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**10,519**	10,791	**2,297**	-8,222	-78.2%	-8,494	-78.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**29,909**	30,705	**24,654**	-5,254	-17.6%	-6,050	-19.7%	30,909	**6,058**	**5,923**	**5,788**	**5,579**	**7,235**	-24,329 to -23,850	-81.3% to -79.7%	-19,075 to -18,596	-77.4% to -75.4%	-25,330 to -24,851	-81.9% to -80.4%
2Q	**38,324**	39,305	**1,935**	-36,388	-95.0%	-37,370	-95.1%	40,211	**18,500**	**12,253**	**14,704**	**11,279**	**29,644**	-27,045 to -19,824	-70.6% to -51.7%	9,344 to 16,565	482.8% to 856.0%	-28,932 to -21,711	-72.0% to -54.0%
3Q	**43,518**	44,669	**11,442**	-32,076	-73.7%	-33,227	-74.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**33,575**	33,997	**7,228**	-26,348	-78.5%	-26,769	-78.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**145,325**	148,675	**45,259**	-100,066	-68.9%	-103,416	-69.6%	71,120	**24,558**	**18,176**	**20,492**	**16,858**	**36,879**	-51,374 to -43,674	-75.3% to -64.0%	-9,732 to -2,031	-36.6% to -7.6%	-54,262 to -46,562	-76.3% to -65.5%

Passenger revenue

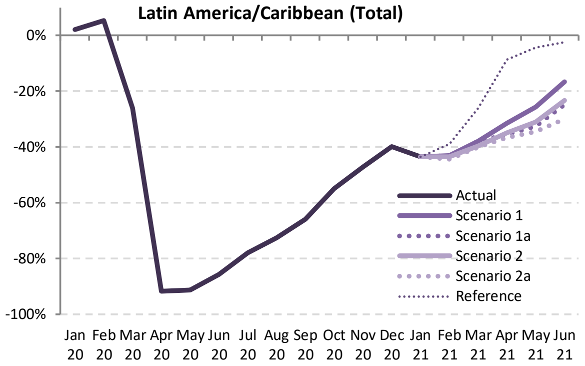
Passenger revenue (USD, million) - Europe International																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**8,094**	8,199	**8,366**	272	3.4%	167	2.0%	8,240	**1,122**	**1,122**	**1,122**	**1,122**	**1,122**	-6,972	-86.1%	-7,244	-86.6%	-7,118	-86.4%
February	**7,471**	7,913	**7,460**	-11	-0.1%	-453	-5.7%	8,019	**936**	**936**	**897**	**859**	**976**	-6,613 to -6,536	-88.5% to -87.5%	-6,601 to -6,525	-88.5% to -87.5%	-7,161 to -7,084	-89.3% to -88.3%
March	**8,707**	9,004	**4,096**	-4,611	-53.0%	-4,908	-54.5%	9,057	**1,729**	**1,625**	**1,544**	**1,407**	**2,509**	-7,300 to -6,978	-83.8% to -80.1%	-2,689 to -2,367	-65.6% to -57.8%	-7,650 to -7,328	-84.5% to -80.9%
April	**9,864**	10,192	**180**	-9,684	-98.2%	-10,012	-98.2%	10,501	**3,094**	**2,147**	**2,525**	**2,102**	**6,800**	-7,763 to -6,771	-78.7% to -68.6%	1,922 to 2,914	1068.6% to 1620.3%	-8,399 to -7,407	-80.0% to -70.5%
May	**10,490**	10,702	**268**	-10,222	-97.4%	-10,434	-97.5%	10,842	**4,549**	**2,747**	**3,462**	**2,607**	**7,811**	-7,883 to -5,941	-75.1% to -56.6%	2,339 to 4,281	874.0% to 1599.4%	-8,235 to -6,294	-76.0% to -58.0%
June	**11,524**	11,967	**612**	-10,912	-94.7%	-11,356	-94.9%	12,424	**7,316**	**4,379**	**5,505**	**3,677**	**8,921**	-7,846 to -4,208	-68.1% to -36.5%	3,065 to 6,704	500.9% to 1095.5%	-8,747 to -5,109	-70.4% to -41.1%
July	**12,542**	12,991	**1,940**	-10,602	-84.5%	-11,051	-85.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	**12,666**	13,045	**2,821**	-9,846	-77.7%	-10,224	-78.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**11,354**	11,685	**2,144**	-9,210	-81.1%	-9,541	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	**10,641**	10,758	**1,807**	-8,834	-83.0%	-8,951	-83.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**8,338**	8,415	**1,073**	-7,265	-87.1%	-7,343	-87.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**8,637**	8,940	**1,404**	-7,233	-83.7%	-7,536	-84.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**24,272**	25,116	**19,922**	-4,350	-17.9%	-5,194	-20.7%	25,316	**3,787**	**3,683**	**3,563**	**3,388**	**4,607**	-20,884 to -20,485	-86.0% to -84.4%	-16,534 to -16,135	-83.0% to -81.0%	-21,928 to -21,529	-86.6% to -85.0%
2Q	**31,878**	32,861	**1,059**	-30,818	-96.7%	-31,802	-96.8%	33,767	**14,958**	**9,273**	**11,492**	**8,386**	**23,532**	-23,492 to -16,919	-73.7% to -53.1%	7,326 to 13,899	691.5% to 1311.9%	-25,381 to -18,809	-75.2% to -55.7%
3Q	**36,562**	37,721	**6,904**	-29,658	-81.1%	-30,816	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**27,616**	28,114	**4,284**	-23,332	-84.5%	-23,830	-84.8%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**120,328**	123,811	**32,169**	-88,158	-73.3%	-91,642	-74.0%	59,083	**18,745**	**12,956**	**15,056**	**11,774**	**28,139**	-44,376 to -37,405	-79.0% to -66.6%	-9,208 to -2,237	-43.9% to -10.7%	-47,309 to -40,338	-80.1% to -68.3%

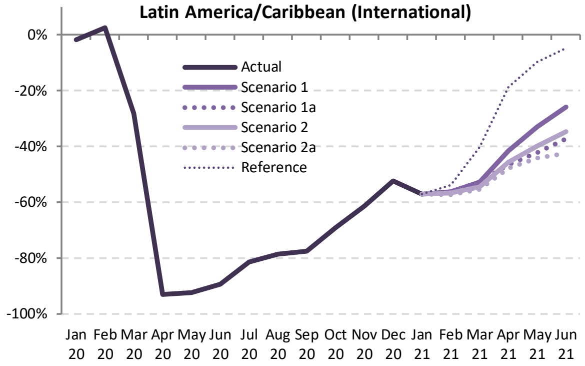
Passenger revenue (USD, million) - Europe Domestic																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**1,851**	1,830	**1,894**	43	2.3%	64	3.5%	1,814	**724**	**724**	**724**	**724**	**724**	-1,127	-60.9%	-1,170	-61.8%	-1,090	-60.1%
February	**1,758**	1,757	**1,765**	7	0.4%	8	0.4%	1,802	**703**	**703**	**693**	**676**	**738**	-1,082 to -1,055	-61.5% to -60.0%	-1,089 to -1,062	-61.7% to -60.2%	-1,125 to -1,099	-62.5% to -61.0%
March	**2,028**	2,001	**1,073**	-955	-47.1%	-928	-46.4%	1,979	**845**	**814**	**807**	**791**	**1,166**	-1,236 to -1,183	-61.0% to -58.3%	-282 to -228	-26.3% to -21.3%	-1,187 to -1,134	-60.0% to -57.3%
April	**2,020**	2,023	**134**	-1,886	-93.3%	-1,889	-93.4%	2,011	**945**	**841**	**873**	**835**	**1,884**	-1,185 to -1,075	-58.7% to -53.2%	701 to 810	521.1% to 602.5%	-1,175 to -1,066	-58.4% to -53.0%
May	**2,140**	2,137	**159**	-1,981	-92.6%	-1,978	-92.6%	2,143	**1,158**	**961**	**1,047**	**957**	**2,021**	-1,183 to -982	-55.3% to -45.9%	798 to 999	502.5% to 629.0%	-1,186 to -985	-55.4% to -46.0%
June	**2,286**	2,284	**582**	-1,704	-74.5%	-1,701	-74.5%	2,290	**1,439**	**1,177**	**1,292**	**1,100**	**2,207**	-1,186 to -847	-51.9% to -37.1%	518 to 857	89.0% to 147.1%	-1,189 to -851	-51.9% to -37.2%
July	**2,372**	2,369	**1,328**	-1,044	-44.0%	-1,041	-43.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	**2,337**	2,335	**1,743**	-595	-25.4%	-592	-25.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**2,246**	2,244	**1,467**	-779	-34.7%	-777	-34.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**2,155**	2,131	**1,232**	-923	-42.8%	-899	-42.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**1,923**	1,902	**819**	-1,104	-57.4%	-1,083	-56.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	**1,882**	1,850	**893**	-989	-52.6%	-958	-51.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**5,637**	5,589	**4,732**	-904	-16.0%	-857	-15.3%	5,594	**2,272**	**2,240**	**2,224**	**2,192**	**2,628**	-3,445 to -3,365	-61.1% to -59.7%	-2,541 to -2,461	-53.7% to -52.0%	-3,402 to -3,322	-60.8% to -59.4%
2Q	**6,446**	6,444	**876**	-5,570	-86.4%	-5,568	-86.4%	6,443	**3,542**	**2,980**	**3,212**	**2,893**	**6,112**	-3,553 to -2,904	-55.1% to -45.1%	2,017 to 2,666	230.3% to 304.4%	-3,551 to -2,902	-55.1% to -45.0%
3Q	**6,956**	6,948	**4,537**	-2,418	-34.8%	-2,411	-34.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**5,959**	5,883	**2,944**	-3,016	-50.6%	-2,939	-50.0%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**24,998**	24,864	**13,089**	-11,908	-47.6%	-11,775	-47.4%	12,037	**5,814**	**5,220**	**5,436**	**5,085**	**8,740**	-6,998 to -6,269	-57.9% to -51.9%	-524 to 205	-9.3% to 3.7%	-6,953 to -6,224	-57.8% to -51.7%

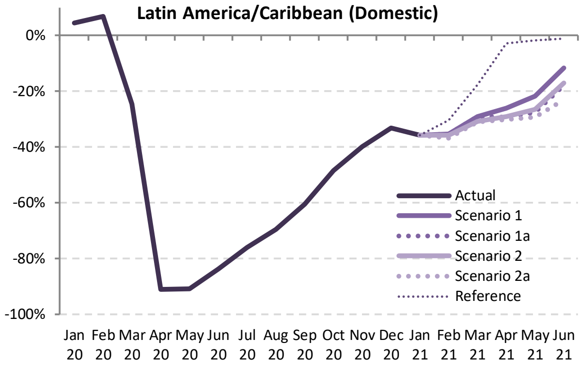
Latin America/Caribbean

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-6.3%	-9.5%	-4.4%	-8,770	-10.1%	-4,698	-15.0%	-4,072	-7.3%	-1,321	-976	-346
2Q 2020	-89.6%	-91.6%	-88.5%	-76,688	-92.2%	-28,082	-96.1%	-48,606	-90.0%	-9,679	-5,628	-4,051
3Q 2020	-72.4%	-79.3%	-68.9%	-67,727	-77.5%	-26,240	-89.4%	-41,486	-71.5%	-8,805	-5,319	-3,486
4Q 2020	-47.1%	-60.4%	-40.4%	-45,698	-52.7%	-21,778	-76.2%	-23,920	-41.2%	-6,450	-4,434	-2,016
Total 2020	**-53.3%**	**-58.9%**	**-50.4%**	**-198,883**	**-57.8%**	**-80,799**	**-68.2%**	**-118,084**	**-52.4%**	**-26,256**	**-16,358**	**-9,899**
1Q 2021	-42.6% to -41.5%	-56.6% to -55.4%	-34.5% to -33.4%	-42,700 to -41,293	-49.2% to -47.6%	-22,437 to -21,729	-71.7% to -69.4%	-20,264 to -19,564	-36.6% to -35.3%	-6,299 to -6,103	-4,588 to -4,451	-1,711 to -1,652
2Q 2021	-33.6% to -24.6%	-44.8% to -33.5%	-27.5% to -19.9%	-34,330 to -25,272	-41.3% to -30.4%	-18,285 to -13,716	-62.6% to -47.0%	-16,044 to -11,555	-29.7% to -21.4%	-5,080 to -3,813	-3,739 to -2,845	-1,341 to -968
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-38.2% to -33.3%**	**-51.0% to -45.0%**	**-31.1% to -26.7%**	**-77,030 to -66,564**	**-45.3% to -39.2%**	**-40,722 to -35,445**	**-67.3% to -58.6%**	**-36,308 to -31,119**	**-33.2% to -28.4%**	**-11,379 to -9,916**	**-8,327 to -7,296**	**-3,052 to -2,621**

Seat capacity







Seat Capacity (thousand) - Latin America/Caribbean International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**37,918**	38,484	**38,769**	851	2.2%	285	0.7%	39,039	**21,439**	**21,439**	**21,439**	**21,439**	**21,439**	-16,479	-43.5%	-17,330	-44.7%	-17,600	-45.1%
February	**33,375**	34,855	**35,166**	1,791	5.4%	311	0.9%	35,222	**19,028**	**19,028**	**18,878**	**18,562**	**20,374**	-14,813 to -14,347	-44.4% to -43.0%	-16,604 to -16,139	-47.2% to -45.9%	-16,660 to -16,194	-47.3% to -46.0%
March	**36,136**	37,503	**26,758**	-9,378	-26.0%	-10,745	-28.7%	38,380	**22,415**	**22,415**	**21,833**	**21,647**	**26,731**	-14,489 to -13,722	-40.1% to -38.0%	-5,111 to -4,343	-19.1% to -16.2%	-16,733 to -15,965	-43.6% to -41.6%
April	**34,019**	35,632	**2,808**	-31,211	-91.7%	-32,824	-92.1%	36,978	**23,297**	**21,939**	**22,145**	**21,595**	**31,107**	-12,423 to -10,722	-36.5% to -31.5%	18,788 to 20,489	669.1% to 729.7%	-15,383 to -13,682	-41.6% to -37.0%
May	**34,267**	36,112	**2,976**	-31,291	-91.3%	-33,136	-91.8%	37,045	**25,483**	**23,113**	**23,640**	**22,467**	**32,758**	-11,800 to -8,784	-34.4% to -25.6%	19,491 to 22,508	655.0% to 756.4%	-14,579 to -11,562	-39.4% to -31.2%
June	**33,623**	35,813	**4,789**	-28,835	-85.8%	-31,024	-86.6%	37,518	**28,025**	**25,305**	**25,802**	**23,594**	**32,843**	-10,029 to -5,598	-29.8% to -16.6%	18,805 to 23,236	392.7% to 485.2%	-13,924 to -9,492	-37.1% to -25.3%
July	**37,333**	38,664	**8,244**	-29,089	-77.9%	-30,421	-78.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**35,832**	37,045	**9,806**	-26,026	-72.6%	-27,239	-73.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	**32,965**	34,439	**11,263**	-21,702	-65.8%	-23,176	-67.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**34,404**	35,289	**15,499**	-18,905	-54.9%	-19,790	-56.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**34,497**	35,091	**18,229**	-16,268	-47.2%	-16,862	-48.1%	-	-	-	-	-	-	-	-	-	-	-	-
December	**37,593**	38,138	**22,584**	-15,009	-39.9%	-15,554	-40.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**107,430**	110,842	**100,693**	-6,737	-6.3%	-10,148	-9.2%	112,641	**62,882**	**62,882**	**62,151**	**61,649**	**68,545**	-45,781 to -44,548	-42.6% to -41.5%	-39,044 to -37,811	-38.8% to -37.6%	-50,992 to -49,759	-45.3% to -44.2%
2Q	**101,909**	107,557	**10,572**	-91,337	-89.6%	-96,985	-90.2%	111,541	**76,805**	**70,357**	**71,588**	**67,656**	**96,709**	-34,253 to -25,104	-33.6% to -24.6%	57,084 to 66,233	539.9% to 626.5%	-43,885 to -34,736	-39.3% to -31.1%
3Q	**106,130**	110,149	**29,313**	-76,818	-72.4%	-80,836	-73.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**106,494**	108,518	**56,312**	-50,182	-47.1%	-52,206	-48.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**421,963**	437,065	**196,890**	-225,073	-53.3%	-240,175	-55.0%	224,182	**139,687**	**133,239**	**133,738**	**129,305**	**165,253**	-80,034 to -69,652	-38.2% to -33.3%	18,039 to 28,422	16.2% to 25.5%	-94,877 to -84,495	-42.3% to -37.7%

Source: ICAO estimates

ICAO UNITING AVIATION

Seat capacity

Seat Capacity (thousand) - Latin America/Caribbean International

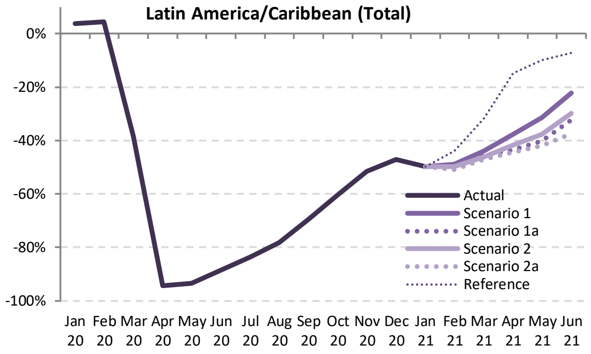
Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	13,804	13,528	13,553	-251	-1.8%	25	0.2%	13,383	5,931	5,931	5,931	5,931	5,931	-7,873	-57.0%	-7,621	-56.2%	-7,452	-55.7%
February	12,228	12,396	12,543	315	2.6%	147	1.2%	12,292	5,347	5,347	5,301	5,212	5,649	-7,016 to -6,881	-57.4% to -56.3%	-7,331 to -7,196	-58.4% to -57.4%	-7,080 to -6,945	-57.6% to -56.5%
March	13,495	13,244	9,676	-3,820	-28.3%	-3,569	-26.9%	12,936	6,368	6,368	6,141	6,030	8,063	-7,466 to -7,128	-55.3% to -52.8%	-3,646 to -3,308	-37.7% to -34.2%	-6,906 to -6,568	-53.4% to -50.8%
April	12,170	12,539	840	-11,331	-93.1%	-11,700	-93.3%	12,809	7,121	6,509	6,628	6,348	9,878	-5,823 to -5,049	-47.8% to -41.5%	5,508 to 6,281	655.8% to 747.8%	-6,461 to -5,688	-50.4% to -44.4%
May	11,787	12,242	906	-10,881	-92.3%	-11,336	-92.6%	12,632	7,910	6,821	7,094	6,579	10,648	-5,208 to -3,877	-44.2% to -32.9%	5,673 to 7,004	626.1% to 773.0%	-6,052 to -4,721	-47.9% to -37.4%
June	11,834	12,226	1,253	-10,580	-89.4%	-10,972	-89.7%	12,508	8,781	7,414	7,735	6,821	11,266	-5,012 to -3,053	-42.4% to -25.8%	5,568 to 7,528	444.3% to 600.7%	-5,686 to -3,727	-45.5% to -29.8%
July	12,806	13,103	2,371	-10,434	-81.5%	-10,732	-81.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	12,203	12,642	2,607	-9,596	-78.6%	-10,035	-79.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	10,491	11,018	2,364	-8,127	-77.5%	-8,654	-78.5%	-	-	-	-	-	-	-	-	-	-	-	-
October	10,906	10,820	3,373	-7,533	-69.1%	-7,446	-68.8%	-	-	-	-	-	-	-	-	-	-	-	-
November	11,631	11,459	4,483	-7,149	-61.5%	-6,977	-60.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	13,268	13,108	6,332	-6,936	-52.3%	-6,776	-51.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	39,527	39,168	35,772	-3,756	-9.5%	-3,396	-8.7%	38,611	17,646	17,646	17,373	17,174	19,644	-22,354 to -21,881	-56.6% to -55.4%	-18,598 to -18,126	-52.0% to -50.7%	-21,438 to -20,965	-55.5% to -54.3%
2Q	35,791	37,007	2,999	-32,792	-91.6%	-34,007	-91.9%	37,948	23,812	20,744	21,457	19,748	31,792	-16,043 to -11,979	-44.8% to -33.5%	16,749 to 20,813	558.4% to 694.0%	-18,200 to -14,136	-48.0% to -37.3%
3Q	35,499	36,763	7,342	-28,157	-79.3%	-29,421	-80.0%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	35,805	35,387	14,188	-21,617	-60.4%	-21,199	-59.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	146,623	148,324	60,301	-86,322	-58.9%	-88,024	-59.3%	76,559	41,458	38,390	38,830	36,922	51,436	-38,397 to -33,860	-51.0% to -45.0%	-1,849 to 2,688	-4.8% to 6.9%	-39,638 to -35,101	-51.8% to -45.8%

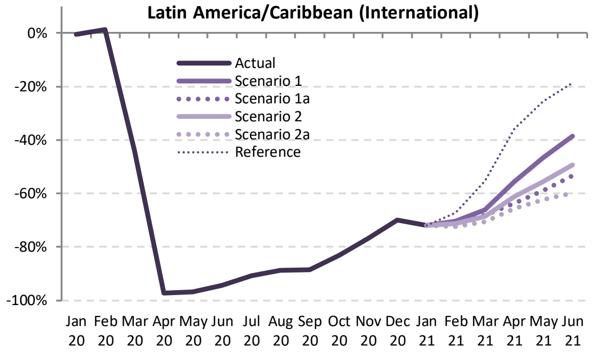
Seat Capacity (thousand) - Latin America/Caribbean Domestic

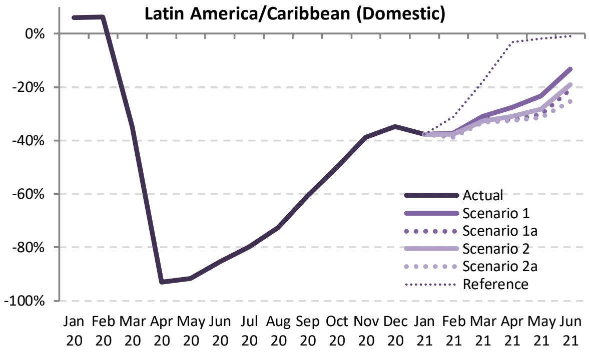
Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	24,114	24,956	25,216	1,102	4.6%	260	1.0%	25,656	15,508	15,508	15,508	15,508	15,508	-8,606	-35.7%	-9,708	-38.5%	-10,148	-39.6%
February	21,147	22,459	22,623	1,476	7.0%	164	0.7%	22,930	13,681	13,681	13,577	13,350	14,725	-7,797 to -7,466	-36.9% to -35.3%	-9,273 to -8,942	-41.0% to -39.5%	-9,580 to -9,249	-41.8% to -40.3%
March	22,641	24,259	17,082	-5,559	-24.6%	-7,177	-29.6%	25,444	16,047	16,047	15,693	15,617	18,667	-7,024 to -6,594	-31.0% to -29.1%	-1,465 to -1,035	-8.6% to -6.1%	-9,827 to -9,397	-38.6% to -36.9%
April	21,848	23,093	1,968	-19,880	-91.0%	-21,125	-91.5%	24,169	16,176	15,429	15,518	15,248	21,230	-6,600 to -5,673	-30.2% to -26.0%	13,280 to 14,208	674.8% to 722.0%	-8,922 to -7,994	-36.9% to -33.1%
May	22,480	23,870	2,070	-20,410	-90.8%	-21,801	-91.3%	24,414	17,573	16,292	16,546	15,887	22,109	-6,593 to -4,907	-29.3% to -21.8%	13,818 to 15,504	667.7% to 749.1%	-8,526 to -6,840	-34.9% to -28.0%
June	21,790	23,587	3,536	-18,254	-83.8%	-20,052	-85.0%	25,010	19,244	17,891	18,067	16,773	21,578	-5,017 to -2,546	-23.0% to -11.7%	13,237 to 15,709	374.4% to 444.3%	-8,237 to -5,766	-32.9% to -23.1%
July	24,528	25,562	5,873	-18,655	-76.1%	-19,689	-77.0%	-	-	-	-	-	-	-	-	-	-	-	-
August	23,629	24,403	7,199	-16,430	-69.5%	-17,204	-70.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	22,474	23,421	8,899	-13,575	-60.4%	-14,522	-62.0%	-	-	-	-	-	-	-	-	-	-	-	-
October	23,498	24,469	12,126	-11,372	-48.4%	-12,343	-50.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	22,866	23,632	13,746	-9,119	-39.9%	-9,885	-41.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	24,326	25,030	16,252	-8,074	-33.2%	-8,778	-35.1%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	67,903	71,674	64,922	-2,981	-4.4%	-6,752	-9.4%	74,030	45,236	45,236	44,778	44,476	48,901	-23,427 to -22,667	-34.5% to -33.4%	-20,446 to -19,686	-31.5% to -30.3%	-29,555 to -28,794	-39.9% to -38.9%
2Q	66,118	70,550	7,573	-58,545	-88.5%	-62,977	-89.3%	73,593	52,993	49,612	50,131	47,908	64,917	-18,210 to -13,125	-27.5% to -19.9%	40,335 to 45,420	532.6% to 599.8%	-25,685 to -20,600	-34.9% to -28.0%
3Q	70,631	73,385	21,971	-48,660	-68.9%	-51,415	-70.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	70,689	73,131	42,124	-28,565	-40.4%	-31,007	-42.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	275,341	288,741	136,590	-138,751	-50.4%	-152,151	-52.7%	147,623	98,229	94,848	94,909	92,383	113,817	-41,637 to -35,792	-31.1% to -26.7%	19,889 to 25,734	27.4% to 35.5%	-55,240 to -49,394	-37.4% to -33.5%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - Latin America/Caribbean International + Domestic

Year	2019	2020						2021					
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-
January	**30,843**	31,496	**32,007**	1,165	3.8%	511	1.6%	32,142	**15,468**	**15,468**	**15,468**	**15,468**	**15,468**
February	**26,782**	28,144	**27,966**	1,185	4.4%	-177	-0.6%	28,607	**13,668**	**13,668**	**13,479**	**13,173**	**15,014**
March	**29,083**	30,363	**17,963**	-11,120	-38.2%	-12,399	-40.8%	31,251	**16,279**	**15,858**	**15,683**	**15,366**	**19,796**
April	**27,557**	29,032	**1,530**	-26,027	-94.4%	-27,502	-94.7%	30,293	**17,203**	**15,569**	**16,057**	**15,355**	**23,464**
May	**27,945**	29,622	**1,832**	-26,113	-93.4%	-27,789	-93.8%	30,552	**19,187**	**16,748**	**17,431**	**16,205**	**25,181**
June	**27,710**	29,678	**3,162**	-24,548	-88.6%	-26,517	-89.3%	31,260	**21,549**	**18,752**	**19,454**	**17,322**	**25,732**
July	**31,416**	32,731	**5,165**	-26,251	-83.6%	-27,566	-84.2%	-	-	-	-	-	-
August	**29,495**	30,672	**6,447**	-23,048	-78.1%	-24,225	-79.0%	-	-	-	-	-	-
September	**26,499**	27,847	**8,072**	-18,427	-69.5%	-19,775	-71.0%	-	-	-	-	-	-
October	**27,937**	28,829	**11,102**	-16,836	-60.3%	-17,728	-61.5%	-	-	-	-	-	-
November	**27,860**	28,511	**13,508**	-14,353	-51.5%	-15,003	-52.6%	-	-	-	-	-	-
December	**30,886**	31,517	**16,376**	-14,510	-47.0%	-15,141	-48.0%	-	-	-	-	-	-
1Q	**86,707**	90,003	**77,937**	-8,770	-10.1%	-12,066	-13.4%	92,001	**45,415**	**44,993**	**44,630**	**44,007**	**50,278**
2Q	**83,212**	88,332	**6,524**	-76,688	-92.2%	-81,808	-92.6%	92,104	**57,940**	**51,069**	**52,943**	**48,882**	**74,377**
3Q	**87,410**	91,250	**19,684**	-67,727	-77.5%	-71,567	-78.4%	-	-	-	-	-	-
4Q	**86,684**	88,857	**40,985**	-45,698	-52.7%	-47,872	-53.9%	-	-	-	-	-	-
Total	**344,013**	358,442	**145,130**	-198,883	-57.8%	-213,312	-59.5%	184,105	**103,355**	**96,063**	**97,573**	**92,889**	**124,655**

