

Perishables Logistics and Air Transport



Contents

1.	Perishables Goods Air Transportation	3
1.1	Market Outlook	3
2.	Perishable Freight Logistics Challenges	4
2.1	Unique Challenges of Shipping Perishables	4
2.2	Impact of Disruptions on the Food Supply Chain	4
3.	Priorities for Perishable Freight	5
3.1	Boosting Efficiency in Cargo Operations	5
3.2	Sustainability in the Perishable Handling Process	6
3.3	Digitalization to Drive Air Cargo Forward	7
3.4	Industry Communication and Collaboration	7
	IATA's Pipeline of Initiatives Supporting Standard Development, Sustainability, and Innovation in Perishables	8

Introduction

Every day, perishable goods make their way across domestic, international, and intercontinental routes, through an elaborate supply chain from point of harvest to retail to fulfil worldwide consumption needs. These consumable and non-consumable products, such as meats, fish, flowers need to be handled and transported in a fast and reliable manner to ensure shipment integrity and minimize any losses. This is largely made possible by air transport which facilitates the movement of perishables across the world. Though proven to be robust, perishable transport has succumbed to inevitable pressures inflicted on the supply chain by the pandemic, such as capacity constraints and transport restrictions which significantly impact food loss and waste.

Effective supply chain management has been the resounding theme these past two years, with the efficacy of processes and procedures being a determining factor in whether commodities would make their way to the end-consumer and guarantee food security and nutrition.

Today's airfreight logistics capabilities are designed to meet the transportation requirements of numerous commodities. In the area of perishables, various technological advancements have been made to enable their movement by air cargo. However, challenges are ever-present, and COVID-19 has served as a powerful reminder that agility and responsiveness to market changes are key enablers in operational success. It is also essential that efforts being undertaken throughout the supply chain be in line with various organizations involved in food distribution missions and humanitarian efforts to ensure that we are able to avoid any opportunity loss and continuously plan for the demand of an ever-growing population for years to come.

This whitepaper explores the unique challenges of perishables transport by air and draws attention to the efforts and initiatives being undertaken by the air cargo supply chain to address them.

1. Perishables Goods Air Transportation

According to a 2018 article written by Joseph Poore and Thomas Nemecek in Science, air travel contributes just 0.16% of global food miles. In contrast, sea shipping generates 58.97% of global food miles, road 30.97%, and rail 9.9%. Though within the air freight industry, perishables represent an essential commodity, accounting for roughly 15% of total global air cargo in 2022 (IATA CargoS). Their short shelf life makes perishables prime candidates for air freight, which ensures the fastest transportation option while preserving the commodities time and temperature-sensitive state. While alternative modes of transport may offer preferential rates, this may come at the expense of product condition.

According to a Research and Markets report, the global food logistics market is projected to reach around \$162 billion by 2024, expanding at a compound annual growth rate (CAGR) of 8.3 percent during the 2019-2024 period. "Air cargo is an essential logistics component of the food industry, and while we expect to see a continuous increase in perishables, we also foresee diversification in commodity types being transported", says Fabrice Panza, Manager Global Cool Chain Solutions, Etihad Cargo. By tonnage, the top five year-to-date imports are fresh-cut flowers, fish fillets, chilled or frozen, fish, fresh or chilled, peppers, asparagus, squash, and strawberries, blueberries, etc. (Shankaran, 2022).

