WORLD AIR CARGO FORECAST

2024-2043

Contents

Foreword

The World Air Cargo Forecast (WACF) is the Boeing Company's biennial overview and long-term outlook for the air cargo industry. It summarizes the world's major air trade markets, identifies industry trends, and presents forecasts for future development of markets and the global freighter fleet.

This document provides our customers, stakeholders and industry with valuable information that informs decision-making for the future of air cargo and global trade.

A special thank you to contributors:

Sharon Felix
Gregg Gildemann
Tom Hoang
Calvin Jin
Diego Rodriguez
Wendy Sowers
Aaron Tayler
Diane Tchakirides

The next WACF will be published in the fourth quarter of 2026.

Feedback welcome:

Boeing Air Cargo Market Analysis
Boeing Commercial Airplanes
P.O. Box 3703, MC 9U7-12
Seattle, WA 98124
USA

www.boeing.com/wacf

WACF Focal: Calvin Jin

Freighter Fleet Forecast Focal: Aaron Tayler

Executive Summary

Quick Stats

4.0%
Annual air cargo traffic growth* through 2043

3,900
Global freighter fleet in 2043

>50%
Long-term freighter share of air cargo traffic

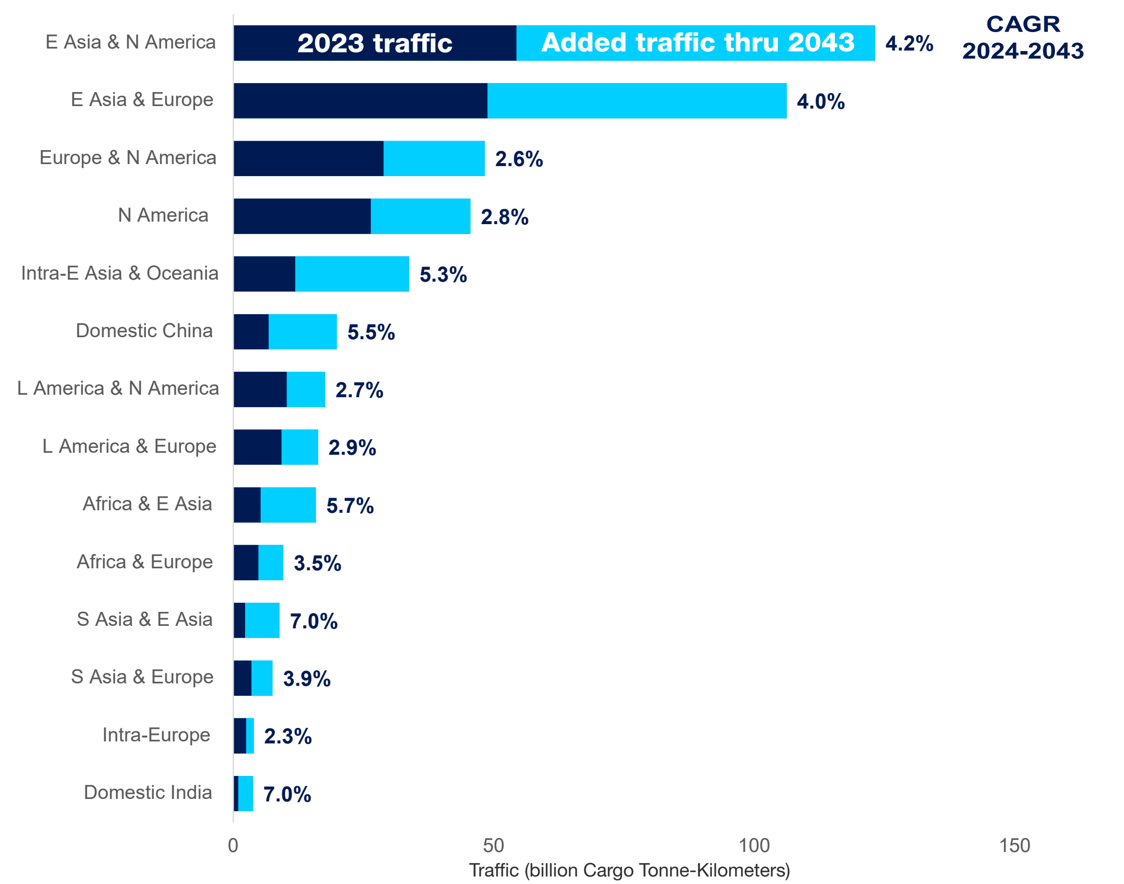
1,005
Production freighter deliveries through 2043

25%
Express carrier traffic share in 2043

1,840
Converted freighter redeliveries through 2043

*Note: Long-term Compound Annual Growth Rates (CAGRs) may change across WACF editions due to base year volatility

Air Cargo Traffic Forecast by Flow



Air Cargo Industry Overview

18% Express carrier share of traffic, 2023

2.6% Historical air trade growth, 2003-23

2.1x Volumes in 2043 vs. 2023

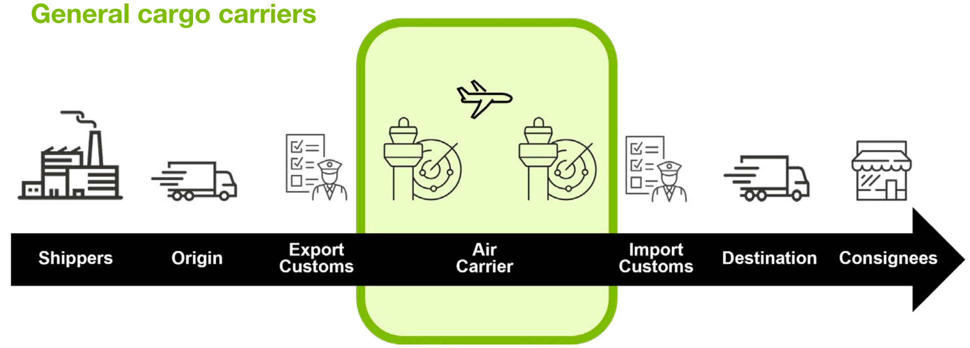
Air cargo plays a unique role in global trade due to its unparalleled reliability, speed, and security. Nearly 99% of world trade consists of low-value bulk commodities transported via ocean freight such as oil, metal ores, and grains. Though less than 1% of trade volumes are transported via air, air freight commodities tend to be perishable, high-value, or time-sensitive goods which collectively generate around 35% of world trade value.

The two main types of air cargo have been express and general. In recent years, e-commerce has emerged as a significant third, often overlapping the other two.

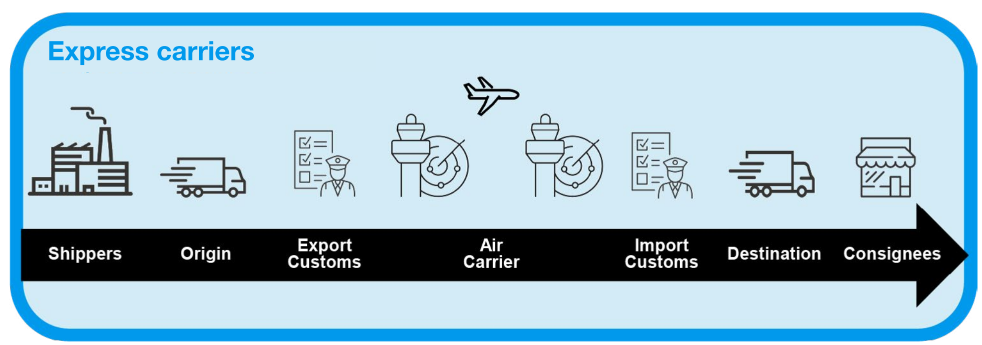
There are several distinct airline business models for air cargo:

- **Belly-only operators** provide air cargo capability using existing passenger networks and fleets
- **All-cargo operators** offer dedicated main-deck freighter capability for general freight, charter operations, and special or outsize cargo needs
- **Combination carriers** use both dedicated main-deck freighters as well as the belly capacity of passenger aircraft to serve a broad network and diverse markets
- **Express carriers** operate main-deck freighter fleets of all sizes to provide time-definite services from first-mile pickup to last-mile delivery, as well as general air cargo capability

General cargo carriers



- **82%** of global air cargo traffic
- Capacity is sold to freight forwarders
- Responsible for moving freight from airport to airport
- Usually move larger, bulky shipments (more than 70kg)

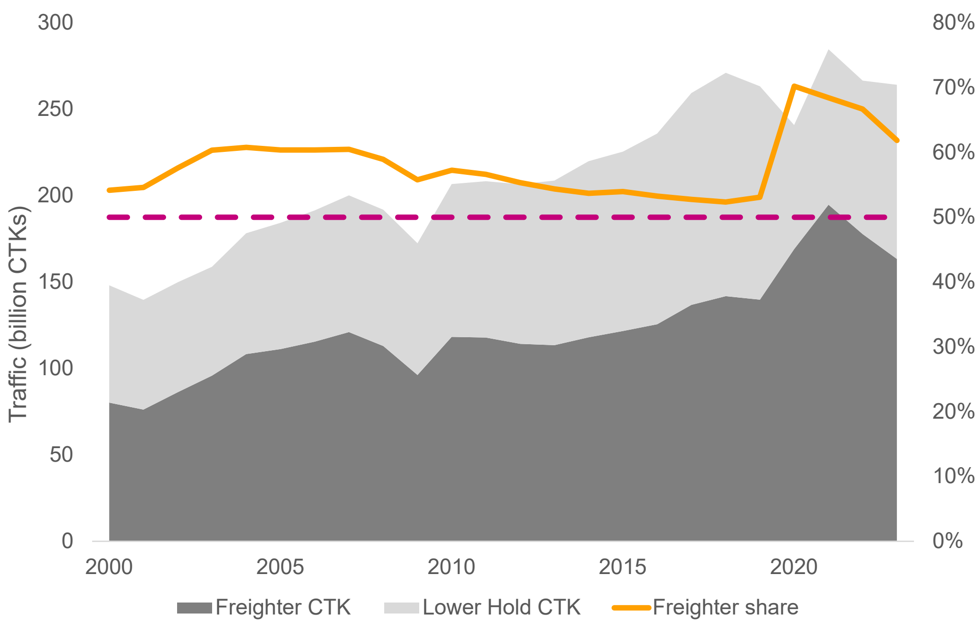


- **18%** of global air cargo traffic
- Includes first-mile pick up and last-mile delivery
- Total control of logistics flow from shipper to consignee
- Optimized air network around main and regional hubs
- Extensive ground network
- Usually move documents and small packages

Air Cargo Industry Overview

Freighters are essential to the global air cargo market. Though widebody passenger airplanes offer ample lower hold cargo capacity on the world's major cargo flows, approximately 54% of global air cargo traffic measured in Cargo Tonne-Kilometers (CTKs) has historically been transported by main-deck freighters. Consequently, airlines operating freighters generated 90% of total air cargo industry revenues in 2023.

Freighter/Lower Hold Share of Air Cargo Traffic



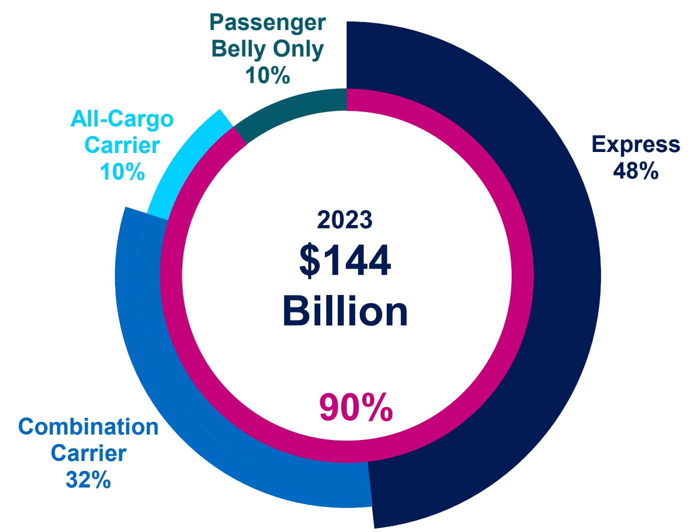
Key reasons why freighters are preferred in air cargo markets include:

- Most passenger networks do not serve key air cargo hubs
- Widebody passenger schedules often do not meet shipper timing needs
- Hazardous and outsize cargo cannot be transported in the lower holds of passenger aircraft
- Payload-range considerations on passenger airplanes may limit cargo carriage

The COVID-19 pandemic underscored the critical role of freighter aircraft in global trade. Approximately 60-70% of air cargo traffic between 2020 and 2023 was carried by freighters due to the significant reduction in passenger flights.