Year	2021					
Month	Compared to 2019		Compared to 2020		Compared to Baseline	
	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	-15,375	-49.8%	-16,539	-51.7%	-16,674	-51.9%
February	-13,609 to -13,114	-50.8% to -49.0%	-14,794 to -14,299	-52.9% to -51.1%	-15,434 to -14,939	-54.0% to -52.2%
March	-13,717 to -12,804	-47.2% to -44.0%	-2,597 to -1,684	-14.5% to -9.4%	-15,885 to -14,972	-50.8% to -47.9%
April	-12,202 to -10,353	-44.3% to -37.6%	13,825 to 15,674	903.9% to 1024.7%	-14,938 to -13,089	-49.3% to -43.2%
May	-11,740 to -8,758	-42.0% to -31.3%	14,372 to 17,355	784.4% to 947.1%	-14,347 to -11,365	-47.0% to -37.2%
June	-10,388 to -6,161	-37.5% to -22.2%	14,160 to 18,387	447.9% to 581.5%	-13,937 to -9,710	-44.6% to -31.1%
July	-	-	-	-	-	-
August	-	-	-	-	-	-
September	-	-	-	-	-	-
October	-	-	-	-	-	-
November	-	-	-	-	-	-
December	-	-	-	-	-	-
1Q	-42,700 to -41,293	-49.2% to -47.6%	-33,930 to -32,522	-43.5% to -41.7%	-47,993 to -46,586	-52.2% to -50.6%
2Q	-34,330 to -25,272	-41.3% to -30.4%	42,358 to 51,416	649.3% to 788.1%	-43,222 to -34,165	-46.9% to -37.1%
3Q	-	-	-	-	-	-
4Q	-	-	-	-	-	-
Total	-77,030 to -66,564	-45.3% to -39.2%	8,428 to 18,893	10.0% to 22.4%	-91,216 to -80,751	-49.5% to -43.9%

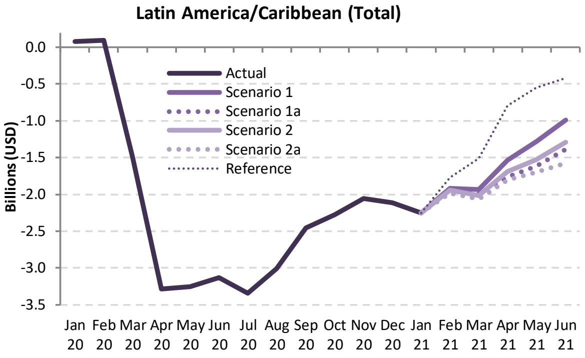
Passenger number

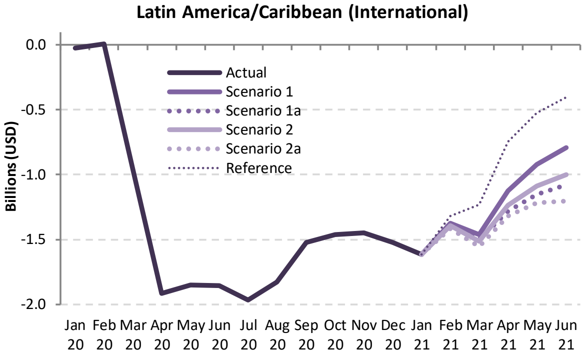
Passenger Number (thousand) - Latin America/Caribbean International																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**10,926**	10,751	**10,875**	-51	-0.5%	124	1.1%	10,657	**3,056**	**3,056**	**3,056**	**3,056**	**3,056**	-7,870	-72.0%	-7,818	-71.9%	-7,600	-71.3%
February	**9,534**	9,706	**9,652**	118	1.2%	-54	-0.6%	9,644	**2,835**	**2,835**	**2,740**	**2,625**	**3,129**	-6,909 to -6,700	-72.5% to -70.3%	-7,027 to -6,817	-72.8% to -70.6%	-7,019 to -6,809	-72.8% to -70.6%
March	**10,830**	10,670	**6,066**	-4,764	-44.0%	-4,605	-43.2%	10,438	**3,671**	**3,458**	**3,402**	**3,172**	**4,837**	-7,658 to -7,159	-70.7% to -66.1%	-2,893 to -2,395	-47.7% to -39.5%	-7,266 to -6,767	-69.6% to -64.8%
April	**9,833**	10,171	**275**	-9,558	-97.2%	-9,897	-97.3%	10,408	**4,372**	**3,570**	**3,818**	**3,374**	**6,298**	-6,459 to -5,460	-65.7% to -55.5%	3,099 to 4,098	1129.0% to 1492.8%	-7,034 to -6,036	-67.6% to -58.0%
May	**9,569**	9,976	**299**	-9,270	-96.9%	-9,677	-97.0%	10,311	**5,104**	**3,936**	**4,257**	**3,609**	**7,120**	-5,960 to -4,465	-62.3% to -46.7%	3,310 to 4,805	1106.9% to 1606.8%	-6,702 to -5,207	-65.0% to -50.5%
June	**9,808**	10,168	**554**	-9,253	-94.3%	-9,614	-94.5%	10,418	**6,017**	**4,568**	**4,965**	**3,942**	**7,980**	-5,866 to -3,791	-59.8% to -38.7%	3,387 to 5,463	611.0% to 985.2%	-6,476 to -4,401	-62.2% to -42.2%
July	**10,759**	11,055	**988**	-9,771	-90.8%	-10,067	-91.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	**10,182**	10,587	**1,155**	-9,027	-88.7%	-9,432	-89.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	**8,413**	8,868	**970**	-7,443	-88.5%	-7,898	-89.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**8,630**	8,599	**1,460**	-7,170	-83.1%	-7,139	-83.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	**9,239**	9,139	**2,129**	-7,110	-77.0%	-7,010	-76.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**10,726**	10,641	**3,228**	-7,498	-69.9%	-7,413	-69.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**31,290**	31,127	**26,592**	-4,698	-15.0%	-4,535	-14.6%	30,738	**9,562**	**9,349**	**9,198**	**8,854**	**11,023**	-22,437 to -21,729	-71.7% to -69.4%	-17,738 to -17,031	-66.7% to -64.0%	-21,884 to -21,177	-71.2% to -68.9%
2Q	**29,210**	30,316	**1,128**	-28,082	-96.1%	-29,188	-96.3%	31,137	**15,493**	**12,074**	**13,039**	**10,925**	**21,399**	-18,285 to -13,716	-62.6% to -47.0%	9,797 to 14,365	868.5% to 1273.5%	-20,212 to -15,643	-64.9% to -50.2%
3Q	**29,354**	30,510	**3,113**	-26,240	-89.4%	-27,397	-89.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**28,595**	28,378	**6,817**	-21,778	-76.2%	-21,562	-76.0%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**118,449**	120,332	**37,650**	-80,799	-68.2%	-82,682	-68.7%	61,875	**25,055**	**21,423**	**22,237**	**19,778**	**32,422**	-40,722 to -35,445	-67.3% to -58.6%	-7,942 to -2,665	-28.7% to -9.6%	-42,097 to -36,820	-68.0% to -59.5%

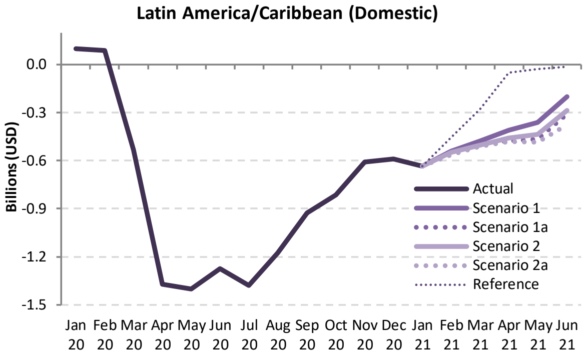
Passenger Number (thousand) - Latin America/Caribbean Domestic																			
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**19,917**	20,745	**21,133**	1,216	6.1%	387	1.9%	21,486	**12,412**	**12,412**	**12,412**	**12,412**	**12,412**	-7,505	-37.7%	-8,721	-41.3%	-9,074	-42.2%
February	**17,247**	18,438	**18,315**	1,067	6.2%	-124	-0.7%	18,963	**10,833**	**10,833**	**10,739**	**10,548**	**11,885**	-6,700 to -6,414	-38.8% to -37.2%	-7,767 to -7,481	-42.4% to -40.8%	-8,415 to -8,130	-44.4% to -42.9%
March	**18,253**	19,692	**11,898**	-6,355	-34.8%	-7,795	-39.6%	20,813	**12,608**	**12,399**	**12,282**	**12,194**	**14,959**	-6,059 to -5,645	-33.2% to -30.9%	296 to 710	2.5% to 6.0%	-8,619 to -8,205	-41.4% to -39.4%
April	**17,724**	18,860	**1,255**	-16,469	-92.9%	-17,605	-93.3%	19,885	**12,831**	**11,999**	**12,239**	**11,981**	**17,165**	-5,742 to -4,893	-32.4% to -27.6%	10,726 to 11,576	854.7% to 922.3%	-7,903 to -7,054	-39.7% to -35.5%
May	**18,376**	19,645	**1,533**	-16,843	-91.7%	-18,112	-92.2%	20,241	**14,083**	**12,812**	**13,175**	**12,596**	**18,061**	-5,780 to -4,293	-31.5% to -23.4%	11,062 to 12,550	721.5% to 818.5%	-7,645 to -6,158	-37.8% to -30.4%
June	**17,902**	19,510	**2,607**	-15,295	-85.4%	-16,903	-86.6%	20,842	**15,532**	**14,184**	**14,489**	**13,380**	**17,752**	-4,522 to -2,370	-25.3% to -13.2%	10,773 to 12,925	413.2% to 495.7%	-7,462 to -5,310	-35.8% to -25.5%
July	**20,657**	21,676	**4,176**	-16,481	-79.8%	-17,499	-80.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**19,314**	20,085	**5,292**	-14,021	-72.6%	-14,793	-73.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	**18,086**	18,979	**7,102**	-10,984	-60.7%	-11,877	-62.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**19,307**	20,230	**9,641**	-9,666	-50.1%	-10,589	-52.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**18,622**	19,372	**11,379**	-7,243	-38.9%	-7,993	-41.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**20,160**	20,876	**13,149**	-7,011	-34.8%	-7,728	-37.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**55,417**	58,876	**51,345**	-4,072	-7.3%	-7,531	-12.8%	61,262	**35,853**	**35,644**	**35,432**	**35,153**	**39,255**	-20,264 to -19,564	-36.6% to -35.3%	-16,192 to -15,492	-31.5% to -30.2%	-26,109 to -25,409	-42.6% to -41.5%
2Q	**54,002**	58,016	**5,396**	-48,606	-90.0%	-52,620	-90.7%	60,968	**42,446**	**38,995**	**39,903**	**37,958**	**52,978**	-16,044 to -11,555	-29.7% to -21.4%	32,562 to 37,051	603.5% to 686.7%	-23,010 to -18,521	-37.7% to -30.4%
3Q	**58,057**	60,740	**16,570**	-41,486	-71.5%	-44,169	-72.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**58,089**	60,479	**34,169**	-23,920	-41.2%	-26,310	-43.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**225,564**	238,110	**107,480**	-118,084	-52.4%	-130,630	-54.9%	122,230	**78,299**	**74,639**	**75,336**	**73,111**	**92,234**	-36,308 to -31,119	-33.2% to -28.4%	16,370 to 21,559	28.9% to 38.0%	-49,119 to -43,931	-40.2% to -35.9%

Source: ICAO estimates

Passenger revenue







Passenger revenue (USD, million) - Latin America/Caribbean International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**3,865**	3,887	**3,940**	75	1.9%	53	1.4%	3,943	**1,616**	**1,616**	**1,616**	**1,616**	**1,616**	-2,249	-58.2%	-2,324	-59.0%	-2,327	-59.0%
February	**3,361**	3,483	**3,457**	96	2.9%	-26	-0.8%	3,523	**1,443**	**1,443**	**1,416**	**1,378**	**1,587**	-1,982 to -1,918	-59.0% to -57.1%	-2,078 to -2,014	-60.1% to -58.3%	-2,144 to -2,080	-60.9% to -59.1%
March	**3,688**	3,768	**2,196**	-1,492	-40.5%	-1,571	-41.7%	3,826	**1,752**	**1,694**	**1,673**	**1,621**	**2,177**	-2,067 to -1,936	-56.0% to -52.5%	-575 to -444	-26.2% to -20.2%	-2,205 to -2,074	-57.6% to -54.2%
April	**3,444**	3,609	**154**	-3,290	-95.5%	-3,455	-95.7%	3,745	**1,908**	**1,683**	**1,751**	**1,643**	**2,651**	-1,801 to -1,536	-52.3% to -44.6%	1,489 to 1,754	965.5% to 1137.4%	-2,102 to -1,837	-56.1% to -49.0%
May	**3,439**	3,630	**184**	-3,256	-94.7%	-3,446	-94.9%	3,745	**2,156**	**1,822**	**1,914**	**1,740**	**2,888**	-1,699 to -1,284	-49.4% to -37.3%	1,556 to 1,972	846.3% to 1072.4%	-2,005 to -1,589	-53.5% to -42.4%
June	**3,450**	3,666	**316**	-3,134	-90.8%	-3,350	-91.4%	3,831	**2,456**	**2,060**	**2,163**	**1,870**	**3,033**	-1,579 to -993	-45.8% to -28.8%	1,554 to 2,141	492.0% to 677.6%	-1,961 to -1,375	-51.2% to -35.9%
July	**3,875**	4,038	**529**	-3,346	-86.4%	-3,509	-86.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	**3,664**	3,827	**657**	-3,007	-82.1%	-3,170	-82.8%	-	-	-	-	-	-	-	-	-	-	-	-
September	**3,229**	3,398	**777**	-2,452	-75.9%	-2,620	-77.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**3,364**	3,437	**1,087**	-2,278	-67.7%	-2,351	-68.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	**3,405**	3,436	**1,347**	-2,059	-60.5%	-2,089	-60.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	**3,826**	3,867	**1,712**	-2,114	-55.3%	-2,155	-55.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**10,914**	11,138	**9,593**	-1,321	-12.1%	-1,545	-13.9%	11,292	**4,811**	**4,753**	**4,705**	**4,616**	**5,381**	-6,299 to -6,103	-57.7% to -55.9%	-4,977 to -4,782	-51.9% to -49.8%	-6,676 to -6,481	-59.1% to -57.4%
2Q	**10,333**	10,905	**654**	-9,679	-93.7%	-10,251	-94.0%	11,320	**6,520**	**5,564**	**5,827**	**5,253**	**8,571**	-5,080 to -3,813	-49.2% to -36.9%	4,599 to 5,866	703.3% to 897.1%	-6,067 to -4,800	-53.6% to -42.4%
3Q	**10,768**	11,263	**1,963**	-8,805	-81.8%	-9,300	-82.6%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**10,595**	10,740	**4,145**	-6,450	-60.9%	-6,594	-61.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**42,611**	44,045	**16,355**	-26,256	-61.6%	-27,691	-62.9%	22,612	**11,331**	**10,317**	**10,533**	**9,869**	**13,952**	-11,379 to -9,916	-53.6% to -46.7%	-378 to 1,084	-3.7% to 10.6%	-12,744 to -11,281	-56.4% to -49.9%

Source: ICAO estimates

Passenger revenue

Passenger revenue (USD, million) - Latin America/Caribbean International																			
Year	**2019**	**2020**						**2021**											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**2,201**	2,157	**2,175**	-25	-1.2%	19	0.9%	2,152	**587**	**587**	**587**	**587**	**587**	-1,614	-73.3%	-1,588	-73.0%	-1,565	-72.7%
February	**1,921**	1,947	**1,929**	9	0.5%	-17	-0.9%	1,944	**544**	**544**	**526**	**504**	**601**	-1,417 to -1,377	-73.8% to -71.7%	-1,426 to -1,385	-73.9% to -71.8%	-1,440 to -1,400	-74.1% to -72.0%
March	**2,167**	2,127	**1,208**	-959	-44.3%	-919	-43.2%	2,092	**706**	**665**	**654**	**610**	**936**	-1,557 to -1,460	-71.9% to -67.4%	-598 to -501	-49.5% to -41.5%	-1,482 to -1,386	-70.9% to -66.2%
April	**1,970**	2,040	**52**	-1,918	-97.3%	-1,988	-97.4%	2,092	**844**	**687**	**736**	**649**	**1,226**	-1,321 to -1,126	-67.0% to -57.2%	597 to 791	1141.3% to 1513.1%	-1,442 to -1,248	-69.0% to -59.7%
May	**1,911**	1,996	**59**	-1,853	-96.9%	-1,938	-97.1%	2,063	**987**	**759**	**821**	**695**	**1,389**	-1,216 to -924	-63.6% to -48.3%	637 to 929	1085.3% to 1583.5%	-1,368 to -1,075	-66.3% to -52.1%
June	**1,962**	2,043	**104**	-1,858	-94.7%	-1,939	-94.9%	2,098	**1,168**	**883**	**961**	**760**	**1,559**	-1,202 to -794	-61.3% to -40.5%	656 to 1,063	628.6% to 1019.1%	-1,337 to -930	-63.8% to -44.3%
July	**2,156**	2,234	**190**	-1,965	-91.2%	-2,044	-91.5%	-	-	-	-	-	-	-	-	-	-	-	-
August	**2,057**	2,154	**227**	-1,830	-89.0%	-1,927	-89.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	**1,720**	1,815	**196**	-1,524	-88.6%	-1,618	-89.2%	-	-	-	-	-	-	-	-	-	-	-	-
October	**1,754**	1,753	**292**	-1,462	-83.3%	-1,460	-83.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**1,855**	1,825	**406**	-1,449	-78.1%	-1,419	-77.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	**2,145**	2,129	**621**	-1,524	-71.0%	-1,508	-70.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**6,288**	6,231	**5,313**	-976	-15.5%	-918	-14.7%	6,188	**1,837**	**1,796**	**1,767**	**1,700**	**2,124**	-4,588 to -4,451	-73.0% to -70.8%	-3,612 to -3,475	-68.0% to -65.4%	-4,487 to -4,350	-72.5% to -70.3%
2Q	**5,844**	6,080	**215**	-5,628	-96.3%	-5,864	-96.5%	6,252	**2,999**	**2,329**	**2,517**	**2,105**	**4,174**	-3,739 to -2,845	-64.0% to -48.7%	1,890 to 2,784	877.6% to 1292.9%	-4,147 to -3,253	-66.3% to -52.0%
3Q	**5,932**	6,202	**613**	-5,319	-89.7%	-5,589	-90.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**5,754**	5,707	**1,319**	-4,434	-77.1%	-4,387	-76.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**23,818**	24,220	**7,461**	-16,358	-68.7%	-16,759	-69.2%	12,440	**4,836**	**4,126**	**4,284**	**3,805**	**6,298**	-8,327 to -7,296	-68.6% to -60.1%	-1,723 to -692	-31.2% to -12.5%	-8,635 to -7,603	-69.4% to -61.1%

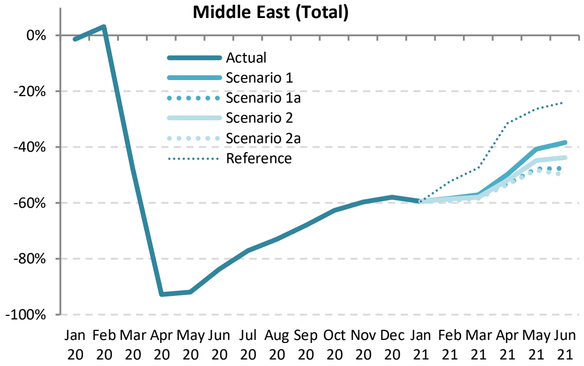
Passenger revenue (USD, million) - Latin America/Caribbean Domestic																			
Year	**2019**	**2020**						**2021**											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**1,664**	1,731	**1,765**	100	6.0%	34	2.0%	1,791	**1,029**	**1,029**	**1,029**	**1,029**	**1,029**	-635	-38.2%	-735	-41.7%	-762	-42.5%
February	**1,440**	1,536	**1,527**	87	6.1%	-9	-0.6%	1,579	**898**	**898**	**891**	**875**	**986**	-565 to -541	-39.3% to -37.6%	-652 to -629	-42.7% to -41.2%	-704 to -681	-44.6% to -43.1%
March	**1,522**	1,640	**988**	-533	-35.0%	-652	-39.7%	1,734	**1,046**	**1,028**	**1,019**	**1,011**	**1,241**	-510 to -476	-33.5% to -31.3%	23 to 57	2.3% to 5.8%	-723 to -688	-41.7% to -39.7%
April	**1,474**	1,569	**102**	-1,372	-93.1%	-1,467	-93.5%	1,653	**1,064**	**995**	**1,015**	**994**	**1,425**	-481 to -410	-32.6% to -27.8%	892 to 962	875.2% to 944.5%	-659 to -589	-39.9% to -35.6%
May	**1,528**	1,634	**125**	-1,403	-91.8%	-1,509	-92.3%	1,682	**1,168**	**1,063**	**1,093**	**1,045**	**1,499**	-483 to -360	-31.6% to -23.5%	920 to 1,043	734.4% to 833.1%	-637 to -514	-37.9% to -30.5%
June	**1,487**	1,623	**212**	-1,276	-85.8%	-1,411	-87.0%	1,733	**1,289**	**1,177**	**1,202**	**1,110**	**1,473**	-378 to -199	-25.4% to -13.4%	898 to 1,077	424.7% to 509.2%	-623 to -445	-36.0% to -25.7%
July	**1,719**	1,804	**338**	-1,381	-80.3%	-1,466	-81.2%	-	-	-	-	-	-	-	-	-	-	-	-
August	**1,607**	1,673	**430**	-1,177	-73.2%	-1,243	-74.3%	-	-	-	-	-	-	-	-	-	-	-	-
September	**1,509**	1,583	**581**	-928	-61.5%	-1,002	-63.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**1,610**	1,684	**794**	-816	-50.7%	-890	-52.8%	-	-	-	-	-	-	-	-	-	-	-	-
November	**1,551**	1,611	**941**	-610	-39.3%	-670	-41.6%	-	-	-	-	-	-	-	-	-	-	-	-
December	**1,681**	1,737	**1,091**	-590	-35.1%	-647	-37.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**4,626**	4,908	**4,280**	-346	-7.5%	-627	-12.8%	5,104	**2,973**	**2,956**	**2,939**	**2,915**	**3,256**	-1,711 to -1,652	-37.0% to -35.7%	-1,365 to -1,307	-31.9% to -30.5%	-2,189 to -2,131	-42.9% to -41.7%
2Q	**4,490**	4,825	**439**	-4,051	-90.2%	-4,387	-90.9%	5,068	**3,521**	**3,235**	**3,310**	**3,148**	**4,397**	-1,341 to -968	-29.9% to -21.6%	2,710 to 3,083	617.7% to 702.8%	-1,920 to -1,547	-37.9% to -30.5%
3Q	**4,835**	5,060	**1,349**	-3,486	-72.1%	-3,711	-73.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**4,842**	5,033	**2,826**	-2,016	-41.6%	-2,207	-43.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**18,792**	19,826	**8,894**	-9,899	-52.7%	-10,932	-55.1%	10,173	**6,495**	**6,191**	**6,248**	**6,064**	**7,654**	-3,052 to -2,621	-33.5% to -28.8%	1,345 to 1,776	28.5% to 37.6%	-4,109 to -3,678	-40.4% to -36.2%

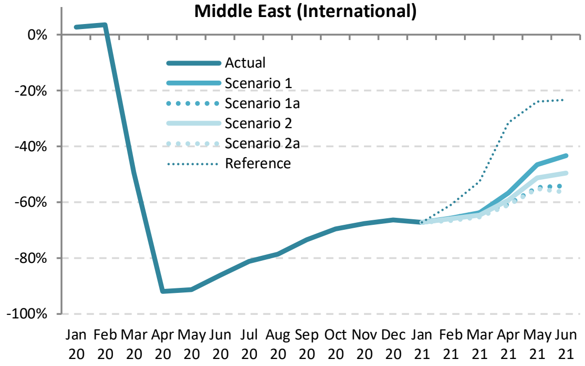
Source: ICAO estimates

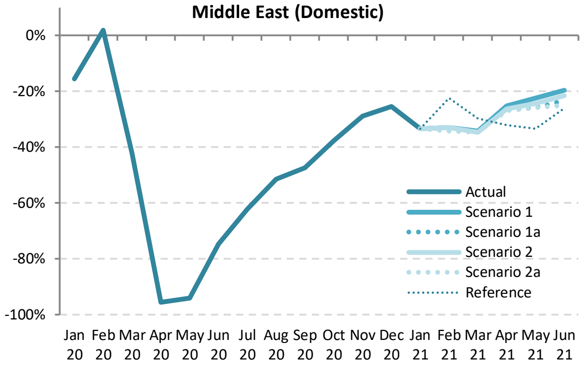
Middle East

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-15.8%	-14.8%	-19.1%	-8,127	-18.3%	-5,982	-17.3%	-2,145	-21.7%	-1,243	-1,040	-203
2Q 2020	-89.4%	-89.7%	-88.2%	-43,712	-95.5%	-34,279	-96.1%	-9,433	-93.1%	-7,184	-6,292	-891
3Q 2020	-72.8%	-77.9%	-53.7%	-44,477	-86.5%	-36,766	-90.1%	-7,711	-72.7%	-7,451	-6,722	-729
4Q 2020	-60.0%	-67.8%	-30.7%	-35,348	-78.0%	-30,093	-83.7%	-5,254	-56.1%	-6,023	-5,526	-497
Total 2020	**-59.7%**	**-62.9%**	**-48.0%**	**-131,664**	**-70.4%**	**-107,121**	**-72.9%**	**-24,543**	**-61.4%**	**-21,901**	**-19,581**	**-2,319**
1Q 2021	-59.0% to -58.3%	-66.3% to -65.5%	-34.0% to -33.5%	-33,578 to -32,606	-75.7% to -73.5%	-27,952 to -27,297	-81.0% to -79.1%	-5,626 to -5,309	-56.9% to -53.7%	-5,645 to -5,492	-5,113 to -4,990	-532 to -502
2Q 2021	-50.5% to -42.9%	-57.5% to -48.7%	-25.9% to -22.4%	-31,608 to -25,492	-69.0% to -55.7%	-26,609 to -21,979	-74.6% to -61.6%	-5,000 to -3,513	-49.4% to -34.7%	-5,345 to -4,340	-4,873 to -4,008	-473 to -332
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-54.8% to -50.6%**	**-61.9% to -57.1%**	**-30.0% to -28.0%**	**-65,187 to -58,098**	**-72.3% to -64.4%**	**-54,561 to -49,275**	**-77.8% to -70.2%**	**-10,626 to -8,823**	**-53.1% to -44.1%**	**-10,990 to -9,832**	**-9,986 to -8,998**	**-1,004 to -834**

Seat capacity







Seat Capacity (thousand) - Middle East International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**20,935**	21,294	**20,651**	-283	-1.4%	-643	-3.0%	21,185	**8,478**	**8,478**	**8,478**	**8,478**	**8,478**	-12,456	-59.5%	-12,173	-58.9%	-12,706	-60.0%
February	**18,681**	19,576	**19,296**	615	3.3%	-280	-1.4%	19,408	**7,783**	**7,783**	**7,747**	**7,617**	**8,920**	-11,063 to -10,897	-59.2% to -58.3%	-11,679 to -11,513	-60.5% to -59.7%	-11,790 to -11,624	-60.8% to -59.9%
March	**20,637**	20,982	**10,797**	-9,840	-47.7%	-10,185	-48.5%	20,493	**8,855**	**8,855**	**8,676**	**8,591**	**10,859**	-12,046 to -11,783	-58.4% to -57.1%	-2,206 to -1,942	-20.4% to -18.0%	-11,902 to -11,638	-58.1% to -56.8%
April	**19,673**	20,513	**1,416**	-18,257	-92.8%	-19,097	-93.1%	20,667	**9,889**	**9,213**	**9,447**	**9,180**	**13,480**	-10,493 to -9,784	-53.3% to -49.7%	7,764 to 8,473	548.3% to 598.3%	-11,487 to -10,779	-55.6% to -52.2%
May	**19,505**	21,155	**1,561**	-17,944	-92.0%	-19,594	-92.6%	21,735	**11,556**	**10,175**	**10,752**	**10,108**	**14,400**	-9,397 to -7,949	-48.2% to -40.8%	8,547 to 9,995	547.5% to 640.3%	-11,627 to -10,180	-53.5% to -46.8%
June	**20,736**	21,286	**3,388**	-17,349	-83.7%	-17,898	-84.1%	21,437	**12,776**	**10,855**	**11,675**	**10,399**	**15,799**	-10,338 to -7,960	-49.9% to -38.4%	7,011 to 9,389	206.9% to 277.1%	-11,039 to -8,661	-51.5% to -40.4%
July	**21,924**	22,458	**5,015**	-16,910	-77.1%	-17,444	-77.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**22,639**	22,971	**6,095**	-16,544	-73.1%	-16,877	-73.5%	-	-	-	-	-	-	-	-	-	-	-	-
September	**20,534**	20,934	**6,585**	-13,949	-67.9%	-14,349	-68.5%	-	-	-	-	-	-	-	-	-	-	-	-
October	**20,470**	20,469	**7,642**	-12,828	-62.7%	-12,826	-62.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	**19,516**	19,342	**7,897**	-11,619	-59.5%	-11,445	-59.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	**20,828**	21,169	**8,759**	-12,069	-57.9%	-12,410	-58.6%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**60,252**	61,852	**50,744**	-9,508	-15.8%	-11,108	-18.0%	61,085	**25,116**	**25,116**	**24,900**	**24,686**	**28,257**	-35,566 to -35,136	-59.0% to -58.3%	-26,058 to -25,628	-51.4% to -50.5%	-36,399 to -35,969	-59.6% to -58.9%
2Q	**59,914**	62,954	**6,365**	-53,549	-89.4%	-56,589	-89.9%	63,840	**34,221**	**30,242**	**31,874**	**29,687**	**43,679**	-30,227 to -25,693	-50.5% to -42.9%	23,322 to 27,856	366.4% to 437.7%	-34,153 to -29,619	-53.5% to -46.4%
3Q	**65,097**	66,364	**17,694**	-47,402	-72.8%	-48,669	-73.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**60,814**	60,979	**24,298**	-36,516	-60.0%	-36,681	-60.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**246,077**	252,149	**99,102**	-146,975	-59.7%	-153,047	-60.7%	124,925	**59,337**	**55,358**	**56,775**	**54,373**	**71,936**	-65,794 to -60,830	-54.8% to -50.6%	-2,736 to 2,228	-4.8% to 3.9%	-70,552 to -65,588	-56.5% to -52.5%

