
OPERATIONAL AND REGULATORY ASPECTS OF REPURPOSING AIRCRAFT PASSENGER CABIN FOR TRANSPORT OF CARGO

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Abstract: *COVID-19 reduced demand for passenger flights but boosted air freight demand due to the need for timely delivery of critical products such as pharmaceuticals, medical supplies and personal protective equipment and other products that are vital to the functioning of sensitive supply chains. Therefore, one of the consequences of the outbreak of the COVID-19 pandemic is the global lack of air cargo capacity and the consequent increase in passenger-to-freighter conversions and use of aircraft passenger cabins for cargo loading, which allows air carriers an essential source of revenue as demand for passengers remained declining due to travel restrictions related to Covid-19 and ruined passenger revenues. This paper provides insight into current regulatory requirements, risk assessment and guidelines for best operational practice regarding the transport of cargo on the main deck of passenger aircraft. Operational and regulatory aspects for P2F conversion that needs to be approved by the state aircraft registration to ensure an acceptable level of safety, regardless of whether the seats and other passenger service provisions are completely removed or not, are elaborated in the paper.*

Keywords: *conversion of aircraft passenger cabin, air cargo demand, COVID-19 pandemic, safety risk assessment*

1. INTRODUCTION

The COVID-19 pandemic severely and unprecedentedly set back the business of airlines, airports, and air navigation service providers. It has caused a sharp and sudden drop in air traffic, and the air transport industry is one of the hardest hit industries in this context, with the uncertain prospects for its return to pre-COVID-19 levels (Albers and Rundshagen, 2020). The air cargo sector has suffered comparatively less than the passenger sector, which is more sensitive to external influences (Li, 2020, Sun et al., 2021). Wang et al. (2021) have found that GDP and inflation directly influence passenger and cargo volume, while fuel prices directly influence only cargo volume with the cargo network being less sensitive to GDP and inflation changes than the passenger network. With the collapse of passenger air travel demand due to the coronavirus crisis and the closure of borders, many carriers have cancelled most of their routes, leaving passenger

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planes grounded at airports around the world. This caused a significant reduction in cargo capacity for the part that belonged to the belly of passenger aircraft.

The pandemic has forced some airlines to modify their passenger aircraft to make room for cargo in their passenger compartments, in addition to their cargo holds. Among first to do so were Lufthansa which removed seats from four of its A330s for cargo carriage, Finnair which modified two Airbus A330 for cargo use and Air Canada which reconfigured the cabins of three of its Boeing 777 aircraft to make extra space for cargo.

Since passenger aircraft are not certified to carry cargo in the passenger cabin, any aircraft reconfiguration in this manner requires a formal authorisation from the national aviation authority (NAA) of the State of the Operator as well as thorough evaluation of cargo limitations to ensure that structural loads meet design limits.

The paper clarifies regulatory and operational requirements for the:

1. transport of cargo in existing approved cabin areas,
2. transport of medical supply on passengers' seats,
3. transport of non-medical supply cargo on passengers' seats,
4. transport of cargo after seat removal.

2. THE IMPACT OF COVID-19 PANDEMIC ON AIR CARGO TRAFFIC OUTCOMES

After decades of continued growth in global passenger traffic, the pandemic has halted almost all air traffic operations in the second quarter of 2020. As a result, the total number of passengers for the year has dropped dramatically from 2019, to levels recorded in the 1990s. As for cargo traffic, it started to recover rapidly around May 2020 when lockdowns began to ease, leading to a V-shaped recovery for the rest of the year. At the end of the year, global air cargo traffic measured in revenue tonne-kilometres had returned close to pre-crisis values.

The International Air Transport Association (IATA) data for global air freight markets (IATA, 2022) shows that full-year demand for air cargo increased 6.9% in 2021, compared with 2019 (pre-covid levels) and 18.7% compared with 2020. Regional differences in international air cargo performance in 2021 compared to 2019 are shown in table 1. North American, Middle East and African carriers were the strongest performers, Asia-Pacific and European carriers recorded small rise while Latin American carriers were the only ones to record a decrease.