Air Cargo Industry Revenues by Airline Business Model

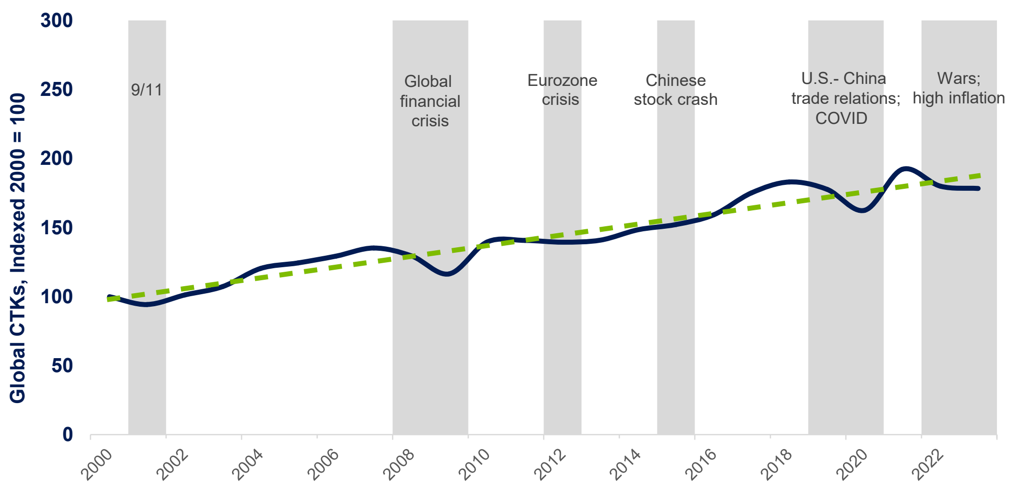
Airlines with freighters generate 90% of industry revenues



Air Cargo Industry Overview

The air cargo market faced significant challenges in early 2023 due to global economic uncertainty—but experienced a strong recovery in the latter half of the year, driven by a surge in demand for Chinese e-commerce goods, which continues in 2024. While the past year highlights short-term volatility, the industry has demonstrated long-term resilience. Despite multiple downturns, the industry has grown at an average of 2.6% per year over the last 20 years.

World Air Cargo Market Resilience



Our forecast for the global air cargo industry is primarily driven by the projected growth of global real GDP, which is expected to increase 2.6% annually over the next 20 years. South Asia, China, Southeast Asia, and Africa will lead this growth as their economies continue to develop and mature. Global trade and industrial production, also drivers of air cargo, are projected to grow 2.9% and 2.2% annually over the same period.

Another significant factor contributing to future air cargo growth is supply chain diversification. The rise of geopolitical risk and the COVID-19 pandemic exposed the vulnerabilities of single-source supply chains, including labor, shipping, and manufacturing constraints. In response, manufacturers have begun diversifying their operations and supply chains to other parts of Asia. Southeast Asian countries, for example, have significantly increased their industrial capabilities and global air exports since 2017 as a result of these shifts. Increasingly, multi-node supply chains will depend on air cargo for reliable and timely connectivity across different stages of the manufacturing process.

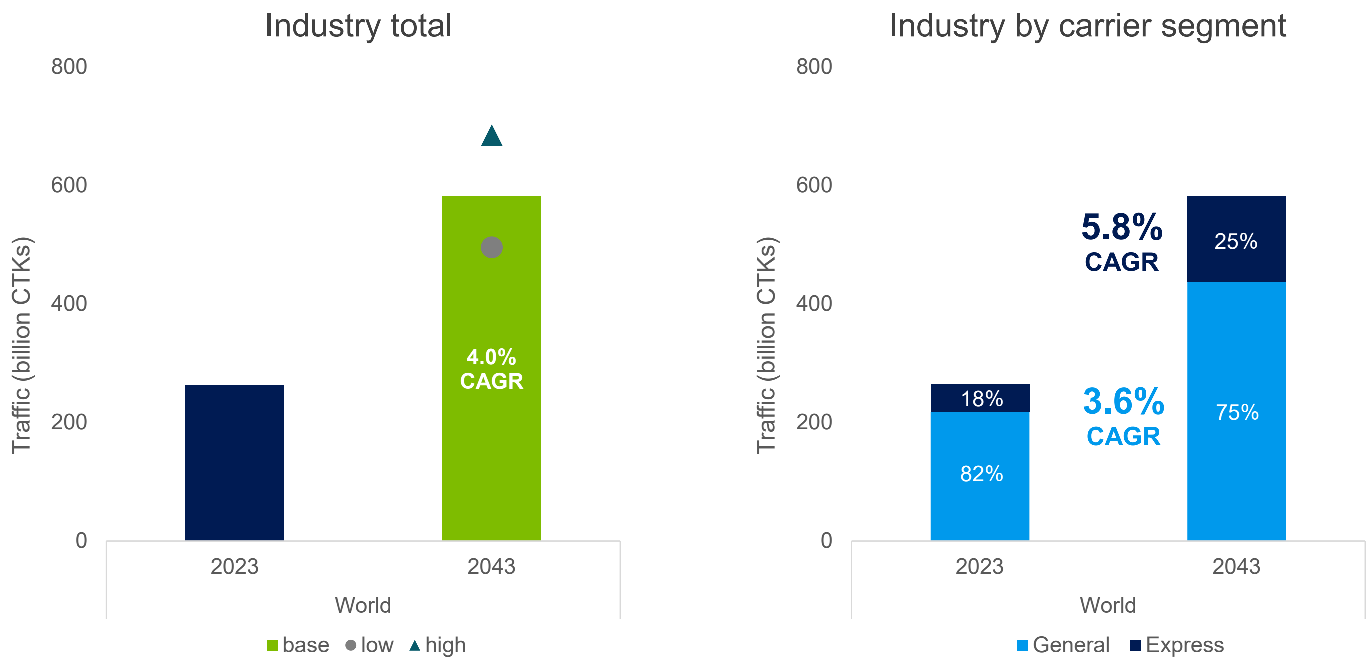
Growth of e-commerce and express networks will provide a further boost to air cargo demand. The entry of new e-commerce market players significantly accelerated air cargo growth in the latter half of 2023 and into 2024, underscoring the importance of air cargo's unmatched speed to serve the digital economy. Global e-commerce revenues are forecast to rise around 9% per year through 2029, with the fastest growth in the emerging markets of South Asia and Southeast Asia. Air cargo networks will play an essential role in this expansion.

Air Cargo Industry Overview

Based on these factors, we forecast that global air cargo traffic, measured in CTKs, will average 4.0% annual growth from 2024 to 2043. With a 2019 base year, this Compound Annual Growth Rate (CAGR) is 3.4%.

Express carriers, which accounted for 18% of total industry traffic in 2023, are expected to grow at an average annual rate of 5.8%. Due to their greater flexibility in handling express cargo, general cargo as well as e-commerce, these carriers are anticipated to outpace overall industry growth and increase their market share to 25% by 2043. However, other types of carriers will remain essential to e-commerce transport, particularly as e-commerce shipments become denser over time.

Global Forecast



CAGR: Compound Annual Growth Rate

East Asia - North America

21% Share of global traffic, 2023

1.1% Historical air trade growth, 2013-23

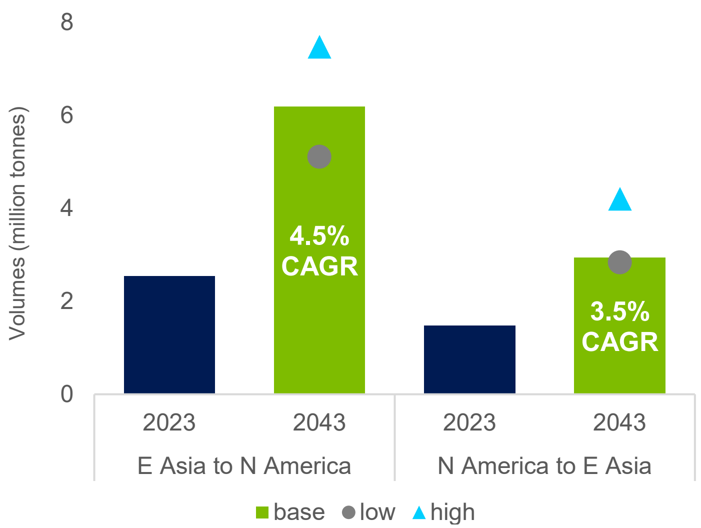
2.3x Volumes in 2043 vs. 2023

East Asia - North America is the largest air cargo market in the world, as measured by CTKs. Because of the high industrial output of East Asia—especially in advanced technology—and the large consumer market of North America, air trade tends to be imbalanced with nearly twice as much cargo flying eastbound to North America compared to westbound.

Air trade on this flow is heavily concentrated. The United States accounts for nearly 90% of North American trade with East Asia, while China is the largest East Asian air trade partner of North America with a 55% share of North American air imports and 37% share of exports. As a result, the overall transpacific market tends to be highly dependent on relations between the two large economies. Risks posed by geopolitical tensions and pandemic-era disruptions have prompted companies to diversify their supply chains beyond China to Vietnam, Thailand, and Malaysia, raising those countries' collective share of North American imports from 10% in 2017 to 17% in 2023.

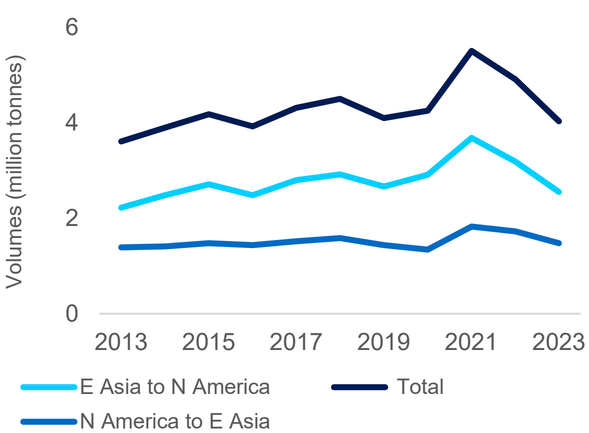
Supply chain diversification, rising economies in Southeast Asia, and growth of e-commerce on both sides of the Pacific are expected to drive air trade growth. Though the challenge of directionality is expected to remain in the future, volumes in the total market are projected to more than double by 2043.

FORECAST

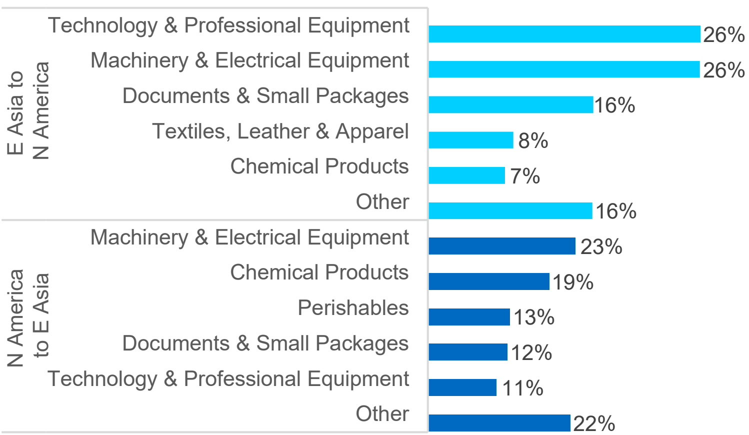


CAGR: Compound Annual Growth Rate

HISTORICAL



COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Growing economies and consumer demand
- Supply chain diversification bolstering industrial capabilities of Southeast Asia
- Increasing trade cooperation across the Pacific
- Developing e-commerce markets

RISKS

- Geopolitical tensions
- Supply chain disruptions and near-shoring to North America
- Demographic transitions in Northeast Asian countries
- Weather events and climate threats

East Asia - Europe

18% Share of global traffic, 2023

1.9% Historical air trade growth, 2013-23

2.2x Volumes in 2043 vs. 2023

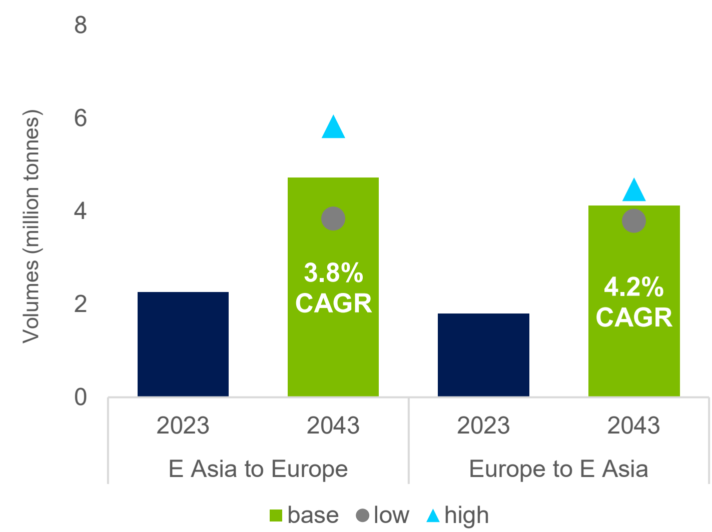
East Asia - Europe is the world's second-largest air cargo market, as measured by CTKs. Freighter capacity between the two regions nearly doubled over the past two years due to passenger belly capacity reductions following escalation of the Russo-Ukrainian War in 2022. Capacity remains elevated because of supply chain disruptions related to the Red Sea crisis and high demand for Chinese e-commerce.

Unlike the directionality on transpacific flows, volumes on this trade lane are fairly balanced. The East Asia-to-Europe direction is dominated by consumer goods, whereas Europe-to-East Asia is driven by manufacturing and industrial goods. However, European exports of consumer goods, luxury items, and perishables have increased in recent years as East Asia's middle class and consumer base continue to grow.