1.1 Market Outlook

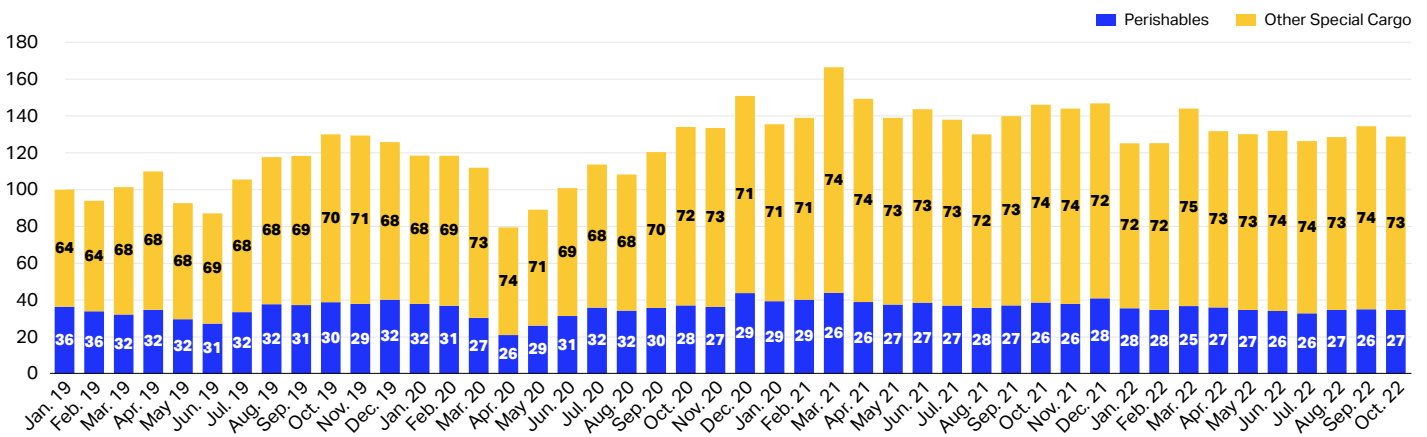
Perishable growth YoY 2019-2022

Year	Percent Difference
2022 vs 2021	-10%
2022 vs 2020	7%
2022 vs 2019	2%

Perishable % Difference Chargeable Weight, January to October 2022 versus same period 2019 by region

Origin Region Name	Percent Difference
Africa	21%
Asia Pacific	-12%
Central and South America	42%
Europe	2%
Middle East & South Asia	-37%
North America	7%
Total	2%

Chargeable Weight Index Perishables vs Other Special Cargo (index Total Special Cargo 2019 = 100), %



Source: CargoS

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2. Perishable Freight Logistics Challenges

2.1 Unique Challenges of Shipping Perishables

Cargo is designated as perishable when the contents of the shipments start deteriorating after a period due to exposure to environmental conditions like humidity or extreme temperatures. Thus, making perishables unique in that logistical requirements relevant to their transport must take their short shelf life into consideration. Within the scope of air cargo, several challenges present themselves along the process to ensuring product quality and freshness.

Requirements such as proper packaging and temperature control by means of insulation and appropriate refrigerant use are essential to maintaining solid supply chains and steering away from the 20% perishable shipments that are damaged due to cold chain disruptions, as found by IATA in 2019.

In addition to these tangible requirements, timing plays a crucial role in ensuring product quality. Add to that the evolution of regulatory requirements which must be respected, and it becomes quite evident that the handling and transport of this sensitive cargo presents an intricate challenge for today's air cargo supply chain.

During the pandemic, the consumer shift from restaurants to foods consumed at home led to changes in the supply chain status quo. Demand for retail products, particularly for frozen and packaged foods, saw immense spikes and while the requirements for product types may be similar, the supply chain has had to adapt to retail-specific requirements (Food Supply Chains and COVID-19: Impacts and Policy Lessons, 2020). Disruptions as a result of unforeseen circumstances, shifts in demand, inefficient processes ultimately result in perishables not moving through the supply chain to attain their ultimate consumer, which in certain cases are populations in situations of poverty, thus directly but disproportionately impacting food security in various countries.

The lack of harmonized regulations and standards that exists today is also cause for disruption. Cumbersome formalities and documentation, the lack of digitalization and cooperation and coordination between border agencies can result in wastage and goods deterioration. International organizations, governments and the private sector are working together to ensure the implementation of a harmonized regulatory framework and the development of modern, adapted, and efficient processes to ultimately accelerate border clearance and make air cargo cross-border trade easier, faster and more reliable.

2.2 Impact of Disruptions on the Food Supply Chain

The impact of logistical challenges on perishables can be far-reaching, particularly when breaks in the supply chain occur. The movement of consumable goods and flowers has been disrupted during the pandemic due to the impact on transport and logistics, notably air freight, which has seen a significantly reduced global air cargo capacity because of passenger aircraft being grounded. The issue was most pronounced for perishable goods, affected not only by the mode of transport but also by quarantine measures and border inspections.