Table 1. International air cargo developments (% change 2021 vs. 2019)

| | RCTK* (% Change) | ACTK* (% Change) |
|--|------------------|------------------|
| Total market | 7.6 | -19.4 |
| Africa | 11.3 | -14.6 |
| Asia Pacific | 3.6 | -17.1 |
| Europe | 3.6 | -17.4 |
| Latin America | -15.2 | -30.2 |
| Middle East | 10.6 | -10.1 |
| North America | 20.2 | 0.2 |
| * RCTK: revenue cargo tonne-kilometres ACTK: available cargo tonne-kilometres | | |

At the same time, global passenger traffic fell by 58.4% in 2021 compared to the full year of 2019. This represented an improvement compared to 2020, when full year revenue passenger kilometres were down 65.8% versus 2019. International passenger demand in 2021 was 75.5% below 2019 levels, while domestic demand in 2021 was down 28.2% compared to 2019. Capacity in 2021 was 65.3% and 9.3% lower than in 2019 for international and domestic travel respectively.

Figure 1 (IATA, 2022b) illustrates the different traffic results on key international passenger and freight routes in 2021. The recovery of passenger traffic was much slower than the recovery of cargo traffic, with significant differences on routes.

Routes to, from and especially within Asia experienced the largest decrease in 2021 mainly because of the policy of strict border closures pursued by the Asia-Pacific governments. On the other hand, traffic on routes that were subjected to more relaxed travel recovered much faster, especially tourism-intensive North and Central America.

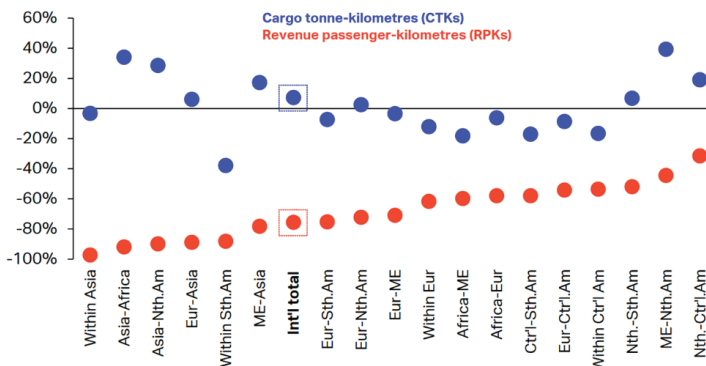


Figure 1. International CTKs and RPKs, % change 2021 vs. 2019

As for the cargo traffic, traffic results were varying across key international markets. Middle East-North America, Asia-Africa and Asia-North America routes increased by almost one third versus 2019. However, some markets showed a significant decline, for example within South America it amounted for 38%. The differences can be at least in part attributed to the availability of dedicated freighters. Routes with a high share of cargo capacity on belly-hold aircraft capacity of passenger aircraft have been left without that capacity due to the cancellation of international wide-body passenger flights.

Gudmundsson et al. (2021) predicted that the cargo sector in Europe and the Asia Pacific will recover in about 2.2 years, and in North America in about 1.5 years. Figure 2 (Gudmundsson et al., 2021) highlights the difference between passengers (a) and freight (b) in terms of average recovery time and the 5th and 95th percentile confidence levels.

Evidently, there is a longer duration of the decline in passenger than cargo traffic. The reduction in the number of passengers in air transport averages about 60% compared to 10% for cargo. Overall, the simulation analysis indicates that air transport recovery will take on average 2.4 for passengers and 2.2 years for freight. Despite faster recovery of freight than passenger transport, passenger transport appears to be recovering more strongly after major economic shocks.