Sixth-Freedom carriers centrally located on this trade lane have risen to prominence in recent years. Their ability to link the two regions and beyond by efficiently connecting cargo through their hubs has allowed them to capture market share and lead industry growth, particularly given the Russia overflight restrictions faced by many other carriers.

Strong economic fundamentals and expanding e-commerce markets on both sides of this trade lane will drive air cargo growth at around 4.0% per year over the next 20 years.

FORECAST



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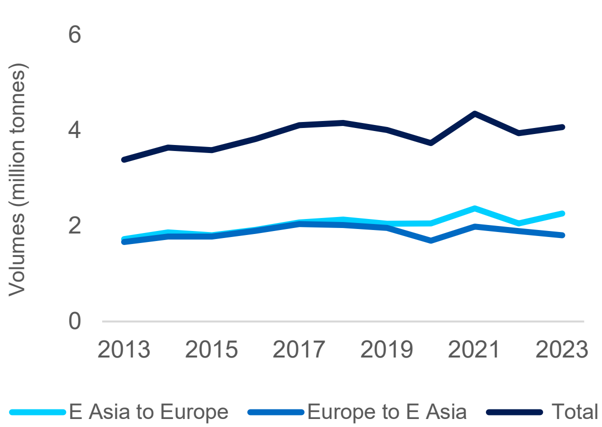
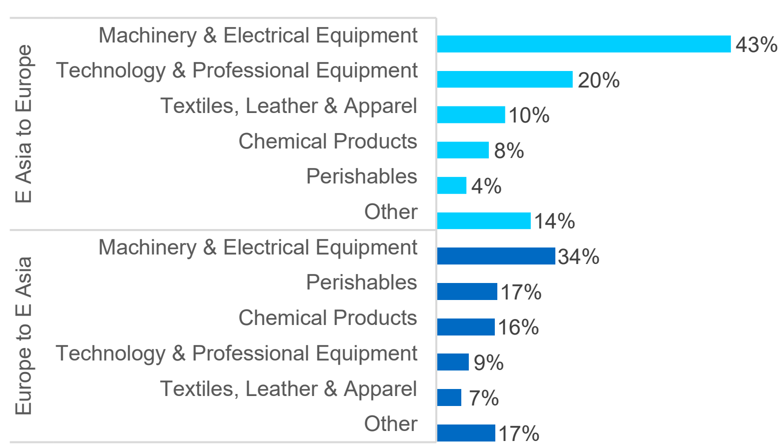


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Rising middle class in East Asia
- Expanding economies in Europe and East Asia
- Strong cross-border e-commerce growth
- Free trade agreements and inter-regional partnerships

RISKS

- Regional conflicts and geopolitical tensions
- Weak economic growth in major European economies
- Rising nationalism
- Increased trade tariffs

Europe - North America

11% Share of global traffic, 2023

2.5% Historical air trade growth, 2013-23

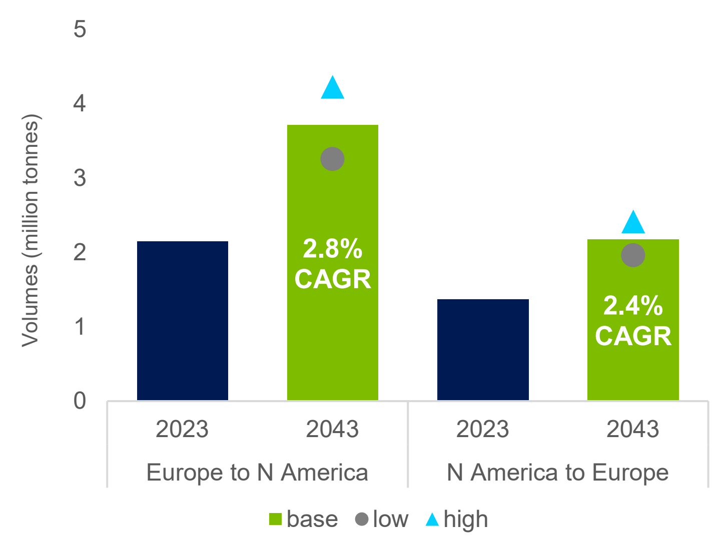
1.7x Volumes in 2043 vs. 2023

Air trade between Europe and North America has been volatile in recent years due to the effects of COVID-19, high inflation, and slowing of the global economy. However, long-term growth has remained positive. Although the 300 to 600 daily widebody passenger flights each way across the North Atlantic (depending on season) provide more than enough lower hold capacity to fulfill all air cargo demand, regulations, special cargo requirements, and logistics infrastructure often limit the use of this capacity. As a result, dedicated freighters continue to transport over 40% of cargo traffic between the two regions.

Germany, the UK, Italy, France, and the Netherlands were the top five European air trade partners of North America in 2023, together accounting for over 60% of the market. At the same time, the United States contributed over 90% of North American air cargo volumes traded with Europe. Countries in Eastern Europe and the Balkans have steadily been increasing their share over the last decades as their economies and industrial capabilities have grown.

Our forecast takes baseline Gross Domestic Product (GDP) growth of 1.4% per year in Europe and 1.8% per year in North America as the broadest-based driver of air trade between these larger economies. Ongoing efforts to strengthen high-tech industrial production on both sides of the Atlantic, as well as growth in Central and Eastern Europe, will boost future air cargo growth faster than historical trend.

FORECAST



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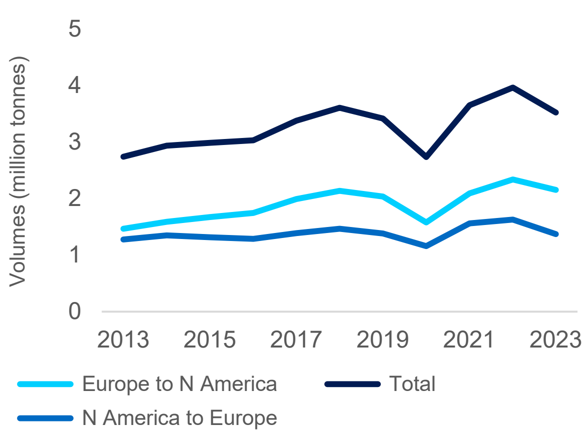
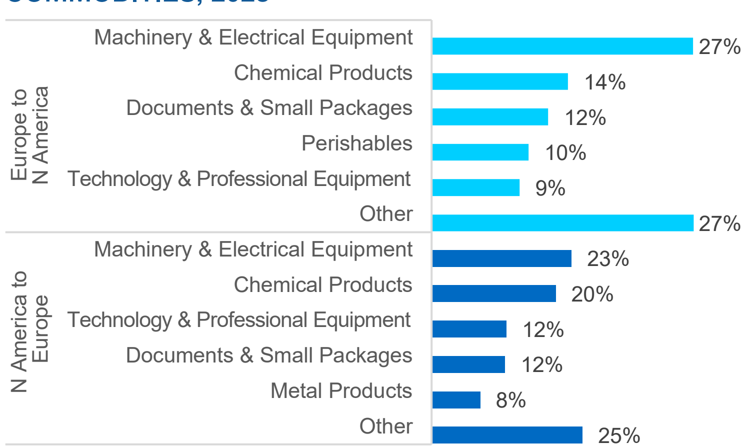


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Advanced economies and growing emerging economies
- Further deregulation of European trade
- European Union expanding
- Services growth boosting consumer growth

RISKS

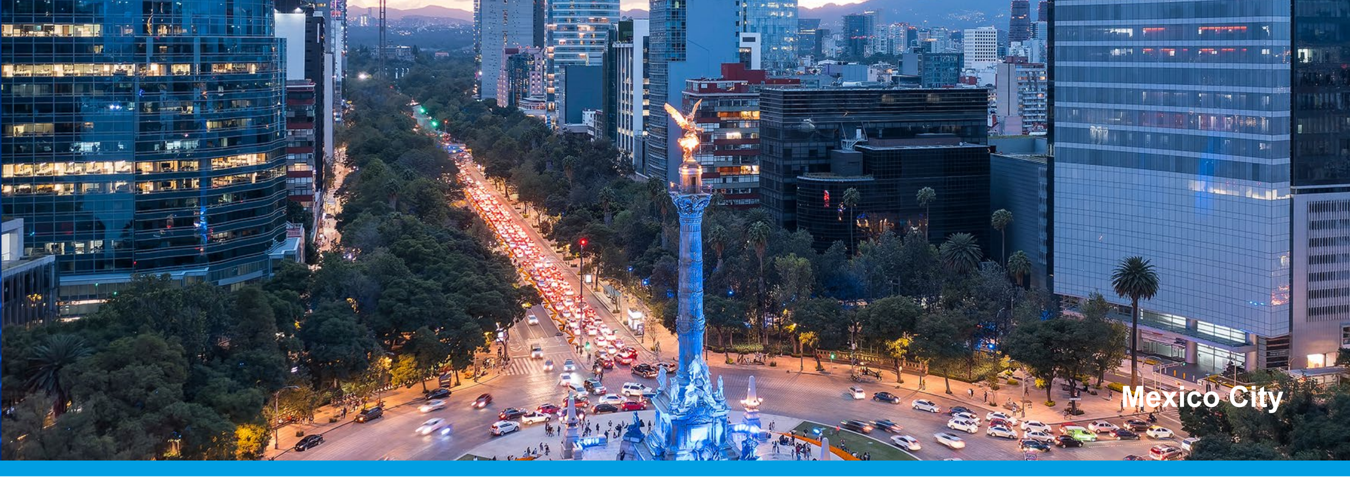
- Geopolitical conflicts impacting supply chains and energy prices
- Redirection of capital investments toward Asia
- Trade tensions, tariffs, and restrictions
- Rise of nationalism hampering regional cooperation

Latin America - North America

4% Share of global traffic, 2023

1.6% Historical air trade growth, 2013-23

1.7x Volumes in 2043 vs. 2023

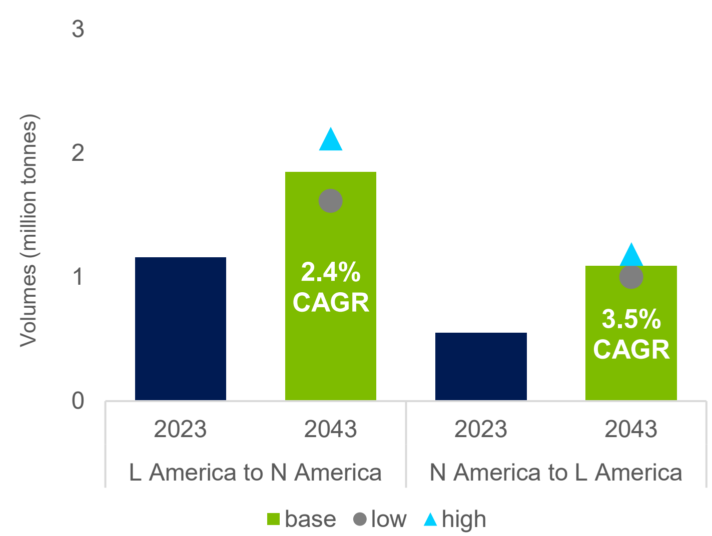


Despite global volatility, air trade between Latin America and North America remains robust, driven by strong economic ties, growing commodity flows, and geographic proximity. In 2023, around 65% of freighter capacity between these regions passed through Miami, underscoring the city's key role.

Over the past 20 years, Colombia, Chile, and Ecuador have more than doubled their exports to the U.S., largely driven by the resilience of perishables as essential commodities. Nicaragua now exports three times the volume it did in 2003, with shipments primarily consisting of perishables and a growing share of electrical equipment. Mexico and Brazil, the largest Latin American economies with strong ties to North America, accounted for over 40% of all Latin American air exports to North America by value. However, by tonnage, Colombia, Chile, and Ecuador represented around 65% of exports to North America, reflecting their dominance in lower-value commodities like perishables and flowers.

Our forecast anticipates accelerated growth of air trade between these regions over the next 20 years. Policies like the United States-Mexico-Canada Agreement will lower trade barriers and foster increased volumes. Air trade will be further stimulated by expanding consumer economies, rising e-commerce, and U.S. efforts to nearshore manufacturing to Latin American countries.