Nonetheless, perishables continued to be transported by air on priority basis, deemed as important as medical supplies, however with certain commodities taking precedence over others, such as foods items in lieu of flowers. Disruption to other modes of transport has been less severe, as they tend to transport perishable commodities which are less time and temperature sensitive, such as cereals and oilseeds.

The airline industry proved resilient and innovative in beating the capacity crunch and food shortages during the pandemic. Its success drew attention to the importance of perishable transport by air.

Top 10 Trade Lanes for Perishables Jan 2022 to Oct 2022

Origin Country Name	Destination Country Name	Rank
Ecuador	Netherlands	1
United States	Japan	2
Kenya	Netherlands	3
Colombia	Netherlands	4
Norway	Japan	5
Netherlands	United States	6
Norway	Thailand	7
Japan	Hong Kong (SAR), China	8
Australia	Singapore	9
Kenya	United Kingdom	10

3. Priorities for Perishable Freight

3.1 Boosting Efficiency in Cargo Operations

Ensuring the integrity of the logistics value chain is the ultimate goal when transporting perishables by air. **Critical to a successful product journey from shipper to consignee** is the effectiveness of the cold chain, which requires the supply chain to be equipped accordingly and to have the necessary logistics and infrastructure in place, such as cold rooms, freezers and appropriate packaging for the commodity at hand.

The cold chain ensures that perishable products are safe and of high quality at the point of consumption. Failing to keep product at the correct temperatures can result in a variety of negative attributes. These can include textural degradation, discolouring, bruising and microbial growth. Effective management of cold chain maintains the quality of a product, which leads to a satisfied customer, greater demand, and overall protection of public health (The Cold Chain, 2020).

At many airports, cold rooms and freezers are available for temporary storage at acceptance, transit or awaiting final delivery. Temperatures of these facilities are mainly around 5 degrees, or -18 and 20. In some locations, other temperatures can be available but that will be dependent on products being shipped to or from that airport.

Product deterioration as a result of temperature excursions can be prevented with the efficient planning of the product journey, ensuring that any and all facilities and airports at which the product transits are equipped with proper storage facilities, notably processing and work areas with controlled environments for special loads, cold rooms and freezers, treatments rooms, equipment for pre-cooling and possibility for segregation.

Appropriate handling procedures need to be applied to perishable cargo shipments. ULDs are the main means of carrying packaged perishables for air shipments and it is essential that the right type be selected to account for the temperature, humidity and physical protection requirements of the perishable commodities being transported. The process for transport between the cargo warehouse and the aircraft should be planned in a manner that minimizes product exposure, as this can have an impact on the product's temperature range. Well-packed loads are unlikely to deteriorate rapidly when kept in a temperature-controlled environment.

All perishable cargo shipments must be easily identifiable. Appropriate documentation and its diligent completion are crucial and must be in order beforehand to prevent delays in the customs process and any steps during the import, export, transit, quarantine or health requirement process, as well as to ensure that proper handling measures are taken for the perishable goods being shipped. Each shipment should be accompanied by all necessary documentation and labels as per the IATA PCR.

Temperature Control	Documentation	Handling Procedures
<ul style="list-style-type: none"> Controlled environments required for special loads 	<ul style="list-style-type: none"> Eases product identification 	<ul style="list-style-type: none"> Appropriate packaging and carriage prevent loss and deterioration
<ul style="list-style-type: none"> Maintains product quality 	<ul style="list-style-type: none"> Prevents delays 	<ul style="list-style-type: none"> Minimize product exposure
<ul style="list-style-type: none"> Delays deterioration 	<ul style="list-style-type: none"> Indicates handling measures to be taken 	<ul style="list-style-type: none"> Minimize product exposure

3.1.1 Supply Chain Visibility

Ensuring the integrity of perishable goods while shipping means all stakeholders must work closely and promptly to keep cold chain logistics running as smoothly as possible. Understanding each step of the shipping process is as vital to all stakeholders involved as traceability and tracking of the shipment. It is essential for stakeholders to work in conjunction to ensure that the perishable goods arrive intact. Visibility of end-to-end supply chain processes enables shippers to improve their own processes and customer service, all while limiting disruptions and mitigating risk. Fabrice Panza, Manager Global Cool Chain Solution, Etihad Cargo has commented on the importance of end-to-end visibility, stating that **"From our new cool chain facility in Abu Dhabi, Etihad Cargo will continue to work closely with customers and partners to ensure the smooth, efficient, safe and on-time delivery of fresh products. A key component of achieving this will be ensuring transparency, clear communication and the provision of accessible and accurate information at every step of a perishable cargo's journey. We monitor and control external conditions and have robust contingency plans in place to mitigate the risks associated with temperature and other external factors so we can ensure cargo arrives at its final destination in perfect condition."** (Shankaran, 2022).

