COMMERCIAL AVIATION 101



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GREG GAYDEN



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INFORMATION SOURCES

All the information you are reading about in this book is open-source, which means that it is all publicly available and accessible to anyone with an Internet connection, even those few folks still plodding along with dial-up. For all the conjecture about the U.S. government classifying "everything" and being overly secretive, it is quite remarkable what information is made public. Between the public websites of federal government agencies, texts of public laws, a smorgasbord of Government Accountability Office reports and public testimony before Congress (which most people probably never read, but I've leaned on somewhat in this book) and other raw statistics, it was a rather simple effort to obtain more than enough information to explain everything in this book.

Internally, TSA is a (somewhat controversially) heavy user of what is called Sensitive Security Information (SSI). SSI is information that, if publicly released, would be detrimental to transportation security, as defined by Federal Regulation 49 C.F.R. Part 1520. Basically, SSI is considered sensitive but not worthy of being classified.

As a category of information, SSI got its start over 50 years ago in the Air Transportation Security Act of 1974 and is primarily used by people who work in transportation security. As SSI information cannot be released to the public, you won't find any of it (airline security programs, detailed TSA screening procedures, etc.) here. SSI material cannot be released to persons without a need to know. 49 CFR 1520 discusses SSI in more depth; however, releasing SSI information to the public is grounds for being assessed a civil fine.

SSI information does not rise to the level of Secret or Top-Secret data, release of which would cause grave damage to the national security of the U.S.

INTRODUCTION

I have been gainfully employed in the aviation security field since joining the Transportation Security Administration (TSA) in September 2002. For nearly 25 years, I have worked as a regulatory inspector in a variety of positions, both in the field (domestically and internationally) and at TSA Headquarters.

I spent several years as a domestic inspector at Dallas/Fort Worth International Airport (DFW), working with both foreign and domestic carriers as well as the airport itself, while carrying out the full range of inspector responsibilities — which are described elsewhere in this book.

In March 2009, I moved to TSA Headquarters near Washington, D.C., where I served as a Regional Security Inspector. I was responsible for overseeing a region that included five Southwestern states (Arizona, California, Hawaii, Nevada, and New Mexico) as well as three Pacific territories (American Samoa, Guam, and Saipan). This area encompassed more than 50 commercial airports and over 100 TSA inspectors. My duties included providing technical guidance on aviation security regulations to stakeholders and industry partners, answering field inspectors' questions, reviewing and drafting new regulations, and contributing to the annual national work plan for inspectors. I also taught new hires at the TSI Basic Training course on occasion.

In June 2012, I returned home to Texas to take a position as an international inspector based in Dallas. Today, I conduct foreign airport assessments and carrier inspections at airports overseas, primarily in Canada, Mexico, and Central America, although I've been further afield more recently to India and the United Arab Emirates.

In my free time, I enjoy airplane spotting and photographing commercial aircraft. I hold an unofficial world record for tail logs, with more than 136,000 to date. My passion for aviation began in childhood, when my father would take me to watch planes at LAX and London

Heathrow — I still vividly remember seeing the Concorde and Pan Am 747s, and the "fever" never left me.

Alongside my TSA career, I publish *Flightline*, a twice-weekly aviation newsletter read by more than 10,000 subscribers.



With nearly 25 years of professional experience and a lifetime of personal interest, I have built a deep knowledge of aviation security and commercial aviation. Over the course of my career, I have worked at or visited more than 75 U.S. airports and approximately 50 airports in over 30 different countries. These experiences have allowed me to observe and learn from a wide variety of practices

around the world. I have documented them here in the hope of sharing useful insights with you.

GREG GAYDEN Fort Worth, Texas

Note: If you are interested, the various topic titles are in a font called Langdon that I found online, took a liking to, and downloaded for free.

PART I: FOUNDATIONS OF AVIATION

INTRODUCTION TO THE COMMERCIAL AVIATION INDUSTRY

We've now gone over some of the basics as far as aviation security and the various programs in place that contribute to that effort. Of course, to be successful in any profession, it is imperative that you have a good knowledge of the industry you are in. With that being said, let's look at the ins and outs of the aviation industry itself - the business side of things.

Have you ever wondered how airports make money or how airlines work out scheduling? What about all the various acronyms and codes that are in use? That's what this section of the book will answer.

The commercial aviation industry is a highly cyclical business characterized by boom-and-bust cycles. The largest airlines today are behemoths that operate hundreds, and in some cases, over 1,000 aircraft. Airlines themselves run far more than flights – entire divisions exist to operate and manage facilities and buildings, among other things. Airlines own fleets of literally thousands of cars and other specialty vehicles, all of which require maintenance and repair. One carrier, Delta, even owns and operates its own oil refinery! Each major airline also has huge divisions devoted to marketing, scheduling, ticketing, acquisitions, human resources, and so on.

We've already discussed various aviation security measures and procedures. Now in the second half of this book we will discuss the commercial aviation industry itself, attempting to give you an idea of its history and how things work.

By no means is this guide an all-inclusive review of every topic in commercial aviation (for example, you probably aren't too concerned with airlines sending out blankets to local laundry services – yes, it does

happen), but hopefully we will cover enough ground to familiarize you with some of the more common subjects within.

Before we get to all that though, let's have a quick review of how the airline industry in the U.S. came to be today. For the first 50 years of its history, the federal government closely regulated the airline industry; it has only been since the late 1970s that airlines have really been subjected, for the most part, to the forces of the open market.

A BRIEF HISTORY OF AVIATION SECURITY

Aviation security has come a long way in our country to where it stands today. Long gone are the days when one could simply drive to the airport and walk onto the plane; of course, the memory of even a humble X-ray and walk-through metal detector can seem quaint now as you stand in a circular device with your arms up and the walls of the machine rotating around your body. I can remember being invited up to the cockpit on British Caledonian flights as a young boy in the 1980s during the long trip from Los Angeles to London; such a thing would not even be considered today with hardened cockpit doors that remain closed for nearly the entire flight.

So how exactly has aviation security evolved over the years, and when did the process we are now familiar with begin to take shape?

The first recorded hijacking of a commercial flight occurred in 1948 on a flight from Macau to Hong Kong. Both pilots were shot and killed, and the aircraft then crashed into a river, killing 25 people.

Now we move to November 1955 and United Flight 629. A 23-year-old man named Jack Graham placed some dynamite in his mother's checked luggage; it detonated during flight, killing his mother along with all 39 passengers and five crew on board of the DC-6. It was later found that Graham had purchased a large life insurance policy on his mother not long before her ill-fated trip. Interestingly, in 1955 there was no federal statute that made it a crime to blow up an aircraft. Graham was instead charged with premediated murder against his mother, found guilty, and was subsequently executed in 1957.

The first attempted hijacking on U.S. soil took place in July 1961 in Chico, California. A man shot two airline employees as he attempted to hijack a Pacific Airlines flight before being subdued by passengers.

UNITED STATES DEPARTMENT OF JUSTICE

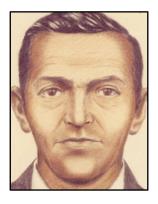
\$10,000 REWARD \$10,000 HIJACKING OF AIRLINERS

The Attorney General of the United States hereby offers a reward of Ten Thousand Dollars (\$10,000.00) for information leading to the arrest and conviction of anyone for violating any federal statute in any actual, attempted, or planned hijacking of aircraft.

As used in this offer, "hijacking" means the use of force, threats, or other means in illegally obtaining control of an aircraft of United States registry, or of any aircraft while in or over United States territory, for purposes which include the unauthorized removal of such aircraft from the United States or the unauthorized prevention of its return to the United States. This offer is made pursuant to Title 18, United States Code, section 3059.

Anyone having any information which he or she believes may be of the kind described above should give such information promptly to the nearest office of the Federal Bureau of Investigation.

August 4, 1961 at Washington, D. C. That same year, President Kennedy ordered the first armed guards to be placed on commercial aircraft. Throughout the 1960s as metal detectors began to be installed in airports, there were several hijackings of commercial aircraft; in 1968 alone, there were 82 aircraft hijackings, the most ever recorded in a single year in the history of civil aviation.