FORECAST



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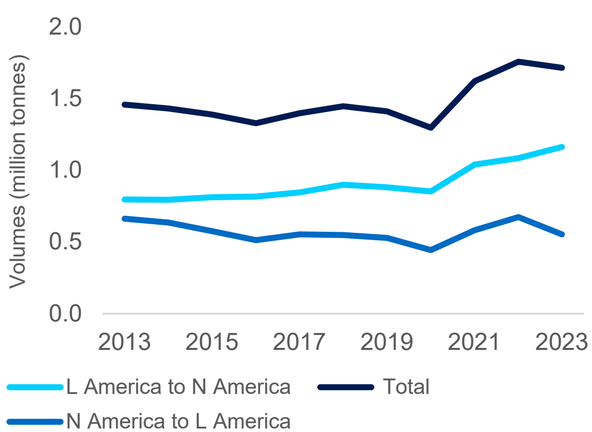
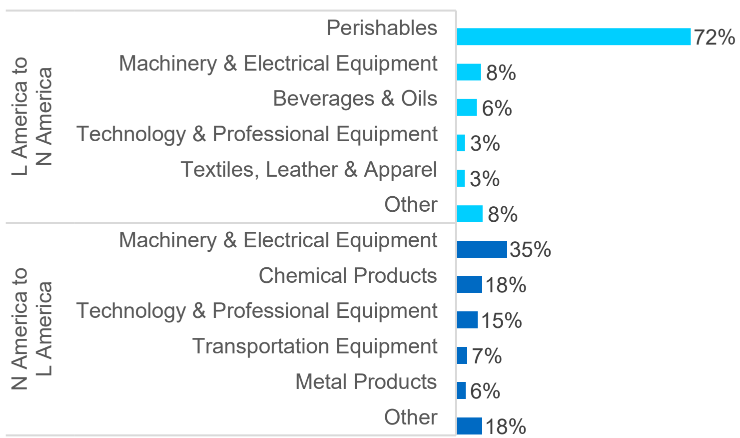


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Strong economic ties and trade agreements
- Proximity and growing regional cooperation
- Resilience of perishables as essential time-sensitive cargo
- Robust e-commerce and consumer goods demand

RISKS

- Geopolitical volatility and trade tensions
- Economic slowdowns in key markets
- Capacity constraints and infrastructure challenges
- Increased regulatory burdens and compliance costs

Latin America - Europe

4% Share of global traffic, 2023

1.3% Historical air trade growth, 2013-23

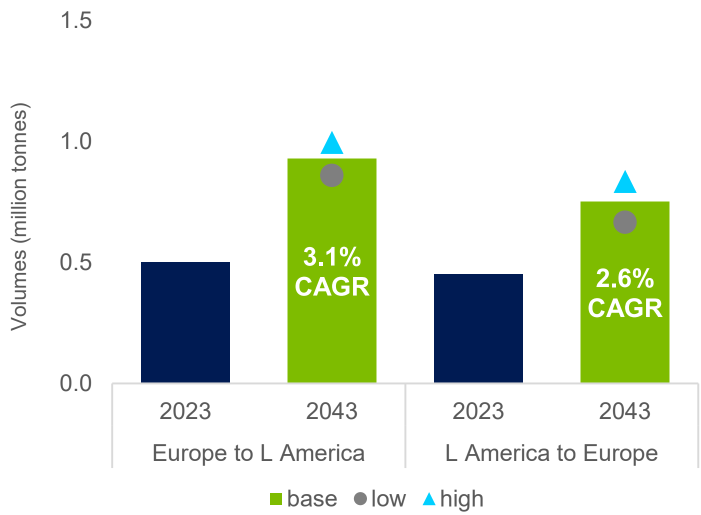
1.8x Volumes in 2043 vs. 2023

Air trade between Latin America and Europe is supported by strong trade relationships and diverse commodity exchanges, resulting in relatively balanced air cargo volumes in each direction. Routings through Miami and West Africa link these two distant markets and allow operators to efficiently build loads along the way.

Spain, Germany, and the Netherlands account for over 60% of total trade tonnage from Europe, while Mexico and Brazil represent over 50% on the Latin American side. Emerging economies such as Paraguay, Uruguay, and Peru are among the fastest-growing. These three countries have expanded exports of fruits and vegetables, which rely on air cargo to meet freshness and quality requirements, as well as textiles. Paraguay has also increased its export of spirits, particularly rum, which enjoys strong demand in Europe.

Expanding consumer markets in Latin America will drive future air cargo demand between these regions. Strategic partnerships, technological advancements, and evolving trade policies such as the EU-Mercosur trade agreement will further foster air trade growth.

FORECAST



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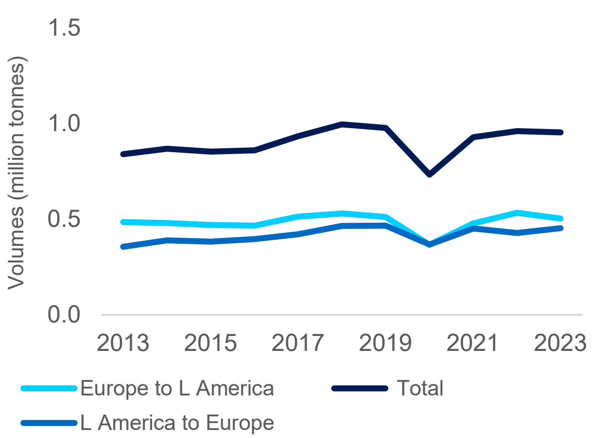
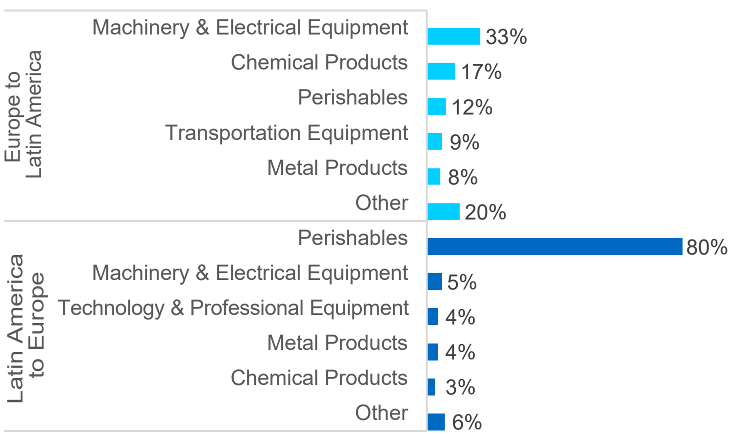


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Strategic partnerships and bilateral agreements
- Development of intra-regional logistics networks
- Increased trade collaboration
- Growing e-commerce and consumer markets

RISKS

- Economic volatility
- Rise of nationalism hampering regional cooperation
- Insufficient infrastructure investment
- Capacity constraints and regulatory hurdles

Africa - East Asia

2% Share of global traffic, 2023

7.2% Historical air trade growth, 2013-23

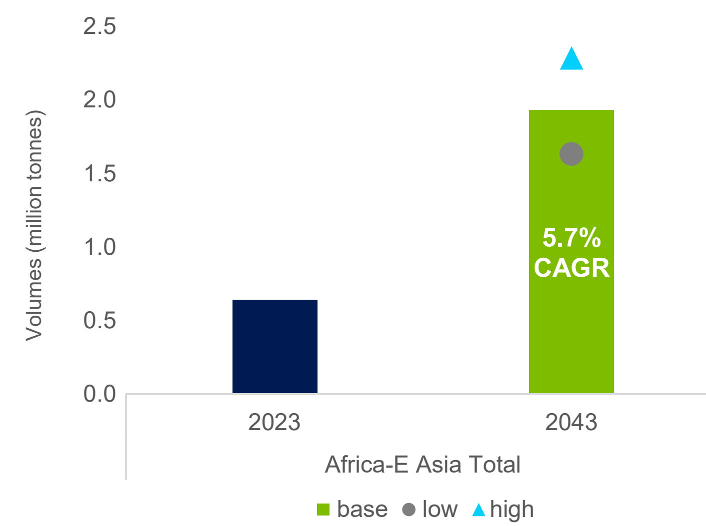
3.0x Volumes in 2043 vs. 2023

East Asia is Africa's second largest air cargo partner. In contrast to the established Africa-Europe market, traffic between Africa and East Asia has grown rapidly over the past decade. Whereas Europe is the main destination for African air exports, East Asia is the primary source of imports to the continent. Most of these goods come from China. Trade with China greatly expanded and paralleled growing Chinese investment and engagement across Africa in the 21st century.

Africa imports a diverse array of industrial and manufactured commodities from East Asia. African e-commerce is boosting demand for Asia-sourced consumer products and has huge potential to expand. Today, the African e-commerce market is largely untapped. Although nearly one-fifth of the world's population lives in Africa, the continent accounts for less than half a percent of global e-commerce sales. African e-commerce is expected to grow at double-digit rates in coming years to meet this demand, driving continued air cargo growth.

The Africa-East Asia air cargo market will continue to grow rapidly over the next two decades. It will triple in volume and surpass Europe as Africa's largest air cargo market. Africa's population is expected to double to 2.5 billion people by 2050, by which time one-quarter of the world's population will live on the continent. A significant increase in the working age population, coupled with industrialization and economic development, will raise incomes and boost consumption. Industrialization in Africa will also generate demand for machinery and manufacturing inputs from East Asia.

FORECAST



CAGR: Compound Annual Growth Rate

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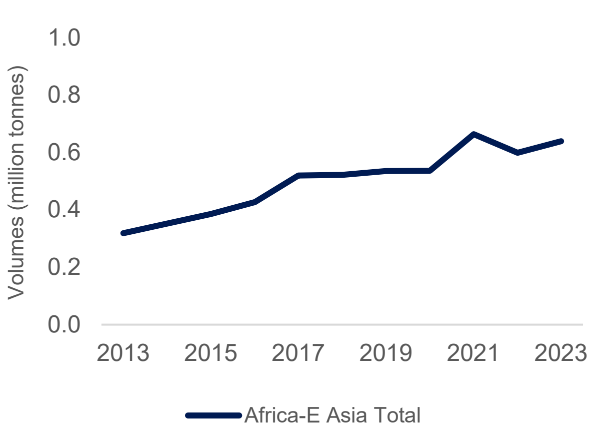
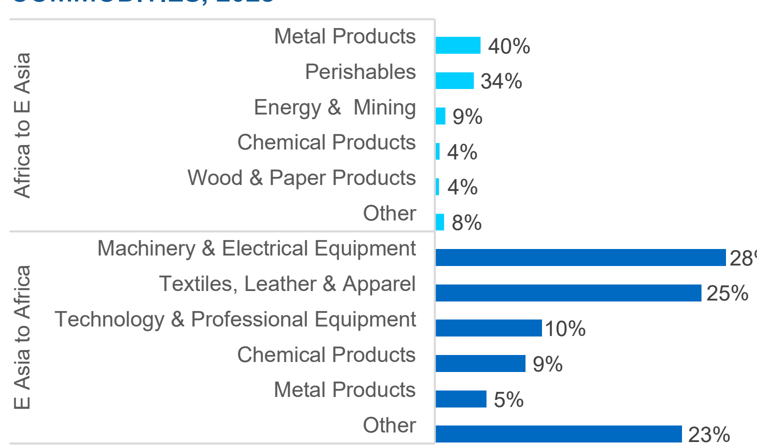


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- African demographics and rising consumption
- African e-commerce market growth
- Economic growth and diversifying sources of foreign direct investment
- African economic diversification and industrialization

RISKS

- Transportation and digital infrastructure investment
- Internet use levels, currency differences, and lack of customs process harmonization
- Limited direct air connectivity to East Asia markets
- Political and economic instability discouraging investment

Africa - Europe

2% Share of global traffic, 2023

0.1% Historical air trade growth, 2013-23

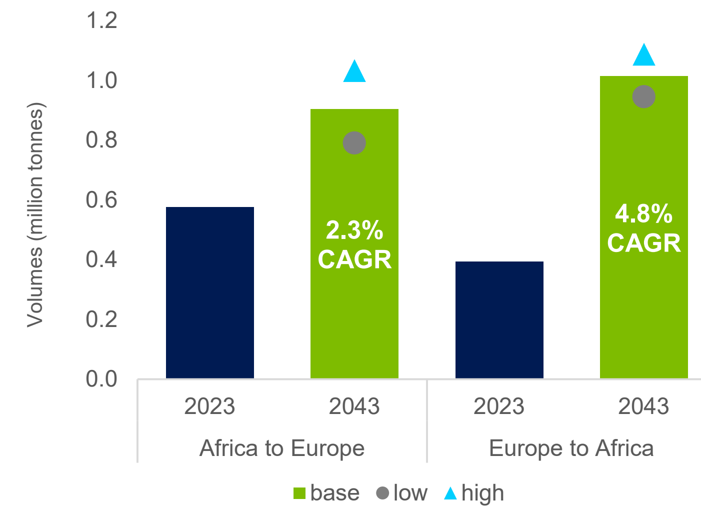
2.0x Volumes in 2043 vs. 2023

Europe remains Africa's largest air cargo partner and the destination for roughly two-thirds of all African air exports. The market is mature, with tonnage flat over the past decade.

Fresh horticultural exports—especially cut flowers, fruits, and vegetables—dominate African air cargo to Europe. After Colombia and Ecuador, Kenya and Ethiopia are the world's third and fourth largest producers of fresh cut flowers, respectively. Nearly all African flowers are exported by air with the majority destined for European markets, especially the Netherlands, though the Middle East is also emerging as a destination. The global flower market is expected to grow strongly at 5% per year through 2030. Imports to Africa are more diversified and cover an array of industrial and manufactured goods, reflecting limited industrialization that does not meet local demand. Because of these different commodity mixes, African imports are up to ten times more valuable per tonne than perishable exports.

Future growth in Africa-Europe air cargo will be driven by continued demand for perishables in Europe and African economic development. However, improving the sustainability of air cargo, via methods such as sustainable aviation fuel (SAF) and next-generation freighters, will be critical for meeting European initiatives to decarbonize fresh produce supply chains. African GDP is expected to grow at 3.7%, outpacing the global average of 2.6%. Increasing African industrialization will diversify air exports as air trade expands to also include finished products and generates more import demand for intermediate goods.