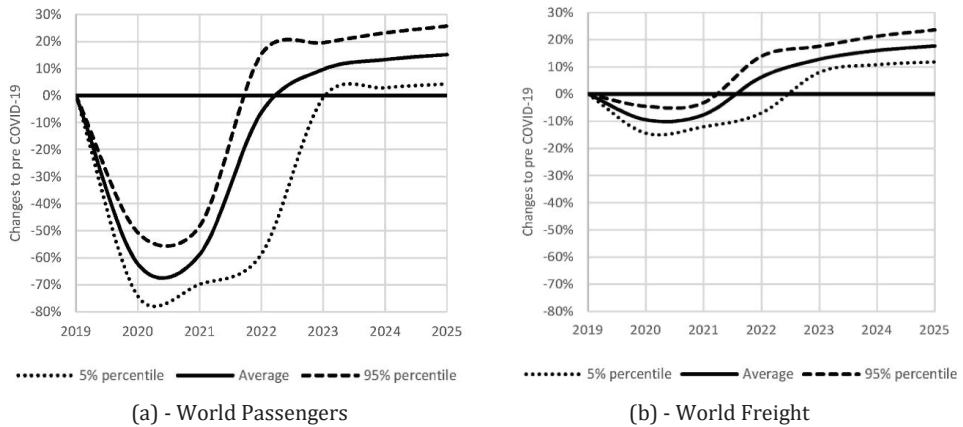


Figure 2. Distribution of recovery times for air passenger and air freight

3. WAYS OF INCREASING AIR CARGO CAPACITY DURING THE PANDEMIC

Since the COVID-19 pandemic caused the sharp decrease in passenger travel, many airlines turned to transport of freight to provide alternative revenues and reduce losses. Prior the pandemic, most of the world’s air cargo was normally transported in the belly of passenger planes rather than the cargo aircraft, rising as high as 80% on transatlantic routes (Thorn, 2020). With the cancellation of many passenger flights and the consequent loss of their belly hold capacity, existing dedicated freighter aircraft were insufficient to meet demand, and the price for air cargo increased.

Moreover, re-opening of supply chains in late February 2020 was accompanied with a strong impact on airfreight rates due to lack of belly hold space. TAC Index figures from March 17, 2020, show that average airfreight rates on services from Shanghai to the US increased by 29.7% on the prior week to reach \$4.71 per kg. On services from Shanghai to Europe there was a 17.7% week on week increase to \$3.19 per kg (Brett, 2021).

Aircraft operators considered two possible solutions:

1. to convert passenger to freight aircraft, or
2. to carry cargo in the main cabins of passenger aircraft.

Converting passenger into cargo aircraft is a complex engineering process, and every aircraft and aircraft type is unique. It can take several months and involves the elements shown in Table 2 (Spells and Tan, 2022).

Table 2. Main elements of passenger to freight aircraft conversion process

| CONVERSION ELEMENT | DESCRIPTION |
|---------------------------------|---|
| Removal out of the cabin | Galley, seats, overhead lockers, toilets, in-flight entertainment facilities, etc.... |
| New loading door | The door is usually cut at the front of the fuselage, after which new reinforced frames are installed. |
| New higher strength cabin floor | Reinforced floor that is strong enough to withstand cargo loads and ensure the maximum utilisation of the floor space is installed. |
| Testing | A series of tests, and inspections are required throughout the conversion process prior to certification. |

Boeing's World Air Cargo Forecast released in November 2020 covering the 2020-2039 period predicts the cargo market will grow at an annual rate of 4 percent over the next 20 years, demanding 60 percent larger freighter fleet. Boeing predicts that one-third of these deliveries will be new widebody freighters while nearly two-thirds of the deliveries (1,980 aircraft) will be conversions, 72 percent of which will be 737-sized freighters (Boeing, 2020b).

The demand for passenger-to-freighter conversions, previously largely driven by the need of express parcel carriers to expand their fleets of smaller freighters was increased by the pandemic. However, it is time consuming and very expensive process. Longney and Standen (2022) in the Reed Smith's report titled *Global Air Freight's Future*, cited IBA data to say a narrowbody conversion could cost about \$4.2 million for a 737-800 and \$6.1 million for an A321-200. A widebody conversion could cost \$14.7 million for a 767-300ER and \$18.4 million for an A330-300.

All the above has led to the launch of so called *freighter's flights* to make up for the shortfall in belly hold capacity. Many airline operators began to modify their passenger aircraft to transport cargo on passenger seats or even stowed on cabin floor after removing passenger seats. Moreover, to fit and transport as much cargo as possible, they have removed passenger "luxuries" (inflight entertainment facilities, and even some of the catering facilities) out of their cabins (Soni, 2022). Freighters have played an important role on some markets, for example more than one fifth of cargo was carried by freighters on top Middle East routes as shown in the Figure 3 (IATA, 2021).