1971 saw the infamous D.B. Cooper incident onboard a Northwest Orient Boeing 727. A man identified as "Dan Cooper" bought a ticket for Flight 305 from Portland, Oregon to Seattle. Once the flight was underway, Cooper passed a note to a flight attendant stating he had a bomb. Cooper demanded the aircraft land in Seattle, where he was to be given \$200,000 in cash as well as a few parachutes. (Left: Sketch of D.B. Cooper)

After the aircraft landed in Seattle, Cooper released all the passengers except for the flight deck crew and one flight attendant. After the aircraft was refueled and airborne again, he directed the crew to fly towards Reno, Nevada.

Approximately 30 minutes into the flight, Cooper released the rear air stairs of the aircraft and parachuted with the money out of the aircraft he was never seen again. The case is one of the most celebrated robberies of all time; it was only in July 2016 that the Federal Bureau of Investigation (FBI) announced that they would no longer continue to actively pursue the only unsolved act of air piracy in American aviation history.

Physical passenger screening was introduced in 1972, as the Federal Aviation Administration (FAA) ordered that all passengers and their carry-on baggage be screened by metal detectors or hand.

In 1973, a violent incident transpired in Rome when Palestinian terrorists opened fire and hurled bombs onto a Pan Am aircraft, killing 30.

On November 15, 1979, Ted Kaczynski, also known as the "Unabomber," attempted to destroy American Airlines Flight 444, a Boeing 727 flying from Chicago to Washington, DC. Kaczynski's improvised explosive device (IED) consisted of a detonator made from triacetone triperoxide (TATP) and a main charge using ammonium nitrate. The device was contained within a small wooden crate, covered by cardboard and brown paper; a 7.5 inch by 4-inch diameter metal can, four "C" cell batteries, a barometric pressure switch, and a "loop" switch. The bomb failed to detonate because it contained barium nitrate, a powder often used to create green smoke in fireworks, not explosive powder. The device burned in the cargo compartment causing the aircraft to make an emergency landing at Washington Dulles. due to dense, green, smoke.

In 1985, Lebanese terrorists hijacked a Trans World Airlines (TWA) flight from Athens to Rome. The saga ended after 17 days and the murder of a passenger - a U.S. Navy diver. Subsequently, Federal Air Marshals were set up as a permanent workforce and begin flying on international flights.

As an additional action after this incident, Congress mandated that the U.S. government (originally via the FAA but now TSA) conduct regular assessments of security measures at foreign airports that serve the U.S. We will learn about those assessments later in this book.

On December 21, 1988, Libyan government agent Abdel Basset Ali al-Megrahi placed a bomb on an Air Malta flight that was subsequently transferred to Pan American Airlines Flight 103, a Boeing 747-100 flying from London to New York City. The IED consisted of a modified Toshiba stereo radio cassette recorder, containing an explosive charge, an altimeter arming mechanism, an electronic time delay, and a commercial detonator, all placed inside a Samsonite suitcase that was processed as a checked bag. The resulting explosion caused the aircraft to break apart in flight falling over an 848 square mile area. The plane's wings, along with tanks carrying 100 tons of jet fuel, plummeted into Lockerbie, Scotland, creating an inferno and a crater more than 150 feet deep that registered miles away as a seismic event. The explosion resulted in the loss of 270 lives (259 passengers and crew of Pan Am Flight 103 and 11 citizens of Lockerbie).

The principle of positive passenger bag match (PPBM) came into fruition after this incident, and nearly all checked baggage that was on board an international flight had to belong to a passenger who was also on board the aircraft. It bears noting that PPBM is not currently a requirement for all flights.



(Above: The remains of Pan Am 103.)

While the Bojinka plot of 1995 was thankfully foiled it was instructive in many regards. Ramzi Yousef placed a device on board Philippine Airlines Flight 434, a Boeing 747 flying from Cebu, Philippines to Tokyo, Japan. The device consisted of a Casio DB-61 Databank wristwatch timer, a contact lens solution bottle filled with a homemade explosive main charge, two 9-volt batteries, and a pilot lamp wrapped with guncotton within a small cardboard tube made from an airline ticket to create a TATP detonator. The device exploded in-flight killing one passenger and injuring six others. This was a test run for attacks planned for January 1995 to destroy twelve trans-Pacific U.S. flagged airline flights in a 24-hour period. The plot was discovered and disrupted in Manila, Philippines. The terrorists referred to this plot as "Operation Bojinka." Yousef was the nephew of Khalid Sheikh

Mohammad, the mastermind of the 9/11 attacks on the World Trade Center and the Richard Reid shoe bomb attack.

Yousef was later apprehended in February 1995 in Pakistan and is currently serving life without the possibility of parole at a federal Supermax prison in Colorado.

In 1998, the Computer Assisted Passenger Prescreening System (CAPPS) began operations. CAPPS was the first system that designated passengers who were thought to need additional screening as selectee passengers.

Sadly, September 11, 2001, needs little further explanation; a band of 19 Al Qaeda terrorists hijacked four U.S. aircraft and proceeded to crash them into the World Trade Center towers in New York City, the Pentagon in Arlington, Virginia, and a field in Pennsylvania. Nearly 3,000 people were killed on the day that forever changed the landscape of aviation security at large.

On November 19, 2001, the Aviation and Transportation Security Act (ATSA) was signed into law. ATSA removed private screeners and gave the federal government full responsibility for security screening at U.S. airports with the creation of TSA.



December 22, 2001, witnessed the failed attempt of 'shoe bomber' Richard Reid to ignite C-4 explosives hidden in his shoes on an American Airlines Boeing 767 flight from Paris to Miami. The device consisted of an improvised TATP blasting cap and a PETN-based plastic explosive. Other components included a hiking shoe, detonating cord, and matches. The device failed to detonate, and passengers and crew members

subdued and restrained Reid until the plane was able to land safely. Largely because of this attempt, passengers have subsequently been required to remove their shoes while passing through security checkpoints at U.S. airport.

In June 2002, TSA began deploying explosives detection systems (EDS) to more than 400 airports in the U.S. as part of a mandate to screen 100 percent of all checked baggage using EDS systems.

By April 2003, all air carriers had met new requirements to reinforce cockpit doors on commercial aircraft to protect from intrusion, small-arms fire and fragmentation devices such as grenades

August 9, 2006, saw the liquid bomb plot. Twenty-four people were arrested while planning to bomb up to 10 airliners scheduled to fly from London to the United States. British police had been observing the plot evolve for months and the investigation reached a critical point on the night of August 9, 2006. Their devices consisted of detonators made with TATP and concentrated hydrogen peroxide mixed with Tang as a main charge. The devices were concealed in sports drink bottles and used batteries from disposable cameras to initiate the homemade detonators that were contained in AA battery cases. The plot was discovered and interrupted and none of the devices were brought on board any aircraft. The flights targeted were based on reports found on a USB drive

By March 2008, TSA was deploying canines to aid in the screening of 100 percent of all air cargo that is loaded onto passenger aircraft.



On December 25, 2009, the so called "underwear bomber," Umar Farouk Abdulmutallab, attempted to detonate a concealed explosive while on board a Delta Air Lines flight from Amsterdam to Detroit. The device consisted of a chemical initiator and a powdered main charge explosive consisting of PETN. Other components included modified underwear and a syringe containing the initiating chemicals. The device caused a brief fire but failed

to detonate, and Abdulmutallab was subdued by passengers and crew. This event caused, among other changes, TSA to seek new avenues beyond the No-Fly and Selectee lists to mitigate risks presented by unknown passengers.

June 2010 saw TSA's Secure Flight Program providing pre-screening for 100 percent all covered flights to, from, and within the U.S. 100 percent of all cargo on domestic passenger aircraft was required to be screened by August 2010; all cargo traveling on foreign passenger aircraft traveling to or from the U.S. was required to be screened by August 2013.

On October 29, 2010, an attempted air cargo bomb plot was foiled. Individuals from Yemen with ties to Al-Qaeda attempted to ship two IEDs, hidden in laser printers, to the United States. The devices were found on separate cargo planes from Yemen due to a tip from a Saudi Arabian intelligence official during stopovers in the U.K. and the United Arab Emirates. Each package contained a Hewlett-Packard HP LaserJet P2055 desktop laser printer. Inside each printer's toner cartridge was a sophisticated bomb. The devices consisted of improvised detonators and powdered PETN main charge explosives hidden within the cartridges. Each bomb was triggered by a cell phone alarm, which activated a phone battery to send power through a thin wire filament inside a syringe containing five grams of lead azide, a powerful chemical initiator. Once hot, the lead azide would ignite, causing the PETN to detonate. The device's wiring was artfully concealed so that all the printer components would appear to be correct if the device was X-rayed.