FORECAST



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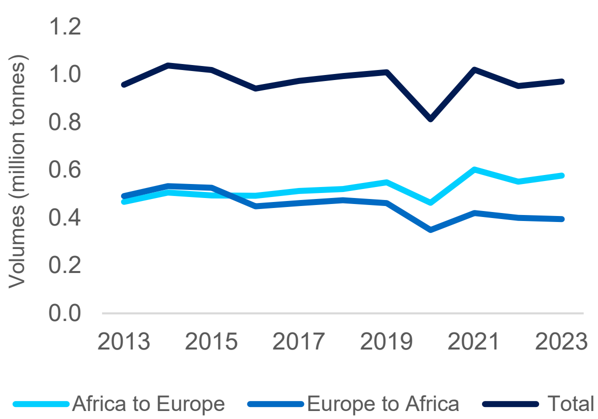
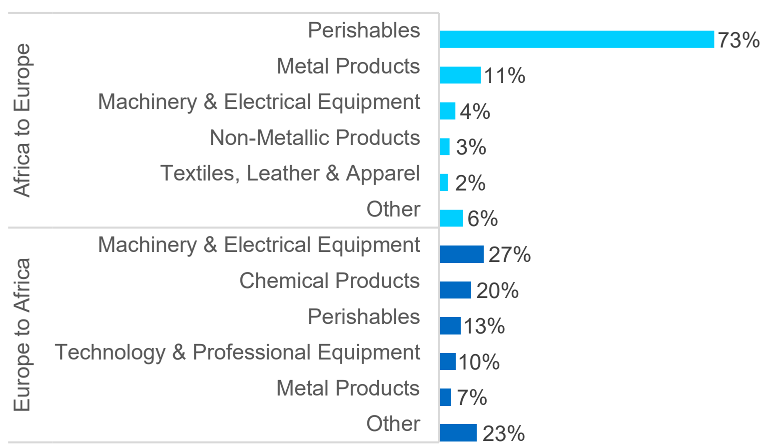


COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Demand for perishables in Europe
- African economic diversification and industrialization
- African demographics and rising consumption

RISKS

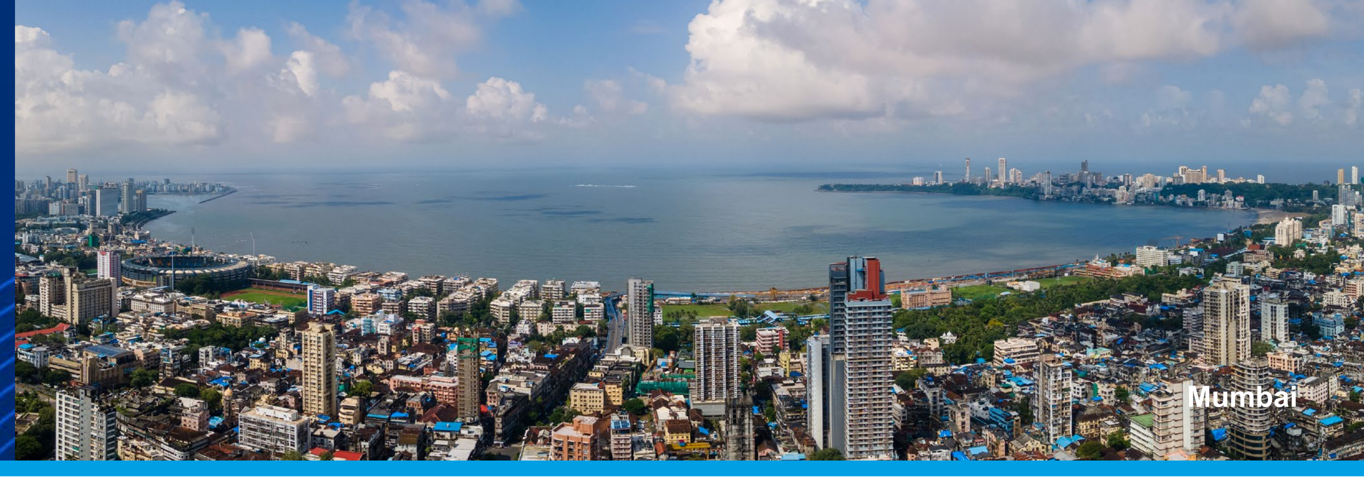
- European initiatives to drastically decarbonize supply chains
- Slow adoption of trade union and air liberalization initiatives
- African transportation infrastructure investment
- Foreign exchange shortages in Africa

South Asia - East Asia

1% Share of global traffic, 2023

2.3% Historical air trade growth, 2013-23

3.9x Volumes in 2043 vs. 2023

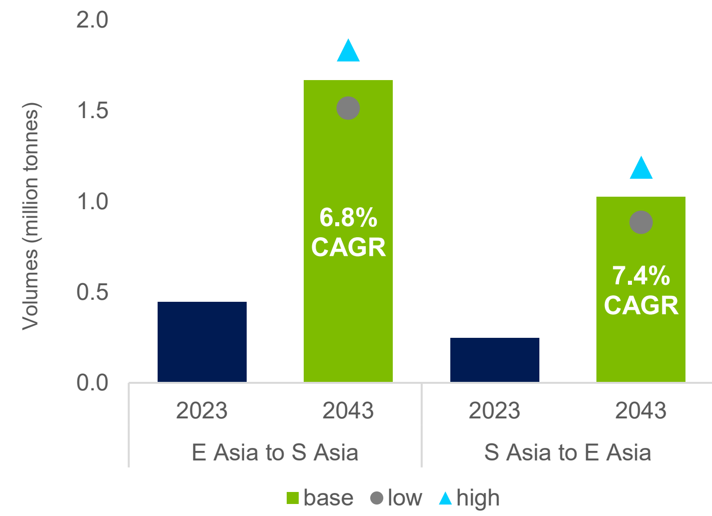


East Asia is South Asia's largest air cargo partner, and traffic between the two generated impressive growth prior to the pandemic. East Asia is a major source of air imports for South Asian markets, including semiconductors used to feed growing electronics manufacturing in India and raw textiles to be sewn into garments in Bangladesh.

India is the largest air cargo market in South Asia and will be the primary driver of its continued growth. India demonstrates how economic development plans can boost air cargo. For example, the country is striving to transform into a hub of advanced manufacturing through its "Make in India" program, which provides incentives for foreign companies to manufacture in India. Targeted industries—such as personal electronics, semiconductors, and automobiles—generate demand for air cargo through their supply chains and exports of finished products. Supply chain diversification throughout the Indo-Pacific will complement India's manufacturing initiatives and accelerate demand for air cargo.

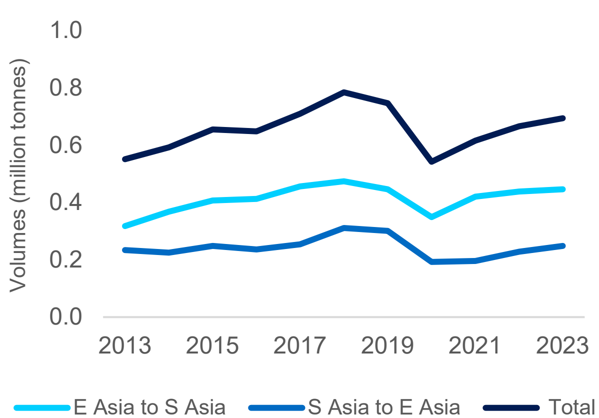
Air cargo between South Asia and East Asia is expected to grow nearly fourfold in volume over the next two decades. Imports from East Asia will remain the larger share of this trade, especially driven by the need to support accelerating e-commerce demand in the region. Expanding manufacturing will lift exports to East Asia, especially as prominent global brands expand production in India and some develop export-oriented products targeted at East Asian markets.

FORECAST

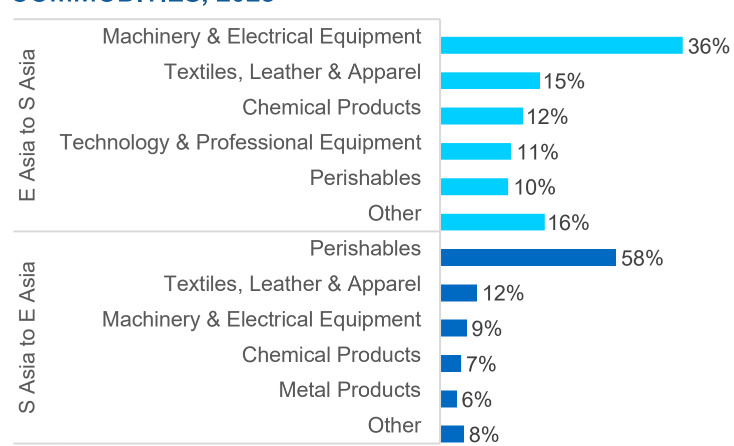


CAGR: Compound Annual Growth Rate

HISTORICAL



COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- Accelerating e-commerce in South Asia
- Manufacturing sector poised for rapid growth
- Supply chain diversification trends
- Strong global demand for fashion industry will boost garment value chain

RISKS

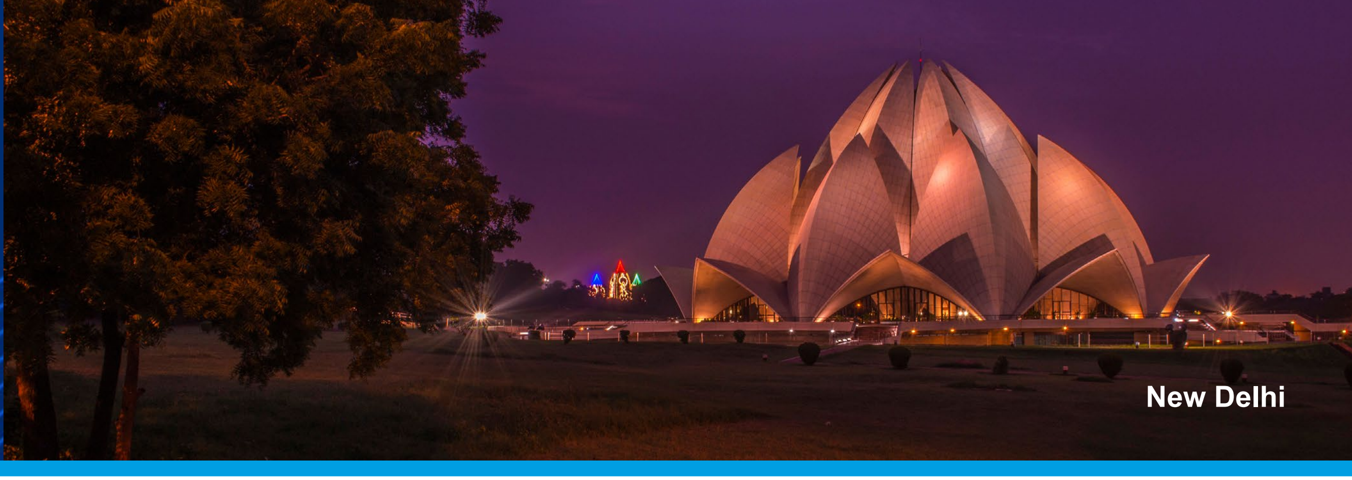
- Sluggish foreign investment could restrain export-oriented manufacturing in South Asia
- Income levels, unemployment, and infrastructure challenges in South Asia
- Political tensions between India and China

South Asia - Europe

1% Share of global traffic, 2023

0.6% Historical air trade growth, 2013-23

2.1x Volumes in 2043 vs. 2023

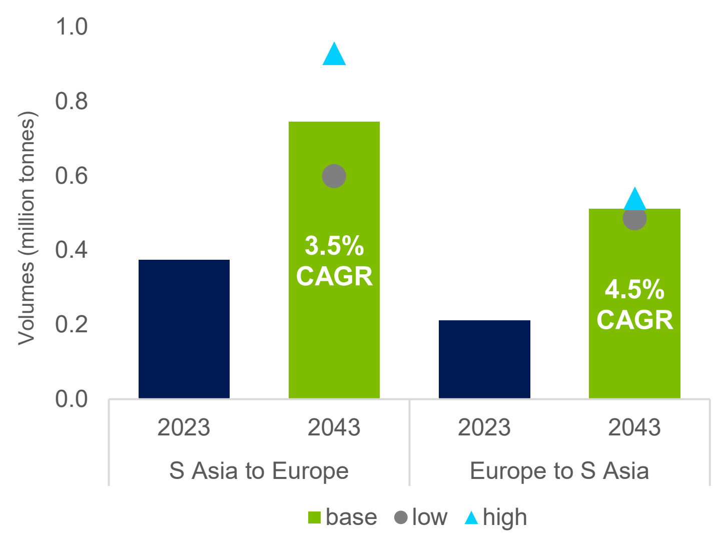


Air cargo between South Asia and Europe has largely recovered from the successive impacts of India's economic slowdown in 2019 and the pandemic. In contrast to the import-heavy trade from East Asia, South Asia's air trade with Europe is mostly westbound exports.