Source: ICAO estimates

Seat capacity

Seat Capacity (thousand) - Middle East International

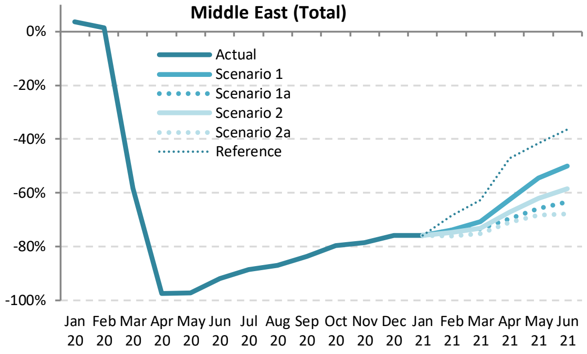
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**16,184**	16,864	**16,636**	452	2.8%	-228	-1.4%	16,907	**5,311**	**5,311**	**5,311**	**5,311**	**5,311**	-10,873	-67.2%	-11,325	-68.1%	-11,597	-68.6%
February	**14,502**	15,544	**15,035**	532	3.7%	-510	-3.3%	15,625	**4,979**	**4,979**	**4,949**	**4,866**	**5,681**	-9,636 to -9,524	-66.4% to -65.7%	-10,169 to -10,056	-67.6% to -66.9%	-10,759 to -10,646	-68.9% to -68.1%
March	**16,046**	16,718	**8,142**	-7,904	-49.3%	-8,576	-51.3%	16,506	**5,833**	**5,833**	**5,673**	**5,592**	**7,630**	-10,454 to -10,213	-65.2% to -63.6%	-2,551 to -2,309	-31.3% to -28.4%	-10,914 to -10,673	-66.1% to -64.7%
April	**15,327**	16,198	**1,227**	-14,100	-92.0%	-14,971	-92.4%	16,490	**6,639**	**6,030**	**6,244**	**6,000**	**10,524**	-9,327 to -8,688	-60.9% to -56.7%	4,773 to 5,412	389.1% to 441.2%	-10,490 to -9,851	-63.6% to -59.7%
May	**14,928**	16,610	**1,292**	-13,635	-91.3%	-15,318	-92.2%	17,361	**8,001**	**6,776**	**7,284**	**6,712**	**11,350**	-8,216 to -6,927	-55.0% to -46.4%	5,419 to 6,708	419.3% to 519.1%	-10,649 to -9,360	-61.3% to -53.9%
June	**16,376**	16,956	**2,281**	-14,095	-86.1%	-14,675	-86.5%	17,311	**9,272**	**7,513**	**8,253**	**7,129**	**12,577**	-9,246 to -7,104	-56.5% to -43.4%	4,848 to 6,991	212.6% to 306.5%	-10,182 to -8,040	-58.8% to -46.4%
July	**17,335**	17,901	**3,280**	-14,054	-81.1%	-14,621	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**18,009**	18,374	**3,845**	-14,164	-78.6%	-14,529	-79.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	**16,148**	16,579	**4,276**	-11,872	-73.5%	-12,303	-74.2%	-	-	-	-	-	-	-	-	-	-	-	-
October	**16,072**	16,533	**4,897**	-11,175	-69.5%	-11,636	-70.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	**15,440**	15,714	**4,998**	-10,441	-67.6%	-10,716	-68.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	**16,544**	17,231	**5,564**	-10,980	-66.4%	-11,667	-67.7%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**46,732**	49,127	**39,813**	-6,919	-14.8%	-9,314	-19.0%	49,038	**16,123**	**16,123**	**15,932**	**15,769**	**18,622**	-30,964 to -30,610	-66.3% to -65.5%	-24,045 to -23,690	-60.4% to -59.5%	-33,270 to -32,916	-67.8% to -67.1%
2Q	**46,630**	49,764	**4,800**	-41,830	-89.7%	-44,964	-90.4%	51,162	**23,911**	**20,319**	**21,782**	**19,841**	**34,451**	-26,789 to -22,719	-57.5% to -48.7%	15,041 to 19,111	313.4% to 398.2%	-31,321 to -27,251	-61.2% to -53.3%
3Q	**51,491**	52,854	**11,402**	-40,090	-77.9%	-41,453	-78.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**48,055**	49,478	**15,459**	-32,596	-67.8%	-34,019	-68.8%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**192,909**	201,223	**71,474**	-121,435	-62.9%	-129,749	-64.5%	100,200	**40,034**	**36,442**	**37,714**	**35,610**	**53,073**	-57,753 to -53,329	-61.9% to -57.1%	-9,004 to -4,579	-20.2% to -10.3%	-64,591 to -60,166	-64.5% to -60.0%

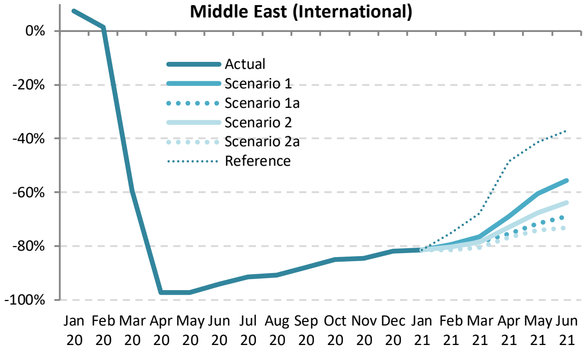
Seat Capacity (thousand) - Middle East Domestic

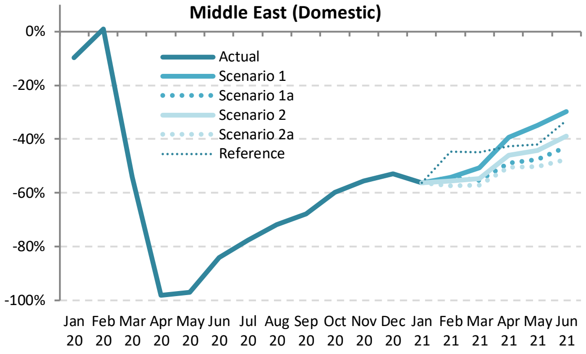
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**4,751**	4,430	**4,015**	-736	-15.5%	-415	-9.4%	4,277	**3,167**	**3,167**	**3,167**	**3,167**	**3,167**	-1,584	-33.3%	-848	-21.1%	-1,110	-25.9%
February	**4,178**	4,032	**4,261**	83	2.0%	230	5.7%	3,783	**2,805**	**2,805**	**2,798**	**2,751**	**3,239**	-1,427 to -1,373	-34.2% to -32.9%	-1,510 to -1,456	-35.4% to -34.2%	-1,032 to -978	-27.3% to -25.9%
March	**4,591**	4,263	**2,655**	-1,936	-42.2%	-1,609	-37.7%	3,987	**3,021**	**3,021**	**3,003**	**2,999**	**3,229**	-1,592 to -1,570	-34.7% to -34.2%	344 to 366	13.0% to 13.8%	-988 to -966	-24.8% to -24.2%
April	**4,346**	4,316	**189**	-4,157	-95.6%	-4,126	-95.6%	4,178	**3,250**	**3,182**	**3,203**	**3,180**	**2,956**	-1,166 to -1,096	-26.8% to -25.2%	2,991 to 3,061	1579.5% to 1616.2%	-997 to -928	-23.9% to -22.2%
May	**4,577**	4,545	**269**	-4,308	-94.1%	-4,276	-94.1%	4,374	**3,555**	**3,399**	**3,467**	**3,396**	**3,050**	-1,181 to -1,022	-25.8% to -22.3%	3,128 to 3,286	1164.2% to 1223.2%	-978 to -819	-22.4% to -18.7%
June	**4,361**	4,330	**1,107**	-3,254	-74.6%	-3,223	-74.4%	4,126	**3,505**	**3,342**	**3,422**	**3,269**	**3,222**	-1,091 to -856	-25.0% to -19.6%	2,162 to 2,398	195.3% to 216.6%	-857 to -621	-20.8% to -15.1%
July	**4,590**	4,557	**1,734**	-2,855	-62.2%	-2,823	-61.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	**4,630**	4,597	**2,249**	-2,381	-51.4%	-2,348	-51.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	**4,386**	4,355	**2,309**	-2,077	-47.4%	-2,046	-47.0%	-	-	-	-	-	-	-	-	-	-	-	-
October	**4,398**	3,935	**2,745**	-1,653	-37.6%	-1,190	-30.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**4,076**	3,628	**2,898**	-1,178	-28.9%	-729	-20.1%	-	-	-	-	-	-	-	-	-	-	-	-
December	**4,284**	3,938	**3,195**	-1,089	-25.4%	-743	-18.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**13,520**	12,725	**10,931**	-2,589	-19.1%	-1,794	-14.1%	12,047	**8,993**	**8,993**	**8,968**	**8,917**	**9,635**	-4,603 to -4,527	-34.0% to -33.5%	-2,014 to -1,938	-18.4% to -17.7%	-3,130 to -3,054	-26.0% to -25.3%
2Q	**13,284**	13,190	**1,565**	-11,719	-88.2%	-11,625	-88.1%	12,678	**10,310**	**9,923**	**10,093**	**9,846**	**9,228**	-3,438 to -2,974	-25.9% to -22.4%	8,281 to 8,745	529.2% to 558.8%	-2,832 to -2,368	-22.3% to -18.7%
3Q	**13,606**	13,510	**6,293**	-7,313	-53.7%	-7,217	-53.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**12,758**	11,501	**8,839**	-3,920	-30.7%	-2,662	-23.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**53,168**	50,926	**27,628**	-25,540	-48.0%	-23,298	-45.7%	24,725	**19,303**	**18,916**	**19,061**	**18,763**	**18,863**	-8,041 to -7,501	-30.0% to -28.0%	6,267 to 6,807	50.2% to 54.5%	-5,962 to -5,422	-24.1% to -21.9%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - Middle East International + Domestic

Year	2019	2020							2021										
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**15,580**	15,907	**16,141**	561	3.6%	234	1.5%	15,879	**3,774**	**3,774**	**3,774**	**3,774**	**3,774**	-11,806	-75.8%	-12,367	-76.6%	-12,105	-76.2%
February	**13,560**	14,262	**13,747**	187	1.4%	-515	-3.6%	14,187	**3,549**	**3,549**	**3,420**	**3,251**	**4,285**	-10,309 to -10,010	-76.0% to -73.8%	-10,496 to -10,197	-76.4% to -74.2%	-10,937 to -10,638	-77.1% to -75.0%
March	**15,238**	15,543	**6,364**	-8,875	-58.2%	-9,180	-59.1%	15,234	**4,449**	**4,060**	**4,079**	**3,775**	**5,683**	-11,463 to -10,789	-75.2% to -70.8%	-2,588 to -1,915	-40.7% to -30.1%	-11,459 to -10,785	-75.2% to -70.8%
April	**15,717**	16,444	**398**	-15,319	-97.5%	-16,046	-97.6%	16,624	**5,913**	**4,767**	**5,167**	**4,571**	**8,299**	-11,146 to -9,804	-70.9% to -62.4%	4,173 to 5,515	1048.7% to 1386.1%	-12,053 to -10,711	-72.5% to -64.4%
May	**14,250**	15,506	**404**	-13,846	-97.2%	-15,102	-97.4%	15,984	**6,490**	**4,866**	**5,401**	**4,508**	**8,335**	-9,743 to -7,760	-68.4% to -54.5%	4,104 to 6,086	1015.7% to 1506.4%	-11,477 to -9,494	-71.8% to -59.4%
June	**15,824**	16,293	**1,277**	-14,547	-91.9%	-15,016	-92.2%	16,464	**7,896**	**5,796**	**6,553**	**5,105**	**10,071**	-10,720 to -7,928	-67.7% to -50.1%	3,827 to 6,619	299.7% to 518.3%	-11,359 to -8,568	-69.0% to -52.0%
July	**17,697**	18,188	**2,033**	-15,664	-88.5%	-16,155	-88.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	**18,438**	18,772	**2,397**	-16,041	-87.0%	-16,376	-87.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	**15,282**	15,628	**2,510**	-12,771	-83.6%	-13,118	-83.9%	-	-	-	-	-	-	-	-	-	-	-	-
October	**14,973**	15,032	**3,046**	-11,927	-79.7%	-11,986	-79.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	**14,307**	14,235	**3,076**	-11,231	-78.5%	-11,160	-78.4%	-	-	-	-	-	-	-	-	-	-	-	-
December	**16,051**	16,376	**3,862**	-12,190	-75.9%	-12,515	-76.4%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**44,378**	45,712	**36,251**	-8,127	-18.3%	-9,461	-20.7%	45,300	**11,772**	**11,383**	**11,272**	**10,800**	**13,741**	-33,578 to -32,606	-75.7% to -73.5%	-25,451 to -24,479	-70.2% to -67.5%	-34,501 to -33,528	-76.2% to -74.0%
2Q	**45,791**	48,243	**2,079**	-43,712	-95.5%	-46,164	-95.7%	49,072	**20,299**	**15,428**	**17,122**	**14,183**	**26,705**	-31,608 to -25,492	-69.0% to -55.7%	12,104 to 18,220	582.2% to 876.4%	-34,889 to -28,773	-71.1% to -58.6%
3Q	**51,417**	52,589	**6,940**	-44,477	-86.5%	-45,649	-86.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**45,331**	45,644	**9,984**	-35,348	-78.0%	-35,660	-78.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**186,918**	192,188	**55,253**	-131,664	-70.4%	-136,935	-71.3%	94,373	**32,072**	**26,811**	**28,394**	**24,983**	**40,446**	-65,187 to -58,098	-72.3% to -64.4%	-13,347 to -6,259	-34.8% to -16.3%	-69,390 to -62,301	-73.5% to -66.0%

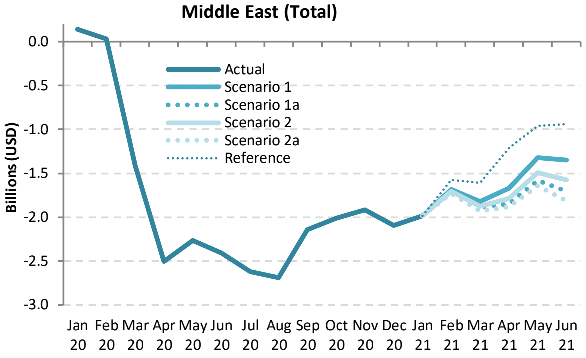
Source: ICAO estimates

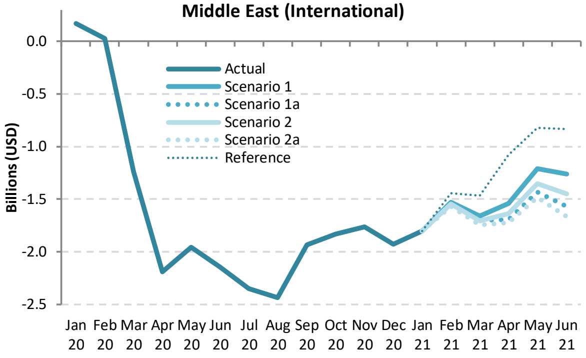
Passenger number

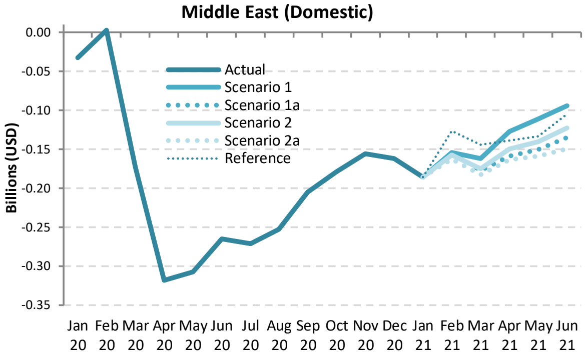
Passenger Number (thousand) - Middle East International																				
Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**12,091**	12,646	**12,995**	904	7.5%	349	2.8%	12,724	**2,251**	**2,251**	**2,251**	**2,251**	**2,251**	-9,840	-81.4%	-10,744	-82.7%	-10,473	-82.3%
February	**10,554**	11,354	**10,711**	157	1.5%	-643	-5.7%	11,453	**2,173**	**2,173**	**2,081**	**1,969**	**2,620**	-8,585 to -8,381	-81.3% to -79.4%	-8,742 to -8,539	-81.6% to -79.7%	-9,484 to -9,281	-82.8% to -81.0%
March	**11,849**	12,389	**4,806**	-7,043	-59.4%	-7,583	-61.2%	12,278	**2,774**	**2,551**	**2,545**	**2,322**	**3,818**	-9,527 to -9,075	-80.4% to -76.6%	-2,484 to -2,032	-51.7% to -42.3%	-9,955 to -9,503	-81.1% to -77.4%
April	**12,285**	13,028	**335**	-11,950	-97.3%	-12,693	-97.4%	13,310	**3,829**	**3,014**	**3,317**	**2,867**	**6,334**	-9,418 to -8,456	-76.7% to -68.8%	2,532 to 3,494	755.9% to 1042.9%	-10,443 to -9,482	-78.5% to -71.2%
May	**10,893**	12,165	**303**	-10,590	-97.2%	-11,862	-97.5%	12,762	**4,306**	**3,104**	**3,527**	**2,836**	**6,390**	-8,058 to -6,587	-74.0% to -60.5%	2,533 to 4,003	835.4% to 1320.4%	-9,926 to -8,456	-77.8% to -66.3%
June	**12,483**	12,968	**744**	-11,739	-94.0%	-12,224	-94.3%	13,288	**5,548**	**3,884**	**4,510**	**3,350**	**7,838**	-9,133 to -6,935	-73.2% to -55.6%	2,606 to 4,804	350.2% to 645.6%	-9,938 to -7,740	-74.8% to -58.2%
July	**13,998**	14,506	**1,207**	-12,791	-91.4%	-13,300	-91.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**14,721**	15,073	**1,351**	-13,370	-90.8%	-13,722	-91.0%	-	-	-	-	-	-	-	-	-	-	-	-
September	**12,085**	12,447	**1,480**	-10,605	-87.8%	-10,967	-88.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**11,819**	12,204	**1,782**	-10,037	-84.9%	-10,422	-85.4%	-	-	-	-	-	-	-	-	-	-	-	-
November	**11,340**	11,589	**1,756**	-9,584	-84.5%	-9,833	-84.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	**12,800**	13,381	**2,328**	-10,473	-81.8%	-11,053	-82.6%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**34,494**	36,390	**28,512**	-5,982	-17.3%	-7,878	-21.6%	36,455	**7,198**	**6,974**	**6,877**	**6,542**	**8,689**	-27,952 to -27,297	-81.0% to -79.1%	-21,970 to -21,314	-77.1% to -74.8%	-29,913 to -29,257	-82.1% to -80.3%
2Q	**35,662**	38,161	**1,382**	-34,279	-96.1%	-36,779	-96.4%	39,360	**13,683**	**10,003**	**11,354**	**9,053**	**20,562**	-26,609 to -21,979	-74.6% to -61.6%	7,671 to 12,301	555.0% to 889.9%	-30,308 to -25,678	-77.0% to -65.2%
3Q	**40,804**	42,026	**4,037**	-36,766	-90.1%	-37,989	-90.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**35,960**	37,174	**5,866**	-30,093	-83.7%	-31,307	-84.2%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**146,919**	153,751	**39,798**	-107,121	-72.9%	-113,953	-74.1%	75,815	**20,881**	**16,977**	**18,231**	**15,595**	**29,251**	-54,561 to -49,275	-77.8% to -70.2%	-14,299 to -9,014	-47.8% to -30.2%	-60,220 to -54,935	-79.4% to -72.5%

Passenger Number (thousand) - Middle East Domestic																				
Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**3,489**	3,261	**3,146**	-343	-9.8%	-115	-3.5%	3,155	**1,523**	**1,523**	**1,523**	**1,523**	**1,523**	-1,966	-56.4%	-1,623	-51.6%	-1,633	-51.7%
February	**3,006**	2,907	**3,036**	30	1.0%	128	4.4%	2,734	**1,377**	**1,377**	**1,339**	**1,282**	**1,665**	-1,724 to -1,629	-57.4% to -54.2%	-1,754 to -1,659	-57.8% to -54.6%	-1,452 to -1,357	-53.1% to -49.6%
March	**3,389**	3,154	**1,557**	-1,831	-54.0%	-1,597	-50.6%	2,956	**1,675**	**1,509**	**1,534**	**1,453**	**1,865**	-1,936 to -1,714	-57.1% to -50.6%	-104 to 117	-6.7% to 7.5%	-1,503 to -1,281	-50.8% to -43.3%
April	**3,432**	3,416	**63**	-3,369	-98.2%	-3,353	-98.2%	3,314	**2,085**	**1,753**	**1,850**	**1,704**	**1,965**	-1,728 to -1,347	-50.4% to -39.3%	1,641 to 2,022	2607.0% to 3212.6%	-1,610 to -1,229	-48.6% to -37.1%
May	**3,357**	3,341	**101**	-3,256	-97.0%	-3,240	-97.0%	3,223	**2,184**	**1,761**	**1,875**	**1,672**	**1,944**	-1,685 to -1,173	-50.2% to -34.9%	1,571 to 2,083	1557.7% to 2065.4%	-1,551 to -1,039	-48.1% to -32.2%
June	**3,341**	3,325	**533**	-2,808	-84.0%	-2,792	-84.0%	3,176	**2,348**	**1,912**	**2,043**	**1,755**	**2,234**	-1,586 to -993	-47.5% to -29.7%	1,222 to 1,815	229.2% to 340.5%	-1,421 to -828	-44.7% to -26.1%
July	**3,699**	3,682	**826**	-2,873	-77.7%	-2,856	-77.6%	-	-	-	-	-	-	-	-	-	-	-	-
August	**3,717**	3,700	**1,046**	-2,671	-71.9%	-2,654	-71.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	**3,197**	3,182	**1,030**	-2,166	-67.8%	-2,151	-67.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**3,154**	2,829	**1,264**	-1,889	-59.9%	-1,564	-55.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**2,967**	2,646	**1,319**	-1,648	-55.5%	-1,327	-50.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	**3,251**	2,996	**1,534**	-1,717	-52.8%	-1,462	-48.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**9,884**	9,322	**7,739**	-2,145	-21.7%	-1,583	-17.0%	8,845	**4,574**	**4,409**	**4,395**	**4,257**	**5,052**	-5,626 to -5,309	-56.9% to -53.7%	-3,482 to -3,165	-45.0% to -40.9%	-4,588 to -4,271	-51.9% to -48.3%
2Q	**10,130**	10,082	**697**	-9,433	-93.1%	-9,385	-93.1%	9,712	**6,617**	**5,426**	**5,768**	**5,130**	**6,143**	-5,000 to -3,513	-49.4% to -34.7%	4,433 to 5,920	636.2% to 849.6%	-4,582 to -3,095	-47.2% to -31.9%
3Q	**10,613**	10,563	**2,902**	-7,711	-72.7%	-7,661	-72.5%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**9,372**	8,471	**4,118**	-5,254	-56.1%	-4,353	-51.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**39,998**	38,437	**15,455**	-24,543	-61.4%	-22,982	-59.8%	18,557	**11,191**	**9,834**	**10,163**	**9,388**	**11,195**	-10,626 to -8,823	-53.1% to -44.1%	952 to 2,755	11.3% to 32.7%	-9,170 to -7,367	-49.4% to -39.7%

Passenger revenue







Passenger revenue (USD, million) - Middle East International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	2,553	2,631	2,692	139	5.5%	62	2.3%	2,643	567	567	567	567	567	-1,986	-77.8%	-2,125	-79.0%	-2,076	-78.6%
February	2,221	2,357	2,252	31	1.4%	-106	-4.5%	2,361	538	538	517	491	649	-1,730 to -1,683	-77.9% to -75.8%	-1,761 to -1,714	-78.2% to -76.1%	-1,870 to -1,823	-79.2% to -77.2%
March	2,502	2,574	1,089	-1,413	-56.5%	-1,486	-57.7%	2,541	679	621	623	573	891	-1,928 to -1,823	-77.1% to -72.9%	-515 to -410	-47.3% to -37.6%	-1,968 to -1,862	-77.4% to -73.3%
April	2,583	2,717	74	-2,509	-97.1%	-2,643	-97.3%	2,764	915	731	797	699	1,368	-1,884 to -1,668	-72.9% to -64.6%	625 to 841	841.0% to 1131.7%	-2,065 to -1,849	-74.7% to -66.9%
May	2,333	2,559	69	-2,264	-97.1%	-2,490	-97.3%	2,654	1,013	749	838	690	1,377	-1,643 to -1,320	-70.4% to -56.6%	621 to 944	906.5% to 1377.9%	-1,965 to -1,641	-74.0% to -61.8%
June	2,612	2,695	201	-2,410	-92.3%	-2,494	-92.5%	2,743	1,260	908	1,038	794	1,673	-1,818 to -1,352	-69.6% to -51.8%	592 to 1,058	294.3% to 525.7%	-1,949 to -1,483	-71.1% to -54.1%
July	2,935	3,015	316	-2,619	-89.2%	-2,699	-89.5%	-	-	-	-	-	-	-	-	-	-	-	-
August	3,055	3,110	364	-2,690	-88.1%	-2,746	-88.3%	-	-	-	-	-	-	-	-	-	-	-	-
September	2,526	2,587	384	-2,141	-84.8%	-2,203	-85.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	2,471	2,507	458	-2,013	-81.4%	-2,048	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
November	2,372	2,398	454	-1,918	-80.9%	-1,944	-81.1%	-	-	-	-	-	-	-	-	-	-	-	-
December	2,674	2,754	582	-2,092	-78.2%	-2,172	-78.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	7,276	7,562	6,032	-1,243	-17.1%	-1,530	-20.2%	7,544	1,784	1,726	1,707	1,631	2,107	-5,645 to -5,492	-77.6% to -75.5%	-4,402 to -4,249	-73.0% to -70.4%	-5,913 to -5,761	-78.4% to -76.4%
2Q	7,528	7,971	344	-7,184	-95.4%	-7,627	-95.7%	8,161	3,187	2,388	2,673	2,183	4,417	-5,345 to -4,340	-71.0% to -57.7%	1,839 to 2,843	534.3% to 826.2%	-5,978 to -4,973	-73.3% to -60.9%
3Q	8,515	8,712	1,064	-7,451	-87.5%	-7,648	-87.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	7,518	7,659	1,495	-6,023	-80.1%	-6,164	-80.5%	-	-	-	-	-	-	-	-	-	-	-	-
Total	30,836	31,904	8,936	-21,901	-71.0%	-22,969	-72.0%	15,705	4,971	4,114	4,379	3,814	6,524	-10,990 to -9,832	-74.2% to -66.4%	-2,563 to -1,405	-40.2% to -22.0%	-11,892 to -10,734	-75.7% to -68.3%