In June 2017 TSA added new procedures that required enhanced screening for electronics and more thorough passenger vetting at foreign airports that fly directly to the U.S. One month later, TSA issued new screening procedures for carry-on items that required travelers to place all electronics larger than a cell phone in bins for x-ray screening at U.S. airports.

Lest you think that threats to the commercial aviation system have been rendered totally moot - in July 2017 a terrorist group shipped partially assembled components of a bomb from Turkey to Australia with plans to detonate the assembled device on a passenger flight.

Over the years, plots and threats will continuously evolve and change. It is incumbent upon all individuals who work in the aviation security field to adapt quickly and precisely to meet these emerging dangers.

JET ENGINES: HOW THEY WORK



Modern jet engines work by compressing incoming air, mixing it with fuel, and igniting the mixture to produce high-energy exhaust gases. These gases pass through turbines that drive the compressor and are expelled to generate thrust. Variations

like turbofan engines enhance efficiency by combining core engine thrust with additional bypass air thrust. Technological advancements in materials, aerodynamics, and noise reduction further improve the performance and environmental impact of these engines.

Here's a detailed explanation of how these components work together to generate thrust:

Air Intake

The air intake directs incoming air into the engine. As the aircraft moves forward, air is drawn into the engine through the intake. The design of the intake helps to slow down and manage the airflow entering the engine.

Compressor

The compressor compresses the incoming air to increase its pressure. It is comprised of multiple stages of rotating blades (rotors) and stationary blades (stators). As air passes through the compressor stages, it is compressed to a fraction of its original volume, significantly increasing its pressure and temperature. This high-pressure air is essential for efficient combustion.

Combustion Chamber

The combustion chamber burns the fuel-air mixture to produce highenergy exhaust gases. The compressed air enters the combustion chamber, where it is mixed with fuel and ignited. The combustion process rapidly increases the temperature and energy of the air, turning it into high-energy exhaust gases.

Turbine

The turbine extracts energy from the high-energy exhaust gases to power the compressor and other engine systems. Like the compressor, the turbine consists of multiple stages of rotors and stators. The high-energy exhaust gases pass through the turbine stages, causing the turbine blades to spin. This rotational energy drives the compressor via a connecting shaft, maintaining the continuous cycle of air compression and combustion.

Exhaust

After passing through the turbine, the exhaust gases are expelled out of the engine through the nozzle. The acceleration of these gases out of the nozzle creates a high-speed jet stream, generating thrust according to Newton's third law of motion (for every action, there is an equal and opposite reaction).

Turbofan Engine

The most common type of jet engine in modern commercial aviation. Components: Features a large fan at the front of the engine, which bypasses a significant portion of air around the core engine.

Thrust Production: Combines thrust from the high-speed exhaust gases with additional thrust generated by the bypassed air, making it more efficient and quieter than turbojets.

Efficiency and Performance Enhancements

Modern jet engines incorporate several advanced technologies to enhance efficiency, performance, and environmental impact:

Turbofan engines with high-bypass ratios (more air bypassing the core) improve fuel efficiency and reduce noise. The use of lightweight, heat-resistant materials such as composite materials and advanced alloys to withstand high temperatures and reduce engine weight. blade shapes and engine nacelle designs to reduce drag and improve airflow, while the incorporation of noise-reducing features such as chevrons on engine nozzles and acoustic liners within the nacelles.

Did You Know? The CFM 56 turbofan is the best-selling engine in the world, with over 33,000 being sold since it entered revenue service in 1982. Its successor, the CFM LEAP engine, powers Airbus A320neo and Boeing 737 MAX aircraft. The LEAP has already delivered several thousand engines and has a backlog of over 10,000 to be delivered.

AIRCRAFT MODEL TYPES

Every aircraft made by Airbus and Boeing has its own model number, although most passengers are more familiar with the series number. For example, you may be aware that you are flying on a Boeing 737-800 but not realize that the model is a 737-8H4 if you are on a Southwest aircraft and a 737-823 if you are flying on American. So what is the difference?

Not very much.

Historically, Boeing affixed unique customer codes to all its commercial aircraft from the 707 through the 777. The 787 is the first Boeing model not to use customer codes, and the practice ended across Boeing's entire commercial aircraft range from January 2017. The truth is that the only people who typically realize and understand the customer codes are aviation aficionados or nerds.

Previously, the customer codes ended up on every model of aircraft an airline will buy from Boeing. Delta Air Lines has a customer code of 32, which meant that their 737-800s will be 737-832s, while their 757-200s will be 757-232s, and so on. The codes do not change when the aircraft goes to a different operator. As Boeing ended the practice, all aircraft will simply be referred to as 737-800s, 777-300s and so on, including on the FAA certificates.

Airbus has employed a different system in annotating the model of their aircraft, using technical specifications rather than a customer code assigned to an individual airline. With this system, many airlines may end up operating the same model number aircraft. Airbus denotes their aircraft by three categories: version, engine manufacturer and engine type. So, for example, an Airbus A319-112 will be a 100 series aircraft, with engines manufactured by CFM International with 23,500 pounds of thrust.

AIRCRAFT ABBREVIATIONS

When reviewing schedules, you are most likely going to come across aircraft abbreviations. Here is an example of what I am talking about:

WN334 MCI0920 – 1310LGA 738 D WN333 MCI1630 – 2020LGA 7M8 D

We've already learned how to read an airline schedule, but now we have some abbreviations to discuss: 738 and 7M8 in this case. 738 means the aircraft is a Boeing 737-800, while 7M8 means it is a Boeing 737 MAX 8. So, how on earth are you to figure out what all these codes stand for?

ICAO defines these aircraft designator codes, and if you are interested, they are published in ICAO Document 8643 – Aircraft Type Designators. However, to add confusion, the ICAO codes are mostly used by air traffic control and flight planning departments. So, when you are booking flights online, you are most likely to come across the IATA codes, and that is what we have on the next few pages.

Code	Aircraft	Code	Aircraft
319	Airbus A319	752	Boeing 757-200
320	Airbus A320	753	Boeing 757-300
321	Airbus A321	757	Boeing 757 all pax models
31N	Airbus A319neo	75F	Boeing 757 Freighter
32N	Airbus A320neo	763	Boeing 767-300
32Q	Airbus A321neo	764	Boeing 767-400
330	Airbus A330 all models	767	Boeing 767 all pax models
332	Airbus A330-200	76F	Boeing 767 all Freighter models
333	Airbus A330-300	76X	Boeing 767-200 Freighter
338	Airbus A330-800neo	76Y	Boeing 767-300 Freighter
339	Airbus A330-900neo	77L	Boeing 777-200 LR
340	Airbus A340 all models	772	Boeing 777-200
343	Airbus A340-300	773, 77W	Boeing 777-300
345	Airbus A340-500	778	Boeing 777-8
346	Airbus A340-600	779	Boeing 777-9
359	Airbus A350-900	77F	Boeing 777/Freighter
351, 35K	Airbus A350-1000	788	Boeing 787-8
388	Airbus A380	789	Boeing 787-9
712, 717	Boeing 717	781, 78K	Boeing 787-10
73G, 73W	Boeing 737-700	73G, 73W	Boeing 737-700 pax
738, 73H	Boeing 737-800	787	Boeing 787 all pax models
739	Boeing 737-900	221, BCS1	Airbus A220-100
73F	Boeing 737 all Freighter models	223, BCS3	Airbus A220-200
7M7	Boeing 737 MAX 7	CR2	Canadair Regional Jet 200
7M8	Boeing 737 MAX 8	CR5	Canadair Regional Jet 500
7M9	Boeing 737 MAX 9	CR7	Canadair Regional Jet 550/700
744	Boeing 747-400	CR9	Canadair Regional Jet 900
747	Boeing 747 all pax models	ER3, ER4, ERD	Embraer ERJ-135, 140, 145
748	Boeing 747-800	ERJ	Embraer RJ135 / RJ140 / RJ145
74E	Boeing 747-400 Combi	E70, E75	Embraer 170
74F	Boeing 747 all Freighter models	E90, E95	Embraer 190
74Y	Boeing 747-400 Freighter	EMJ	Embraer 170/190
M1F	McDonnell Douglas MD11/F	290, 295	Embraer E190 2nd Gen.