Nearly half of South Asian air exports to Europe are apparel and clothing, reflecting the region's well-established garment industry. Pharmaceuticals are also an important export, particularly from India. The country is one of the world's largest pharmaceutical producers and leads the branded generics market, producing one-fifth of global pharmaceuticals by volume and nearly two-thirds of vaccines. Projected to grow more than tenfold by the country's centenary of independence in 2047, India's pharmaceutical industry will drive demand for air cargo exports. This will be true of both finished products and intermediate goods needed by the rest of the industry, such as active pharmaceutical ingredients.

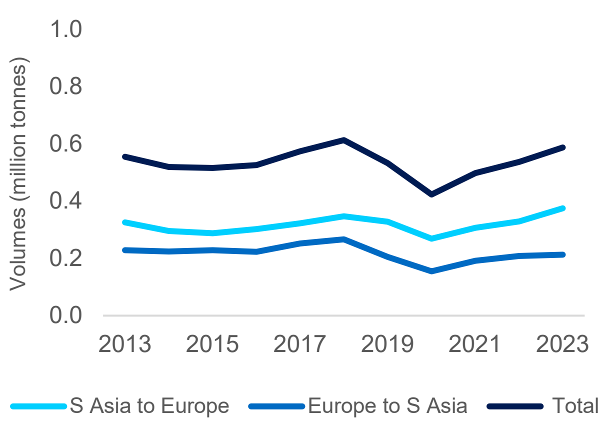
The South Asia–Europe air cargo market will more than double in volume over the coming two decades. South Asia's rapidly growing population and rising household incomes will strengthen demand for imports of European products, while manufacturing will require European-sourced intermediate goods. Economic reforms, competitive production costs, and the imperative to diversify supply chains are making South Asia an increasingly attractive place to do business and will propel air exports as well.

FORECAST

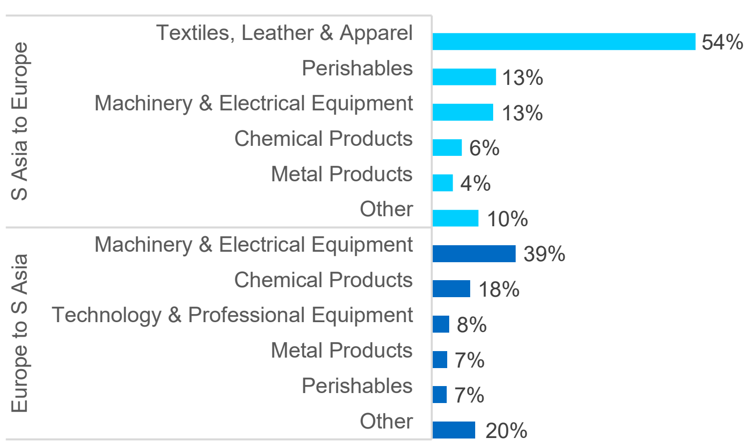


CAGR: Compound Annual Growth Rate

HISTORICAL



COMMODITIES, 2023



Bar length: volumes in tonnes, 2023; Percentages: commodity share of directional flow

DRIVERS

- South Asian economic development and population growth
- Manufacturing growth, especially in advanced commodities
- Pharmaceutical industry growth
- Fashion industry demand boosting garment value chain

RISKS

- Infrastructure challenges, especially in cold chain logistics
- Sluggish foreign investment restraining advanced manufacturing growth in South Asia
- Low incomes and unemployment in developing economies

North America

10% Share of global traffic, 2023

3.5% Historical air trade growth, 2013-23

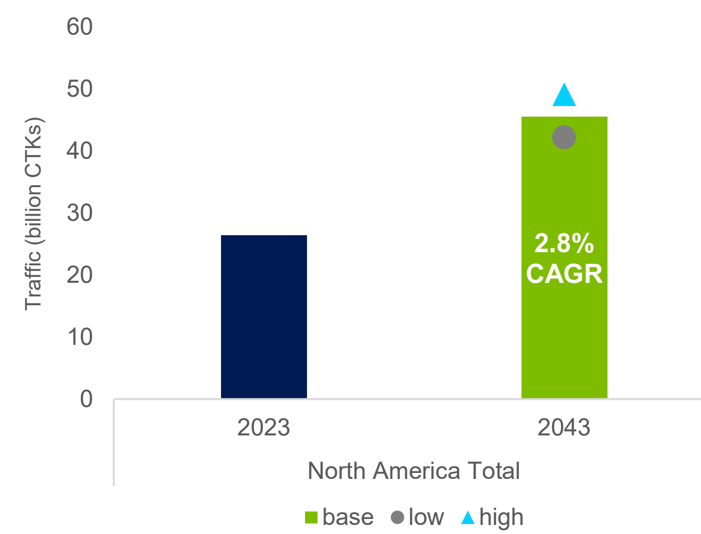
1.7x Volumes in 2043 vs. 2023

North American air cargo is dominated by the domestic U.S. market, which represented over 95% of the region's total traffic in 2023. Though air cargo contributed less than 1% of total transported tonnage within the U.S., its value as a mode of transport—nearly 80 times that of truck transport—is unmatched.

More than 90% of air cargo traffic in this region was moved on freighters in 2023, with express carriers alone accounting for over 70% of traffic. The market has seen above-trend growth in recent years, largely due to a 16% annual increase in U.S. e-commerce from 2017 to 2023. While e-commerce growth is projected to slow to high single-digits, expansion into segments such as healthcare, pharmaceuticals, groceries, and perishables will sustain growth and ensure that e-commerce remains an important driver of air cargo demand.

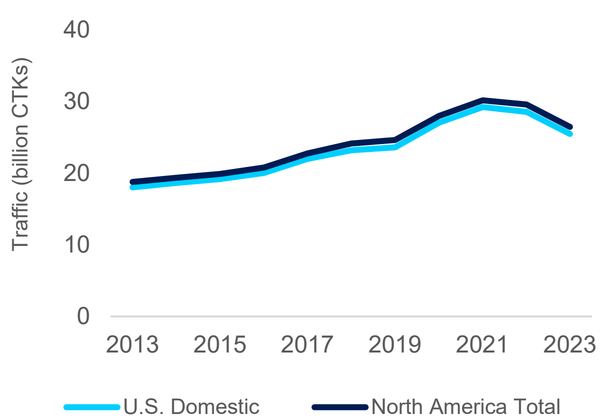
The North American air cargo market is expected to grow at an annual rate of 2.8% over the next 20 years, driven by steady retail growth and continued e-commerce expansion. Weak consumer demand, increasing capability of alternate modes of transport, and realigning consumer preferences of cost vs. speed may require operators to adjust their business strategies. However, the unique value proposition of air cargo in high-priority, time-sensitive, and secure shipments will sustain future growth.

FORECAST



CAGR: Compound Annual Growth Rate

HISTORICAL



U.S. FREIGHT BY MODE, 2023

DRIVERS

- E-commerce growth
- Steady economic growth and consumer demand
- Renewed government focus on infrastructure development

RISKS

- Weakening consumer demand
- E-commerce growth lagging expectations
- Labor availability to support logistics
- Increased competition from alternative transportation modes

Intra-East Asia and Oceania

5% Share of global traffic, 2023

-1.1% Historical air trade growth, 2013-23

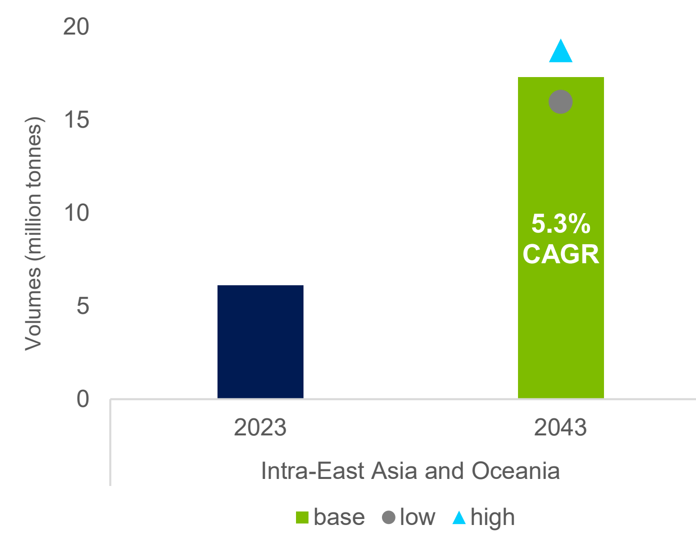
2.8x Volumes in 2043 vs. 2023

Air trade within East Asia and Oceania is closely tied to the East Asia-North America and East Asia-Europe flows. However, geopolitical tensions, the COVID-19 pandemic, and economic uncertainty have hurt intra-regional traffic over the last decade. The market, though, is recovering in 2024 and will return to fast-paced growth in the future.

Industrial machinery, semiconductors, and consumer electronics account for nearly half of all goods carried in the market, highlighting the region's specialization in industrial and electronic sectors. China remains the dominant player due to its immense manufacturing output and is expected to continue to play a crucial role in global supply chains. At the same time, Southeast Asia is poised to grow its market share as its economies mature, private consumption rises, and industrial capabilities expand due to diversifying global supply chains. This trend is already reflected in the increase of Northeast and Southeast Asia's share of regional air exports to the U.S. from 37% in 2017 to 50% in 2023.

As the digital economy in East Asia and Oceania grows, express and e-commerce networks will develop in conjunction. China, Japan, and South Korea represent the largest digital economies in the region, but Southeast Asia is poised to grow the fastest—over 15% annually through 2030—with the Philippines, Vietnam, Thailand, and Indonesia leading growth.

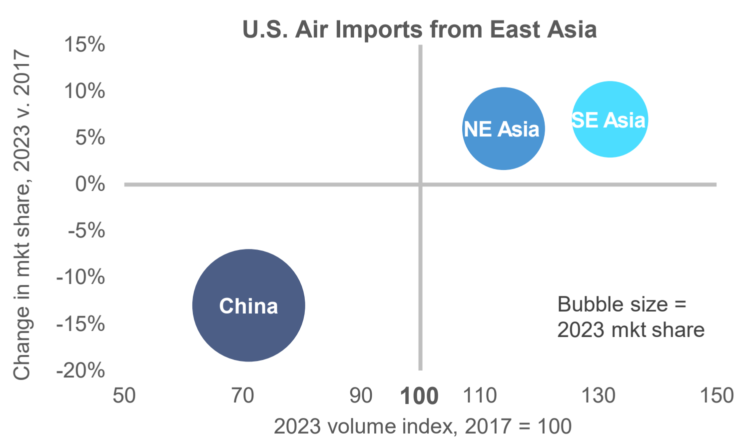
FORECAST



CAGR: Compound Annual Growth Rate

HISTORICAL

SUPPLY CHAIN SHIFTS



DRIVERS

- Growing economies and consumer demand
- Supply chain diversification bolstering industrial capabilities of Southeast Asia
- Increasing regional trade cooperation
- Developing express and e-commerce markets

RISKS

- Geopolitical tensions
- Supply chain disruptions and near-shoring
- Demographic transitions in Northeast Asian countries
- Climate events

Domestic China

3% Share of global traffic, 2023

1.3% Historical air trade growth, 2013-23

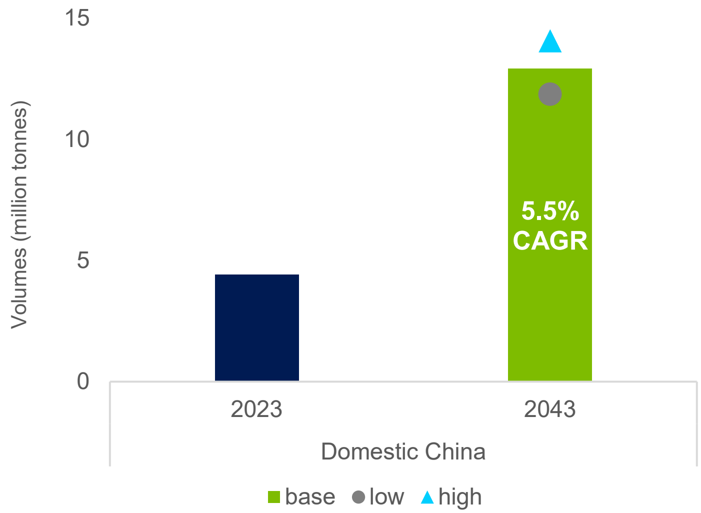
2.9x Volumes in 2043 vs. 2023

China maintained its position as the world's largest manufacturing country for the 14th consecutive year in 2023, accounting for approximately 30% of global manufacturing output, with key industries including apparel, automotive, computing, electronics, and telecommunications. Manufacturing remains a key driver of economic growth, accounting for over 25% of China's total GDP.

Consumer demand in China's rapidly developing cities has become an important stimulus of domestic air cargo growth over the past decade as China shifts to a consumer economy and experiences high e-commerce growth. Over 60% of the Chinese population shops online, resulting in the largest e-commerce market in the world valued at more than $3 trillion in 2023—nearly three times larger than the world's second-largest e-commerce market, the United States. Chinese e-commerce is forecast to grow by over 11% per year, faster than the global average of 9%. This will provide a substantial boost to the domestic air cargo market, particularly in the express segment. Establishment of centrally-located air cargo hubs like the new Ezhou Airport reflect the rising demand for efficient domestic air cargo networks to support this growth.