Passenger revenue

Year	2019	2020						2021												
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
Passenger revenue (USD, million) - Middle East International																			
January	**2,223**	2,322	**2,395**	172	7.7%	72	3.1%	2,345	**423**	**423**	**423**	**423**	**423**	-1,800	-81.0%	-1,972	-82.3%	-1,922	-82.0%
February	**1,937**	2,083	**1,965**	28	1.4%	-118	-5.7%	2,102	**408**	**408**	**391**	**370**	**491**	-1,567 to -1,529	-80.9% to -78.9%	-1,595 to -1,557	-81.2% to -79.2%	-1,732 to -1,694	-82.4% to -80.6%
March	**2,181**	2,276	**941**	-1,240	-56.8%	-1,335	-58.6%	2,261	**521**	**479**	**478**	**436**	**715**	-1,745 to -1,661	-80.0% to -76.1%	-506 to -421	-53.7% to -44.7%	-1,826 to -1,741	-80.7% to -77.0%
April	**2,259**	2,394	**68**	-2,190	-97.0%	-2,326	-97.1%	2,451	**718**	**566**	**622**	**538**	**1,183**	-1,721 to -1,541	-76.2% to -68.2%	470 to 650	687.3% to 950.5%	-1,913 to -1,733	-78.0% to -70.7%
May	**2,016**	2,243	**59**	-1,957	-97.1%	-2,184	-97.4%	2,350	**807**	**582**	**661**	**532**	**1,193**	-1,484 to -1,209	-73.6% to -60.0%	473 to 748	801.3% to 1266.8%	-1,818 to -1,543	-77.4% to -65.7%
June	**2,296**	2,381	**151**	-2,145	-93.4%	-2,230	-93.7%	2,442	**1,038**	**728**	**844**	**628**	**1,461**	-1,668 to -1,258	-72.6% to -54.8%	477 to 887	316.1% to 587.5%	-1,814 to -1,405	-74.3% to -57.5%
July	**2,585**	2,667	**238**	-2,348	-90.8%	-2,429	-91.1%	-	-	-	-	-	-	-	-	-	-	-	-
August	**2,703**	2,761	**265**	-2,438	-90.2%	-2,495	-90.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**2,223**	2,286	**287**	-1,937	-87.1%	-1,999	-87.5%	-	-	-	-	-	-	-	-	-	-	-	-
October	**2,173**	2,239	**339**	-1,834	-84.4%	-1,900	-84.9%	-	-	-	-	-	-	-	-	-	-	-	-
November	**2,092**	2,148	**329**	-1,762	-84.3%	-1,819	-84.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**2,367**	2,471	**437**	-1,930	-81.5%	-2,034	-82.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**6,341**	6,681	**5,301**	-1,040	-16.4%	-1,380	-20.7%	6,708	**1,351**	**1,309**	**1,291**	**1,229**	**1,629**	-5,113 to -4,990	-80.6% to -78.7%	-4,072 to -3,950	-76.8% to -74.5%	-5,480 to -5,357	-81.7% to -79.9%
2Q	**6,570**	7,018	**278**	-6,292	-95.8%	-6,740	-96.0%	7,243	**2,562**	**1,876**	**2,128**	**1,698**	**3,837**	-4,873 to -4,008	-74.2% to -61.0%	1,420 to 2,284	510.1% to 820.7%	-5,545 to -4,681	-76.6% to -64.6%
3Q	**7,512**	7,714	**790**	-6,722	-89.5%	-6,924	-89.8%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**6,632**	6,859	**1,105**	-5,526	-83.3%	-5,753	-83.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**27,056**	28,272	**7,475**	-19,581	-72.4%	-20,797	-73.6%	13,951	**3,913**	**3,185**	**3,419**	**2,926**	**5,466**	-9,986 to -8,998	-77.3% to -69.7%	-2,653 to -1,666	-47.6% to -29.9%	-11,025 to -10,038	-79.0% to -71.9%

Year	2019	2020						2021												
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
Passenger revenue (USD, million) - Middle East Domestic																			
January	**330**	308	**297**	-32	-9.8%	-11	-3.5%	298	**144**	**144**	**144**	**144**	**144**	-186	-56.4%	-153	-51.6%	-154	-51.7%
February	**284**	275	**287**	3	1.0%	12	4.4%	258	**130**	**130**	**126**	**121**	**157**	-163 to -154	-57.4% to -54.2%	-166 to -157	-57.8% to -54.6%	-137 to -128	-53.1% to -49.6%
March	**320**	298	**147**	-173	-54.0%	-151	-50.6%	279	**158**	**143**	**145**	**137**	**176**	-183 to -162	-57.1% to -50.6%	-10 to 11	-6.7% to 7.5%	-142 to -121	-50.8% to -43.3%
April	**324**	323	**6**	-318	-98.2%	-317	-98.2%	313	**197**	**166**	**175**	**161**	**186**	-163 to -127	-50.4% to -39.3%	155 to 191	2607.0% to 3212.6%	-152 to -116	-48.6% to -37.1%
May	**317**	316	**10**	-308	-97.0%	-306	-97.0%	305	**206**	**166**	**177**	**158**	**184**	-159 to -111	-50.2% to -34.9%	148 to 197	1557.7% to 2065.4%	-147 to -98	-48.1% to -32.2%
June	**316**	314	**50**	-265	-84.0%	-264	-84.0%	300	**222**	**181**	**193**	**166**	**211**	-150 to -94	-47.5% to -29.7%	115 to 172	229.2% to 340.5%	-134 to -78	-44.7% to -26.1%
July	**350**	348	**78**	-272	-77.7%	-270	-77.6%	-	-	-	-	-	-	-	-	-	-	-	-
August	**351**	350	**99**	-252	-71.9%	-251	-71.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	**302**	301	**97**	-205	-67.8%	-203	-67.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**298**	267	**119**	-179	-59.9%	-148	-55.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**280**	250	**125**	-156	-55.5%	-125	-50.2%	-	-	-	-	-	-	-	-	-	-	-	-
December	**307**	283	**145**	-162	-52.8%	-138	-48.8%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**934**	881	**731**	-203	-21.7%	-150	-17.0%	836	**432**	**417**	**415**	**402**	**477**	-532 to -502	-56.9% to -53.7%	-329 to -299	-45.0% to -40.9%	-434 to -404	-51.9% to -48.3%
2Q	**957**	953	**66**	-891	-93.1%	-887	-93.1%	918	**625**	**513**	**545**	**485**	**581**	-473 to -332	-49.4% to -34.7%	419 to 559	636.2% to 849.6%	-433 to -293	-47.2% to -31.9%
3Q	**1,003**	998	**274**	-729	-72.7%	-724	-72.5%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**886**	801	**389**	-497	-56.1%	-411	-51.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**3,780**	3,633	**1,461**	-2,319	-61.4%	-2,172	-59.8%	1,754	**1,058**	**929**	**960**	**887**	**1,058**	-1,004 to -834	-53.1% to -44.1%	90 to 260	11.3% to 32.7%	-867 to -696	-49.4% to -39.7%

Source: ICAO estimates

North America

Compared to 2019	Seat capacity (%)			Passenger number (thousand)						Passenger revenue (USD, million)		
	Total	International	Domestic	Total		International		Domestic		Total	International	Domestic
1Q 2020	-2.2%	-11.4%	-0.3%	-31,354	-13.7%	-6,786	-18.1%	-24,568	-12.8%	-4,675	-1,780	-2,895
2Q 2020	-71.4%	-91.4%	-67.5%	-228,637	-87.4%	-39,617	-96.7%	-189,020	-85.6%	-32,893	-10,618	-22,274
3Q 2020	-50.2%	-80.0%	-44.3%	-185,817	-70.1%	-39,286	-90.7%	-146,531	-66.1%	-28,047	-10,780	-17,267
4Q 2020	-44.2%	-67.0%	-40.1%	-153,541	-62.8%	-30,354	-82.4%	-123,187	-59.4%	-22,799	-8,283	-14,517
Total 2020	**-42.8%**	**-63.2%**	**-38.8%**	**-599,350**	**-59.9%**	**-116,043**	**-73.2%**	**-483,307**	**-57.4%**	**-88,414**	**-31,461**	**-56,954**
1Q 2021	-48.4% to -47.3%	-65.7% to -64.8%	-44.9% to -43.8%	-153,232 to -146,156	-66.9% to -63.8%	-29,880 to -29,135	-79.8% to -77.8%	-123,352 to -117,022	-64.3% to -61.0%	-22,419 to -21,490	-7,883 to -7,700	-14,536 to -13,790
2Q 2021	-41.1% to -33.8%	-55.4% to -44.5%	-38.3% to -31.7%	-157,062 to -117,137	-60.0% to -44.8%	-29,552 to -23,507	-72.1% to -57.4%	-127,509 to -93,630	-57.8% to -42.4%	-23,233 to -17,709	-8,207 to -6,675	-15,026 to -11,034
3Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
4Q 2021	-	-	-	-	-	-	-	-	-	-	-	-
Total 1Q/2Q 2021	**-44.6% to -40.3%**	**-60.4% to -54.4%**	**-41.4% to -37.5%**	**-310,294 to -263,293**	**-63.2% to -53.6%**	**-59,432 to -52,641**	**-75.8% to -67.1%**	**-250,862 to -210,652**	**-60.8% to -51.1%**	**-45,652 to -39,199**	**-16,090 to -14,375**	**-29,562 to -24,824**

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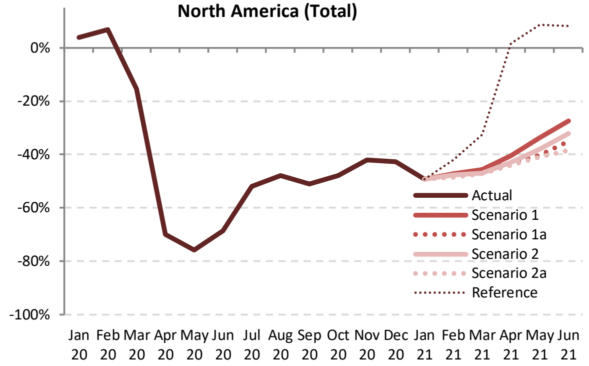
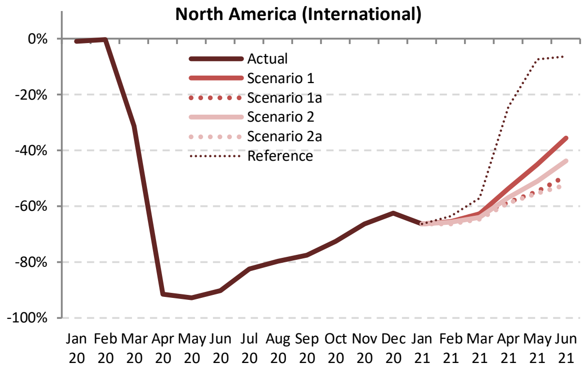
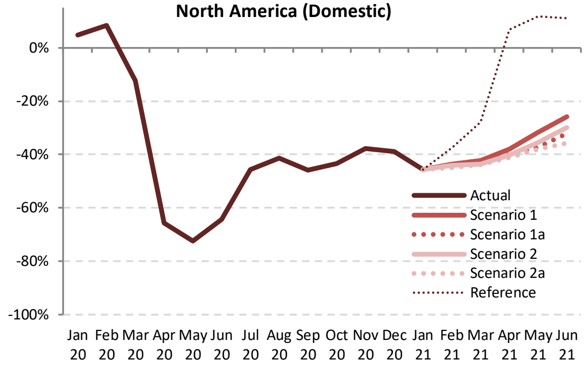
Seat capacity







Seat Capacity (thousand) - North America International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**93,905**	95,051	**97,514**	3,609	3.8%	2,463	2.6%	97,328	**47,686**	**47,686**	**47,686**	**47,686**	**47,686**	-46,219	-49.2%	-49,828	-51.1%	-49,642	-51.0%
February	**85,504**	89,395	**91,385**	5,882	6.9%	1,991	2.2%	91,220	**45,032**	**45,032**	**44,654**	**43,908**	**49,605**	-41,595 to -40,472	-48.6% to -47.3%	-47,477 to -46,354	-52.0% to -50.7%	-47,312 to -46,189	-51.9% to -50.6%
March	**100,867**	101,844	**85,238**	-15,629	-15.5%	-16,606	-16.3%	103,941	**54,860**	**54,860**	**53,473**	**53,119**	**67,936**	-47,748 to -46,007	-47.3% to -45.6%	-32,119 to -30,378	-37.7% to -35.6%	-50,822 to -49,082	-48.9% to -47.2%
April	**97,530**	100,769	**29,373**	-68,156	-69.9%	-71,396	-70.9%	103,871	**58,042**	**55,456**	**55,536**	**54,501**	**99,121**	-43,029 to -39,488	-44.1% to -40.5%	25,127 to 28,668	85.5% to 97.6%	-49,371 to -45,830	-47.5% to -44.1%
May	**101,683**	105,738	**24,681**	-77,002	-75.7%	-81,057	-76.7%	109,485	**67,285**	**60,835**	**63,060**	**60,119**	**110,450**	-41,564 to -34,397	-40.9% to -33.8%	35,438 to 42,605	143.6% to 172.6%	-49,366 to -42,200	-45.1% to -38.5%
June	**102,378**	107,581	**32,109**	-70,268	-68.6%	-75,472	-70.2%	109,971	**74,298**	**66,544**	**69,360**	**62,968**	**110,809**	-39,409 to -28,080	-38.5% to -27.4%	30,859 to 42,189	96.1% to 131.4%	-47,003 to -35,673	-42.7% to -32.4%
July	**106,790**	113,441	**51,382**	-55,408	-51.9%	-62,059	-54.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**106,184**	109,871	**55,341**	-50,842	-47.9%	-54,530	-49.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	**97,042**	102,488	**47,516**	-49,527	-51.0%	-54,972	-53.6%	-	-	-	-	-	-	-	-	-	-	-	-
October	**100,677**	102,812	**52,459**	-48,218	-47.9%	-50,353	-49.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	**94,651**	95,805	**54,837**	-39,814	-42.1%	-40,968	-42.8%	-	-	-	-	-	-	-	-	-	-	-	-
December	**98,992**	101,830	**56,803**	-42,189	-42.6%	-45,027	-44.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**280,275**	286,289	**274,137**	-6,138	-2.2%	-12,153	-4.2%	292,489	**147,577**	**147,577**	**145,813**	**144,713**	**165,226**	-135,562 to -132,698	-48.4% to -47.3%	-129,424 to -126,559	-47.2% to -46.2%	-147,776 to -144,912	-50.5% to -49.5%
2Q	**301,590**	314,088	**86,164**	-215,426	-71.4%	-227,924	-72.6%	323,328	**199,625**	**182,836**	**187,955**	**177,588**	**320,380**	-124,002 to -101,965	-41.1% to -33.8%	91,424 to 113,461	106.1% to 131.7%	-145,740 to -123,703	-45.1% to -38.3%
3Q	**310,016**	325,800	**154,239**	-155,777	-50.2%	-171,561	-52.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**294,320**	300,446	**164,099**	-130,222	-44.2%	-136,348	-45.4%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,186,201**	1,226,623	**678,637**	-507,564	-42.8%	-547,986	-44.7%	615,817	**347,202**	**330,413**	**333,768**	**322,301**	**485,606**	-259,564 to -234,663	-44.6% to -40.3%	-38,000 to -13,098	-10.5% to -3.6%	-293,516 to -268,615	-47.7% to -43.6%

Seat capacity

Seat Capacity (thousand) - North America International

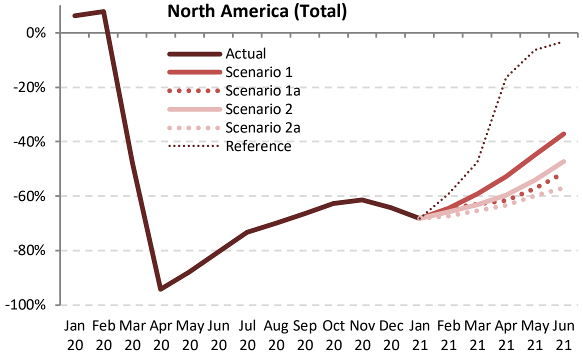
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**16,096**	15,506	**15,947**	-149	-0.9%	442	2.8%	15,429	**5,410**	**5,410**	**5,410**	**5,410**	**5,410**	-10,687	-66.4%	-10,538	-66.1%	-10,019	-64.9%
February	**14,365**	14,391	**14,338**	-27	-0.2%	-53	-0.4%	14,325	**4,972**	**4,972**	**4,923**	**4,841**	**5,228**	-9,524 to -9,393	-66.3% to -65.4%	-9,496 to -9,366	-66.2% to -65.3%	-9,484 to -9,353	-66.2% to -65.3%
March	**16,706**	16,170	**11,500**	-5,205	-31.2%	-4,670	-28.9%	16,108	**6,226**	**6,226**	**6,008**	**5,909**	**7,186**	-10,797 to -10,480	-64.6% to -62.7%	-5,592 to -5,275	-48.6% to -45.9%	-10,200 to -9,883	-63.3% to -61.4%
April	**16,153**	16,300	**1,365**	-14,788	-91.6%	-14,935	-91.6%	16,584	**7,505**	**6,683**	**6,971**	**6,656**	**12,226**	-9,497 to -8,648	-58.8% to -53.5%	5,291 to 6,140	387.7% to 449.9%	-9,928 to -9,079	-59.9% to -54.7%
May	**16,441**	16,711	**1,202**	-15,238	-92.7%	-15,509	-92.8%	17,046	**9,047**	**7,432**	**8,062**	**7,348**	**15,250**	-9,093 to -7,394	-55.3% to -45.0%	6,145 to 7,845	511.1% to 652.4%	-9,698 to -7,999	-56.9% to -46.9%
June	**17,118**	17,390	**1,690**	-15,428	-90.1%	-15,700	-90.3%	17,639	**11,027**	**8,726**	**9,650**	**8,160**	**16,057**	-8,958 to -6,090	-52.3% to -35.6%	6,470 to 9,338	382.9% to 552.6%	-9,479 to -6,612	-53.7% to -37.5%
July	**18,138**	18,510	**3,177**	-14,960	-82.5%	-15,332	-82.8%	-	-	-	-	-	-	-	-	-	-	-	-
August	**17,797**	18,096	**3,608**	-14,188	-79.7%	-14,488	-80.1%	-	-	-	-	-	-	-	-	-	-	-	-
September	**15,583**	15,971	**3,497**	-12,086	-77.6%	-12,474	-78.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**15,357**	14,961	**4,224**	-11,132	-72.5%	-10,737	-71.8%	-	-	-	-	-	-	-	-	-	-	-	-
November	**14,303**	13,859	**4,804**	-9,498	-66.4%	-9,055	-65.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**15,987**	15,543	**6,015**	-9,972	-62.4%	-9,528	-61.3%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**47,167**	46,066	**41,785**	-5,382	-11.4%	-4,281	-9.3%	45,862	**16,607**	**16,607**	**16,341**	**16,160**	**17,823**	-31,007 to -30,560	-65.7% to -64.8%	-25,626 to -25,178	-61.3% to -60.3%	-29,703 to -29,255	-64.8% to -63.8%
2Q	**49,711**	50,401	**4,257**	-45,454	-91.4%	-46,144	-91.6%	51,269	**27,579**	**22,842**	**24,684**	**22,164**	**43,533**	-27,548 to -22,132	-55.4% to -44.5%	17,907 to 23,322	420.6% to 547.9%	-29,105 to -23,689	-56.8% to -46.2%
3Q	**51,518**	52,577	**10,283**	-41,235	-80.0%	-42,294	-80.4%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**45,646**	44,364	**15,043**	-30,603	-67.0%	-29,320	-66.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**194,042**	193,408	**71,368**	-122,674	-63.2%	-122,040	-63.1%	97,131	**44,187**	**39,449**	**41,025**	**38,323**	**61,356**	-58,555 to -52,692	-60.4% to -54.4%	-7,719 to -1,856	-16.8% to -4.0%	-58,808 to -52,944	-60.5% to -54.5%

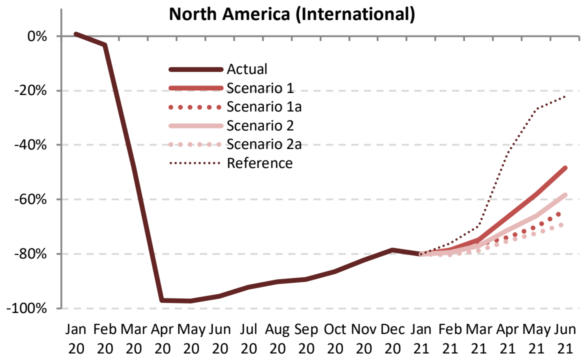
Seat Capacity (thousand) - North America Domestic

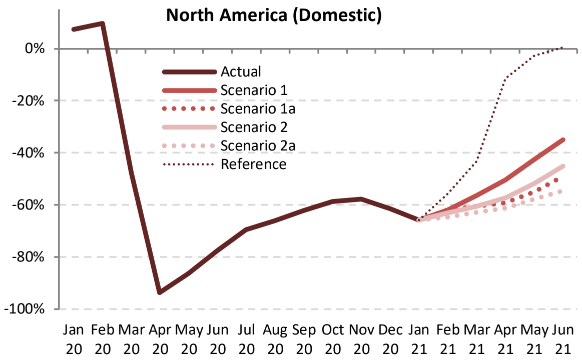
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**77,808**	79,545	**81,567**	3,758	4.8%	2,021	2.5%	81,899	**42,276**	**42,276**	**42,276**	**42,276**	**42,276**	-35,532	-45.7%	-39,290	-48.2%	-39,623	-48.4%
February	**71,139**	75,004	**77,048**	5,909	8.3%	2,044	2.7%	76,895	**40,060**	**40,060**	**39,731**	**39,067**	**44,377**	-32,072 to -31,079	-45.1% to -43.7%	-37,981 to -36,988	-49.3% to -48.0%	-37,828 to -36,835	-49.2% to -47.9%
March	**84,161**	85,673	**73,737**	-10,424	-12.4%	-11,936	-13.9%	87,833	**48,634**	**48,634**	**47,465**	**47,210**	**60,750**	-36,951 to -35,527	-43.9% to -42.2%	-26,527 to -25,103	-36.0% to -34.0%	-40,623 to -39,199	-46.3% to -44.6%
April	**81,377**	84,469	**28,009**	-53,368	-65.6%	-56,460	-66.8%	87,287	**50,537**	**48,773**	**48,564**	**47,845**	**86,896**	-33,532 to -30,840	-41.2% to -37.9%	19,836 to 22,528	70.8% to 80.4%	-39,443 to -36,751	-45.2% to -42.1%
May	**85,242**	89,027	**23,478**	-61,763	-72.5%	-65,548	-73.6%	92,439	**58,238**	**53,403**	**54,998**	**52,771**	**95,200**	-32,471 to -27,003	-38.1% to -31.7%	29,293 to 34,760	124.8% to 148.1%	-39,668 to -34,201	-42.9% to -37.0%
June	**85,260**	90,191	**30,420**	-54,840	-64.3%	-59,772	-66.3%	92,332	**63,271**	**57,818**	**59,710**	**54,808**	**94,752**	-30,451 to -21,989	-35.7% to -25.8%	24,389 to 32,851	80.2% to 108.0%	-37,524 to -29,061	-40.6% to -31.5%
July	**88,652**	94,932	**48,204**	-40,448	-45.6%	-46,727	-49.2%	-	-	-	-	-	-	-	-	-	-	-	-
August	**88,387**	91,775	**51,733**	-36,654	-41.5%	-40,042	-43.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	**81,459**	86,517	**44,018**	-37,440	-46.0%	-42,498	-49.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**85,321**	87,850	**48,235**	-37,086	-43.5%	-39,616	-45.1%	-	-	-	-	-	-	-	-	-	-	-	-
November	**80,348**	81,945	**50,032**	-30,316	-37.7%	-31,913	-38.9%	-	-	-	-	-	-	-	-	-	-	-	-
December	**83,006**	86,287	**50,789**	-32,217	-38.8%	-35,498	-41.1%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**233,108**	240,223	**232,351**	-757	-0.3%	-7,871	-3.3%	246,627	**130,970**	**130,970**	**129,472**	**128,553**	**147,403**	-104,555 to -102,138	-44.9% to -43.8%	-103,798 to -101,382	-44.7% to -43.6%	-118,074 to -115,657	-47.9% to -46.9%
2Q	**251,878**	263,687	**81,907**	-169,972	-67.5%	-181,780	-68.9%	272,059	**172,045**	**159,994**	**163,272**	**155,424**	**276,847**	-96,455 to -79,833	-38.3% to -31.7%	73,517 to 90,139	89.8% to 110.1%	-116,635 to -100,013	-42.9% to -36.8%
3Q	**258,498**	273,223	**143,956**	-114,542	-44.3%	-129,267	-47.3%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**248,675**	256,083	**149,055**	-99,619	-40.1%	-107,027	-41.8%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**992,159**	1,033,215	**607,269**	-384,890	-38.8%	-425,946	-41.2%	518,686	**303,015**	**290,964**	**292,744**	**283,977**	**424,251**	-201,010 to -181,971	-41.4% to -37.5%	-30,281 to -11,243	-9.6% to -3.6%	-234,709 to -215,670	-45.3% to -41.6%

Source: ICAO estimates

Passenger number







Passenger Number (thousand) - North America International + Domestic

Year	2019	2020							2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**73,792**	74,960	**78,339**	4,547	6.2%	3,379	4.5%	76,995	**23,400**	**23,400**	**23,400**	**23,400**	**23,400**	-50,392	-68.3%	-54,940	-70.1%	-53,596	-69.6%
February	**68,976**	72,402	**74,269**	5,293	7.7%	1,867	2.6%	74,126	**24,434**	**24,434**	**23,589**	**22,564**	**28,189**	-46,412 to -44,542	-67.3% to -64.6%	-51,705 to -49,835	-69.6% to -67.1%	-51,562 to -49,692	-69.6% to -67.0%
March	**86,380**	87,572	**45,187**	-41,194	-47.7%	-42,385	-48.4%	89,682	**35,159**	**31,957**	**31,760**	**29,953**	**45,341**	-56,427 to -51,221	-65.3% to -59.3%	-15,234 to -10,028	-33.7% to -22.2%	-59,729 to -54,523	-66.6% to -60.8%
April	**82,715**	85,788	**4,727**	-77,988	-94.3%	-81,061	-94.5%	88,718	**38,947**	**31,782**	**33,448**	**30,200**	**69,104**	-52,515 to -43,768	-63.5% to -52.9%	25,474 to 34,220	538.9% to 724.0%	-58,518 to -49,771	-66.0% to -56.1%
May	**87,928**	91,786	**10,606**	-77,323	-87.9%	-81,180	-88.4%	95,355	**48,456**	**37,542**	**40,427**	**35,215**	**82,322**	-52,713 to -39,472	-60.0% to -44.9%	24,609 to 37,851	232.0% to 356.9%	-60,140 to -46,899	-63.1% to -49.2%
June	**91,099**	96,104	**17,772**	-73,327	-80.5%	-78,331	-81.5%	98,556	**57,202**	**44,277**	**48,022**	**39,265**	**88,209**	-51,834 to -33,897	-56.9% to -37.2%	21,493 to 39,430	120.9% to 221.9%	-59,290 to -41,354	-60.2% to -42.0%
July	**94,493**	100,766	**25,265**	-69,228	-73.3%	-75,501	-74.9%	-	-	-	-	-	-	-	-	-	-	-	-
August	**91,330**	94,839	**27,316**	-64,014	-70.1%	-67,523	-71.2%	-	-	-	-	-	-	-	-	-	-	-	-
September	**79,119**	83,859	**26,544**	-52,576	-66.5%	-57,316	-68.3%	-	-	-	-	-	-	-	-	-	-	-	-
October	**83,797**	85,904	**31,227**	-52,570	-62.7%	-54,677	-63.6%	-	-	-	-	-	-	-	-	-	-	-	-
November	**76,490**	77,711	**29,543**	-46,946	-61.4%	-48,168	-62.0%	-	-	-	-	-	-	-	-	-	-	-	-
December	**84,091**	86,843	**30,066**	-54,025	-64.2%	-56,777	-65.4%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**229,148**	234,934	**197,795**	-31,354	-13.7%	-37,139	-15.8%	240,804	**82,992**	**79,790**	**78,748**	**75,916**	**96,929**	-153,232 to -146,156	-66.9% to -63.8%	-121,878 to -114,803	-61.6% to -58.0%	-164,887 to -157,811	-68.5% to -65.5%
2Q	**261,742**	273,678	**33,105**	-228,637	-87.4%	-240,573	-87.9%	282,629	**144,605**	**113,601**	**121,896**	**104,681**	**239,635**	-157,062 to -117,137	-60.0% to -44.8%	71,576 to 111,500	216.2% to 336.8%	-177,948 to -138,024	-63.0% to -48.8%
3Q	**264,942**	279,465	**79,125**	-185,817	-70.1%	-200,340	-71.7%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**244,378**	250,459	**90,837**	-153,541	-62.8%	-159,622	-63.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**1,000,211**	1,038,535	**400,861**	-599,350	-59.9%	-637,674	-61.4%	523,433	**227,598**	**193,392**	**200,644**	**180,597**	**336,563**	-310,294 to -263,293	-63.2% to -53.6%	-50,302 to -3,302	-21.8% to -1.4%	-342,835 to -295,835	-65.5% to -56.5%