AIRCRAFT ACRONYMS

Perhaps you've seen an article that mentions a recent order for aircraft and states either *ceo* or *neo*. CEO means "current engine option" while NEO means "new engine option." NEOs are next generation aircraft with engines that will be more efficient.

Some other common initials rather than acronyms you may run across are ER, LR, and F. ER means Extended Range, LR means Long Range, and F means freighter. Airbus has created XWB to stand for "Extra-Wide Body" as well in recent years, although it is mainly a marketing term rather than representing any vastly greater size over any comparable aircraft.

AIRPLANE DIAGRAM



Unless you've been in and around the aviation industry for some time, there is a good chance that you aren't totally familiar with the various bits and pieces of an aircraft. For example, did you know that commercial aircraft tires are typically inflated anywhere from 180 – 200 psi? The above diagram (featuring a Boeing 787-8) breaks down some of the most important parts on the exterior of an airplane.

Now you can't see them on this photo, but up near the front of the aircraft's nose are several other metal prongs, which are known as pitot tubes. Pitot tubes are used to measure air speed and are very sensitive pieces of equipment. *Don't ever touch these!*

Wait; there are engines *and* nacelles? What is all that? Quite simply, the nacelles are the protective housing for the engine. You may also see the nacelles slide open during landing to assist in the braking process.

AIRLINE CODES

Airlines are given short-hand codes to designate them in schedules. The International Air Transport Association (IATA) uses a two-character code, while the International Civil Aviation Organization (ICAO) uses a three-character code. To make things even more confusing, both the FAA and TSA bypass these well- known standards entirely and use a four-character code established by the FAA!

Both the IATA codes, which were based on the ICAO codes, and the ICAO codes themselves debuted in 1947. The IATA two-character codes are by far more prevalent, and you will see them when Googling a flight or when listed on any schedule. For example, BA193 would represent British Airways Flight 193.

Did You Know? After an airline goes out of business, IATA can make its two-character code available for reuse after a six-month period. The re-issue is called a "controlled duplicate" and is given to airlines whose destinations are not likely to overlap. Examples: MX is given to Breeze Airways, but years ago it belonged to the original Mexicana Airlines. Air Canada Rouge uses RV currently, but in the past that code belonged to three other carriers.

AIRPORT CODES

Let's talk a bit about the three-letter airport codes and how many of them came to be. Officially, the three-letter codes are called IATA Location Identifiers. In the very early days of flight, airplanes landed at any flat field with a decent wind. The National Weather Service (NWS) took weather reports from cities around the U.S. and used a two-letter code to identify these. Early on, airlines and airfields basically used these codes, but as the industry expanded, cities that didn't have a NWS station got into the mix, thus, the three-letter code was born.

Some cities simply added an X at the end of their current weatherstation code, hence LAX for Los Angeles, PDX for Portland and so-on. Other airports simply took the first three letters of the city name, hence ATL is Atlanta, BOS is Boston, etc. Overseas, Madrid took MAD, Sydney took SYD in the same manner. Airports for multiple cities ended up taking the initials of each, such as DFW for Dallas/Fort Worth and MSP for Minneapolis/St. Paul.

The U.S. Navy kept the letter N for its uses. Similarly, W and K codes were kept by the Federal Communications Committee (FCC) and used by radio stations, with W generally being kept west of the Mississippi River and K east of the Mississippi. This is why you don't see airport codes starting with K, N, or W, and how Newark became EWR and Kansas City ended up as MCI.

Q and Z have also been kept for other uses and our friends in Canada made off with all the Y codes for themselves.

Of course, some airports have codes that seemingly have no relation to the city. Chicago O'Hare is ORD, named for an old airstrip north of Chicago named Orchard Field. Other airports have ended up with somewhat unfortunate codes... In California, the Fresno Air Terminal is FAT while Sioux City, Iowa is SUX.

Finally, worldwide air traffic control and weather agencies use a fourletter ICAO identifier for airports, but that's a whole separate topic and one you won't come across very often.

Did You Know? The first and second letters or second and third letters of an identifier may not be duplicated from an airport within 200 nautical miles. This is why you have DCA for Washington National and IAD for Washington Dulles; the original DIA for Dulles was confusing with DCA nearby.

Did You Know? Three-letter codes can be recycled after one year. If an airport closes or changes its code, the old code can be used by another airport after a year. New York Kennedy is JFK, but originally it was known as Idlewild Airport (IDL). IDL is now used by Indianola, Mississippi.

CALL SIGNS

Call signs or telephony designators are used by airlines to identify themselves to air traffic control; "American 61" is American Airlines Flight 61. Of course, the call sign is not necessarily the same name as the airline itself. British Airways' call sign is *Speedbird*, while Endeavor Air's is *Flagship*. So in this case, you would hear "Flagship 3719" to describe Endeavor Air Flight 3719.

Did You Know? Aircraft with a gross take-off weight of over 300,000 pounds (basically, any wide-body) will add the word "heavy" to the end of their call sign: "American 61 Heavy." This is done to indicate that the aircraft may cause significant wake turbulence. The "heavy" designator is mainly used in the U.S.

Did You Know? The Airbus A380 is the only passenger aircraft that uses the term "super" rather than heavy: "Qantas 7 Super."

AIRCRAFT MAINTENANCE CHECKS

Just like cars or any other mechanical device, aircraft need standard and heavy maintenance to keep them up and running. For commercial aircraft, four distinct checks are performed: A check, B check, C check, and D check, with the complexity of each check rising from A to D. What are the differences then?

A check

The A Check is primarily a preventive maintenance procedure. It is designed to identify and address any minor issues before they develop into more significant problems, ensuring that the aircraft remains safe and operationally efficient.

A Checks are performed at regular intervals, typically every 400 to 600 flight hours or around 200 to 300 flight cycles (a flight cycle being one takeoff and landing). The exact interval can vary depending on the aircraft type and the operator's maintenance program, which is approved by aviation regulatory authorities (e.g., the FAA in the United States or EASA in Europe).

Visual inspections, functional checks, fluid checks and top ups, filter replacements, tire and brake inspections, and minor repairs are typically completed during an A check.

An A Check is relatively quick compared to other maintenance checks. It usually takes between 6 to 24 hours to complete, depending on the size of the aircraft and the extent of the work required. This allows airlines to perform A Checks overnight or during short layovers, minimizing the aircraft's downtime.

A Checks can be performed at the airline's maintenance base or at a certified maintenance facility. Some airlines also perform A Checks at outstations or during layovers at various airports, depending on their operational requirements and the capabilities of the maintenance teams.

B check

A "B Check" in commercial aviation is a scheduled maintenance inspection that is more comprehensive than an A Check but less extensive than a C Check. It is part of an airline's regular maintenance program, designed to ensure the continued safety, reliability, and airworthiness of the aircraft.

The B Check is aimed at identifying and correcting any potential issues that could affect the aircraft's performance, safety, or compliance with regulatory standards. It serves as a more detailed follow-up to the A Check, covering additional systems and components that require periodic inspection and maintenance.

B Checks are performed at longer intervals than A Checks, typically every 6 to 8 months or approximately every 1,500 to 3,000 flight hours, depending on the aircraft type, the airline's maintenance program, and regulatory requirements. The exact interval can vary based on the operator's specific maintenance schedule approved by aviation authorities.

B Checks include expanded visual inspections of the aircraft's structure, more in-depth system checks to include hydraulics, avionics, and electrical systems. Moving parts are lubricated and emergency equipment is checked as well.

A B Check typically takes longer than an A Check, generally requiring 1 to 3 days to complete, depending on the size of the aircraft, the complexity of the work required, and the number of tasks to be performed. The aircraft will be out of service for the duration of the B Check.

B Checks are usually performed at the airline's maintenance base or at a certified maintenance facility equipped to handle the more extensive inspections and tasks required. These facilities have the necessary tools, equipment, and skilled personnel to perform B Checks efficiently and effectively.

C check

A "C Check" in commercial aviation is one of the more extensive maintenance inspections conducted on an aircraft. It is a thorough examination that goes beyond the routine checks (like A and B Checks) and involves a detailed inspection of various systems and components to ensure the aircraft's continued airworthiness and operational reliability.

The C Check is designed to inspect and perform maintenance on a broad range of systems and structures within the aircraft. This check is crucial for identifying and correcting any issues that may not be apparent during less comprehensive inspections, ensuring the aircraft remains safe, efficient, and compliant with regulatory standards.