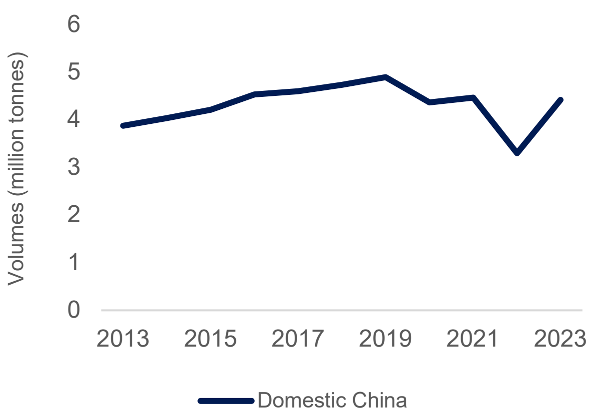
Domestic Chinese air cargo traffic faced significant volatility during the pandemic but is normalizing. The market has grown 5.1% annually over the last two decades and is projected to rise an average of 5.5% per year over the forecast period.

FORECAST

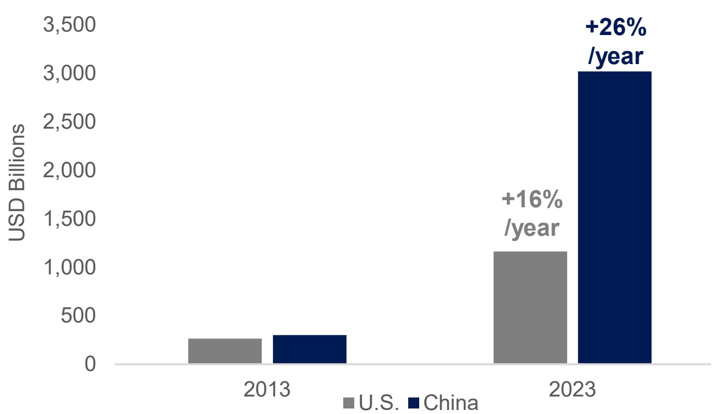


CAGR: Compound Annual Growth Rate

HISTORICAL



ONLINE RETAIL SALES



DRIVERS

- Large online consumer and vendor base
- Widespread adoption of secure digital payment networks
- Expansion of e-commerce into live-streaming and social networking platforms
- Growing domestic supply chains for manufacturing

RISKS

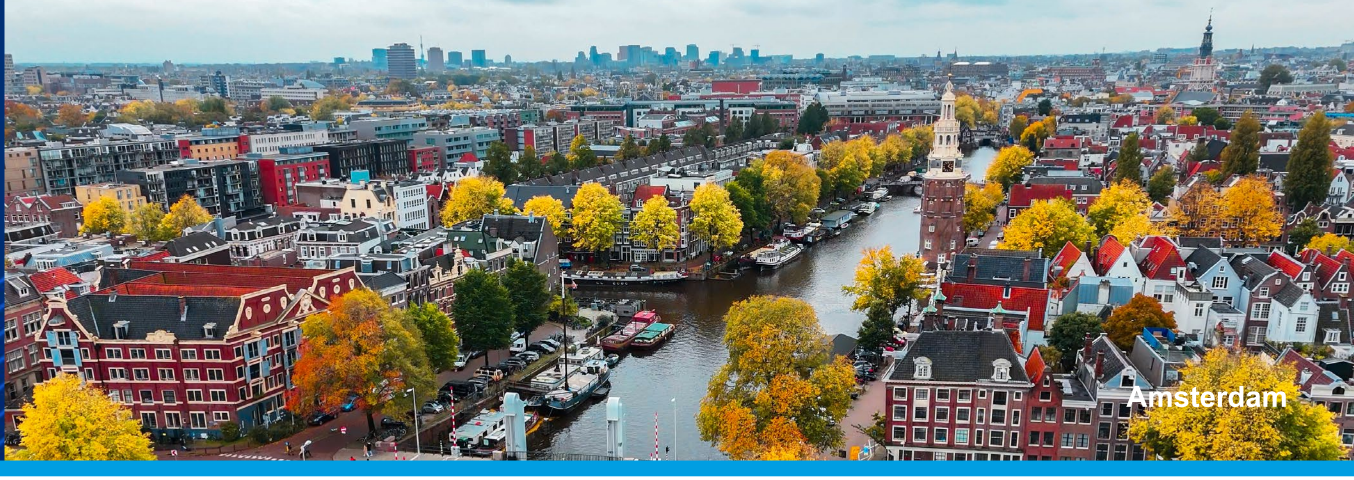
- Economic headwinds
- Continued domestic logistics infrastructure investment required
- Sustainability of e-commerce business models
- Increased competition from alternative transportation modes

Intra-Europe

1% Share of global traffic, 2023

1.8% Historical air trade growth, 2013-23

1.6x Volumes in 2043 vs. 2023



Intra-European air cargo is dominated by express shipments. Integrated express carrier traffic has been the main driver of air cargo growth in this region since the late 1990s and, as such, has accounted for more than half of the region's traffic since 2003.

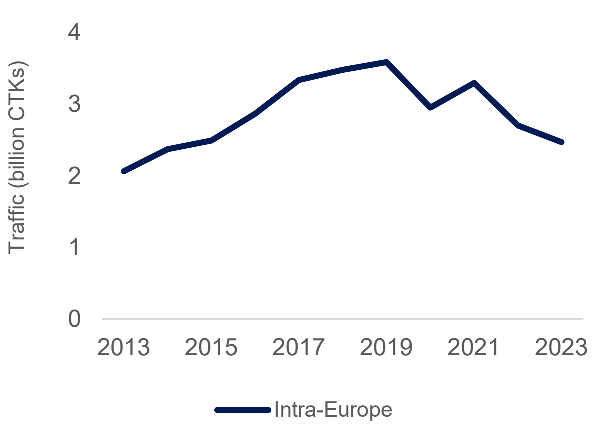
This market has remained highly volatile since the COVID-19 pandemic; in fact, traffic declined nearly 9% year-on-year in 2023 and remains 31% below 2019 levels. High eurozone inflation and uncertainty arising from wars and geopolitical tensions within and directly adjacent to the region have posed further challenges to the market. But despite weak overall performance, pandemic-related shifts in consumer behavior have resulted in express shipment and e-commerce growth since 2019.

Sustainability efforts promoting the development and use of surface transport such as rail or road create competition with air cargo within this region. Furthermore, the rise of nationalism and slower-than-anticipated growth in major European economies may hamper trade. Nevertheless, growing express shipments, normalizing inflation, and expanding consumer and e-commerce markets in Eastern and Southern Europe will support intra-European air cargo growth at an average of 2.3% per year over the next 20 years.

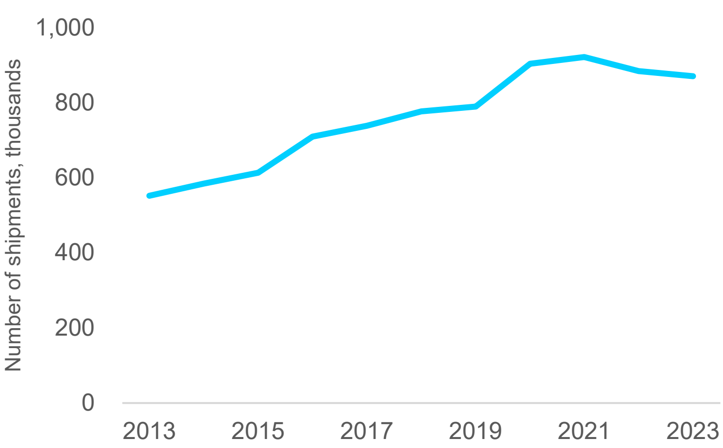
FORECAST

CAGR: Compound Annual Growth Rate

HISTORICAL



AIR EXPRESS SHIPMENTS



DRIVERS

- Express and e-commerce growth
- Expanding Eastern and Southern European economies
- New air cargo networks and operators in Eastern Europe

RISKS

- Slow economic growth in major economies
- High operating cost environment
- Sustainability efforts boosting surface transport competitiveness
- Rising nationalism

Domestic India

<1% Share of global traffic, 2023

7.3% Historical air trade growth, 2013-23

3.9x Volumes in 2043 vs. 2023

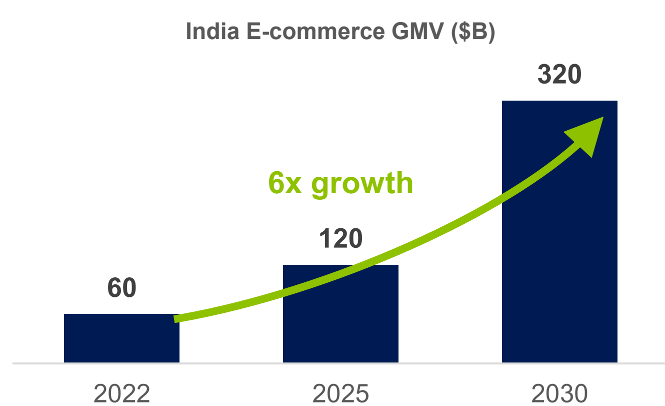
India's domestic air cargo traffic grew significantly prior to the pandemic and recovered quickly. This reflects the strong fundamentals of the Indian market. The country is one of the fastest-growing large economies in the world, rising from the world's 10th largest in 2014 to the fifth largest by 2023. It is projected to become the third largest by the end of this decade. Favorable demographic trends, especially a growing working-age population and improving public health, are priming India for further development.

Rising household incomes, high internet penetration, and widespread smartphone adoption are powering a booming e-commerce market. Although still relatively small in volume compared to established e-commerce markets like China, the U.S., or the EU, Indian e-commerce volumes are growing faster than almost anywhere else at more than 25% per year. In addition to a massive internet user base, the India Stack ecosystem facilitates digital transactions and allows more Indians to make online purchases. Higher household incomes across the board, along with a rising affluent class, will drive explosive e-commerce growth and demand for distribution via domestic air cargo.

Economic growth, expanding manufacturing, and an enormous domestic consumer market will propel a fourfold increase in Indian air cargo over the next 20 years. Growing air cargo will support India's goal to become a developed country by its 2047 centenary of independence, and the government is investing heavily in aviation and cargo infrastructure.

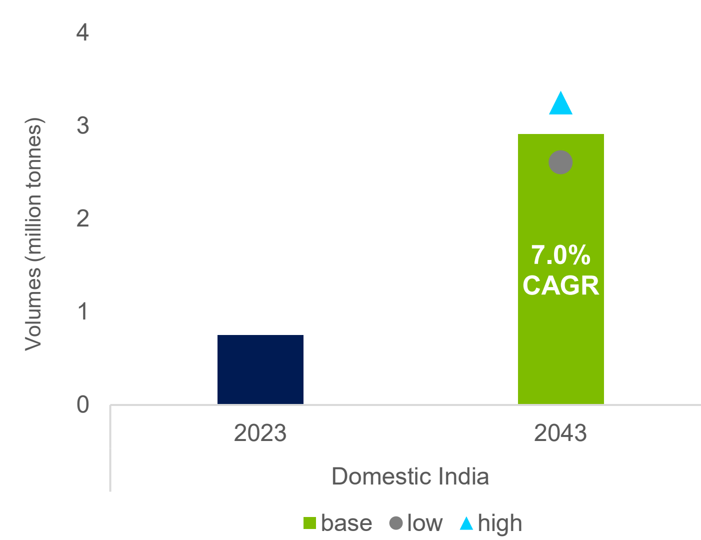
HISTORICAL

PROJECTED E-COMMERCE GROWTH



GMV: Gross Merchandise Value

FORECAST



CAGR: Compound Annual Growth Rate

DRIVERS

- Rapid economic growth and favorable demographics
- Government support for air cargo and infrastructure development
- Large and fast-growing e-commerce market
- "Make in India" bolstering manufacturing growth

RISKS

- Barriers to trade hinder manufacturing growth
- Unevenly developed infrastructure impedes domestic logistics
- Insufficient domestic freighter capacity
- Developing economy facing low incomes, unemployment, and low literacy rates

Freighter Fleet Forecast

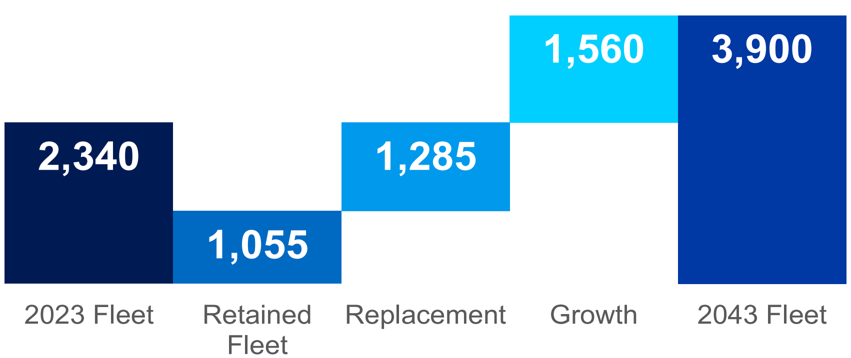
Of the 2,845 freighter deliveries, approximately 45% will replace retiring airplanes, while the remainder will grow the fleet to meet projected traffic growth.