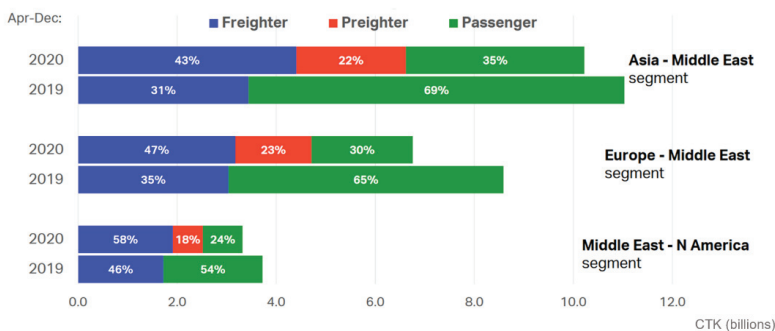


Figure 3. Scheduled cargo tonne-kilometres by type of operation

According to Cirium (Mellon et al., 2021) 200 aircraft were reconfigured to freighters until May 2021. The largest part refers to wide-body aircraft (81.5%), among them 63 Airbus A330 and 68 Boeing 777.

4. TRANSPORT OF CARGO IN THE AIRCRAFT PASSENGER CABIN

Since passenger aircraft are not certified to carry cargo in the passenger cabin, any aircraft reconfiguration in this manner requires a formal authorisation from the national aviation authority (NAA) of the State of the operator as well as thorough evaluation of cargo limitations to ensure that structural loads meet design limits.

Aviation authorities of different countries and main professional air transport organisations have prepared and published guidelines and technical instructions to

support and help airlines with the repurposing of aircraft passenger cabin for the transport of cargo. Also, aircraft manufacturers and design approval holders such as Airbus and Boeing have published specific guidelines to support the repurposing of aircraft passenger cabin for the transport of cargo (Boeing, 2020a and Airbus, 2020).

4.1. Regulatory requirements

There are many potential problems that arise in the air transport of cargo and mail, especially in the passenger cabin of aircraft, and the current regulations are dynamic and inconsistent in terms of testing and quarantine. For example, a 14-day quarantine at the destination not only for the entire crew, but also for cargo implied 14-day delay and posed serious problem for airline operations. Because of this unsustainable situation, airlines have been vigorously lobbying and asking governments to allow exemptions from these regulations, such as exempting flight crew who do not communicate with the public from quarantine rules.

Loading of verified cargo and mail in the cabin of passenger aircraft is permitted subject to defined conditions and specific regulator authorisation. According to ICAO (International Civil Aviation Organisation) Annex 8, the repurposing of a passenger aircraft not certified for the transport of cargo needs to be approved by the State of aircraft registry to ensure the continuing airworthiness of the aircraft after modification. Cargo loaded in the passenger cabin must not include any dangerous goods or live animals. The passenger cabin should be considered as a Class A cargo compartment, i.e., one in which the presence of a fire would be easily detected by a crew member and each part of the compartment is easily accessible in flight (ICAO, 2021). ICAO has provided information (ICAO, 2020) on the guidelines published by ICAO Member States and other organisations concerning the transportation of cargo in a cabin certified to carry passengers and conditions for the issuance of an exception/exemption to operators.

Basic regulations relating to the carriage of cargo in the passenger compartments of aircraft are contained in:

- a. Regulation (EU) No 965/2012, CAT.OP.MPA.160 Stowage of baggage and cargo (Commission Regulation (EU), 2012)
- b. FAA (US Federal Aviation Administration): Title 14 Code of Federal Regulation (14 CFR) part 121 (FAA, 2022).

According to CAT.OP.MPA.160 operator shall establish procedures to ensure that:

- a. only hand baggage that can be adequately and securely stowed is taken into the passenger compartment; and
- b. all baggage and cargo on board that might cause injury or damage, or obstruct aisles and exits if displaced, is stowed to prevent movement (Commission Regulation (EU), 2012).