C Checks are performed much less frequently than A or B Checks. Typically, a C Check occurs every 18 to 24 months, depending on the aircraft type, the number of flight hours or cycles, and the airline's maintenance program. The exact interval can vary based on the aircraft's operational conditions and the maintenance schedule set by the operator.

The C Check involves detailed visual and functional inspections of the aircraft's major systems, including airframe, landing gear, avionics, and engines. Technicians check for signs of wear, corrosion, structural damage, and component failure. Detailed inspections of the aircraft's fuselage, wings, tail, and internal structures are conducted, and parts that have reached their service limits or show signs of wear may be overhauled or replaced during a C Check. This could include components like landing gear, avionics units, and flight control surfaces.

C Checks are significantly more time-consuming than A or B Checks. They typically take 1 to 3 weeks to complete, depending on the aircraft's size, the scope of work, and the findings during the inspection. This extended downtime means the aircraft is out of service for a substantial period.

Due to the extensive nature of a C Check, it is usually performed at a specialized maintenance, repair, and overhaul (MRO) facility or at the airline's major maintenance base. These facilities are equipped with the necessary tools, equipment, and highly skilled personnel to carry out the complex tasks involved in a C Check.

D check

A "D Check" in commercial aviation, also known as a "heavy maintenance visit" (HMV), is the most thorough and comprehensive inspection and maintenance process that an aircraft undergoes. It involves a complete teardown of the aircraft and a meticulous inspection of virtually every component, system, and structure.

The D Check is designed to ensure the long-term airworthiness and safety of the aircraft by thoroughly inspecting, overhauling, and refurbishing all critical systems and structures. It is intended to catch and correct any potential issues that could affect the aircraft's performance, safety, or structural integrity over the long term.

D Checks are performed very infrequently compared to other maintenance checks due to their complexity and cost. Typically, a D Check occurs every 6 to 10 years, depending on the aircraft type, its usage, and the operator's maintenance program, which must be approved by aviation regulatory authorities. The specific interval is determined by the number of flight hours or flight cycles (takeoff and landing operations) the aircraft has accumulated, as well as the airline's maintenance schedule.

The aircraft is stripped down to its bare structure. Panels, coverings, and interior components are removed to allow for a detailed inspection of the aircraft's airframe, including the fuselage, wings, tail, and landing gear. Every part of the aircraft's structure is inspected for signs of wear, fatigue, corrosion, and other forms of damage. Non-destructive testing (NDT) methods, such as ultrasonic testing, X-ray, and eddy current inspections, are often used to detect internal defects. Critical systems, such as the aircraft's hydraulic, pneumatic, electrical, and fuel systems, are disassembled, inspected, and overhauled. This

includes replacing worn or outdated components, rewiring, and testing all systems for proper operation. Engines are removed and either sent to specialized facilities for overhaul or undergo detailed inspections onsite. This may involve disassembly, inspection, repair, or replacement of key components. The landing gear is usually removed and overhauled, including inspection and replacement of parts such as wheels, brakes, struts, and actuators.

After the inspection and maintenance tasks are completed, the aircraft is reassembled. Extensive ground testing is conducted to ensure that all systems are functioning correctly. The aircraft may also undergo a test flight to verify its airworthiness.

A D Check is the most time-consuming of all maintenance checks, typically taking 4 to 6 weeks (and 50,000 work hours) or even longer to complete. In some cases, depending on the extent of the work required, a D Check can take several months. During this period, the aircraft is out of service and unavailable for operations. Cost? It is not uncommon to see a bill over \$5 million. With all that in mind, airlines must schedule D checks well in advance, and it is not uncommon for an aging aircraft to be retired rather than be put through another D check – the cost of the check may be more than the value of the aircraft towards the end of its life.

D Checks are usually performed at specialized maintenance, repair, and overhaul (MRO) facilities that have the necessary equipment, tools, and skilled personnel to handle such extensive work. These facilities may be operated by the airline itself or by third-party maintenance providers.

Summary

Keep in mind that these are rough outlines for all the types of checks. Depending on the airline, the country, and even the aircraft manufacturer, the time frames and man hours will vary somewhat, but the figures supplied here are good ballparks for what is involved.

THE END OF AN AIRPLANE'S LIFE

Airplanes, much like cars, are complex mechanical devices that inevitably reach the stage where they are too costly to maintain and operate. After a few decades of faithful service, including tens of thousands of hours in the air, what exactly happens to an airplane at the end of its life? Scrapping and recycling an airplane is a complex and highly regulated process that involves dismantling the aircraft, salvaging valuable components, and recycling materials in an environmentally responsible manner.

The ultimate results are a rough dismantling that will make even the hardest stomach turn.

An airplane is typically scrapped when it has reached the end of its service life, which could be due to factors like aging, high maintenance costs, technological obsolescence, or the availability of more fuel-efficient models. The decision to scrap an aircraft is often based on economic analysis, where the value of its parts and materials is weighed against the cost of continued operation or storage.

The aircraft is decommissioned, meaning it is officially retired from service. This includes removing the aircraft from the airline's registry and ensuring it is no longer listed as an active airframe. They are most often flown out to a desert "boneyard" in the southwestern U.S. and parked. The dry conditions in the desert help reduce corrosion, and the hard, alkaline soil means aircraft can be towed and parked without sinking – and without the need to even pave the surface.

If there is a chance the airplane may fly again, it is mothballed. During this process, the landing gear, engines, and windows are covered up to protect against sand and dirt. A well-sealed plane can last for years in the desert thanks to its low humidity.

For planes that have been retired and have no hope of ever taking to the skies again, the process is grim. Upon arrival at the scrapyard, the aircraft undergoes a thorough inspection to assess the condition of its parts and components. This inspection helps determine which parts can

be salvaged and sold on the secondary market. Valuable components such as engines, avionics, landing gear, and auxiliary power units (APUs) are cataloged. These parts often retain significant value and can be refurbished or sold to operators of similar aircraft models.

The engines are among the most valuable components of the aircraft and are often removed first. They are carefully detached and transported to specialized facilities for testing, refurbishment, and resale. High-tech avionics systems and electronics are also removed, as they can be repurposed or sold to other aircraft operators or maintenance providers. Items like seats, galleys, lavatories, and overhead bins are removed. Some of these components can be reused in other aircraft or sold in the aftermarket.

Any remaining fuel, hydraulic fluids, lubricants, and other liquids are drained from the aircraft.

Now is when things get ugly, and all sentiment is cast aside. A giant excavator will violently gash the aluminum frame apart, tearing and rending the once proud airplane into grotesque heaps of twisted aluminum and steel, all destined to be recycled. But how exactly are the various types of metals sorted out from this large pile?

The materials from the airframe—mainly aluminum, titanium, and steel—are separated for recycling. This involves sorting the different metals and materials, often using techniques like shredding and magnetic separation. The shredded pile of metal is fed onto a conveyor belt that then uses steel teeth to mash the bits down into thousands of smaller pieces. These pieces are in turn sorted onto another conveyor belt, where various magnets separate aluminum and steel from each other. Aluminum goes one way and steel goes another; each to be recycled. A large commercial aircraft can fetch tens of thousands of dollars just in recycled metal.

Just think, your next can of Dr. Pepper could be made from a former airplane! The circle of life.

ONE MAN. THREE ICONIC LOGOS.

The name Saul Bass (1920-1996) is familiar to any student of graphic design; after all, he is the man who designed, amongst many other well-known logos, the old "Ma Bell" icon, the AT&T ball, as well as the logos of United Way, Quaker Oats, and several other corporations and companies. Beyond those endeavors, Bass was an early pioneer in using title sequences in movies to help foreshadow the coming story line.

But did you know that Bass designed three of the most iconic airline logos in history? These three logos are well known to aviation aficionados and to this day have a long list of admirers. In fact, one of these has been brought back into use after a nearly three-decade hiatus!

Let's take a quick look at the trio of logos in question.

We will begin with a logo known to many people who have been around the aviation industry for some length of time. In 1968, Bass was contracted by Continental Airlines to develop a new logo and branding; he returned



with the "jetstream" logo. This effort, affectionately known by many as the "meatball," would last 23 years until it was replaced in 1991 by the "globe" logo.