Building on the World Air Cargo Forecast, the Freighter Fleet Forecast translates projected traffic growth into demand for dedicated freighters over the next 20 years. Dedicated freighters typically carry more than half of global air cargo traffic, and we expect this to continue. The fleet forecast categorizes freighters into three segments by payload capacity measured in tonnes. Each segment is also distinguished by its typical share of factory-produced freighters relative to freighters converted from used passenger airplanes.

Standard body freighters offer less than 40 tonnes of payload, are almost all conversions, and have the same fuselage cross-sections as single-aisle airplanes. Medium widebody freighters have 40 to 80 tonnes of payload. They have medium twin-aisle cross-sections and are roughly evenly split between production and converted freighters. Large widebody freighters provide more than 80 tonnes of payload and are derivatives of large twin-aisle passenger airplanes.

Although large freighters have historically come from both factory production and conversion, as was the case with the 747, we forecast that future demand will favor factory-produced freighter models. Carriers value the superior efficiency, lowest unit cost, higher utilization, and greater capability offered by new, factory-build large widebody freighters.

Large widebody freighters account for more than three-quarters of global dedicated freighter capacity Available Cargo Tonne Kilometers (ACTKs), with the remainder split between medium widebody and standard body freighters.



Standard Body	**Medium Widebody**	**Large Widebody**
<40 tonnes	**40-80 tonnes**	**>80 tonnes**
Boeing 727	Boeing 767	Boeing 747
Boeing 737	Boeing DC-10	Boeing 777
Boeing 757	Airbus A300/A310	Boeing MD-11
Boeing MD-80	Airbus A330	Airbus A350
Boeing DC-9	Ilyushin IL-76	Antonov An-124
Airbus A320 Series		Ilyushin IL-96

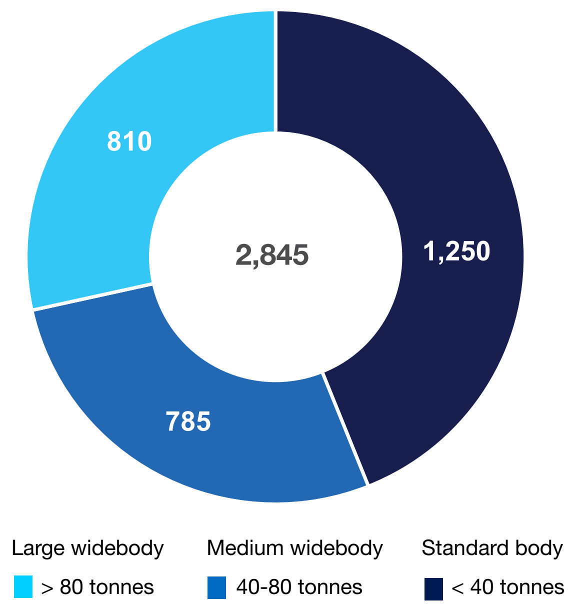
The Freighter Fleet Forecast projects the global freighter fleet to grow by approximately 66% from 2,340 airplanes in 2023 to 3,900 airplanes in 2043.

Freighter deliveries will total 2,845, with roughly two-thirds being converted passenger airplanes. Of those conversions, nearly 70% will be standard body freighters.

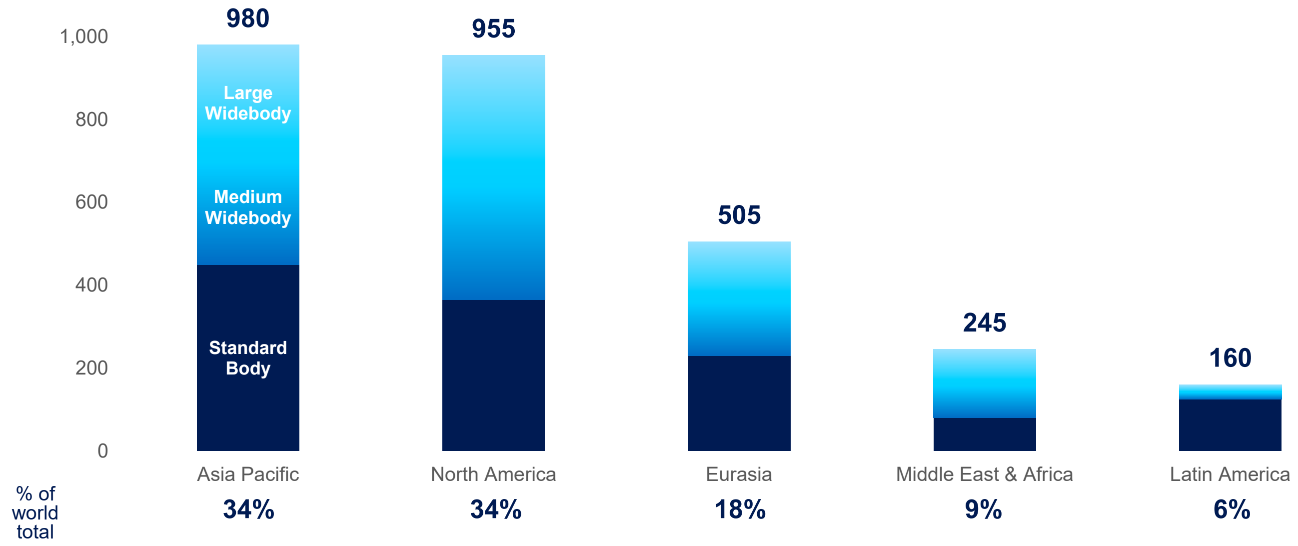
Freighter Fleet Forecast

The Asia Pacific and North American regions will require the most freighter deliveries. Roughly one-third of all freighter demand will come from Asia Pacific carriers—reflecting the expansion of cross-border e-commerce traffic, supply chain diversification, and growing cargo demand within the region. North American carriers will receive another third of projected freighter deliveries, with more than 70% replacing older airplanes.

Deliveries 2024-2043



New and Converted Freighter Deliveries by Region 2024-2043



Eurasia includes Europe, Russia and Central Asia

Methodology and Sourcing

Econometric modeling

Econometric modeling is used for our long-term forecasts to determine the importance of underlying economic factors such as GDP, industrial production, and world trade to historical and future air cargo traffic.

Qualitative evaluation

Qualitative evaluation accounts for unexpected changes in non-econometric growth factors such as geopolitical agreements, evolving supply chains, shifting consumer behaviors, and changes in trade patterns.

Freighter fleet forecast

Boeing's long-term market forecast of demand for dedicated freighters projects the change in the freighter fleet size and composition from the current year to 20 years in the future.

Data represented as historical in this document were compiled from multiple sources, including:

Airports Council International

Association of Asia Pacific Airlines

Boeing Air Cargo Traffic Database

Cirium Diio Mi

Civil Aviation Administration of China

Directorate General of Civil Aviation India

Eurostat

HM Revenue & Customs

International Air Transport Association

International Civil Aviation Organization

S&P Global

U.S. Department of Commerce

U.S. Department of Transportation

The World Air Cargo Forecast is integrated with Boeing's annual Commercial Market Outlook. Find out more: boeing.com/cmo

Glossary

ACTK: Available Cargo Tonne-Kilometer. A metric of freight capacity defined as the weight that can be carried multiplied by the distance flown.

CAGR: Compound Annual Growth Rate.

Cargo: For the purposes of this document, freight, express or airmail.

Chartered operations: The business of reserving aircraft for private transport of goods or passengers.

Combination carrier: A scheduled and chartered commercial operator that carriers both passengers and cargo on revenue flights with a fleet of passenger and freighter aircraft.

CTK: Cargo Tonne-Kilometer. A metric of freight traffic defined as the weight carried multiplied by the distance flown.

Express cargo: Goods which are guaranteed time-definite service. In addition to airport-to-airport transport, such cargo is also offered door-to-door pickup and delivery.

Feedstock: Retired passenger aircraft available for conversion to freighters.

Freight forwarder: A business that manages the shipment of goods from originators to end markets, consumers, or distribution locations.

Nonscheduled operations: Aircraft flights operated as demand warrants rather than on predetermined schedules.

Outsize cargo: Freight too large for standard pallets and often carried by large widebody freighters.

Payload: The portion of an aircraft load that provides revenue.

Scheduled operations: Aircraft flights operated on predetermined schedules.

Sixth Freedom of the Air: The right to transport, via a carrier's home state, passengers or cargo between two other states.

Utilization: The number of hours effectively flown by an airplane in a given unit of time.

REGIONS

Africa: Entire continent of Africa plus Cabo Verde, Comoros, Madagascar, Mauritius, Mayotte, Réunion, São Tomé and Príncipe, and the Seychelles.

East Asia: ASEAN member nations, Australia, China, Hong Kong, Japan, Macau, Mongolia, New Zealand, South Korea, and Taiwan.

Europe: All EU member states plus Albania, Bosnia and Herzegovina, Gibraltar, Iceland, Macedonia, Montenegro, Norway, Serbia, Switzerland, Türkiye, and the United Kingdom.

Latin America: The Caribbean Basin, Central America including Mexico, and South America.

Middle East: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, the Palestinian territories, Qatar, Saudi Arabia, Syria, the United Arab Emirates, and Yemen.

North America: Canada and the United States.

Russia and Central Asia: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

South Asia: Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka.

APPENDIX: Air Cargo Traffic Database

TRAFFIC BY DOMICILE

CTKs in millions

Africa	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	3,045	3,279	3,289	3,395	4,245	4,203	4,406	3,825	5,034	5,401	5,445
Nonscheduled Cargo	98	125	142	139	179	194	210	744	900	891	397
Total	**3,143**	**3,404**	**3,431**	**3,534**	**4,424**	**4,397**	**4,616**	**4,569**	**5,933**	**6,292**	**5,842**

Asia Pacific	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	71,928	77,942	79,679	81,832	88,381	90,688	85,357	69,037	81,163	73,904	80,249
Nonscheduled Cargo	790	590	845	865	360	268	1,020	5,261	6,883	5,924	1,745
Total	**72,718**	**78,532**	**80,525**	**82,696**	**88,740**	**90,956**	**86,378**	**74,298**	**88,046**	**79,829**	**81,994**

Europe	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	42,775	43,691	42,583	44,609	49,430	51,189	51,573	42,768	51,916	48,654	47,991
Nonscheduled Cargo	1,371	1,258	1,299	1,569	2,193	3,705	2,583	3,070	3,770	5,427	5,724
Total	**44,146**	**44,949**	**43,882**	**46,178**	**51,622**	**54,895**	**54,155**	**45,838**	**55,686**	**54,081**	**53,715**

Latin America	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	5,687	5,811	5,893	6,061	6,384	6,966	7,041	6,471	6,004	6,880	7,259
Nonscheduled Cargo	118	98	85	123	215	486	506	136	201	233	328
Total	**5,805**	**5,909**	**5,978**	**6,184**	**6,599**	**7,452**	**7,547**	**6,607**	**6,205**	**7,112**	**7,587**

Middle East	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	22,841	25,211	28,463	30,764	33,638	34,725	32,973	29,640	36,084	31,148	33,139
Nonscheduled Cargo	136	93	123	154	36	34	261	286	228	784	315
Total	**22,978**	**25,304**	**28,586**	**30,918**	**33,674**	**34,759**	**33,234**	**29,925**	**36,313**	**31,932**	**33,454**

North America	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	42,250	44,517	45,263	46,397	50,156	51,789	51,443	45,411	51,360	50,487	46,991
Nonscheduled Cargo	8,884	8,117	8,216	8,651	10,080	12,368	12,890	21,501	25,641	26,068	25,110
Total	**51,134**	**52,634**	**53,479**	**55,048**	**60,236**	**64,157**	**64,334**	**66,913**	**77,001**	**76,555**	**72,102**

APPENDIX: Air Cargo Traffic Database

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CTKs in millions

Russia & Central Asia	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	5,271	5,615	6,149	7,994	9,857	9,710	9,274	8,415	9,637	6,614	5,756
Nonscheduled Cargo	846	823	810	812	1,070	1,282	993	2,815	4,165	1,487	918
Total	**6,117**	**6,439**	**6,959**	**8,806**	**10,928**	**10,992**	**10,267**	**11,230**	**13,802**	**8,101**	**6,675**

South Asia	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	2,629	2,664	2,552	2,453	3,088	3,462	2,695	1,333	1,474	2,399	2,651
Nonscheduled Cargo	0	0	0	0	1	0	0	28	140	184	27
Total	**2,629**	**2,664**	**2,552**	**2,453**	**3,088**	**3,462**	**2,695**	**1,362**	**1,614**	**2,583**	**2,677**

World	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Scheduled Cargo	196,426	208,730	213,872	223,505	245,178	252,733	244,762	206,900	242,672	225,486	229,482
Nonscheduled Cargo	12,244	11,104	11,520	12,313	14,132	18,337	18,464	33,841	41,928	40,998	34,564
Total	**208,670**	**219,834**	**225,392**	**235,818**	**259,311**	**271,070**	**263,226**	**240,741**	**284,600**	**266,484**	**264,046**

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