Following the decline in air traffic caused by the COVID-19 pandemic, airlines urged IATA to produce instructions on how to use passenger cabins in the aircraft for safe transport of cargo. IATA has issued Guidance for the transport of cargo and mail on aircraft configured for the carriage of passengers (IATA, 2020) with detailed instructions for airlines and a prescribed risk assessment procedure. The IATA guidelines emphasize the importance of interested operators being familiar with cargo transport before even considering carrying cargo in aircraft passenger cabin. Also, a detailed risk assessment to

identify hazards and mitigate possible risks is strongly recommended. Most common hazards and consequences in the worst-case scenario, risks and mitigation actions are detailed in these guidelines. Table 3 (IATA, 2020) shows the possible cargo configurations for diverse types of cargo.

Table 3. Applicable cargo configurations with regards to the type of cargo

| Cargo Type | Passenger cabin | | | | | Cargo CMPRT |
|---------------------------------|----------------------------|------------|--------------------|------------------|--|-------------|
| | Overhead bin/coat cupboard | Under seat | On the seats | | On the cabin floor (no seats, with nets/ straps) | |
| | | | In cargo seat bags | With nets/straps | | |
| Humanitarian supplies/Medicines | YES | YES | A | A | A+C | YES |
| General cargo | YES | YES | A | A | A+C | A |
| Dangerous Goods | NO | NO | NO | NO | NO | B |
| CAO DG* | NO | NO | NO | NO | NO | D |

**Cargo Aircraft Only Dangerous Goods*
A: require NAA (national aviation authority) approval; B: operators holding a NAA approval to carry dangerous goods as cargo;
C: require acceptance by aircraft manufacturer; D: operators holding a NAA approval to carry dangerous goods. CAO dangerous goods must be loaded into a Class C cargo compartment (no passengers on the aircraft)

Very soon, EASA (European Union Aviation Safety Agency) has issued Guidelines for the Transport of Cargo in Passenger Compartment, as a special exemption in terms of Regulation (EU) 2018/1139 of the European Parliament and of the Council, pursuant to which operators are required to request time-limited airworthiness approval for an aircraft whose configuration does not meet the classifications prescribed for cargo transport. For transport of cargo other than medical supplies as well as in case of seats' removal, a STC (Supplemental Type Certificate) application is required and promised to be processed by EASA with priority (EASA, 2020).

In case of transporting medical supplies provided they are not classified as dangerous goods and after having demonstrated an urgent need, an operator may exceptionally consider applying for an exemption pursuant Article 71 of the Regulation (EU) 2018/1139 (EASA, 2022). Exceptionally, national regulators may also grant approval for aircraft that do not have the necessary modifications to enable the transportation of supplies essential for COVID-19 response (Vasilj et al., 2021). US Federal Aviation Administration (FAA) also gave a one-year approval for the transport of goods in the passenger cabin (FAA, 2021).

According to current regulations, verified cargo may be carried in:

- Approved locations within the passenger cabin: overhead stowage bins, closets not dedicated to emergency equipment, floor mounted stowage (e.g., doghouses) and under seat stowage areas,
- Non-approved locations within the passenger cabin: passenger seats and passenger cabin floor (seats removed).

If cargo is carried in approved locations within the passenger cabin no additional approval is needed, but the following restrictions and rules must still be applied (IATA, 2020):

- a. The volume and the mass of cargo shall not exceed stowage maximum capacity and the structural loading limits of the floor or seats prescribed in the manufacturer's Weight and Balance Manual;

- b. Cargo should be stowed only in a location that enable its restraining. Restraint devices and their attachment points shall restrain the cargo in accordance with applicable certification specifications;
- c. The loading of the cargo under the seat place should not exceed 9 kg (20 lbs). The seat must be equipped with a restraint bar system to prevent forward and sideward movement and the cargo placed fully underneath the seat;
- d. Items stowed in lavatories or against bulkheads should be restrained against any movement and the bulkheads should carry a label stating the maximum capacity;
- e. Cargo should be located where it will not impede access to emergency equipment or hinder egress in case of an emergency evacuation;
- f. Dimensions of cargo items placed in enclosed stowage areas shall enable latched doors to be closed securely;
- g. Checks should be made before take-off, before landing and whenever the fasten seat belt signs are illuminated and under orders of pilot in command to ensure that cargo is properly stowed.