Bass' pens were at it again a few years later when he created surely his most memorable aviation design, the United Airlines "tulip." This logo was introduced in 1974 and remained in use throughout several different

re-brandings and liveries – the primary colors may have changed, but the tulip always remained. Indeed, the United "tulip" was only retired a few years ago when United merged with Continental and the new management (former Continental types) opted to keep Continental's visual identity, including their logo.



The third and final legacy of Bass' work for commercial airlines is the stylized "f" logo he created for the original Frontier Airlines. Introduced in 1978, this logo lasted until the demise of the airline in the mid-1980s. It has proven so popular that the current

version of Frontier Airlines brought it back into use in their latest rebranding. The Bass "F" is now green and features prominently in billboard titles on the fuselages of Frontier aircraft.

One man and three logos that have stood the test of time and now occupy a place in aviation history - yesterday, today, and tomorrow.

AIRCRAFT PAINTING

Quite a few people have asked me about how aircraft are painted, so I've decided to add a section on the matter in for the third edition of this book.

The Federal Aviation Administration (FAA) has a 22-page handbook that goes over Aircraft Painting and Finishing and tells you how the entire process works, what's involved, and so forth. While it reads as dry as an El Paso parking lot, it does have some points of interest for me to borrow:

Paint, or more specifically its overall color and application, is usually the first impression that is transmitted to someone when they look at an aircraft for the first time. Paint makes a statement about the aircraft and the person who owns or operates it.

Paint is more than aesthetics; it affects the weight of the aircraft and protects the integrity of the airframe. The topcoat finish is applied to protect the exposed surfaces from corrosion and deterioration. Also, a properly painted aircraft is easier to clean and maintain because the exposed surfaces are more resistant to corrosion and dirt, and oil does not adhere as readily to the surface.

A wide variety of materials and finishes are used to protect and provide the desired appearance of the aircraft. The term "paint" is used in a general sense and includes primers, enamels, lacquers, and the various multipart finishing formulas. Paint has three components: resin as coating material, pigment for color, and solvents to reduce the mix to a workable viscosity.

The painting process works like this: if it is getting a fresh coat, the aircraft has the old paint stripped off. Various chemicals are sprayed over the aircraft to help break up the old paint. Once that's all cleared out, primer is applied. After that, a team of anywhere from eight to 15 people starts painting, using various sprayers. Depending on the size of the aircraft, the paint can add 500 to over 1,000 pounds to the aircraft's

weight. The entire process can take about a week and cost well over \$100,000.

The plane will then need anywhere from a day to a week, again, depending on the type of paint, to dry. Airplanes are usually repainted every five to seven years, typically. There are quite a few cool videos on YouTube showing the whole process that you might want to check out.

"Bare metal" liveries, like the old American Airlines scheme, were not in fact the bare metal but coated with various protectants, lacquers, and such.

While most aircraft in an airline's fleet have a standard livery applied, there are often some special schemes painted on and flying about. In fact, trying to catch a special livery is one of the things that makes plane spotting so exciting, if you are into that kind of thing. These special liveries are often painted by hand and require significantly more work (and cost) as additional colors and patterns may be used.

AIRLINE LIVERIES

Aircraft paint and liveries are not just functional elements of an aircraft; they play a significant role in branding, marketing, and the overall image of an airline. They serve both practical and marketing functions, from protecting the aircraft to conveying a company's values and culture. As technology and design trends evolve, airlines continue to innovate in how they use liveries to stand out in the competitive aviation market.

The livery of an aircraft is a crucial part of an airline's visual identity. It includes the color scheme, logo, and other design elements that make an airline instantly recognizable. This visual identity helps to differentiate one airline from another, creating a strong brand presence in the sky and on the ground.

Airlines use consistent color palettes, logos, and design elements across their fleet to ensure brand uniformity. This consistency extends beyond aircraft to other brand touchpoints, such as airport signage, uniforms, and marketing materials.



Aircraft serve as flying billboards, displaying the airline's brand to millions of people worldwide. The large surface area of an aircraft, especially on wide-body jets, provides ample space for advertising messages or special promotions.

As mentioned in the last few pages, airlines often create special liveries to commemorate anniversaries, partnerships, or cultural events. For instance, an airline might paint an aircraft in a unique design to celebrate a national holiday or to promote a tourism campaign. These

special liveries attract attention and generate media coverage, serving as effective marketing tools.

Some airlines collaborate with other brands or organizations, incorporating their logos or designs into the livery. For example, airlines may partner with sports teams, entertainment franchises, or luxury brands to create co-branded aircraft that appeal to specific customer segments.

The choice of colors in an aircraft livery is often influenced by color psychology. For example, blue is frequently used because it conveys trust, professionalism, and calmness, which are desirable qualities for airlines. Bright colors might be used to evoke excitement or adventure, appealing to leisure travelers. Think of Spirit Airlines' unique allyellow aircraft.

Modern technology allows for increasingly complex and artistic designs on aircraft. Some airlines push the boundaries of traditional liveries by incorporating intricate patterns, gradients, and even 3D effects. These designs can make an airline stand out in a crowded market.

Many airlines incorporate national symbols, colors, or cultural motifs into their liveries to reflect their heritage and connect with local and international passengers. For example, Qatar Airways' livery features an Oryx, a national symbol of Qatar, while Air India uses the Maharajah as a cultural icon.

The exterior appearance of an aircraft contributes to passengers' first impressions of an airline. A well-maintained and attractive livery can enhance the perceived quality of the airline, while a worn or outdated design might negatively impact customer perceptions.

Special liveries can create a buzz among passengers, who often share photos on social media, generating word-of-mouth marketing. Think of any "retro" or "heritage" livery aircraft you may have seen. They typically stand out. Airlines can engage with passengers by explaining the story or significance behind a special livery, further enhancing the customer experience.

Aircraft paint must withstand extreme conditions, including high speeds, UV radiation, and temperature fluctuations. The paint used is typically high-quality and durable, designed to last several years with minimal maintenance. However, over time, the paint may need touchups or full repainting, which can be costly.

The weight of the paint can affect the aircraft's fuel efficiency. Airlines balance the aesthetic appeal of a livery with the need to minimize weight, sometimes opting for lighter colors or designs that use less paint.

Finally, aircraft liveries have evolved significantly over time. Early designs were often simple, with basic logos and color schemes. As the aviation industry grew, liveries became more sophisticated, reflecting the increasing importance of branding.

SPECIAL EVENT FLIGHTS

Increasingly "special event" flights are being scheduled in the last few years, as airlines use A.I. and reactive revenue management to better increase their schedules and chase profits.

Whether its golf majors, the Kentucky Derby, NASCAR races, college/professional football games, or other special events, airlines have become more adept at adjusting their schedules to chase these high-yield and shortage-driven bookings. Some airlines will even add a flight sector for large-scale corporate events if they are held in places with limited flights.

In the last few months, both Delta and United added dozens of one- off flights on Saturdays to college football towns, or single rotations to places like Green Bay, Wisc. (GRB) in December. In other cases, larger aircraft are put on a certain route for a day or two to catch the additional demand.

In the past, charters or additional sectors like this were often planned or arranged by travel agents (after getting enough passengers to signal interest). Now, the airlines are cutting that middleman out of the equation and using A.I. to accurately predict where the demand will surge. Extra legs and flights are already scheduled for the next year's Masters golf tournament, for example. Southwest has added extra flights to take people to various Taylor Swift concerts as well.

Don't be surprised to see one of these types of flights pop up at your airport in the future.

PART II: THE AIRLINE INDUSTRY

U.S. AIRLINE INDUSTRY: BEFORE AND AFTER DEREGULATION



Before the Airline Deregulation Act of 1978, the U.S. airline industry was heavily regulated by the federal government, particularly through the Civil Aeronautics Board (CAB). This period, known as the era of regulation, saw extensive government control over various aspects of the airline industry, including routes, fares, and competition.

The Civil Aeronautics Board (CAB) was established in 1938 under the Civil Aeronautics Act, following the Air Mail Scandal and the recognition of the need for federal oversight of the burgeoning airline industry. The CAB was tasked with regulating interstate air transportation in the United States. The CAB had broad authority over the economic aspects of the airline industry. This included setting airline fares, determining which airlines could serve specific routes, approving mergers and acquisitions, and ensuring the financial stability of the airlines.