Passenger number

Passenger Number (thousand) - North America International

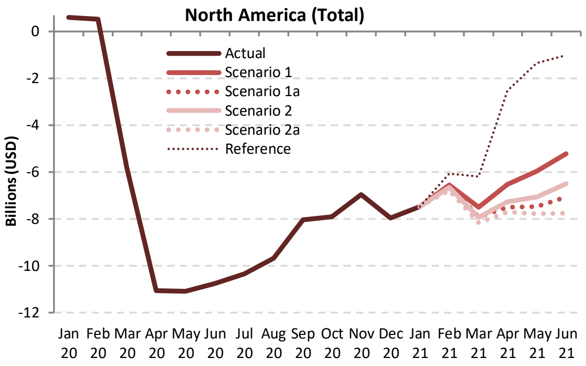
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**12,728**	12,303	**12,827**	99	0.8%	524	4.3%	12,265	**2,516**	**2,516**	**2,516**	**2,516**	**2,516**	-10,212	-80.2%	-10,311	-80.4%	-9,748	-79.5%
February	**11,162**	11,222	**10,790**	-372	-3.3%	-432	-3.8%	11,189	**2,403**	**2,403**	**2,301**	**2,186**	**2,650**	-8,976 to -8,759	-80.4% to -78.5%	-8,604 to -8,387	-79.7% to -77.7%	-9,003 to -8,787	-80.5% to -78.5%
March	**13,565**	13,174	**7,052**	-6,513	-48.0%	-6,122	-46.5%	13,150	**3,401**	**3,163**	**3,120**	**2,872**	**4,098**	-10,692 to -10,163	-78.8% to -74.9%	-4,179 to -3,651	-59.3% to -51.8%	-10,278 to -9,749	-78.2% to -74.1%
April	**13,169**	13,333	**379**	-12,790	-97.1%	-12,954	-97.2%	13,591	**4,413**	**3,417**	**3,783**	**3,257**	**7,481**	-9,912 to -8,756	-75.3% to -66.5%	2,878 to 4,034	759.3% to 1064.2%	-10,334 to -9,178	-76.0% to -67.5%
May	**13,346**	13,605	**350**	-12,996	-97.4%	-13,254	-97.4%	13,901	**5,585**	**3,993**	**4,541**	**3,687**	**9,770**	-9,660 to -7,762	-72.4% to -58.2%	3,336 to 5,235	952.3% to 1494.0%	-10,214 to -8,316	-73.5% to -59.8%
June	**14,467**	14,741	**636**	-13,831	-95.6%	-14,104	-95.7%	14,978	**7,478**	**5,208**	**6,044**	**4,487**	**11,267**	-9,981 to -6,989	-69.0% to -48.3%	3,850 to 6,842	605.1% to 1075.2%	-10,492 to -7,500	-70.0% to -50.1%
July	**15,475**	15,840	**1,216**	-14,259	-92.1%	-14,623	-92.3%	-	-	-	-	-	-	-	-	-	-	-	-
August	**15,240**	15,542	**1,491**	-13,749	-90.2%	-14,051	-90.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**12,609**	12,959	**1,332**	-11,278	-89.4%	-11,628	-89.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	**12,323**	12,040	**1,657**	-10,666	-86.6%	-10,383	-86.2%	-	-	-	-	-	-	-	-	-	-	-	-
November	**11,370**	11,052	**2,020**	-9,350	-82.2%	-9,031	-81.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**13,142**	12,817	**2,803**	-10,338	-78.7%	-10,014	-78.1%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**37,454**	36,699	**30,669**	-6,786	-18.1%	-6,030	-16.4%	36,604	**8,320**	**8,081**	**7,938**	**7,575**	**9,264**	-29,880 to -29,135	-79.8% to -77.8%	-23,094 to -22,349	-75.3% to -72.9%	-29,030 to -28,285	-79.3% to -77.3%
2Q	**40,983**	41,679	**1,366**	-39,617	-96.7%	-40,313	-96.7%	42,470	**17,476**	**12,618**	**14,369**	**11,431**	**28,518**	-29,552 to -23,507	-72.1% to -57.4%	10,065 to 16,110	736.9% to 1179.6%	-31,040 to -24,994	-73.1% to -58.9%
3Q	**43,325**	44,341	**4,039**	-39,286	-90.7%	-40,302	-90.9%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**36,835**	35,909	**6,481**	-30,354	-82.4%	-29,428	-82.0%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**158,597**	158,627	**42,554**	-116,043	-73.2%	-116,073	-73.2%	79,075	**25,796**	**20,699**	**22,306**	**19,005**	**37,782**	-59,432 to -52,641	-75.8% to -67.1%	-13,029 to -6,238	-40.7% to -19.5%	-60,070 to -53,279	-76.0% to -67.4%

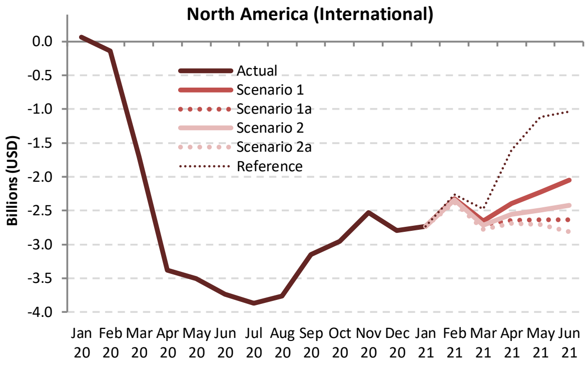
Passenger Number (thousand) - North America Domestic

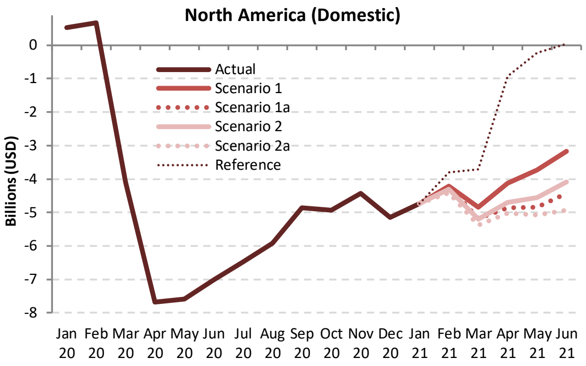
Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**61,064**	62,657	**65,512**	4,448	7.3%	2,855	4.6%	64,731	**20,883**	**20,883**	**20,883**	**20,883**	**20,883**	-40,180	-65.8%	-44,629	-68.1%	-43,847	-67.7%
February	**57,815**	61,181	**63,480**	5,665	9.8%	2,299	3.8%	62,937	**22,032**	**22,032**	**21,287**	**20,378**	**25,539**	-37,437 to -35,783	-64.8% to -61.9%	-43,102 to -41,448	-67.9% to -65.3%	-42,559 to -40,905	-67.6% to -65.0%
March	**72,816**	74,398	**38,135**	-34,681	-47.6%	-36,263	-48.7%	76,532	**31,758**	**28,794**	**28,640**	**27,081**	**41,243**	-45,735 to -41,058	-62.8% to -56.4%	-11,054 to -6,377	-29.0% to -16.7%	-49,452 to -44,774	-64.6% to -58.5%
April	**69,546**	72,455	**4,348**	-65,198	-93.7%	-68,107	-94.0%	75,127	**34,534**	**28,365**	**29,665**	**26,943**	**61,623**	-42,603 to -35,012	-61.3% to -50.3%	22,595 to 30,186	519.7% to 694.3%	-48,184 to -40,593	-64.1% to -54.0%
May	**74,582**	78,181	**10,255**	-64,327	-86.2%	-67,926	-86.9%	81,454	**42,872**	**33,549**	**35,886**	**31,528**	**72,552**	-43,054 to -31,711	-57.7% to -42.5%	21,273 to 32,616	207.4% to 318.0%	-49,926 to -38,583	-61.3% to -47.4%
June	**76,632**	81,363	**17,136**	-59,496	-77.6%	-64,227	-78.9%	83,578	**49,724**	**39,069**	**41,977**	**34,779**	**76,942**	-41,853 to -26,908	-54.6% to -35.1%	17,643 to 32,588	103.0% to 190.2%	-48,799 to -33,853	-58.4% to -40.5%
July	**79,018**	84,927	**24,049**	-54,969	-69.6%	-60,878	-71.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	**76,089**	79,297	**25,825**	-50,265	-66.1%	-53,472	-67.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	**66,510**	70,900	**25,212**	-41,298	-62.1%	-45,688	-64.4%	-	-	-	-	-	-	-	-	-	-	-	-
October	**71,474**	73,864	**29,570**	-41,904	-58.6%	-44,294	-60.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	**65,120**	66,659	**27,523**	-37,597	-57.7%	-39,136	-58.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	**70,949**	74,026	**27,263**	-43,687	-61.6%	-46,763	-63.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**191,694**	198,235	**167,126**	-24,568	-12.8%	-31,109	-15.7%	204,199	**74,673**	**71,709**	**70,810**	**68,342**	**87,665**	-123,352 to -117,022	-64.3% to -61.0%	-98,785 to -92,454	-59.1% to -55.3%	-135,858 to -129,527	-66.5% to -63.4%
2Q	**220,760**	231,999	**31,739**	-189,020	-85.6%	-200,260	-86.3%	240,158	**127,129**	**100,983**	**107,528**	**93,250**	**211,117**	-127,509 to -93,630	-57.8% to -42.4%	61,511 to 95,390	193.8% to 300.5%	-146,908 to -113,029	-61.2% to -47.1%
3Q	**221,617**	235,124	**75,086**	-146,531	-66.1%	-160,038	-68.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**207,543**	214,550	**84,356**	-123,187	-59.4%	-130,194	-60.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**841,614**	879,908	**358,307**	-483,307	-57.4%	-521,601	-59.3%	444,358	**201,802**	**172,692**	**178,338**	**161,592**	**298,782**	-250,862 to -210,652	-60.8% to -51.1%	-37,273 to 2,936	-18.7% to 1.5%	-282,766 to -242,556	-63.6% to -54.6%

Source: ICAO estimates

Passenger revenue







Passenger revenue (USD, million) - North America International + Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	**10,540**	10,651	**11,130**	591	5.6%	480	4.5%	10,900	**3,073**	**3,073**	**3,073**	**3,073**	**3,073**	-7,467	-70.8%	-8,058	-72.4%	-7,828	-71.8%
February	**9,717**	10,161	**10,244**	527	5.4%	83	0.8%	10,369	**3,180**	**3,180**	**3,068**	**2,932**	**3,654**	-6,785 to -6,537	-69.8% to -67.3%	-7,312 to -7,064	-71.4% to -69.0%	-7,436 to -7,189	-71.7% to -69.3%
March	**12,058**	12,183	**6,265**	-5,793	-48.0%	-5,918	-48.6%	12,455	**4,571**	**4,164**	**4,135**	**3,890**	**5,863**	-8,167 to -7,486	-67.7% to -62.1%	-2,375 to -1,694	-37.9% to -27.0%	-8,565 to -7,884	-68.8% to -63.3%
April	**11,677**	12,086	**617**	-11,060	-94.7%	-11,470	-94.9%	12,485	**5,152**	**4,177**	**4,421**	**3,970**	**9,142**	-7,706 to -6,525	-66.0% to -55.9%	3,354 to 4,535	543.7% to 735.2%	-8,515 to -7,333	-68.2% to -58.7%
May	**12,400**	12,924	**1,314**	-11,086	-89.4%	-11,610	-89.8%	13,405	**6,434**	**4,932**	**5,347**	**4,619**	**11,040**	-7,781 to -5,966	-62.8% to -48.1%	3,305 to 5,120	251.4% to 389.6%	-8,786 to -6,971	-65.5% to -52.0%
June	**12,947**	13,599	**2,200**	-10,747	-83.0%	-11,399	-83.8%	13,942	**7,729**	**5,889**	**6,447**	**5,202**	**11,942**	-7,745 to -5,218	-59.8% to -40.3%	3,002 to 5,529	136.4% to 251.3%	-8,740 to -6,213	-62.7% to -44.6%
July	**13,500**	14,320	**3,151**	-10,348	-76.7%	-11,169	-78.0%	-	-	-	-	-	-	-	-	-	-	-	-
August	**13,126**	13,619	**3,447**	-9,680	-73.7%	-10,172	-74.7%	-	-	-	-	-	-	-	-	-	-	-	-
September	**11,365**	12,003	**3,346**	-8,019	-70.6%	-8,657	-72.1%	-	-	-	-	-	-	-	-	-	-	-	-
October	**11,827**	12,037	**3,933**	-7,893	-66.7%	-8,104	-67.3%	-	-	-	-	-	-	-	-	-	-	-	-
November	**10,714**	10,812	**3,754**	-6,960	-65.0%	-7,057	-65.3%	-	-	-	-	-	-	-	-	-	-	-	-
December	**11,842**	12,146	**3,897**	-7,946	-67.1%	-8,249	-67.9%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	**32,314**	32,995	**27,639**	-4,675	-14.5%	-5,356	-16.2%	33,724	**10,824**	**10,417**	**10,275**	**9,895**	**12,590**	-22,419 to -21,490	-69.4% to -66.5%	-17,744 to -16,815	-64.2% to -60.8%	-23,829 to -22,900	-70.7% to -67.9%
2Q	**37,024**	38,610	**4,131**	-32,893	-88.8%	-34,479	-89.3%	39,832	**19,315**	**14,998**	**16,214**	**13,791**	**32,124**	-23,233 to -17,709	-62.8% to -47.8%	9,660 to 15,184	233.8% to 367.5%	-26,041 to -20,517	-65.4% to -51.5%
3Q	**37,991**	39,942	**9,944**	-28,047	-73.8%	-29,998	-75.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	**34,383**	34,995	**11,584**	-22,799	-66.3%	-23,411	-66.9%	-	-	-	-	-	-	-	-	-	-	-	-
Total	**141,713**	146,541	**53,298**	-88,414	-62.4%	-93,243	-63.6%	73,556	**30,139**	**25,415**	**26,489**	**23,686**	**44,715**	-45,652 to -39,199	-65.8% to -56.5%	-8,084 to -1,631	-25.4% to -5.1%	-49,870 to -43,417	-67.8% to -59.0%

Passenger revenue

Passenger revenue (USD, million) - North America International

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	3,344	3,267	3,410	66	2.0%	143	4.4%	3,272	612	612	612	612	612	-2,732	-81.7%	-2,799	-82.1%	-2,660	-81.3%
February	2,904	2,951	2,763	-141	-4.8%	-188	-6.4%	2,952	584	584	559	531	645	-2,373 to -2,320	-81.7% to -79.9%	-2,232 to -2,179	-80.8% to -78.9%	-2,421 to -2,368	-82.0% to -80.2%
March	3,477	3,416	1,771	-1,706	-49.1%	-1,645	-48.2%	3,437	829	771	760	699	1,003	-2,778 to -2,648	-79.9% to -76.2%	-1,072 to -942	-60.5% to -53.2%	-2,738 to -2,608	-79.7% to -75.9%
April	3,481	3,548	104	-3,377	-97.0%	-3,444	-97.1%	3,632	1,083	834	925	795	1,880	-2,686 to -2,399	-77.2% to -68.9%	691 to 978	661.2% to 936.0%	-2,837 to -2,550	-78.1% to -70.2%
May	3,611	3,711	106	-3,505	-97.1%	-3,606	-97.1%	3,807	1,382	979	1,118	904	2,490	-2,708 to -2,229	-75.0% to -61.7%	798 to 1,277	753.8% to 1206.4%	-2,903 to -2,424	-76.3% to -63.7%
June	3,917	4,011	181	-3,736	-95.4%	-3,830	-95.5%	4,093	1,869	1,285	1,500	1,103	2,875	-2,813 to -2,048	-71.8% to -52.3%	923 to 1,688	510.8% to 934.7%	-2,989 to -2,224	-73.0% to -54.3%
July	4,188	4,312	317	-3,871	-92.4%	-3,995	-92.6%	-	-	-	-	-	-	-	-	-	-	-	-
August	4,160	4,274	403	-3,757	-90.3%	-3,871	-90.6%	-	-	-	-	-	-	-	-	-	-	-	-
September	3,528	3,648	375	-3,153	-89.4%	-3,273	-89.7%	-	-	-	-	-	-	-	-	-	-	-	-
October	3,404	3,333	449	-2,955	-86.8%	-2,884	-86.5%	-	-	-	-	-	-	-	-	-	-	-	-
November	3,040	2,956	511	-2,529	-83.2%	-2,445	-82.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	3,482	3,422	684	-2,798	-80.4%	-2,738	-80.0%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	9,725	9,634	7,945	-1,780	-18.3%	-1,690	-17.5%	9,661	2,024	1,966	1,930	1,841	2,260	-7,883 to -7,700	-81.1% to -79.2%	-6,103 to -5,920	-76.8% to -74.5%	-7,819 to -7,636	-80.9% to -79.0%
2Q	11,009	11,271	391	-10,618	-96.4%	-10,880	-96.5%	11,532	4,334	3,098	3,543	2,802	7,246	-8,207 to -6,675	-74.5% to -60.6%	2,411 to 3,943	616.8% to 1008.6%	-8,729 to -7,198	-75.7% to -62.4%
3Q	11,876	12,235	1,096	-10,780	-90.8%	-11,139	-91.0%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	9,926	9,712	1,643	-8,283	-83.4%	-8,068	-83.1%	-	-	-	-	-	-	-	-	-	-	-	-
Total	42,536	42,851	11,075	-31,461	-74.0%	-31,777	-74.2%	21,193	6,359	5,064	5,474	4,644	9,506	-16,090 to -14,375	-77.6% to -69.3%	-3,692 to -1,977	-44.3% to -23.7%	-16,549 to -14,834	-78.1% to -70.0%

Passenger revenue (USD, million) - North America Domestic

Year	2019	2020						2021											
Month	Actual	Baseline	Estimated	Compared to 2019		Compared to Baseline		Baseline	Scenario 1	Scenario 1a	Scenario 2	Scenario 2a	Reference	Compared to 2019		Compared to 2020		Compared to Baseline	
	a	b	c	c-a	c/a-1	c-b	c/b-1	d	e				-	e-a	e/a-1	e-c	e/a-1	e-d	e/d-1
January	7,196	7,384	7,720	524	7.3%	336	4.6%	7,628	2,461	2,461	2,461	2,461	2,461	-4,735	-65.8%	-5,259	-68.1%	-5,167	-67.7%
February	6,813	7,210	7,481	668	9.8%	271	3.8%	7,417	2,596	2,596	2,509	2,401	3,010	-4,412 to -4,217	-64.8% to -61.9%	-5,079 to -4,884	-67.9% to -65.3%	-5,015 to -4,820	-67.6% to -65.0%
March	8,581	8,767	4,494	-4,087	-47.6%	-4,273	-48.7%	9,019	3,742	3,393	3,375	3,191	4,860	-5,390 to -4,838	-62.8% to -56.4%	-1,303 to -751	-29.0% to -16.7%	-5,827 to -5,276	-64.6% to -58.5%
April	8,195	8,538	512	-7,683	-93.7%	-8,026	-94.0%	8,853	4,069	3,343	3,496	3,175	7,262	-5,020 to -4,126	-61.3% to -50.3%	2,663 to 3,557	519.7% to 694.3%	-5,678 to -4,784	-64.1% to -54.0%
May	8,789	9,213	1,209	-7,580	-86.2%	-8,004	-86.9%	9,599	5,052	3,953	4,229	3,715	8,550	-5,074 to -3,737	-57.7% to -42.5%	2,507 to 3,844	207.4% to 318.0%	-5,883 to -4,547	-61.3% to -47.4%
June	9,030	9,588	2,019	-7,011	-77.6%	-7,569	-78.9%	9,849	5,860	4,604	4,947	4,098	9,067	-4,932 to -3,171	-54.6% to -35.1%	2,079 to 3,840	103.0% to 190.2%	-5,751 to -3,989	-58.4% to -40.5%
July	9,312	10,008	2,834	-6,478	-69.6%	-7,174	-71.7%	-	-	-	-	-	-	-	-	-	-	-	-
August	8,966	9,344	3,043	-5,923	-66.1%	-6,301	-67.4%	-	-	-	-	-	-	-	-	-	-	-	-
September	7,838	8,355	2,971	-4,867	-62.1%	-5,384	-64.4%	-	-	-	-	-	-	-	-	-	-	-	-
October	8,423	8,704	3,485	-4,938	-58.6%	-5,220	-60.0%	-	-	-	-	-	-	-	-	-	-	-	-
November	7,674	7,855	3,243	-4,430	-57.7%	-4,612	-58.7%	-	-	-	-	-	-	-	-	-	-	-	-
December	8,361	8,723	3,213	-5,148	-61.6%	-5,511	-63.2%	-	-	-	-	-	-	-	-	-	-	-	-
1Q	22,590	23,360	19,694	-2,895	-12.8%	-3,666	-15.7%	24,063	8,800	8,450	8,344	8,054	10,331	-14,536 to -13,790	-64.3% to -61.0%	-11,641 to -10,895	-59.1% to -55.3%	-16,010 to -15,264	-66.5% to -63.4%
2Q	26,015	27,339	3,740	-22,274	-85.6%	-23,599	-86.3%	28,301	14,981	11,900	12,671	10,989	24,878	-15,026 to -11,034	-57.8% to -42.4%	7,249 to 11,241	193.8% to 300.5%	-17,312 to -13,320	-61.2% to -47.1%
3Q	26,116	27,707	8,848	-17,267	-66.1%	-18,859	-68.1%	-	-	-	-	-	-	-	-	-	-	-	-
4Q	24,457	25,283	9,941	-14,517	-59.4%	-15,342	-60.7%	-	-	-	-	-	-	-	-	-	-	-	-
Total	99,177	103,690	42,223	-56,954	-57.4%	-61,466	-59.3%	52,364	23,781	20,350	21,016	19,042	35,209	-29,562 to -24,824	-60.8% to -51.1%	-4,392 to 346	-18.7% to 1.5%	-33,322 to -28,583	-63.6% to -54.6%

Source: ICAO estimates

Appendix A: Overview of Early Impact

COVID-19 outbreak has impacted air traffic of China starting from late January 2020

Note: The above includes a) international from mainland China, Hong Kong SAR of China, Macao SAR of China, Taiwan, Province of China; b) domestic within mainland China, and c) regional between mainland China and Hong Kong SAR, Macao SAR and Taiwan Province

Source: CARNOC.com/VariFlight (retrieved on 9 March 2020)

A surge of COVID-19 confirmed cases occurred in several States by late February 2020

January 2020	International passenger seat capacity	
Country/Territory	Capacity change from originally-planned	
Russian Federation	-89,778	-1%
Italy	-65,971	-1%
Turkey	-53,262	-1%
China	-45,484	0%
Morocco	-42,684	-2%
United Arab Emirates	-31,464	0%
Iraq	-29,326	-3%
Albania	-22,080	-7%
United Kingdom	-21,888	0%
South Africa	-21,476	-1%
Iran Islamic Republic of	-20,891	-2%
France	-19,537	0%
Poland	-18,154	0%
Romania	-17,493	-1%
Japan	-16,449	0%
United States	-13,067	0%
Indonesia	-12,114	0%
Bulgaria	-10,540	-1%
India	-10,342	0%
Cambodia	-10,158	-1%
Bahamas	-9,588	-2%
Denmark	-8,942	0%
Viet Nam	-8,489	0%
Malta	-7,372	-1%
Lebanon	-7,182	-1%
Bahrain	-7,123	-1%
Uzbekistan	-6,539	-1%
Tunisia	-6,362	-1%
Switzerland	-6,235	0%
Czechia	-5,642	0%

February 2020	International passenger seat capacity	
Country/Territory	Capacity change from originally-planned	
China	-10,532,219	-61%
Hong Kong SAR of China (CN)	-2,363,320	-36%
Republic of Korea	-1,717,147	-19%
Japan	-1,592,429	-15%
Thailand	-1,452,478	-15%
Taiwan, Province of China (CN)	-1,446,686	-23%
Singapore	-807,608	-12%
Viet Nam	-731,936	-16%
Macao SAR of China (CN)	-721,489	-64%
Philippines	-646,104	-18%
United States	-620,296	-3%
Malaysia	-448,172	-8%
Indonesia	-426,102	-10%
Russian Federation	-317,890	-5%
Cambodia	-307,968	-4%
Turkey	-277,868	-21%
Italy	-268,846	-3%
United Arab Emirates	-253,548	-2%
Australia	-241,284	-5%
United Kingdom	-188,864	-1%
Iran Islamic Republic of	-169,782	-18%
France	-157,998	-1%
Myanmar	-147,487	-21%
Germany	-145,561	-1%
India	-116,823	-2%
Morocco	-108,186	-5%
Qatar	-99,338	-2%
Canada	-96,231	-1%
Lao People's Democratic Republi	-71,910	-21%
Finland	-71,413	-4%

In February 2020, international passenger capacity **reduced by 10%**, mainly related to traffic from/to States experiencing an early outbreak and States deeply interconnected to China.

State/Territory with 100 to 999 confirmed cases*

State/Territory with 1,000 to 9,999 confirmed cases*

State/Territory with 10,000 to 49,999 confirmed cases*

State/Territory with 50,000 or more confirmed cases*

*: Coronavirus Disease 2019 (COVID-19) Situation Report by WHO (29 February 2020)

Source: OAG scheduled data adjusted by ICAO estimates

COVID-19 Pandemic was declared and accelerating in March 2020

March 2020 International Passenger Capacity

Country/Territory	Capacity change from originally-planned	
China	-14,841,792	-82%
Italy	-6,860,837	-60%
Republic of Korea	-6,536,917	-70%
Japan	-5,837,894	-51%
Germany	-5,771,162	-31%
Hong Kong SAR of China (CN)	-5,352,855	-77%
United Kingdom	-4,965,296	-22%
United States	-4,950,969	-19%
Thailand	-4,587,421	-46%
Taiwan, Province of China (CN)	-4,074,431	-62%
Spain	-3,792,140	-26%
United Arab Emirates	-3,400,833	-26%
Singapore	-3,297,434	-45%
France	-3,216,482	-25%
Turkey	-2,879,271	-35%
Viet Nam	-2,599,336	-55%
Malaysia	-2,500,355	-42%
India	-2,077,578	-29%
Saudi Arabia	-1,747,385	-31%
Switzerland	-1,691,017	-28%

Country/Territory	Capacity change from originally-planned	
Philippines	-1,669,456	-45%
Indonesia	-1,466,518	-34%
Netherlands	-1,292,472	-17%
Canada	-1,218,383	-16%
Austria	-1,200,864	-30%
Russian Federation	-1,177,704	-19%
Australia	-1,119,345	-25%
Portugal	-1,118,941	-26%
Belgium	-1,060,572	-31%
Qatar	-1,041,439	-21%
Denmark	-980,211	-28%
Israel	-972,061	-44%
Poland	-967,520	-24%
Macao SAR of China (CN)	-954,453	-80%
Egypt	-818,043	-28%
Morocco	-762,145	-31%
Sweden	-761,425	-24%
Ireland	-733,678	-21%
Greece	-635,039	-34%
Czechia	-610,048	-37%

In March 2020, global international passenger capacity **reduced by 48%,** with significant reduction not only in States experiencing an early outbreak but also worldwide.