3.2 Sustainability in the Perishable Handling Process

Supporting the UN SDGs

Perishable loss and waste reduction is a challenge of massive proportions. Almost a third of all food produced globally is lost or wasted from the farm to the fork annually, creating huge economic, social and environmental impact and exacerbating food insecurity and malnutrition. The Food and Agriculture Organization (FAO) estimates that food loss and waste cause about \$940 billion per year in economic losses. While 17% of the world's food is wasted at the consumption stage, 14% is lost during the distribution, handling, and storage stages with developing countries being particularly affected. This represents \$400 billion of perishable food wasted annually, with nearly half of those losses due to temperature changes experienced in transit between the grower and the grocer, according to the FAO.

In developing countries, the matter of food loss is aggravated by poor infrastructure and low investment in food production systems which could be alleviated by state interventions, dedicated projects and initiatives to tackle the root causes of such losses.

In 2015, United Nations adopted 17 Sustainable Development Goals (SDGs) as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

The 17 goals include objectives directly relevant to air transport such as SDG 12, which was established to ensure sustainable consumption and production patterns. Equally important is SDG 2, which aims to end hunger and all forms of malnutrition by 2030.

SDG 12

Target 12.3 aims to halve per capita global food waste at the retail and consumer levels and **reduce food losses along production and supply chains, including post-harvest losses.**

SDG 2

Target 2.1 commits to universal access to safe, nutritious and sufficient food at all times of the year, **where air cargo contributes by facilitating the global distribution of food commodities.**

The air cargo supply chain has an important role to play in achieving these targets by generating connectivity between nations, as well as safely, securely and efficiently managing the distribution of perishable commodities for global consumption.

3.2.1 Relieving the Environmental Impact

Perishable storage and handling activities have significant environmental implications. In a similar manner to perishables distribution centers (PDCs) and supermarkets, cargo handling facilities also produce millions of kg of CO₂ throughout their life cycle which has a direct climate change impact. According to FAO, food loss and waste account for 8-10% of global greenhouse gas emissions (GHGs).

Optimizing postharvest cold chains by prolonging product shelf life, thereby reducing losses, and lowering energy consumption is essential to reduce the environmental impact. To achieve these goals, new cold chain scenarios or ventilated package design have recently demonstrated promising potential (Wentao Wu, 2019). Such innovative technologies require further refinement and an accurate methodology to assess their performance.

3.2.2 Focus on the Reduction of Unnecessary Packaging

While single-use and other plastics have a negative impact on the environment, adequate and innovative containers are also critical to reducing loss. There are many technologies available in the industry today which would need to be researched and mapped to current technologies and packaging solutions that combine quality and sustainability. Changing onboard materials, replacing plastic with alternative covers for wrapping loads and a focus on reuse and recycling are just some examples. Various airline pilot projects are underway relating to the use of plastics in cargo operations, with ambitious targets to implement changes and achieve significant reductions.

Taking action on the SDGs

- Focus on prioritization
- Set ambitious goals
- Engage employees and drive change

3.3 Digitalization to Drive Air Cargo Forward

Imagine a scenario where instantaneous information is available about temperature sensitive shipments throughout the whole supply chain journey, including real-time location tracking, record of environmental conditions, alerts for misrouting or temperature exceedances, and notifications on events such as departure, arrival, and custom clearance. The use of connected devices and ONE Record would ensure collection and distribution of cohesive and seamless location and status data autonomously, this way ensuring the handling of shipment in the required environment, delivery by the requested time and notifications to responsible parties to prevent any potential occurrences; hence resulting in perishable waste reduction, enhanced end-to-end visibility and increased efficiency.