The CAB controlled which airlines could operate on specific routes, effectively determining where airlines could fly. Airlines had to apply to the CAB to serve new routes, and the CAB would decide based on factors like public convenience, necessity, and the potential impact on competition. The CAB restricted the entry of new airlines into the market. Obtaining a certificate to operate as a new airline was a lengthy and difficult process, which limited competition and allowed established airlines to dominate the market.

Airfares that airlines could charge for flights were set by the CAB. Fares were calculated based on a formula that considered the distance of the flight and other operational costs, with the goal of ensuring airlines could cover their costs and earn a reasonable profit. Airlines were required to charge the same fares on specific routes, which meant there was little to no price competition. Discounts, promotional fares, or differential pricing based on service levels were rare and had to be approved by the CAB.

The regulation provided stability to the airline industry, as airlines could operate with guaranteed profitability due to controlled competition and regulated fares. However, this also led to inefficiencies, as airlines had little incentive to cut costs or innovate. Because the CAB controlled market entry and fares, there was minimal competition among airlines. This resulted in higher fares and limited choices for consumers, particularly on less popular routes where only one or two airlines might be allowed to operate.

While the CAB focused on economic regulation, operational aspects such as safety and service quality were overseen by the FAA, which was created in 1958. Airlines were required to maintain certain service standards, but these were often generalized, leading to uniformity rather than differentiation in service offerings. With regulated fares and limited competition, airlines had little flexibility to offer varied service levels or innovative products. Most airlines provided similar services, with little differentiation beyond brand identity.

Airlines were generally profitable during this period because the regulated environment ensured that fares covered costs. However, profitability was also accompanied by inefficiencies, such as overstaffing and the operation of uneconomical routes, which were sometimes mandated by the CAB to ensure nationwide service coverage. The regulated structure meant that airlines could not quickly respond to changes in market demand, leading to inefficiencies like overcapacity on some routes and inadequate service on others. The absence of competition also stifled innovation in service and pricing.

By the 1970s, there was growing public and political criticism of the high airfares and lack of competition in the airline industry. Consumers

and businesses were frustrated with the limited choices and the high cost of air travel. Economists and policymakers began advocating for deregulation to introduce competition, lower fares, and increase efficiency in the airline industry. The belief was that a free market would drive innovation, improve service quality, and make air travel more accessible.

The economic environment of the 1970s, characterized by inflation and stagnant growth, further fueled the push for deregulation. The belief was that deregulation would spur competition, leading to better prices and services for consumers. Deregulation gained political support across party lines, culminating in the passage of the Airline Deregulation Act of 1978 which was signed into law by President Carter on October 24, 1978. Thus began the process of phasing out the CAB's control over the airline industry and transitioning to a free-market system.

A New Frontier

Deregulation removed most federal government controls over the aviation industry and led to airlines being subjected to raw market forces; the CAB itself was abolished in 1985. The deregulation of the U.S. airline industry transformed the landscape of air travel, making it more competitive, accessible, and innovative. While it led to lower fares and increased travel options for consumers, it also introduced challenges such as industry consolidation, variability in service quality, and economic pressures on airlines and their employees. Overall, deregulation had a significant and lasting impact on the structure and dynamics of the U.S. airline industry.

One of the quickest changes to the industry after deregulation was the near wholesale abandonment of the point-to-point system and the adoption of the hub and spoke model. Airlines were no longer forced to fly planes from one location to another, regardless of market need, and quickly set up large operations at central hub airports and fed flights to and from these hubs from smaller cities. Many airlines adopted the hub-and-spoke system to maximize efficiency and profitability. This system involves consolidating flights through central hub airports, which facilitated more frequent and diverse connections.

Major cities like Atlanta, Chicago, and Dallas-Fort Worth became key hubs, significantly increasing traffic and economic activity in these regions.

Deregulation allowed new airlines to enter the market more easily, leading to increased competition. This resulted in the emergence of low-cost carriers (LCCs) like Southwest Airlines.

Airlines gained the freedom to establish new routes and discontinue unprofitable ones without government approval, which led to more direct and diverse flight options.

Overall, fares have remained at the same levels, or lower, when adjusted for inflation since the days of regulation. However, it hardly escapes notice that service levels have decreased markedly, and the airline industry itself has become a model of cyclical volatility. To remain competitive, many airlines reduced costs by cutting amenities, reducing legroom, and implementing fees for services that were previously included in the ticket price (e.g., checked baggage, in-flight meals).



Several legendary U.S. carriers (Braniff, Eastern, Pan Am, and TWA) have vanished since deregulation, while every other large, legacy carrier has filed for bankruptcy at least once. Once formidable hubs (Cincinnati, Pittsburgh, and St. Louis) now find they are little more than common outstations today while airlines seemingly come and go with startling regularity.

The increased competition and financial pressures led to a wave of mergers and acquisitions. Many smaller or financially struggling airlines were absorbed by larger carriers, leading to fewer but larger airlines. By the 2000s, a few major airlines (such as American Airlines, Delta Air Lines, and United Airlines) had come to dominate the U.S. airline market.

A persuasive argument could be made that the U.S. airline industry today might well be considered an oligopoly, with four large carriers and about half a dozen, smaller carriers providing essentially all the service for a nation of some 330 million people. Of course, these large carriers and all others are now subject to the same natural forces of the open market as many other businesses and industries.

Did You Know? The FAA groups airlines into four categories – major, national, large regional, and medium regional. Major airlines are those that have over \$1 billion in annual operating revenue. National airlines have over \$100 million to \$1 billion in annual operating revenue, while large regionals have \$20 million to \$100 million in annual operating revenue. Finally, medium regionals have less than \$20 million in annual operating revenue.

Did You Know? As of June 2025, the U.S. airline industry employed over 1,000,000 people, with U.S. passenger airlines themselves employing over 550,000 people.

HUB AND SPOKE SYSTEM

Prior to deregulation, the federal government controlled commercial aviation and decided in many cases what routes would be flown. Many of the resulting itineraries were direct flights from one small market to another, where, unsurprisingly, half empty planes often plied the routes. After airline deregulation in 1978, the hub and spoke system became the most widely used model for major airlines.

The **hub-and-spoke system** is a highly efficient model used by many airlines to manage their flight operations. In this system, a central airport (the **hub**) serves as the main connecting point for flights from various smaller airports (the **spokes**). The hub airport acts as a central transfer point where passengers from different origins can connect to various destinations.

The hub and spoke system scrapped many of the unprofitable point-topoint routes and instead directed flights from small markets, or spokes, to a large, central hub airport. Imagine a bicycle wheel; with the center being the hub, and every little spoke being another small city. Atlanta for Delta and Dallas/Fort Worth for American are two prime examples of hub airports.

The hub and spoke model saves airlines money and gives passengers more flexibility. Someone flying from a small spoke now has several more options on flights from the hub to his or her destination. Let's take someone in Waco, Texas. He may want to take a trip to Burbank, California. There are no direct flights from Waco to Burbank. With the hub and spoke model, he can get a flight to the hub at Dallas/Fort Worth, and then choose to fly to Burbank, or even Los Angeles, Santa Ana, Long Beach, or Ontario. He now has several more options with different times and fares.

The hub and spoke model has remained relatively unchanged even with the increase in regional jet flying over the past 30 years; the regionals now handle most of the flying to and from spoke airports while the mainline carriers handle the trunk routes. The reliance on regional jets is more pronounced in the U.S. than in any other country. Some 70 percent of all regional jet flights in the world take place in the U.S., and around 40 percent of all scheduled U.S. flights are on regional jets. No other country sees even five percent of their total flights handled by regional jets.

Nationally, Southwest Airlines is one of the few airlines that never embraced the hub and spoke model but instead continues to operate with the point-to-point model, flying short distances between two cities. The point-to-point model remains popular in Europe, particularly with low-cost carriers.

How the Hub-and-Spoke System Works

The **hub** is a major airport where an airline concentrates most of its operations. It serves as the central point for flights arriving from and departing to smaller airports (spokes). Airlines usually choose hub locations based on factors such as geographic centrality, demand, and airport capacity. Large airlines might have multiple hubs to cover different regions.

Spoke airports are smaller airports that connect to the hub. These can be in smaller cities, regional areas, or other major cities. Passengers flying from a spoke airport typically travel first to the hub, where they transfer to a connecting flight that takes them to their destination.