- State/Territory with 100 to 999 confirmed cases*
- State/Territory with 1,000 to 9,999 confirmed cases*
- State/Territory with 10,000 to 49,999 confirmed cases*
- State/Territory with 50,000 or more confirmed cases*

*: Coronavirus Disease 2019 (COVID-19) Situation Report by WHO (31 March 2020)

Source: OAG scheduled data adjusted by ICAO estimates

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The world reached 3 million confirmed COVID-19 cases in April 2020

April 2020 International Passenger Capacity

Country/Territory	Capacity change from originally-planned	
United States	-22,976,621	-88%
United Kingdom	-22,345,210	-90%
Germany	-19,374,444	-92%
Spain	-18,041,897	-94%
China	-16,683,876	-95%
France	-13,480,021	-91%
Italy	-12,464,502	-94%
United Arab Emirates	-11,009,896	-89%
Japan	-9,501,833	-88%
Turkey	-8,798,224	-94%
Thailand	-8,441,105	-94%
Republic of Korea	-7,960,525	-86%
Hong Kong SAR of China (CN)	-7,122,206	-93%
Netherlands	-6,960,693	-89%
Singapore	-6,596,279	-93%
Canada	-6,288,656	-90%
India	-6,286,458	-89%
Switzerland	-5,990,424	-93%
Russian Federation	-5,747,918	-87%
Taiwan, Province of China (CN)	-5,400,277	-85%

Country/Territory	Capacity change from originally-planned	
Malaysia	-4,959,606	-85%
Portugal	-4,913,803	-95%
Saudi Arabia	-4,193,572	-77%
Australia	-4,115,805	-92%
Mexico	-4,104,882	-78%
Austria	-3,812,866	-91%
Qatar	-3,760,492	-80%
Indonesia	-3,723,583	-87%
Viet Nam	-3,681,731	-89%
Ireland	-3,595,318	-92%
Poland	-3,449,632	-79%
Denmark	-3,417,729	-93%
Belgium	-3,323,135	-87%
Greece	-3,078,774	-94%
Philippines	-2,993,741	-86%
Sweden	-2,941,579	-89%
Norway	-2,476,519	-90%
Egypt	-2,248,437	-78%
Brazil	-2,214,850	-92%
Israel	-2,196,238	-91%

In April 2020, global international passenger capacity so far experienced by **unprecedented 94% reduction** (estimated)

State/Territory with 100 to 999 confirmed cases*

State/Territory with 1,000 to 9,999 confirmed cases*

State/Territory with 10,000 to 49,999 confirmed cases*

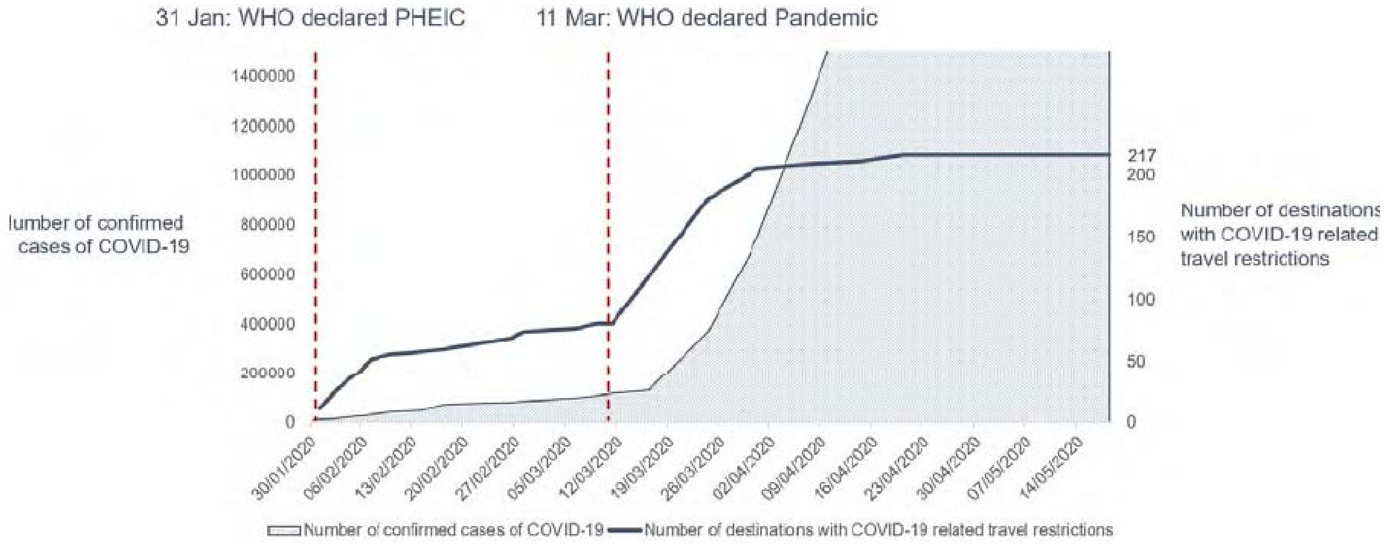
State/Territory with 50,000 or more confirmed cases*

*: Coronavirus Disease 2019 (COVID-19) Situation Report by WHO (30 April 2020)

Source: OAG scheduled data adjusted by ICAO estimates

Drastic reduction in passenger traffic amplified by travel restrictions

Number of confirmed cases and destinations with COVID-19-related travel restrictions



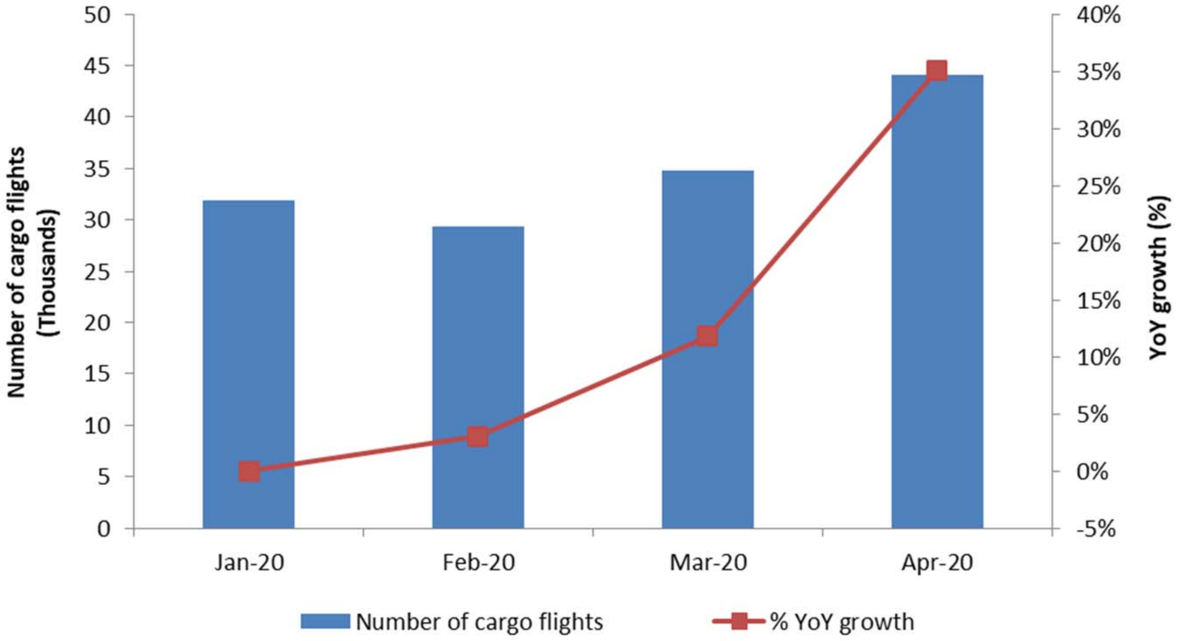
As of 18 May 2020, 100% of all world destinations have travel restrictions. About 185 (85%) destinations have completely or partially closed their borders, while 11 destinations (5%) have suspended completely or partially international flights.

https://www.unwto.org/news/covid-19-response-travel-restrictions

Source: UNWTO COVID-19 Related Travel Restrictions – A Global Review for Tourism (4th report dated 29 May 2020)

In contrast, surge in cargo flights since March 2020

In contrast to the fall in passenger traffic, cargo flights surged with the increased cargo-only operations using passenger aircraft



Source: ICAO ADS-B operation data

Appendix B: Scenario Assumptions in Detail

Assumptions underlying Scenarios

(International and domestic)	Baseline (Originally-planned, business as usual)	
	Seat capacity	Passenger load factor
January to March 2020	Airlines' winter schedules filed with OAG as of 6 January 2020	Forecasted 2020 load factor by region/route group, based on ICAO long-term traffic forecasts (LTF), which was adjusted monthly by difference between 2019 actual monthly results (ICAO, IATA) and 2019 LTF forecasted load factor
April to September 2020	Maximum number of seats taken from airlines' summer schedules filed with OAG during the period from 6 January 2020 to 20 April 2020	
October to December 2020	Using 2019 winter schedule as the base, and applying the pre-COVID-19 trend line growth, i.e. growth rate of 2019/2018 as proxy	
January to June 2021	Using "2020 Baseline" as the base, and applying the baseline growth of 2020/2019, or growth rate of 2019/2018, whichever is smaller	Forecasted 2021 load factor by region/route group, based on ICAO long-term traffic forecasts (LTF), which was adjusted monthly by difference between 2019 actual monthly results (ICAO, IATA) and 2019 LTF forecasted load factor

(International and domestic)	Scenarios 1/1a, 2/2a and Reference	
	Seat capacity	Passenger load factor
January to December 2020	Actual capacity based on ICAO ADS-B data	Actual estimated results by region/route group
January 2021		Average 33 (international) and 19 (domestic) percentage points lower than January 2019 load factor with adjustment of GDP impact by region/route group
February to June 2021	Scenarios 1/1a & 2/2a: Application of monthly "base percentage" which incorporates impacts of intra-/inter-regional share difference (2019) Reference: Most recent airlines' schedules filed with OAG	Application of "base percentage" which incorporates GDP impact by region/route group

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"Base percentages" used for scenarios

International (world average)

Seat capacity	Jan	Feb	Mar	Apr	May	Jun
Reference	-77%	-78%	-64%	-31%	-25%	-25%
Scenario 1	-77%	-79%	-73%	-65%	-54%	-41%
Scenario 1a	-77%	-79%	-73%	-71%	-67%	-59%
Scenario 2	-77%	-79%	-74%	-68%	-61%	-52%
Scenario 2a	-77%	-79%	-75%	-71%	-67%	-62%

Load factor	Jan	Feb	Mar	Apr	May	Jun
Reference	-33%	-28%	-25%	-21%	-17%	-15%
Scenario 1	-33%	-30%	-27%	-23%	-19%	-17%
Scenario 1a	-33%	-30%	-30%	-30%	-27%	-25%
Scenario 2	-33%	-32%	-29%	-27%	-25%	-22%
Scenario 2a	-33%	-33%	-33%	-32%	-31%	-29%

Domestic (world average)

Seat capacity	Jan	Feb	Mar	Apr	May	Jun
Reference	-41%	-33%	-15%	-12%	-10%	-11%
Scenario 1	-41%	-44%	-41%	-39%	-34%	-29%
Scenario 1a	-41%	-44%	-41%	-41%	-39%	-35%
Scenario 2	-41%	-44%	-42%	-41%	-37%	-32%
Scenario 2a	-41%	-45%	-42%	-41%	-39%	-37%

Load factor	Jan	Feb	Mar	Apr	May	Jun
Reference	-19%	-14%	-12%	-10%	-8%	-6%
Scenario 1	-19%	-17%	-14%	-12%	-10%	-9%
Scenario 1a	-19%	-17%	-19%	-19%	-17%	-16%
Scenario 2	-19%	-18%	-17%	-16%	-15%	-14%
Scenario 2a	-19%	-19%	-19%	-19%	-19%	-18%

- Base percentages of seat capacity already take into consideration short-/long-haul (intra-/inter-region) impacts and will be applied to Baseline level of seat capacity
- Base percentages of load factor already take into consideration economic (GDP) factors and will be added to 2019 load factor %

Data used for scenario analysis

- **Seat capacity (seats available for sale):** OAG airlines schedule data; Route Online; airline websites and ICAO ADS-B operational data
- **Load factor (RPKs/ASKs):** ICAO long-term traffic forecasts (LTF); ICAO statistical reporting forms; IATA economics data; and airline news release
- **Historical passenger traffic (including ASKs, RPKs, passenger numbers and operating revenues)**: ICO Annual Report of the Council; and ICAO statistical reporting forms
- **Yield (passenger revenues/RPK):** ICAO revenue-cost analysis of airlines (RCA); and ICAO-ICM Marketing Information Data Transfer (MIDT passenger origin-destination)
- **Macroeconomic factors (GDP impact):** Income elasticity of demand estimated for ICAO LTF; and IMF and World Bank economic outlook data

Note 1: A list of route group is shown in **Appendix C**.

Note 2: Average air fares (i.e. passenger yield multiplied by average trip distance) for each region/route group are used to estimate gross passenger operating revenues.

Appendix C: Estimated Results at Route Group Level

More detailed break-down of the information is available in the COVID-19 Air Traffic Dashboard (https://www.icao.int/sustainability/Pages/COVID-19-Air-Traffic-Dashboard.aspx).
In case of any discrepancy and inconsistency of information contained in this Appendix and the Dashboard, the Appendix information shall prevail as the Dashboard uses non-cleaned data.

Estimated results by route group for Year 2020: Seat capacity

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Route Group	DOM/INT	Seat capacity (compared to Baseline)												Seat capacity (compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Africa	Domestic	-4.3%	-1.6%	-31.5%	-96.6%	-95.4%	-90.3%	-77.3%	-68.4%	-66.4%	-54.7%	-50.2%	-38.0%	0.4%	5.5%	-28.6%	-96.5%	-95.3%	-90.0%	-76.8%	-68.3%	-65.9%	-53.4%	-47.9%	-33.8%
Africa - Asia/Pacific	International	5.2%	-19.9%	-45.8%	-94.8%	-90.8%	-90.1%	-89.6%	-87.5%	-87.2%	-85.5%	-85.5%	-83.5%	18.1%	-2.6%	-37.9%	-94.2%	-89.9%	-89.3%	-89.1%	-87.1%	-86.8%	-85.0%	-84.2%	-82.1%
Africa - Middle East	International	-5.2%	-5.9%	-55.8%	-95.9%	-94.5%	-91.4%	-81.7%	-79.5%	-71.3%	-58.3%	-59.5%	-61.7%	7.2%	9.6%	-50.1%	-95.6%	-94.1%	-91.2%	-81.3%	-79.6%	-69.2%	-56.4%	-54.9%	-57.4%
Africa - North America	International	-7.9%	-3.7%	-26.6%	-87.5%	-87.5%	-87.2%	-79.1%	-78.6%	-72.8%	-61.0%	-51.3%	-57.1%	8.8%	22.8%	-11.8%	-86.0%	-85.5%	-85.8%	-77.3%	-76.3%	-69.3%	-55.8%	-46.9%	-48.3%
Africa & Middle East - Central America/Caribbean	International														38.3%										
Africa & Middle East - South America	International	0.4%	2.4%	-24.6%	-84.1%	-89.6%	-86.4%	-78.1%	-71.5%	-65.5%	-62.6%	-68.4%	-68.6%	-4.9%	1.9%	-26.8%	-81.8%	-87.7%	-84.8%	-77.0%	-69.9%	-64.2%	-64.4%	-70.3%	-70.3%
Central America/Caribbean	Domestic	-2.1%	-2.3%	-20.4%	-83.9%	-85.9%	-71.7%	-54.4%	-41.8%	-34.5%	-33.5%	-28.7%	-26.8%	9.2%	11.7%	-12.0%	-82.8%	-85.1%	-70.0%	-52.4%	-41.8%	-30.2%	-26.0%	-21.9%	-19.5%
Central America/Caribbean - Europe	International	-0.2%	1.2%	-18.7%	-94.6%	-91.5%	-89.2%	-78.0%	-72.0%	-73.7%	-62.8%	-69.8%	-56.1%	-1.0%	3.5%	-21.0%	-94.4%	-91.2%	-88.9%	-76.9%	-70.7%	-73.4%	-63.5%	-69.9%	-54.8%
Central America/Caribbean - North America	International	2.4%	2.2%	-22.2%	-91.5%	-91.7%	-87.4%	-69.9%	-65.0%	-58.6%	-44.3%	-37.2%	-31.3%	0.0%	3.9%	-24.4%	-91.5%	-91.5%	-87.4%	-69.7%	-64.9%	-57.5%	-45.9%	-39.0%	-32.6%
Central America/Caribbean - South America	International	2.7%	2.7%	-25.7%	-96.6%	-94.8%	-94.7%	-95.3%	-93.8%	-95.9%	-87.8%	-77.2%	-68.2%	0.5%	0.6%	-28.4%	-96.4%	-94.5%	-94.4%	-95.2%	-93.7%	-95.7%	-88.0%	-77.1%	-68.2%
China	Domestic	-9.9%	-75.4%	-60.1%	-55.4%	-36.7%	-24.7%	-18.5%	-8.9%	-5.1%	1.8%	2.5%	0.4%	-3.7%	-73.4%	-58.0%	-55.7%	-37.2%	-25.2%	-19.0%	-9.6%	-5.7%	6.8%	5.9%	5.0%
China - Europe	International	2.6%	-51.8%	-74.6%	-93.2%	-91.0%	-92.2%	-91.9%	-91.5%	-89.9%	-88.9%	-87.4%	-88.1%	4.0%	-48.0%	-73.1%	-93.2%	-91.1%	-92.4%	-91.4%	-91.1%	-89.4%	-88.4%	-86.9%	-87.8%
China - Middle East	International	2.7%	-56.2%	-77.1%	-91.9%	-95.8%	-82.8%	-78.5%	-77.2%	-80.1%	-80.9%	-86.0%	-84.9%	3.8%	-56.4%	-77.1%	-91.8%	-95.6%	-82.6%	-79.0%	-77.7%	-79.7%	-80.8%	-85.8%	-84.5%
China - North America	International	0.7%	-46.2%	-67.2%	-92.6%	-87.8%	-90.5%	-87.5%	-89.9%	-88.8%	-86.3%	-83.3%	-84.7%	-5.6%	-48.2%	-70.1%	-92.8%	-88.1%	-90.7%	-87.8%	-90.1%	-89.0%	-87.2%	-84.4%	-85.3%
China & South West Asia - North Asia	International	-0.1%	-43.3%	-84.2%	-89.9%	-88.9%	-91.9%	-90.0%	-89.5%	-88.8%	-90.8%	-94.1%	-94.1%	21.7%	-31.8%	-81.5%	-89.4%	-88.6%	-91.5%	-89.4%	-89.1%	-88.5%	-89.6%	-93.0%	-93.0%
China & South West Asia - Pacific South East Asia	International	-1.5%	-47.1%	-71.9%	-91.2%	-90.7%	-93.2%	-89.8%	-91.2%	-90.2%	-90.9%	-91.5%	-91.3%	6.7%	-45.6%	-71.3%	-91.2%	-90.7%	-93.2%	-89.9%	-91.1%	-90.3%	-90.6%	-91.1%	-90.9%
Europe	Domestic	3.2%	2.4%	-30.9%	-88.0%	-86.9%	-68.0%	-37.8%	-22.7%	-30.5%	-32.5%	-46.9%	-43.8%	1.5%	1.8%	-32.2%	-88.1%	-87.0%	-68.3%	-38.2%	-23.2%	-31.0%	-33.7%	-47.8%	-45.1%
Europe - Middle East	International	1.5%	0.2%	-43.5%	-89.7%	-89.6%	-84.7%	-81.6%	-79.1%	-73.9%	-73.6%	-74.5%	-72.6%	4.9%	6.1%	-42.6%	-89.3%	-88.5%	-84.8%	-81.2%	-78.9%	-74.3%	-72.7%	-73.7%	-71.8%
Europe - North Africa	International	2.6%	0.9%	-41.0%	-97.9%	-96.8%	-95.7%	-76.2%	-71.3%	-76.0%	-73.5%	-75.1%	-68.1%	4.0%	7.9%	-41.0%	-97.7%	-96.7%	-95.1%	-74.6%	-69.7%	-74.9%	-73.1%	-75.1%	-67.7%
Europe - North America	International	3.8%	2.3%	-35.9%	-91.4%	-93.6%	-91.6%	-87.2%	-82.8%	-80.8%	-76.3%	-73.3%	-75.1%	0.4%	4.1%	-36.2%	-91.3%	-93.5%	-91.4%	-87.0%	-82.5%	-80.4%	-76.9%	-74.1%	-75.8%
Europe - North Asia	International	5.6%	2.2%	-43.4%	-90.0%	-90.9%	-88.8%	-84.8%	-82.2%	-83.1%	-79.7%	-76.7%	-76.1%	6.6%	6.4%	-41.9%	-89.4%	-90.4%	-88.3%	-83.7%	-80.8%	-81.6%	-78.9%	-76.3%	-75.9%
Europe - Pacific South East Asia	International	-2.6%	0.1%	-13.8%	-91.7%	-91.1%	-90.7%	-89.6%	-86.1%	-84.1%	-84.0%	-85.7%	-85.3%	5.5%	6.7%	-18.5%	-91.5%	-90.8%	-90.4%	-89.3%	-85.7%	-84.3%	-83.0%	-84.4%	-83.8%
Europe - South America	International	-4.9%	-4.8%	-36.7%	-95.7%	-93.4%	-90.4%	-85.3%	-82.6%	-79.6%	-77.8%	-72.2%	-66.9%	-1.4%	0.9%	-35.8%	-95.5%	-93.3%	-90.2%	-84.9%	-82.0%	-78.6%	-74.8%	-70.6%	-63.1%
Europe - South West Asia	International	1.8%	2.7%	-36.4%	-90.2%	-88.8%	-90.7%	-86.6%	-79.4%	-67.9%	-62.9%	-64.5%	-63.1%	-8.3%	-4.1%	-43.0%	-90.2%	-88.1%	-89.8%	-85.6%	-78.1%	-66.2%	-63.7%	-66.7%	-65.8%
Europe - Sub Saharan Africa	International	0.7%	0.4%	-28.1%	-90.6%	-91.3%	-87.3%	-78.3%	-68.4%	-60.2%	-50.0%	-53.5%	-46.0%	1.1%	5.2%	-27.5%	-90.6%	-90.9%	-87.0%	-78.1%	-68.2%	-59.5%	-49.7%	-54.0%	-45.9%
Intra Africa	International	-9.7%	-10.1%	-44.0%	-95.4%	-94.3%	-91.6%	-89.0%	-81.7%	-75.3%	-65.6%	-59.2%	-55.0%	1.5%	5.3%	-36.4%	-95.0%	-93.4%	-90.7%	-87.9%	-79.8%	-72.7%	-61.6%	-54.1%	-48.9%

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

Estimated results by route group for Year 2020: Seat capacity

Route Group	DOM/INT	Seat capacity (compared to Baseline)												Seat capacity (compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Intra Central America/Caribbean	International	5.2%	1.4%	-29.1%	-90.0%	-88.4%	-82.4%	-79.4%	-78.2%	-80.5%	-75.5%	-69.5%	-57.6%	4.0%	3.9%	-30.3%	-90.0%	-88.6%	-82.6%	-79.9%	-78.8%	-80.4%	-76.0%	-68.7%	-57.0%
Intra China & South West Asia	International	-9.6%	-60.5%	-78.8%	-89.0%	-87.1%	-90.2%	-88.3%	-88.3%	-86.0%	-83.9%	-83.7%	-83.4%	-2.0%	-57.0%	-76.9%	-87.7%	-85.4%	-89.0%	-86.8%	-86.9%	-84.4%	-82.4%	-82.7%	-82.5%
Intra Europe	International	-1.6%	-3.0%	-46.1%	-96.4%	-95.6%	-90.6%	-68.0%	-53.7%	-62.4%	-66.8%	-78.4%	-76.7%	-0.6%	3.4%	-43.0%	-96.3%	-95.6%	-90.3%	-67.1%	-52.7%	-61.5%	-66.9%	-78.4%	-75.8%
Intra Middle East	International	-2.9%	-4.4%	-67.6%	-94.8%	-94.8%	-93.1%	-90.2%	-87.0%	-83.2%	-75.9%	-69.9%	-72.2%	0.3%	0.6%	-66.4%	-94.5%	-94.1%	-92.8%	-89.8%	-86.6%	-82.5%	-75.5%	-71.3%	-71.3%
Intra North America	International	2.7%	2.7%	-23.6%	-93.4%	-96.9%	-95.5%	-92.0%	-92.9%	-93.7%	-92.9%	-90.4%	-87.8%	-5.2%	-1.7%	-29.2%	-93.4%	-96.9%	-95.4%	-91.8%	-92.8%	-93.7%	-93.0%	-90.6%	-88.5%
Intra North Asia	International	-1.5%	-2.0%	-78.6%	-96.4%	-96.2%	-96.1%	-96.1%	-96.0%	-94.6%	-90.0%	-85.0%	-85.9%	-32.3%	-30.9%	-85.0%	-96.5%	-96.3%	-96.2%	-96.1%	-95.9%	-94.0%	-92.5%	-90.4%	-90.3%
Intra Pacific South East Asia	International	-0.6%	-4.8%	-45.3%	-94.9%	-96.0%	-95.7%	-94.9%	-93.8%	-94.2%	-93.6%	-93.5%	-91.8%	7.1%	2.0%	-42.7%	-94.7%	-95.8%	-95.6%	-94.8%	-93.6%	-94.0%	-93.5%	-93.2%	-91.4%
Intra South America	International	-8.9%	-0.6%	-37.0%	-96.7%	-95.8%	-95.7%	-96.6%	-96.7%	-96.2%	-89.9%	-82.9%	-76.6%	-9.5%	2.5%	-34.8%	-96.4%	-95.3%	-95.1%	-96.3%	-96.2%	-95.7%	-89.7%	-83.4%	-77.8%
Latin America/Caribbean - China	International	2.7%									-88.9%	-100.0%	-100.0%	-66.0%	-100.0%	-100.0%	-100.0%	-100.0%	-100.0%	-97.6%	-97.5%	-100.0%	-92.3%	-100.0%	-100.0%
Latin America/Caribbean - North Asia & Pacific South East Asia	International	2.7%	0.9%	-17.4%	-79.4%	-87.0%	-88.3%	-83.7%	-86.2%	-87.1%	-81.3%	-83.9%	-84.5%	2.0%	0.7%	-19.3%	-77.8%	-85.2%	-86.6%	-82.0%	-84.6%	-85.2%	-82.4%	-84.4%	-84.3%
Middle East	Domestic	-9.4%	5.7%	-37.7%	-95.6%	-94.1%	-74.4%	-61.9%	-51.1%	-47.0%	-30.2%	-20.1%	-18.9%	-15.5%	2.0%	-42.2%	-95.6%	-94.1%	-74.6%	-62.2%	-51.4%	-47.4%	-37.6%	-28.9%	-25.4%
Middle East - North America	International	2.4%	2.4%	-27.6%	-90.4%	-92.9%	-76.2%	-76.1%	-69.4%	-64.6%	-60.0%	-58.6%	-58.0%	4.8%	6.5%	-26.2%	-90.1%	-92.5%	-75.8%	-75.9%	-68.6%	-63.7%	-60.7%	-58.2%	-56.8%
Middle East - North Asia & Pacific South East Asia	International	-0.8%	-1.6%	-35.7%	-82.5%	-85.8%	-76.6%	-72.9%	-69.8%	-69.4%	-70.4%	-70.7%	-71.3%	-0.5%	3.4%	-35.0%	-81.4%	-83.8%	-74.8%	-72.5%	-69.2%	-68.4%	-69.8%	-70.9%	-71.2%
Middle East - South West Asia	International	-2.4%	-0.9%	-43.7%	-96.6%	-93.5%	-82.8%	-73.4%	-71.6%	-65.4%	-63.0%	-59.1%	-54.8%	2.9%	9.5%	-39.7%	-96.3%	-92.7%	-81.3%	-71.7%	-70.4%	-63.9%	-61.2%	-56.4%	-51.7%
North America	Domestic	2.5%	2.7%	-13.9%	-66.8%	-73.6%	-66.3%	-49.2%	-43.6%	-49.1%	-45.1%	-38.9%	-41.1%	4.8%	8.3%	-12.4%	-65.6%	-72.5%	-64.3%	-45.6%	-41.5%	-46.0%	-43.5%	-37.7%	-38.8%
North America - North Asia	International	5.7%	2.7%	-26.8%	-85.4%	-87.0%	-83.0%	-76.7%	-74.0%	-72.4%	-69.7%	-67.6%	-67.6%	6.6%	5.0%	-26.7%	-84.8%	-86.2%	-81.9%	-75.5%	-72.8%	-71.2%	-69.9%	-67.8%	-67.0%
North America - Pacific South East Asia	International	5.7%	2.7%	-19.6%	-88.9%	-87.1%	-86.3%	-83.1%	-79.6%	-81.4%	-83.8%	-81.7%	-81.8%	9.3%	10.8%	-18.2%	-88.8%	-86.8%	-86.3%	-82.8%	-79.5%	-80.7%	-83.3%	-82.0%	-81.6%
North America - South America	International	2.6%	2.7%	-29.2%	-94.2%	-94.9%	-94.6%	-93.0%	-90.5%	-84.9%	-70.2%	-55.5%	-46.1%	-8.0%	-2.8%	-34.1%	-94.1%	-94.8%	-94.3%	-92.5%	-89.9%	-84.1%	-73.1%	-61.1%	-52.2%
North America - South West Asia	International	1.4%	2.6%	-29.9%	-92.1%	-88.3%	-94.8%	-80.2%	-56.3%	-40.8%	-24.8%	-30.7%	-28.4%	20.4%	24.4%	-14.9%	-88.7%	-83.0%	-92.4%	-63.1%	-20.0%	-13.7%	-19.6%	-26.7%	-20.8%
North Asia	Domestic	1.0%	-1.8%	-18.7%	-54.6%	-68.8%	-57.8%	-38.7%	-23.5%	-46.9%	-36.7%	-27.0%	-25.4%	3.1%	2.3%	-18.5%	-54.5%	-68.0%	-57.3%	-37.8%	-23.7%	-46.3%	-35.5%	-25.4%	-24.5%
North Asia - Pacific South East Asia	International	0.5%	-6.9%	-63.3%	-89.0%	-88.8%	-86.9%	-87.3%	-89.5%	-86.3%	-87.2%	-86.7%	-86.1%	15.9%	9.0%	-59.9%	-88.9%	-88.6%	-86.8%	-87.2%	-88.2%	-86.4%	-85.4%	-84.7%	-83.7%
Pacific South East Asia	Domestic	-4.3%	-5.2%	-28.3%	-87.8%	-84.2%	-70.8%	-57.7%	-64.9%	-59.1%	-44.6%	-41.1%	-31.3%	1.3%	3.1%	-24.3%	-87.2%	-83.2%	-69.5%	-54.6%	-61.9%	-55.3%	-45.8%	-40.9%	-30.5%
South America	Domestic	2.0%	1.7%	-32.6%	-94.2%	-93.2%	-89.7%	-84.9%	-80.0%	-70.8%	-56.5%	-46.6%	-38.0%	3.2%	5.6%	-28.5%	-93.9%	-92.8%	-88.8%	-84.2%	-79.1%	-69.7%	-55.7%	-45.9%	-37.6%
South West Asia	Domestic	-3.8%	2.2%	-26.2%	-98.7%	-94.0%	-74.8%	-73.4%	-67.9%	-55.1%	-47.1%	-40.7%	-31.2%	0.2%	6.6%	-23.0%	-98.7%	-93.8%	-73.7%	-72.3%	-66.5%	-53.2%	-45.2%	-38.2%	-28.5%
Domestic		-2.0%	-17.3%	-30.7%	-73.6%	-71.8%	-60.7%	-46.3%	-39.4%	-40.3%	-33.2%	-30.7%	-28.8%	1.3%	-12.7%	-28.6%	-73.0%	-71.0%	-59.4%	-44.4%	-37.9%	-38.3%	-31.8%	-29.5%	-26.9%
International		-0.8%	-10.1%	-47.9%	-93.7%	-93.3%	-90.3%	-78.5%	-71.8%	-73.6%	-73.7%	-76.7%	-74.4%	2.0%	-4.9%	-46.2%	-93.5%	-93.1%	-90.0%	-77.8%	-70.9%	-72.8%	-73.2%	-76.3%	-73.5%
Total		-1.6%	-14.4%	-37.7%	-82.1%	-80.9%	-73.6%	-60.3%	-53.6%	-54.6%	-50.1%	-49.0%	-47.3%	1.6%	-9.6%	-35.7%	-81.6%	-80.3%	-72.7%	-58.9%	-52.3%	-53.2%	-49.1%	-48.1%	-45.7%