IATA has developed a set of standards and guidance documents in the areas of track and trace and digitalisation to enable and ease the use of IoT devices for cargo interactions. The Interactive Cargo project and the ONE Record standard are important steps forward in the direction of unlocking the possibilities of a full digital air cargo industry, aiming to equip the air cargo supply chain with responsive air cargo services based on intelligent systems able to self-monitor, send real-time alerts, respond to deviations and report on the cargo journey to better meet customer's expectations.

Refer to the recently developed standard operating procedures (SOPs) on IoT device handling and data sharing at the following links:

- [SOP on IoT device handling](#)
- [SOP on IoT data sharing](#)

3.4 Industry Communication and Collaboration

Transport of perishables commodities is complex, with many considerations to be made to avoid loss and spoilage, such as the selection of the appropriate mode of transport, appropriate containers and packaging to be used, temperature monitoring, weather conditions and admissible transit time, among others. The perishable food supply chain and all other relevant stakeholders must work closely together to align on priorities and establish best practices and processes to achieve the ultimate goal of ensuring quality and safety in sustainable perishables handling and transport.

IATA is consistently engaging with international organizations as well as authorities to seek how critical information can be consolidated and collaboratively shared to ensure appropriate planning across the air supply chain, from manufacturers to consumers. It is through contribution, collaboration, partnerships and support that the air cargo industry can continue to pursue relevant efforts, such as enhancements to regulatory framework, logistical improvements and innovations needed to achieve these missions.

3.4.1 Cool Chain Association (CCA)

The Cool Chain Association (CCA) is a non-profit organisation bringing together all parts of the temperature-sensitive supply chain to create an impact with visible and measurable results both for companies and for society. Their aim is to reduce wastage and improve the quality, efficiency, and value of the temperature-sensitive supply chain by facilitating and enabling vertical and horizontal collaboration, education, and innovation amongst members and stakeholders. The CCA's Technical Committee, which oversees and assists in projects addressing critical points affecting product quality along the cool chain will indirectly contribute to reducing global hunger and the overall health of people and the planet.

IATA and the CCA have a longstanding Memorandum of Understanding to support the safe, sustainable and quality transport of temperature-controlled perishables and pharmaceuticals by sharing feedback, experiences, knowledge and best practice. The Parties recognize their common interest in ensuring the secure handling and transport of perishables and pharmaceuticals through robust standards: improving quality in the air cargo industry worldwide; increasing sustainability; reducing waste and promoting the implementation of methodologies and quality criteria such as those represented in the CEIV Fresh/Pharma programs.

Three concrete steps



Are you in compliance? Your organization and staff must be trained and up-to-date on all regulatory requirements.



Ensure that your operations and facilities have the standard requirements in place for handling and transporting perishables.



Engage with your community to share best practice and improve the performance and productivity of your organization.

IATA's Pipeline of Initiatives Supporting Standard Development, Sustainability, and Innovation in Perishables

STANDARDS & REGULATIONS

- Perishable Cargo Regulations (PCR)

The Perishable Cargo Regulations manual is an essential reference guide for all parties involved in the packaging and handling of temperature-sensitive product.

- Perishable Cargo Working Group (PCWG)

The air cargo industry is working to speed up its efforts to reduce perishable loss during storage, handling and transportation, contribute to economic growth and achieving global access to perishables. To that end, the IATA Perishable Cargo Working Group is working to map the supply chain and analyze where plastic waste occurs today, identifying solutions and prioritizing them.

- IATA Cargo Handling Manual (ICHM)

Describes industry best practices, aligned to the Industry Master Operating Plan and international regulations and standards, ICHM is the first complete set of standards covering the operational activities of all stakeholders in the supply chain.

PROJECTS

- ONE Record

A standard for data sharing and creating a single record view of the shipment. This standard defines a common data model for the data that is shared via standardized and secured web API.

- Interactive Cargo

Developing the relevant standards and guidelines (piece level tracking, real-time notification, and use of connected devices) to enable cargo to talk!

PRODUCTS & SERVICES

- Center of Excellence for Perishable Logistics (CEIV Fresh)

Applying excellence in perishable logistics by ensuring standardized and efficient processes and operations throughout your company.

- Smart Facility Operational Capacity Audit (SFOC)

Creating transparency in cargo handling services and their quality, as well as enhancing handling capabilities to a consistently high standard across the industry.

- ONE Source

The online industry platform for validated aviation capability and infrastructure information.