When transporting cargo in non-approved locations operators should obtain prior approval from their NAA, which may require the issuance of a STC (supplemental type certificate). For carriage of cargo on passenger seats, the following limitations are to be considered (IATA, 2020):

- a. Mass of cargo loaded on the seats must be within the certification limits of the seat (typically, it amounts 77 kg/170 lbs) and should be evenly distributed across the seat row;
- b. Actual weight of cargo and even load distribution shall be in accordance with the limitations in the aircraft flight manual (AFM), aircraft Weight and Balance Manual and minimum flight weight limits;
- c. Flight envelope used for regular passenger flights shall be applied; alternatively, curtailments can be re-assessed but only within applicable parameter limitations;
- d. The number and type of restraint devices and their attachment points shall ensure adequate restraining of the cargo in accordance with applicable certification requirements;
- e. Vertical centre of gravity (CG) of the cargo should be equal to or lower than the passenger CG shown in the envelope drawing of the seats in use;
- f. Mass of cargo should be appropriately accounted for in the weight and balance system and any aircraft operational limit is respected.

Operator may opt to remove passenger seats and load cargo on the passenger cabin floor. In this case the cargo restraints are connected directly to the seat tracks and the following restrictions are to be applied (IATA, 2020):

- a. One complete row of seats at both ends of the tie down area should be unoccupied (free of passengers and cargo);
- b. Maximum cargo weight for any given tie down scenario is recommended by the aircraft manufacturer and should be respected;
- c. Cargo should be evenly distributed across the tie down area and shall not exceed the area load limits recommended by manufacturer or the floor limits defined in the weight and balance manual;
- d. The cargo CG height as well as the lateral and longitudinal CG of the cargo shall not exceed the value provided by the aircraft manufacturer;

- e. Cargo shall not extend or overhang into the aisles, doorways and galleys and shall not be loaded in exit rows;
- f. Cargo must be adequately restrained to avoid movement during flight or emergency landing conditions;
- g. Nets used to restrain cargo items should be TSO/ETSO (FAA Technical Standard Order/EASA European Technical Standard Order) approved and any load limitations of these nets including their attachment means should be adhered to. Any deformation of these nets should be assessed for contact with other facilities in the cabin and be demonstrated not to block emergency evacuation exits nor access to emergency equipment.
- h. The maximum weights that can be restrained as per forward, aft, lateral and vertical limits shall remain within the limits specified by the aircraft manufacturer;
- i. The number of tie down points for a given weight and type of cargo, number of stud tie down fittings and strap assemblies should be applied according to aircraft manufacturer's recommendation. TSO certified nets and straps should be used;
- j. Attention must be given to avoid load share of restrained cargo into any galleys, lavatories, partitions, or other fixed structures.

4.2. Operational aspects

Operators should select cargo that is going to be loaded in the passenger cabin on the basis of suitability for manual handling and loading and availability of restraint devices bearing in mind the following (IATA, 2020):

- a. The content of cargo items should be verified to ensure that there are no dangerous goods, especially if dealing with medical supplies which might be classified as dangerous goods, moreover, wet cargo should not be loaded;
- b. The weight of individual packages should be such as to minimise injury during manual handling and they should be free of sharp edges;
- a. The volume of packages should comply with the dimensions of overhead bins, coat cupboards or under the seats space while weight of the packages should comply with load limitations of available bins, bags, etc.;
- b. The weight distribution throughout the aircraft should be in accordance with the load master's instructions;
- c. CG of the cargo should be equal to or lower than the CG height recommended by the aircraft manufacturer;
- d. Availability of loading, unloading, shoring, load spreading and restraint equipment should be considered.

For carriage of cargo in non-approved locations the operator should also consider the loading limitations and restraint capability of the seats or floor. To identify the cargo that is going to be loaded in passenger cabin the special handling code "CIC" (cargo loaded in passenger cabin) should be used to facilitate resource planning for loading/ unloading, load preparation and load control.