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

ICAO UNITING AVIATION

Estimated results by route group for Year 2020: Passenger number

Route Group	DOM/INT	Scheduled passenger (thousand, compared to Baseline)												Scheduled passenger (thousand, compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Africa	Domestic	-213	-250	-1,614	-3,437	-3,104	-3,157	-3,150	-2,871	-2,750	-2,384	-2,335	-2,021	-41	-19	-1,465	-3,370	-2,990	-3,036	-3,070	-2,862	-2,688	-2,278	-2,173	-1,763
Africa - Asia/Pacific	International	19	-92	-203	-356	-337	-343	-359	-360	-326	-321	-344	-369	61	-31	-155	-316	-304	-315	-342	-346	-315	-307	-310	-336
Africa - Middle East	International	-50	-182	-1,591	-2,563	-2,507	-2,649	-2,714	-2,924	-2,165	-1,670	-1,789	-2,083	264	152	-1,295	-2,328	-2,291	-2,544	-2,643	-2,916	-1,981	-1,558	-1,546	-1,800
Africa - North America	International	-15	-14	-77	-183	-182	-231	-259	-272	-204	-154	-126	-175	17	22	-44	-162	-156	-205	-236	-242	-176	-129	-110	-132
Africa & Middle East - Central America/Caribbean	International	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Africa & Middle East - South America	International	5	1	-43	-113	-110	-107	-110	-111	-93	-82	-84	-95	-2	0	-47	-98	-92	-96	-105	-104	-89	-88	-90	-102
Central America/Caribbean	Domestic	-83	-139	-1,641	-4,325	-4,461	-3,869	-3,481	-2,509	-1,611	-1,784	-1,534	-1,589	420	427	-1,181	-4,020	-4,191	-3,582	-3,255	-2,502	-1,331	-1,268	-1,094	-1,105
Central America/Caribbean - Europe	International	39	-4	-516	-1,397	-1,171	-1,199	-1,297	-1,239	-1,009	-906	-1,094	-1,107	30	29	-554	-1,344	-1,130	-1,158	-1,223	-1,173	-995	-925	-1,096	-1,061
Central America/Caribbean - North America	International	274	-14	-3,625	-7,604	-7,011	-7,223	-7,213	-6,354	-4,422	-3,975	-4,198	-5,037	125	148	-3,833	-7,510	-6,824	-7,187	-7,102	-6,283	-4,255	-4,105	-4,355	-5,150
Central America/Caribbean - South America	International	43	21	-455	-1,171	-1,228	-1,176	-1,230	-1,189	-1,140	-1,051	-984	-956	16	-1	-498	-1,103	-1,160	-1,110	-1,206	-1,159	-1,091	-1,063	-977	-959
China	Domestic	-8,291	-45,936	-36,511	-30,434	-23,398	-18,296	-14,857	-10,525	-4,207	-2,847	-3,338	-5,870	-4,818	-41,765	-33,812	-30,593	-23,562	-18,456	-15,033	-10,706	-4,370	-171	-1,634	-3,588
China - Europe	International	65	-952	-1,520	-1,973	-1,986	-2,069	-2,451	-2,442	-2,202	-2,094	-1,737	-1,755	93	-829	-1,412	-1,959	-1,990	-2,124	-2,314	-2,337	-2,091	-2,007	-1,661	-1,697
China - Middle East	International	38	-290	-453	-573	-553	-529	-565	-567	-537	-527	-526	-565	45	-291	-451	-561	-530	-520	-579	-579	-523	-524	-514	-546
China - North America	International	17	-698	-1,090	-1,510	-1,534	-1,576	-1,608	-1,674	-1,427	-1,362	-1,207	-1,415	-82	-747	-1,228	-1,552	-1,577	-1,620	-1,654	-1,721	-1,458	-1,465	-1,298	-1,475
China & South West Asia - North Asia	International	-37	-3,354	-5,797	-5,764	-5,702	-5,872	-6,287	-6,304	-5,653	-6,685	-7,031	-7,568	1,222	-2,268	-4,836	-5,500	-5,497	-5,545	-5,921	-6,011	-5,487	-5,825	-5,936	-6,403
China & South West Asia - Pacific South East Asia	International	-223	-5,407	-7,839	-8,923	-8,767	-8,893	-9,306	-9,632	-8,473	-9,247	-9,278	-10,117	660	-5,086	-7,592	-8,907	-8,701	-8,829	-9,302	-9,493	-8,466	-8,919	-8,737	-9,647
Europe	Domestic	774	94	-11,287	-22,972	-24,063	-20,693	-12,666	-7,203	-9,451	-10,932	-13,169	-11,649	524	85	-11,611	-22,938	-24,092	-20,724	-12,698	-7,235	-9,482	-11,223	-13,429	-12,028
Europe - Middle East	International	415	-62	-3,851	-7,196	-6,652	-6,996	-8,270	-8,380	-6,391	-6,465	-6,038	-6,443	649	295	-3,727	-6,932	-5,953	-7,066	-8,063	-8,304	-6,503	-6,200	-5,835	-6,211
Europe - North Africa	International	128	-52	-1,732	-3,912	-3,090	-4,242	-4,132	-4,078	-3,577	-3,130	-2,755	-2,699	198	166	-1,703	-3,557	-2,995	-3,664	-3,792	-3,778	-3,361	-3,045	-2,712	-2,616
Europe - North America	International	344	27	-3,093	-7,159	-8,377	-9,253	-9,676	-9,441	-8,324	-6,828	-4,885	-5,074	166	113	-3,120	-7,037	-8,190	-9,084	-9,493	-9,252	-8,088	-7,025	-5,042	-5,246
Europe - North Asia	International	62	-55	-544	-1,064	-1,088	-1,117	-1,188	-1,188	-1,098	-1,017	-816	-806	72	-21	-518	-1,001	-1,034	-1,071	-1,098	-1,094	-1,001	-970	-799	-797
Europe - Pacific South East Asia	International	-21	-150	-568	-1,386	-1,252	-1,233	-1,331	-1,329	-1,159	-1,375	-1,589	-1,738	119	-45	-657	-1,344	-1,209	-1,187	-1,286	-1,288	-1,167	-1,285	-1,440	-1,554
Europe - South America	International	-38	-77	-665	-1,328	-1,331	-1,338	-1,395	-1,362	-1,226	-1,313	-1,134	-1,165	14	-3	-641	-1,282	-1,295	-1,300	-1,344	-1,300	-1,156	-1,129	-1,054	-1,009
Europe - South West Asia	International	65	-69	-952	-1,782	-1,749	-1,839	-1,913	-1,821	-1,546	-1,476	-1,440	-1,428	-131	-187	-1,161	-1,769	-1,634	-1,663	-1,764	-1,701	-1,445	-1,512	-1,548	-1,571
Europe - Sub Saharan Africa	International	41	-43	-732	-1,543	-1,482	-1,492	-1,570	-1,479	-1,266	-1,181	-1,237	-1,192	50	31	-717	-1,538	-1,420	-1,451	-1,548	-1,465	-1,235	-1,170	-1,255	-1,187
Intra Africa	International	-234	-335	-1,265	-2,276	-2,239	-2,244	-2,429	-2,420	-2,085	-1,815	-1,707	-1,758	40	-14	-972	-2,051	-1,933	-2,004	-2,177	-2,161	-1,856	-1,563	-1,445	-1,439

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

Estimated results by route group for Year 2020: Passenger number

ICAO UNITING AVIATION

Route Group	DOM/INT	Scheduled passenger (thousand, compared to Baseline)												Scheduled passenger (thousand, compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Intra Central America/Caribbean	International	78	2	-571	-1,257	-1,319	-1,227	-1,257	-1,229	-1,161	-1,107	-1,095	-1,004	68	37	-590	-1,255	-1,330	-1,236	-1,288	-1,261	-1,149	-1,129	-1,053	-980
Intra China & South West Asia	International	-475	-2,946	-3,919	-4,492	-4,401	-4,460	-4,743	-4,862	-4,091	-4,149	-3,817	-3,987	-90	-2,565	-3,515	-3,989	-3,834	-3,935	-4,151	-4,266	-3,626	-3,756	-3,569	-3,763
Intra Europe	International	265	-2,090	-28,271	-57,483	-61,572	-67,650	-61,485	-54,274	-53,952	-50,915	-39,403	-40,319	1,046	864	-25,217	-55,462	-61,145	-64,565	-58,835	-52,066	-51,885	-50,505	-39,098	-38,128
Intra Middle East	International	65	-168	-2,606	-3,632	-3,328	-3,632	-3,867	-4,098	-3,255	-2,955	-2,549	-3,120	197	8	-2,462	-3,442	-2,943	-3,454	-3,674	-3,939	-3,086	-2,891	-2,678	-2,998
Intra North America	International	98	1	-1,219	-2,673	-2,588	-2,828	-2,992	-2,984	-2,535	-2,519	-2,294	-2,408	-98	-92	-1,427	-2,687	-2,630	-2,770	-2,917	-2,947	-2,503	-2,552	-2,350	-2,547
Intra North Asia	International	-21	-212	-1,050	-1,632	-1,629	-1,643	-1,812	-1,765	-1,321	-808	-615	-771	-589	-688	-1,575	-1,675	-1,672	-1,686	-1,808	-1,714	-1,193	-1,090	-996	-1,146
Intra Pacific South East Asia	International	-39	-1,487	-4,730	-7,559	-7,409	-7,504	-8,000	-7,891	-7,184	-7,485	-7,517	-8,205	562	-988	-4,371	-7,296	-7,010	-7,227	-7,795	-7,621	-6,979	-7,274	-7,220	-7,871
Intra South America	International	-161	-31	-834	-1,595	-1,631	-1,574	-1,816	-1,749	-1,603	-1,356	-1,270	-1,296	-164	28	-768	-1,435	-1,442	-1,372	-1,689	-1,494	-1,373	-1,310	-1,304	-1,368
Latin America/Caribbean - China	International	0	0	0	0	0	0	0	0	0	-5	-8	-4	-5	-7	-8	-9	-9	-9	-8	-8	-8	-7	-8	-6
Latin America/Caribbean - North Asia & Pacific South East Asia	International	2	-4	-27	-65	-68	-68	-72	-69	-66	-55	-58	-71	2	-4	-28	-59	-59	-58	-65	-61	-57	-59	-60	-70
Middle East	Domestic	-115	128	-1,597	-3,353	-3,240	-2,792	-2,856	-2,654	-2,151	-1,564	-1,327	-1,462	-343	30	-1,831	-3,369	-3,256	-2,808	-2,873	-2,672	-2,166	-1,889	-1,648	-1,717
Middle East - North America	International	54	12	-300	-729	-719	-715	-782	-775	-631	-557	-549	-621	71	37	-285	-705	-679	-700	-772	-751	-612	-570	-541	-597
Middle East - North Asia & Pacific South East Asia	International	84	-87	-1,111	-2,231	-2,042	-1,940	-2,047	-2,077	-1,791	-1,844	-1,810	-2,096	98	20	-1,080	-2,082	-1,765	-1,782	-2,008	-2,021	-1,720	-1,795	-1,823	-2,088
Middle East - South West Asia	International	23	-342	-2,620	-4,759	-4,524	-4,284	-4,417	-4,455	-3,850	-3,817	-3,800	-3,998	286	84	-2,294	-4,346	-4,017	-3,897	-4,103	-4,223	-3,641	-3,590	-3,494	-3,643
North America	Domestic	2,855	2,299	-36,263	-68,107	-67,926	-64,227	-60,878	-53,472	-45,688	-44,294	-39,136	-46,763	4,448	5,665	-34,681	-65,198	-64,327	-59,496	-54,969	-50,265	-41,298	-41,904	-37,597	-43,687
North America - North Asia	International	82	-109	-623	-1,320	-1,387	-1,390	-1,413	-1,418	-1,267	-1,200	-1,073	-1,207	95	-81	-618	-1,263	-1,298	-1,298	-1,333	-1,347	-1,203	-1,207	-1,078	-1,180
North America - Pacific South East Asia	International	45	-63	-293	-634	-641	-644	-690	-649	-605	-622	-574	-711	73	-13	-279	-625	-623	-642	-678	-644	-580	-601	-580	-699
North America - South America	International	47	7	-613	-1,242	-1,305	-1,341	-1,443	-1,396	-1,170	-914	-748	-835	-107	-56	-705	-1,228	-1,266	-1,263	-1,330	-1,296	-1,098	-1,022	-889	-986
North America - South West Asia	International	4	-13	-93	-181	-176	-180	-179	-157	-135	-115	-117	-138	34	18	-59	-124	-119	-122	-88	-69	-79	-104	-107	-118
North Asia	Domestic	210	-1,056	-6,777	-9,069	-9,925	-7,536	-6,969	-8,561	-7,211	-5,804	-4,870	-5,822	502	-568	-6,649	-8,965	-9,557	-7,318	-6,707	-8,482	-6,971	-5,458	-4,510	-5,594
North Asia - Pacific South East Asia	International	8	-1,012	-3,350	-3,848	-3,806	-3,725	-3,993	-4,701	-3,640	-4,433	-4,517	-5,197	673	-344	-2,952	-3,785	-3,709	-3,681	-3,927	-4,140	-3,639	-3,831	-3,901	-4,373
Pacific South East Asia	Domestic	-786	-2,279	-11,446	-24,661	-23,087	-21,457	-21,679	-23,446	-19,695	-15,935	-15,526	-14,976	691	-321	-10,010	-23,264	-21,551	-20,281	-19,644	-21,198	-17,380	-16,498	-15,399	-14,601
South America	Domestic	471	15	-6,153	-13,280	-13,651	-13,034	-14,018	-12,284	-10,267	-8,806	-6,460	-6,139	796	641	-5,174	-12,448	-12,652	-11,712	-13,226	-11,519	-9,653	-8,397	-6,149	-5,906
South West Asia	Domestic	-758	-306	-5,166	-13,140	-13,707	-11,926	-11,384	-10,391	-8,168	-7,599	-7,900	-7,037	40	434	-4,402	-12,408	-12,916	-11,141	-10,587	-9,618	-7,420	-6,914	-7,060	-6,221
Domestic		-5,937	-47,430	-118,454	-192,778	-186,561	-166,987	-151,936	-133,917	-111,200	-101,949	-95,595	-103,327	2,221	-35,393	-110,817	-186,575	-179,094	-158,554	-142,062	-127,058	-102,759	-96,001	-90,692	-96,210
International		1,092	-20,347	-88,841	-155,108	-156,894	-166,425	-166,311	-159,111	-142,582	-137,531	-121,812	-129,533	5,782	-12,309	-83,396	-149,319	-151,466	-159,440	-159,657	-152,577	-137,171	-134,106	-118,509	-123,494
Total		-4,844	-67,777	-207,295	-347,886	-343,455	-333,412	-318,247	-293,028	-253,782	-239,480	-217,407	-232,860	8,003	-47,702	-194,213	-335,894	-330,560	-317,994	-301,718	-279,635	-239,930	-230,107	-209,201	-219,705

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

Estimated results by route group for Year 2020: Passenger revenues

ICAO UNITING AVIATION

Route Group	DOM/INT	Gross revenue (USD, million, compared to Baseline)												Gross revenue (USD, million, compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Africa	Domestic	-19	-23	-146	-312	-281	-286	-286	-260	-249	-216	-212	-183	-4	-2	-133	-305	-271	-275	-278	-259	-244	-207	-197	-160
Africa - Asia/Pacific	International	11	-52	-114	-200	-189	-192	-202	-202	-183	-180	-193	-207	34	-18	-87	-177	-170	-177	-192	-194	-177	-172	-174	-188
Africa - Middle East	International	-11	-40	-354	-570	-557	-589	-603	-650	-481	-371	-398	-463	59	34	-288	-518	-509	-565	-588	-648	-440	-346	-344	-400
Africa - North America	International	-11	-11	-57	-137	-136	-172	-194	-203	-152	-115	-94	-130	13	17	-33	-121	-117	-154	-176	-181	-132	-97	-82	-99
Africa & Middle East - Central America/Caribbean	International	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Africa & Middle East - South America	International	2	0	-18	-48	-47	-45	-47	-47	-39	-35	-35	-40	-1	0	-20	-41	-39	-41	-44	-44	-38	-37	-38	-43
Central America/Caribbean	Domestic	-6	-11	-125	-329	-340	-295	-265	-191	-123	-136	-117	-121	32	32	-90	-306	-319	-273	-248	-190	-101	-97	-83	-84
Central America/Caribbean - Europe	International	13	-1	-179	-485	-406	-416	-450	-430	-350	-314	-379	-384	11	10	-192	-466	-392	-402	-424	-407	-345	-321	-380	-368
Central America/Caribbean - North America	International	44	-2	-577	-1,211	-1,117	-1,150	-1,149	-1,012	-704	-633	-669	-802	20	24	-611	-1,196	-1,087	-1,145	-1,131	-1,001	-678	-654	-694	-820
Central America/Caribbean - South America	International	8	4	-84	-217	-228	-218	-228	-220	-211	-195	-182	-177	3	0	-92	-204	-215	-206	-223	-215	-202	-197	-181	-178
China	Domestic	-741	-4,103	-3,261	-2,718	-2,090	-1,634	-1,327	-940	-376	-254	-298	-524	-430	-3,730	-3,020	-2,733	-2,105	-1,649	-1,343	-956	-390	-15	-146	-320
China - Europe	International	20	-293	-468	-608	-612	-637	-755	-752	-678	-645	-535	-541	29	-255	-435	-603	-613	-654	-713	-720	-644	-618	-512	-523
China - Middle East	International	9	-72	-113	-143	-137	-132	-141	-141	-134	-131	-131	-141	11	-72	-112	-140	-132	-129	-144	-144	-130	-130	-128	-136
China - North America	International	7	-284	-444	-615	-625	-642	-655	-682	-581	-555	-492	-577	-33	-304	-500	-632	-642	-660	-674	-701	-594	-597	-529	-601
China & South West Asia - North Asia	International	-7	-606	-1,046	-1,040	-1,029	-1,060	-1,135	-1,138	-1,020	-1,207	-1,269	-1,366	221	-409	-873	-993	-992	-1,001	-1,069	-1,085	-991	-1,052	-1,072	-1,156
China & South West Asia - Pacific South East Asia	International	-49	-1,188	-1,722	-1,960	-1,926	-1,954	-2,044	-2,116	-1,861	-2,031	-2,038	-2,223	145	-1,117	-1,668	-1,957	-1,912	-1,940	-2,043	-2,085	-1,860	-1,959	-1,919	-2,119
Europe	Domestic	64	8	-928	-1,889	-1,978	-1,701	-1,041	-592	-777	-899	-1,083	-958	43	7	-955	-1,886	-1,981	-1,704	-1,044	-595	-780	-923	-1,104	-989
Europe - Middle East	International	78	-12	-719	-1,344	-1,242	-1,307	-1,545	-1,565	-1,194	-1,208	-1,128	-1,203	121	55	-696	-1,295	-1,112	-1,320	-1,506	-1,551	-1,215	-1,158	-1,090	-1,160
Europe - North Africa	International	19	-8	-259	-585	-462	-635	-618	-610	-535	-468	-412	-404	30	25	-255	-532	-448	-548	-567	-565	-503	-456	-406	-391
Europe - North America	International	109	9	-985	-2,281	-2,669	-2,948	-3,082	-3,007	-2,652	-2,175	-1,556	-1,616	53	36	-994	-2,242	-2,609	-2,894	-3,024	-2,947	-2,576	-2,238	-1,606	-1,671
Europe - North Asia	International	30	-26	-259	-506	-518	-532	-565	-565	-522	-484	-388	-384	34	-10	-246	-476	-492	-509	-522	-521	-477	-461	-380	-379
Europe - Pacific South East Asia	International	-11	-76	-288	-703	-635	-625	-675	-674	-588	-697	-806	-881	60	-23	-333	-682	-613	-602	-652	-653	-592	-652	-730	-788
Europe - South America	International	-14	-28	-241	-482	-483	-486	-506	-494	-445	-476	-412	-423	5	-1	-233	-465	-470	-472	-488	-472	-420	-410	-383	-366
Europe - South West Asia	International	18	-19	-261	-488	-479	-503	-524	-498	-423	-404	-394	-391	-36	-51	-318	-484	-447	-455	-483	-465	-396	-414	-424	-430
Europe - Sub Saharan Africa	International	17	-19	-315	-663	-637	-641	-675	-636	-544	-507	-532	-512	21	13	-308	-661	-610	-623	-665	-629	-531	-503	-539	-510
Intra Africa	International	-31	-44	-168	-302	-297	-297	-322	-321	-276	-240	-226	-233	5	-2	-129	-272	-256	-266	-288	-286	-246	-207	-191	-191

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

Estimated results by route group for Year 2020: Passenger revenues

ICAO UNITING AVIATION

Route Group	DOM/INT	Gross revenue (USD, million, compared to Baseline)												Gross revenue (USD, million, compared to 2019)											
		Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	Dec 20
Intra Central America/Caribbean	International	7	0	-48	-106	-112	-104	-106	-104	-98	-94	-93	-85	6	3	-50	-106	-112	-104	-109	-107	-97	-96	-89	-83
Intra China & South West Asia	International	-61	-381	-506	-580	-568	-576	-613	-628	-528	-536	-493	-515	-12	-331	-454	-515	-495	-508	-536	-551	-468	-485	-461	-486
Intra Europe	International	27	-216	-2,921	-5,940	-6,363	-6,991	-6,354	-5,608	-5,575	-5,261	-4,072	-4,166	108	89	-2,606	-5,731	-6,319	-6,672	-6,080	-5,380	-5,362	-5,219	-4,040	-3,940
Intra Middle East	International	8	-20	-303	-422	-387	-422	-449	-476	-378	-343	-296	-362	23	1	-286	-400	-342	-401	-427	-458	-359	-336	-311	-348
Intra North America	International	13	0	-165	-362	-351	-383	-405	-404	-343	-341	-311	-326	-13	-12	-193	-364	-356	-375	-395	-399	-339	-346	-318	-345
Intra North Asia	International	-1	-12	-57	-89	-89	-90	-99	-96	-72	-44	-34	-42	-32	-38	-86	-91	-91	-92	-99	-93	-65	-59	-54	-63
Intra Pacific South East Asia	International	-6	-225	-715	-1,142	-1,120	-1,134	-1,209	-1,192	-1,086	-1,131	-1,136	-1,240	85	-149	-661	-1,103	-1,059	-1,092	-1,178	-1,152	-1,055	-1,099	-1,091	-1,189
Intra South America	International	-28	-5	-147	-281	-288	-277	-320	-308	-283	-239	-224	-229	-29	5	-135	-253	-254	-242	-298	-263	-242	-231	-230	-241
Latin America/Caribbean - China	International	0	0	0	0	0	0	0	0	0	-4	-6	-3	-4	-6	-6	-7	-7	-7	-6	-6	-6	-6	-6	-4
Latin America/Caribbean - North Asia & Pacific South East Asia	International	1	-3	-18	-44	-47	-47	-50	-47	-46	-38	-40	-49	1	-3	-19	-41	-40	-40	-44	-42	-39	-41	-41	-48
Middle East	Domestic	-11	12	-151	-317	-306	-264	-270	-251	-203	-148	-125	-138	-32	3	-173	-318	-308	-265	-272	-252	-205	-179	-156	-162
Middle East - North America	International	26	6	-145	-352	-347	-345	-377	-374	-305	-269	-265	-299	34	18	-138	-340	-328	-338	-372	-363	-295	-275	-261	-288
Middle East - North Asia & Pacific South East Asia	International	23	-24	-302	-606	-555	-527	-556	-564	-487	-501	-492	-570	27	6	-294	-566	-480	-484	-546	-549	-467	-488	-495	-568
Middle East - South West Asia	International	4	-55	-420	-763	-725	-687	-708	-714	-617	-612	-609	-641	46	13	-368	-697	-644	-625	-658	-677	-584	-575	-560	-584
North America	Domestic	336	271	-4,273	-8,026	-8,004	-7,569	-7,174	-6,301	-5,384	-5,220	-4,612	-5,511	524	668	-4,087	-7,683	-7,580	-7,011	-6,478	-5,923	-4,867	-4,938	-4,430	-5,148
North America - North Asia	International	26	-35	-199	-423	-444	-445	-452	-454	-405	-384	-344	-386	30	-26	-198	-404	-416	-416	-427	-431	-385	-386	-345	-378
North America - Pacific South East Asia	International	37	-51	-237	-513	-519	-521	-559	-526	-490	-504	-464	-576	59	-11	-226	-506	-504	-520	-549	-521	-469	-486	-469	-566
North America - South America	International	19	3	-245	-497	-522	-536	-577	-558	-468	-365	-299	-334	-43	-23	-282	-491	-506	-505	-532	-518	-439	-409	-356	-395
North America - South West Asia	International	3	-10	-69	-136	-132	-135	-134	-118	-101	-86	-87	-104	26	13	-44	-93	-89	-91	-66	-52	-59	-78	-80	-88
North Asia	Domestic	11	-54	-344	-460	-504	-382	-354	-434	-366	-295	-247	-295	25	-29	-337	-455	-485	-371	-340	-430	-354	-277	-229	-284
North Asia - Pacific South East Asia	International	2	-265	-879	-1,009	-998	-977	-1,047	-1,233	-955	-1,162	-1,184	-1,363	177	-90	-774	-993	-973	-965	-1,030	-1,086	-954	-1,004	-1,023	-1,147
Pacific South East Asia	Domestic	-49	-142	-712	-1,534	-1,436	-1,335	-1,348	-1,458	-1,225	-991	-966	-932	43	-20	-623	-1,447	-1,341	-1,261	-1,222	-1,318	-1,081	-1,026	-958	-908
South America	Domestic	40	1	-527	-1,138	-1,169	-1,116	-1,201	-1,052	-879	-754	-553	-526	68	55	-443	-1,066	-1,084	-1,003	-1,133	-987	-827	-719	-527	-506
South West Asia	Domestic	-47	-19	-321	-817	-853	-742	-708	-646	-508	-473	-491	-438	3	27	-274	-772	-803	-693	-658	-598	-462	-430	-439	-387
Domestic		-422	-4,059	-10,789	-17,540	-16,961	-15,324	-13,974	-12,127	-10,090	-9,385	-8,704	-9,625	272	-2,989	-10,134	-16,972	-16,276	-14,506	-13,016	-11,511	-9,309	-8,810	-8,269	-8,949
International		350	-4,060	-16,049	-27,852	-27,995	-29,378	-30,130	-29,369	-25,813	-24,989	-22,717	-24,387	1,294	-2,590	-15,242	-26,859	-26,894	-28,240	-28,968	-28,164	-24,869	-24,297	-22,033	-23,277
Total		-72	-8,119	-26,838	-45,392	-44,956	-44,702	-44,103	-41,496	-35,904	-34,374	-31,422	-34,013	1,566	-5,579	-25,376	-43,831	-43,170	-42,746	-41,984	-39,675	-34,179	-33,107	-30,302	-32,226

Source: ICAO estimates based on ICAO ADS-B, OAG, ICAO-ICM MIDT, ICAO LTF, ICAO Statistics, IATA Economics, and IMF/World Bank Economic Outlook

Appendix D: Summary of Analysis by Other Organizations

ACI: Airport would lose USD 111.8 billion gross revenues in 2020

Region	**Passenger number** - both interntional and domestic for full year 2020		**Airport revenue** - both aeronautical and non-aeronautical for full year 2020	
	million and % change from 2020 "business as usual" baseline scenario		USD billion and % change from 2020 "business as usual" baseline scenario	
Africa	-169	-69.5%	-2.970	-69.1%
Asia/Pacific	-2,049	-59.2%	-29.600	-59.3%
Europe	-1,762	-70.8%	-40.800	-68.8%
Latin America/Caribbean	-431	-61.8%	-6.600	-62.9%
Middle East	-268	-70.6%	-9.700	-73.5%
North America	-1,331	-63.6%	-22.100	-63.7%
Total	**-6,011**	**-64.2%**	**-111.770**	**-65.0%**

https://aci.aero/wp-content/uploads/2020/12/Advisory_Bulletin_The_impact_of_COVID_19_on_the_airport_business.pdf

Source: ACI Advisory Bulletin – The Impact of COVID-19 on the Airport Business (dated 8 December 2020)

IATA: Airlines would lose USD 118.5 billion net profits in 2020

IATA's estimates are based on "region of airline registration" while ICAO uses "all traffic from States in each region" for the regional break-down.