Since most of the departure control systems (DCS) are set to calculate the passenger weights only, appropriate solutions for allocating "extra" weight in each cabin section should be investigated and applied to avoid CG error in final calculation. While planning the stowage of cargo items, care should be taken to ensure that the cabin depressurization relief vents shall remain unobstructed. Also, Loading Instruction Report forms do not

include the passenger compartment so all relevant information should be given in the “Special instructions” box. These reports should contain detailed instruction on load quantity and maximum loads per each cabin section, overhead bin and coat cupboard as well as loading/unloading sequence.

Equipment that is used to access aircraft passenger cabin doors is not intended to be used for cargo loading. Elevating equipment, typically used for boarding and loading PRM passengers or catering, may be used for cargo loading safely through the passenger door. When using passenger stairs to load cargo into the cabin, it is recommended to evenly distribute loading personnel on the stairs and move the packages from the ramp upwards by passing the packages from one person to the next.

When cargo is to be loaded in passenger cabin with seats installed, in addition to the above considerations, the following should be considered (IATA, 2020):

- a. Covering all seats with a protective material;
- b. All aisles, and access to emergency equipment shall always remain unobstructed;
- c. For widebody aircraft, cargo must be loaded in such a way as to provide for each section of the cabin a means to cross from one aisle to the other (for example, an empty seat row);
- d. The cargo load shall not exceed the maximum height of the passenger seat in the fully upright position;
- e. Seatbacks should be in the upright position and seat belts behind the seat cushions;
- f. The inner arm rests should be folded if possible;
- g. Cargo in each seat row should be secured with straps, rope or nets;
- h. Heavier boxes should be loaded as low as possible to keep the vertical CG within the limits and towards the centroid to limit the horizontal CG shift;
- i. The load should be distributed in such a manner to reduce the lateral load imbalance
- j. If cargo is carried in cargo seat bags installation instructions provided by manufacturer should be followed.

Moreover, IATA strongly recommends the use of qualified cabin crew familiarized with the correct methods of restraint and trained on cabin fire watch/fighting activities to accompany cargo operations in the passenger cabin.

5. CONCLUSION

Very soon after the outbreak of the COVID-19 pandemic, airlines began to seek the ways to meet increased demand for air cargo operations and cope with the logistical challenges related to COVID-19 while cargo capacity was significantly contracted due to the suspension of passenger aircraft flights that accounted for about half of the world's cargo transported in the belly holds of passenger aircraft.

Thus, they began to assess the possibility of converting aircraft passenger cabins into a space for safe transport of cargo and/or mail to increase cargo capacity. Aircraft that were converted to carry cargo on the main deck were mostly wide-bodied and they accounted for more than one fifth of cargo traffic on some top Middle East routes. Regulatory requirements differ depending on whether the cargo is carried in existing approved cabin areas or on passengers' seats or stowed on the cabin floor after seats being removed. In the first case, no approval is required, while other situations require appropriate

airworthiness approvals from the State of registry. Only exemptions could be granted for the carriage of medical supplies on passengers' seats.

There are many considerations to be made when loading cargo into the passenger cabin and carriers should comply with the effective regulations of the competent authorities as well as adhere to IATA guidelines and instructions of the aircraft manufacturers. When passenger cabin is used for transport of cargo the following goals are identified as most important: timely fire protection and suppression, restraining of cargo to avoid its movement and changes of aircraft centre of gravity during all flight phases and emergency landing conditions, complying of cargo mass and volume with maximum capacity limitations and structural loading limits of the aircraft and all its stowing areas. Sufficient and qualified cabin crew to accompany cargo operations and monitor all areas of the passenger cabin during the flight and address any possible risk of fire, leakage or other unforeseen circumstances that may occur in the aircraft passenger cabin during the flight should be engaged.

The COVID-19 pandemic has severely disrupted the air cargo industry, but cargo markets have recovered to pre pandemic levels with significant differences among regions testifying the vital role of air cargo in delivering critical products like medical supplies and personal protective equipment as well as enabling e-commerce during the lockdown periods. The COVID-19 pandemic has led airlines to see the possibility of using their transport capacities differently and generate revenue in a way that has been unusual so far.

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