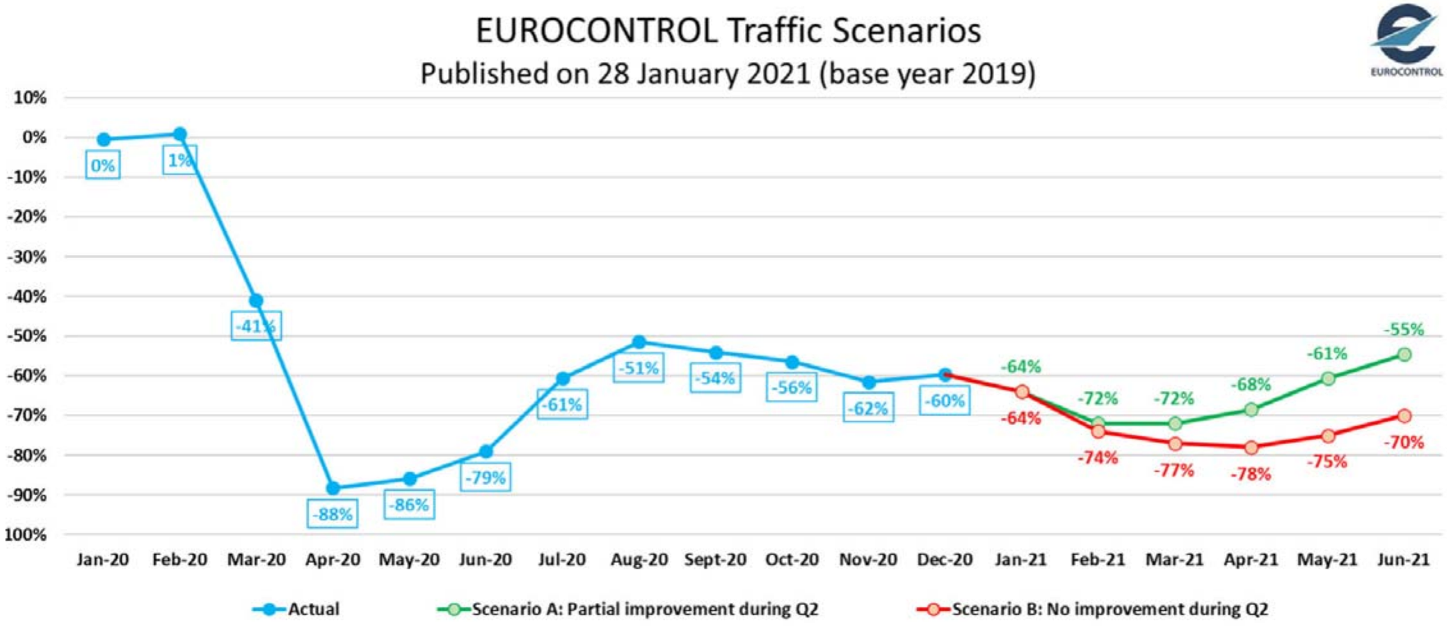
IATA recently updated its estimated loss of gross passenger revenues from **USD 371 billion to USD 421 billion** (USD 510 billion including passengers, cargo and others) but no regional break-down was released.

Region of airline registration	**Revenue Passenger Kilometres (RPKs)** - both interntional and domestic for full year 2020	**Net profit** for full year 2020
	year-on-year % change from 2019 level	USD billion
Africa	-72.0%	-2.0
Asia/Pacific	-62.0%	-31.7
Europe	-70.0%	-26.9
Latin America/Caribbean	-64.0%	-5.0
Middle East	-73.0%	-7.1
North America	-66.0%	-45.8
Total	**-66.3%**	**-118.5**

https://www.iata.org/en/iata-repository/publications/economic-reports/airline-industry-economic-performance---november-2020---data-tables/

Source: IATA Airline Industry Economic Performance - June 2020 - Data tables (dated 9 June 2020)

EUOCONTROL: A loss of € 140 billion for airlines, airports and ANSPs in Europe in 2020

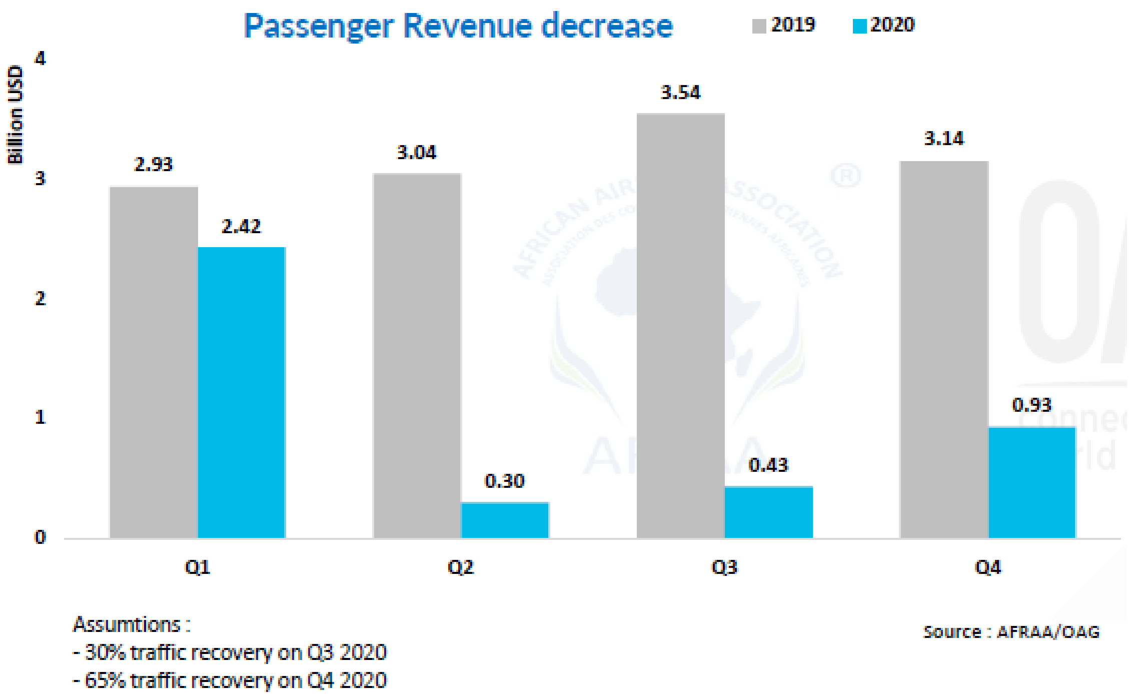


The total number of flights expected in Europe is anticipated to be 55% lower than in 2019, a drop of 6 million fewer flights.

https://www.eurocontrol.int/publication/eurocontrol-draft-traffic-scenarios-january-2021-june-2021

Source: EUROCONTROL issues new Draft traffic scenarios (dated 28 January 2021)

AFRAA: African Airlines would lose USD 8.56 billion passenger revenues in 2020

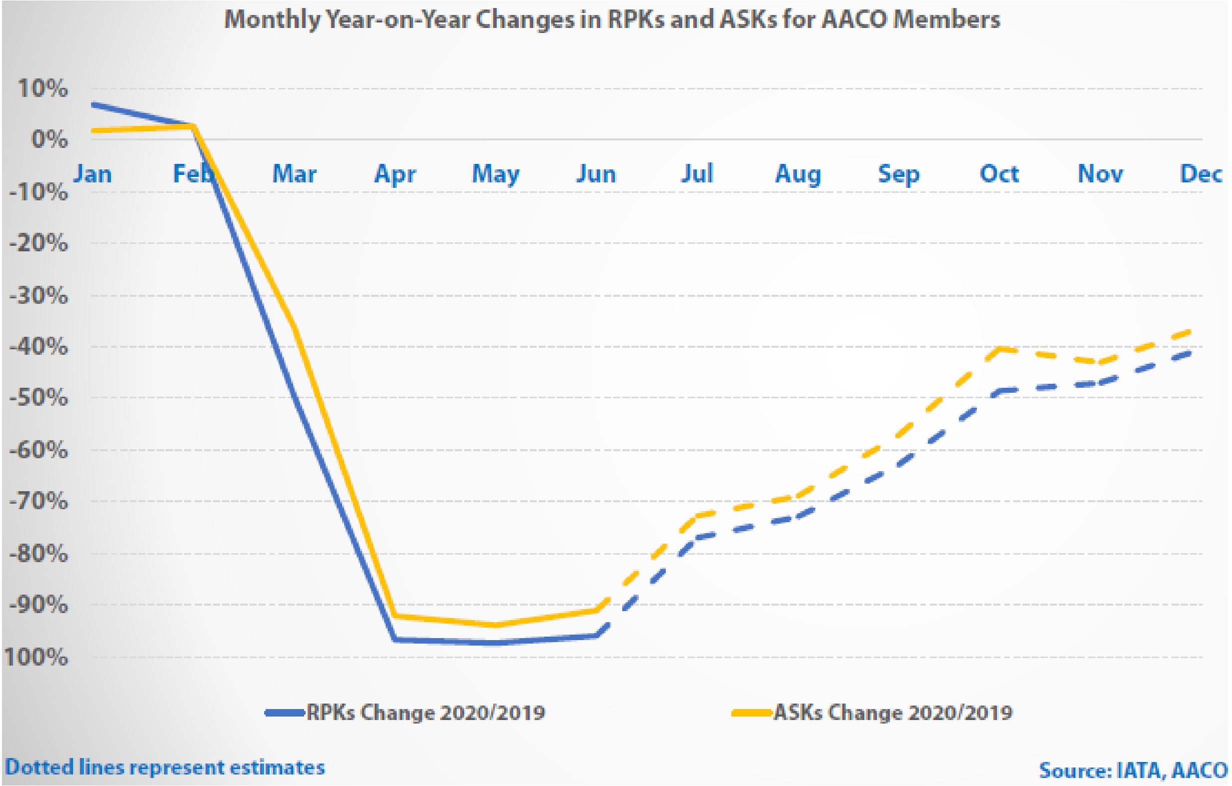


AFRAA's estimates (USD 8.56 billion loss) is greater than IATA's estimates (USD 6 billion loss). Both estimates are for airlines registered in Africa.

https://afraa.org/wp-content/uploads/2020/07/AFRAA-COVID-19-Impact-Assessment-release-date-13-July-2020.pdf

Source: AFRAA COVID-19 Impact Assessment (dated 13 July 2020)

AACO: 57% decline of Arab Airlines' passenger traffic in 2020



Total year's decline in RPKs and ASKs for AACO members is forecasted to reach 57.1% and 34.0%, respectively, in 2020 compared to 2019.

https://aaco.org/media-center/covid-19

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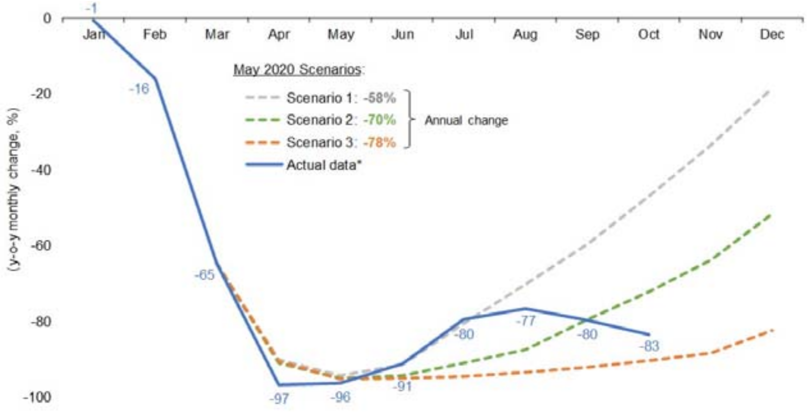
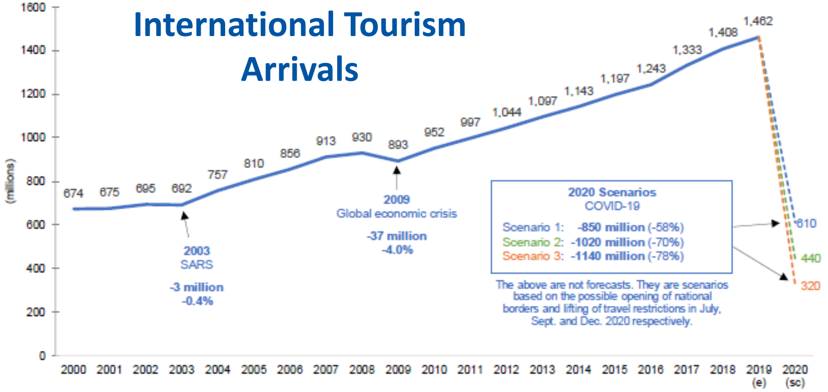
UNWTO: A loss of USD 910 to 1,170 billion in international tourism receipts in 2020

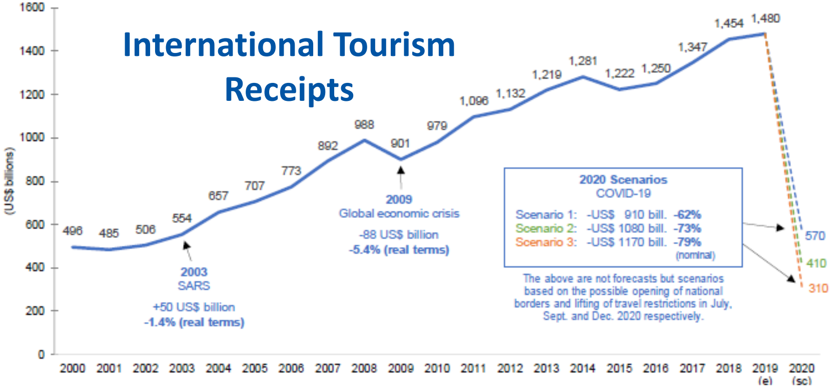
Three scenarios dependent upon re-opening of borders International Tourism Arrivals (year-on-year % change from 2019 level)



Source: World Tourism Organization (UNWTO) (Data collected December 2020)
* Actual data through October includes estimates for countries which have not yet reported monthly results.

https://webunwto.s3.eu-west-1.amazonaws.com/s3fs-public/2020-05/Barometer%20-%20May%202020%20-%20Short.pdf





Source: UNWTO World Tourism Barometer – Special Focus on the Impact of COVID-19 (May 2020)

UNCTAD: USD 1.2 to 3.3 trillion global GDP loss in 2020 due to the break in international tourism

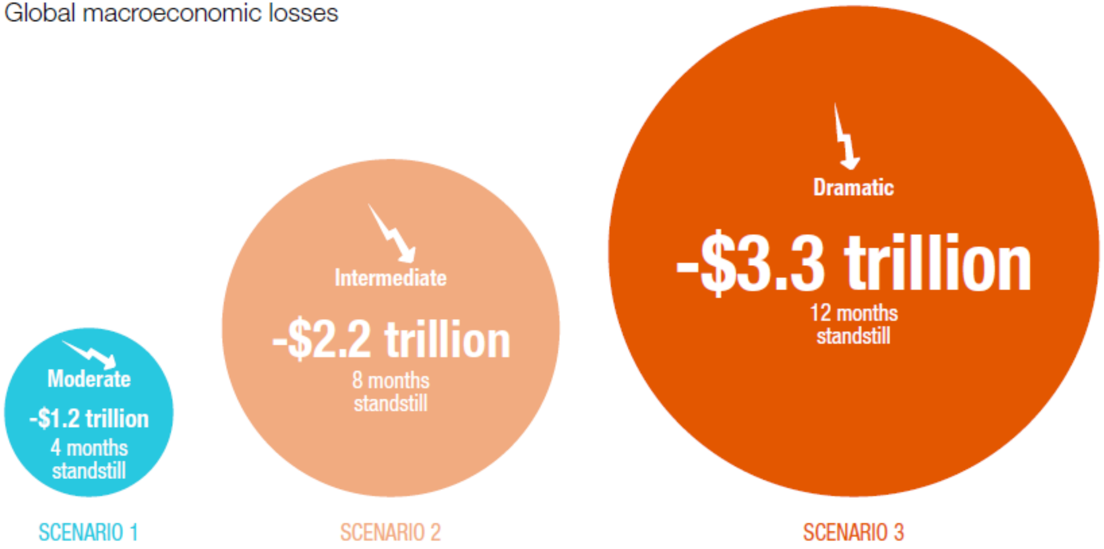
Loss of 1.5%, 2.8% and 4.2% of world's GDP, respectively

Global macroeconomic losses

1 **Moderate** — **1/3** of annual inbound tourism expenditure is removed in each country. This is equivalent to 4 months standstill of international tourism or a ⬇ **80% for 5 months.**

2 **Intermediate** — **2/3** of inbound tourism expenditure are removed in each country. This is equivalent to 8 months standstill of international tourism or a ⬇ **80% for 10 months**.

3 **Dramatic** — **All** annual inbound tourism expenditure is removed in each country. This is equivalent to almost **12 months standstill of international tourism.**



https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2810

Source: UNCTAD COVID-19 and Tourism: Assessing the Economic Consequences (July 2020)

WTTC: A loss of 197 million jobs in travel and tourism sector in 2020

2020 forecasts – COVID-19 impact on travel and tourism sector

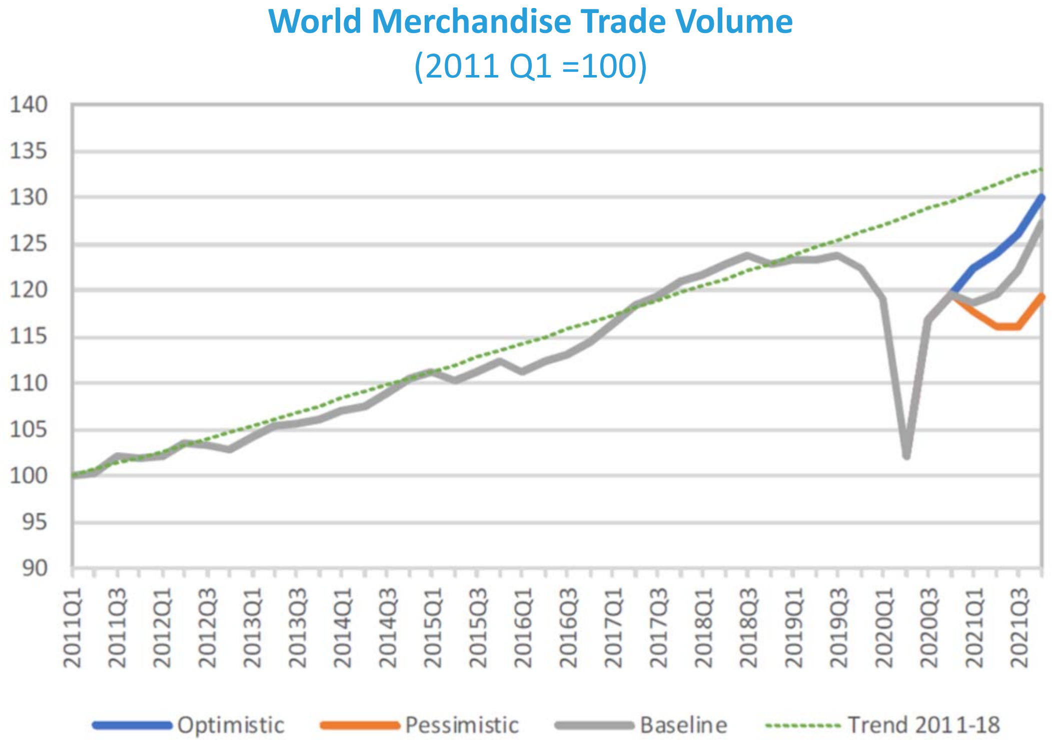
Region	**Total Job Loss** (million)			**Total GDP Loss** (USD billion*)		
	Best-Case	Baseline	Worst-Case	Best-Case	Baseline	Worst-Case
Africa	-7.6	-10.9	-17.4	-53	-75	-120
Asia/Pacific	-59.7	-69.3	-115.0	-980	-1,137	-1,888
Europe	-14.2	-18.4	-29.5	-771	-1,000	-1,608
Latin America/Caribbean	-5.9	-7.7	-12.4	-111	-143	-229
Middle East	-2.7	-3.4	-4.9	-99	-125	-179
North America	-8.1	-11.4	-18.2	-673	-955	-1,520
Total	**-98.2**	**-121.1**	**-197.5**	**-2,686**	**-3,435**	**-5,543**

Worst-case scenario: Current restrictions starting to ease from September for short-haul and regional travel, from October for mid-haul and from November for long-haul. **Baseline scenario**: Current restrictions starting to ease from June for regional travel, July for short-haul or regional travel; from August for mid-haul, and from September for long-haul. **Best-case scenario**: Current measures starting to ease from June for short-haul and regional travel; from July for mid-haul and from August for long-haul. * based on 2019 prices and exchange rates.

https://wttc.org/News-Article/More-than-197m-Travel-Tourism-jobs-will-be-lost-due-to-prolonged-travel-restrictions

Source: WTTC news release (dated 10 June 2020)

WTO: Global trade falling by 9.2% in 2020



- World merchandise trade volume is forecast to fall 9.2% in 2020.
- The projected decline is less than the 12.9% drop foreseen in the optimistic scenario from the April trade forecast.
- Trade volume growth should rebound to 7.2% in 2021 but will remain well below the pre-crisis trend.
- The 14.3% quarter-on-quarter decline in world merchandise trade in the second quarter is the largest on record, but high-frequency data point to a partial rebound in the third quarter.

https://www.wto.org/english/news_e/pres20_e/pr862_e.htm

Source: WTO news release (dated 6 October 2020)

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IMF & World Bank: Global economy is projected to contract by -3.5% to -4.3% in 2020

The Projections assume that the pandemic fades in the second half of 2020 and containment efforts can be gradually unwound

Real GDP (Percent change from previous year)	IMF			World Bank		
	2019	2020	2021	2019	2020	2021
World	2.8	-3.5	5.5	2.3	-4.3	4.0
Advanced economies	1.6	-4.9	4.3	1.6	-5.4	3.3
United States	2.2	-3.4	5.1	2.2	-3.6	3.5
Euro Area	1.3	-7.2	4.2	1.3	-7.4	3.6
Japan	0.3	-5.1	3.1	0.3	-5.3	2.5
Emerging market and developing economies	3.6	-2.4	6.3	3.6	-2.6	5.0
Emerging and Developing Asia	5.4	-1.1	8.3			
East Asia and Pacific				5.8	0.9	7.4
China	6.0	2.3	8.1	6.1	2.0	7.9
South Asia				4.4	-6.7	3.3
India	4.2	-8.0	11.5	4.2	-9.6	5.4
Emerging and Developing Europe	2.2	-2.8	4.0			
Europe and Central Asia				2.3	-2.9	3.3
Russia	1.3	-3.6	3.0	1.3	-4.0	2.6

Real GDP (Percent change from previous year)	IMF			World Bank		
	2019	2020	2021	2019	2020	2021
Emerging market and developing economies						
Middle East and Central Asia	1.4	-3.2	3.0			
Middle East and North Africa				0.1	-5.0	2.1
Saudi Arabia	0.3	-3.9	2.6	0.3	-5.4	2.0
Sub-Saharan Africa	3.2	-2.6	3.2	2.4	-3.7	2.7
Nigeria	2.2	-3.2	1.5	2.2	-4.1	1.1
South Africa	0.2	-7.5	2.8	0.2	-7.8	3.3
Latin America and the Caribbean	0.2	-7.4	4.1	1.0	-6.9	3.7
Brazil	1.4	-4.5	3.6	1.4	-4.5	3.0
Mexico	-0.1	-8.5	4.3	-0.1	-9.0	3.7
High-income countries				1.6	-5.4	3.2
Developing countries				3.7	-2.3	5.2
Low-income countries	5.3	-0.8	5.1	4.0	-0.9	3.3

* IMF and World Bank use different Region/State classification; 2020 estimates; and 2021 projections

https://www.imf.org/en/Publications/WEO/Issues/2021/01/26/2021-world-economic-outlook-update
https://www.worldbank.org/en/publication/global-economic-prospects

Source: IMF and World Bank Word Economic Outlook (January 2021)

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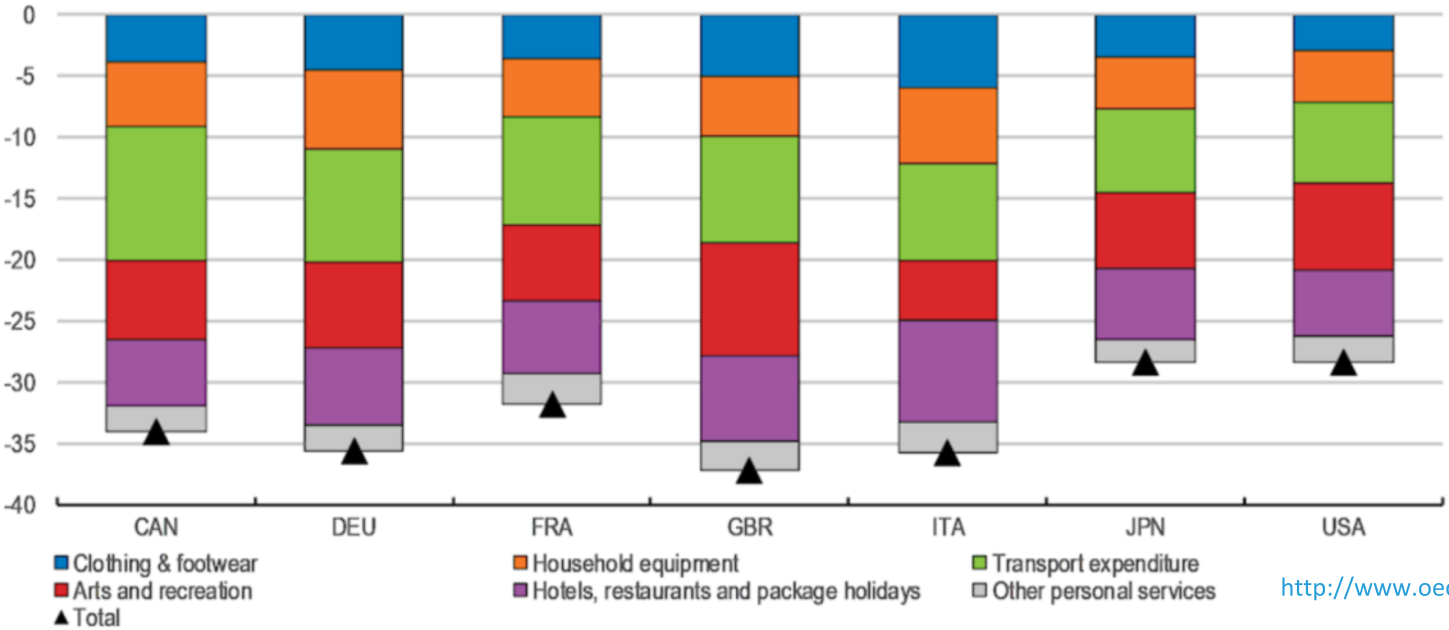
OECD: Sharp decrease in consumers’ expenditures for air travel due to containment measures

The potential initial impact of partial or complete shutdowns on private consumption in the G7 economies

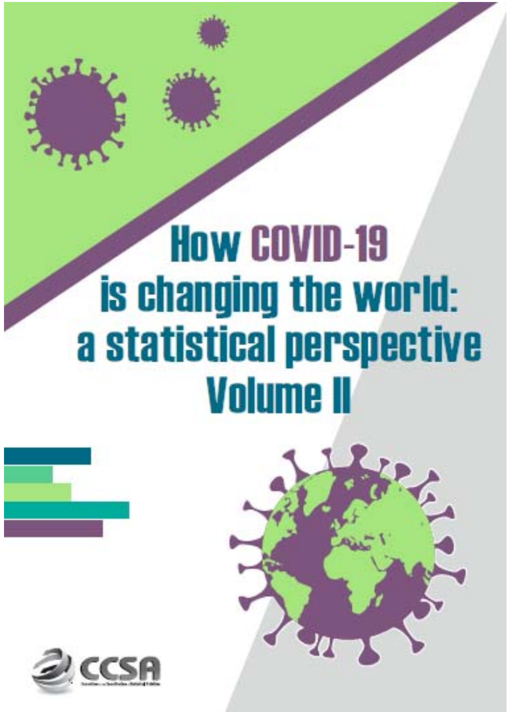
Per cent of total consumers’ expenditure



http://www.oecd.org/coronavirus/en/

Source: OECD Evaluating the Initial Impact of Containment Measures (updated 14 April 2020)

CCSA: Compilation of economic, social, regional and statistical impacts



The new report will be published by the Committee for the Coordination of Statistical Activities (CCSA) under the auspice of the UN-DESA

Aviation standstill with slow and shallow recovery

The global aviation came to a halt in the course of wide-scale lockdown and travel restrictions across all regions. Air travel demand was crippled with stagnant recovery anticipating a long shadow of the crisis.

https://unstats.un.org/unsd/ccsa/documents/covid19-report-ccsa_vol2.pdf

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Contact: Economic Development ECD@icao.int

ICAO

https://www.icao.int/sustainability/Pages/COVID-19-Air-Traffic-Dashboard.aspx

https://www.icao.int/Newsroom/Pages/2020-passenger-totals-drop-60-percent-as-COVID19-assault-on-international-mobility-continues.aspx

https://www.icao.int/sustainability/Pages/Economic-Impacts-of-COVID-19.aspx

https://www.icao.int/sustainability/Pages/Air-Traffic-Monitor.aspx

https://www.icao.int/sustainability/Pages/Economic-and-financial-measures.aspx