The hub-and-spoke system allows passengers from multiple spoke airports to converge at the hub. At the hub, they can then connect to flights going to their final destinations, which could be other spokes or international destinations. This model is especially efficient for airlines because it maximizes aircraft utilization by concentrating flights at central hubs rather than operating numerous direct flights between all possible city pairs.

Advantages of the Hub-and-Spoke System

By concentrating flights at a central hub, airlines can more efficiently manage their fleets. They can schedule multiple flights to arrive and depart from the hub at similar times, allowing for quick and convenient connections for passengers.

The hub-and-spoke system allows airlines to offer more frequent flights between major hubs and spokes, as the traffic is funneled through the hub, creating higher demand for these routes.

Airlines can achieve cost savings by operating more flights on fewer routes. Since all flights pass through the hub, airlines can operate larger aircraft on high-demand routes and use smaller aircraft on lower-demand routes.

This system allows airlines to serve more destinations without needing direct flights between every city pair. Passengers can reach numerous destinations with just one or two connections, effectively expanding the airline's network.

Aircraft, crew, and maintenance resources are centralized at the hub, allowing for more efficient scheduling, reduced downtime, and easier management of operational resources.

Disadvantages of the Hub-and-Spoke System

Hub airports can become congested, especially during peak travel times, leading to delays in takeoff, landing, and ground operations. This congestion can cascade across the network, affecting flights at spoke airports. Since the hub is central to the operation, any disruption at the hub (e.g., severe weather, technical issues, or strikes) can have a significant impact on the airline's entire network, leading to widespread delays and cancellations.

Passengers often must take connecting flights through the hub rather than flying directly to their destination. This can result in longer total travel times compared to direct flights.

Maintaining a major hub requires significant investment in infrastructure, staffing, and resources. The high concentration of flights at a hub also increases the complexity of operations.

In a hub-and-spoke system, direct flights between non-hub airports are often limited or nonexistent. This can inconvenience passengers who prefer or require direct flights.

Conclusion

The hub-and-spoke system is a foundational concept in airline route planning and operations. It allows airlines to offer extensive network coverage, operate efficiently, and optimize resources. However, it also presents challenges such as congestion, vulnerability to disruptions, and longer travel times for passengers on connecting flights. Despite these challenges, the hub-and-spoke model remains a dominant structure in global aviation, especially for large airlines operating extensive domestic and international networks.

LOBBYING

We all know that in the real-world money talks, and perhaps with no louder megaphone then when we get into the political arena. The airline industry is no stranger to the lobbying game, with both airports and airlines having their own lobbying groups. Who are the main players?

To start with, we have the American Association of Airport Executives (AAAE), a group that represents airport executives from over 850 commercial and general aviation airports and boasts a \$30 million annual budget.

Airports Council International (ACI) is a similar group, but representative of airports worldwide. ACI-North America represents 236 airport owners and operators that enplane more than 95 percent of the domestic and nearly all the international airline passenger and cargo traffic in North America.

On the airline side, Airlines for America (A4A) counts all the U.S. major airlines as members and tries to persuade Congress and other decision makers, via various donations, junkets and such, to see things the way the carriers would like.

In addition to their lobbying efforts, most of these groups put out daily newsletters with various links, articles, and opinion pieces for subscribers to review. Naturally, generous donations are made to members of Congress by many lobbying groups, currying favor and hopefully shaping legislation as they see fit.

AIRLINE REVENUE MANAGEMENT

Figuring out airline revenue management can in some ways seem remarkably like rocket science; indeed, there are many jobs and careers built entirely on the study and analysis of this data. Airline revenue management is a sophisticated strategy used by airlines to maximize their revenue by effectively managing the availability and pricing of seats on flights. This practice, often referred to as "yield management," involves analyzing data and forecasting demand to optimize the pricing and allocation of seats.

The primary goal of revenue management is to sell the right seat to the right customer at the right time and at the right price. Airlines aim to maximize revenue from each flight by adjusting seat prices based on various factors, including demand, competition, and booking patterns. Unlike fixed pricing, revenue management involves dynamic pricing, where ticket prices fluctuate based on real-time data and predictions about future demand.

Airlines use historical data, booking trends, and external factors (like holidays or events) to predict demand for a particular flight. Sophisticated algorithms help estimate how many passengers will book seats and how much they are willing to pay. Airlines divide the seats on a flight into different fare classes, each with its own price and set of conditions (e.g., non-refundable, flexible, or with baggage allowance). Revenue management involves deciding how many seats to allocate to each fare class and when to open or close these classes for sale.

Various pricing strategies are set based on customer segmentation. Charging different prices to different customers for the same service based on willingness to pay is one example. For instance, business travelers may pay more for last-minute bookings, while leisure travelers often book in advance at lower prices. Implementing rules and restrictions around ticket prices to target different customer segment is another. For example, lower fares might require advance purchase, have no refund options, or be subject to blackout dates.

Since some passengers cancel or don't show up, airlines often overbook flights to ensure maximum capacity. Revenue management models help determine the optimal overbooking level to balance the risk of denied boarding with the benefit of filling seats.

Airlines collect a vast amount of data, including historical booking data, current reservations, competitive pricing, and market conditions. This data is continuously fed into revenue management systems. Passengers are segmented based on characteristics like booking time, purpose of travel (business vs. leisure), and flexibility. Different pricing strategies are applied to each segment to maximize revenue. Using sophisticated algorithms and machine learning, airlines optimize pricing and seat inventory across multiple flights and routes. These models consider factors such as the time remaining until departure, current booking pace, competitor pricing, and macroeconomic indicators. Revenue management is an ongoing process. Airlines continuously monitor bookings and adjust prices and seat availability as needed. If a flight is booking slower than expected, prices may be lowered, or promotional fares may be introduced. Conversely, if demand is higher than anticipated, prices may be increased, and lower fare classes may be closed.

Of course, there are some basic economic facts at play in all of this. Airlines must balance competitive pricing with maximizing revenue. Setting prices too high might drive customers to competitors, while setting them too low leaves revenue on the table. Predicting customer behavior accurately is challenging. Factors like economic conditions, sudden events (e.g., pandemics, natural disasters), and changes in competitor pricing can impact demand. Effective revenue management relies on advanced technology and data analytics. Developing and maintaining these systems can be costly, and errors in data or algorithms can lead to significant revenue losses. More than once you've probably read articles about an airline accidentally selling business class seats at substantially less than it typically sells for due to an error.

Customers often notice that flight prices can change frequently, sometimes even within the same day. This variability is a direct result of revenue management strategies. To optimize revenue, airlines attach

various conditions to lower fares, such as non-refundable tickets or restrictions on changes. This allows airlines to segment the market and charge more to customers who value flexibility. Prices for last-minute bookings are usually higher, reflecting the airlines' strategy to target business travelers or those with urgent travel needs who are willing to pay a premium.

As with most businesses today, technology and artificial intelligence are being aggressively used to further increase profitability. Airlines use specialized software systems to manage revenue. These systems integrate with reservation systems and continuously analyze data to make real-time pricing and inventory decisions. Advanced AI and machine learning models are increasingly used to improve demand forecasting and pricing optimization. These models can learn from new data and adjust strategies dynamically.

Basic Terms

Let's look at some basic measurements, then, beginning with Available Seat Miles (ASM). At its core, one seat flying one mile represents one ASM. If you have a 100-seat aircraft flying a 500-mile segment, you have 50,000 ASMs.

Next, we have Revenue Passenger Miles (RPM). A passenger who has paid for his or her seat represents one RPM for every mile flown. So, if we take our 100-seat aircraft and have 85 passengers who have paid for seats on this 500-mile flight, we have generated 42,500 RPMs.

Now we arrive at Load Factor. We can determine load factors a couple of ways. If you are looking for a load factor on a given flight or route, you can divide the number of revenue passengers by the number of seats on the plane; for our ongoing example we have 85 passengers on a 100-seat aircraft. This represents an 85 percent load factor. If we wanted to determine an airline's overall, or system-wide, load factor, we would divide RPMs by ASMs.

Of course, it is important to remember that high load factors do not necessarily mean a certain flight or route is profitable, nor do low load factors mean an airline is losing money. An airline may sell every seat on the flight, but if the costs of the tickets that have been sold do not meet the cost of operating the flight, a full aircraft doesn't do much good for the bottom line. That's where yield comes into play.

Once again, we have a few ways to determine yield. If we are simply trying to find a customer's yield, we simply divide the price of the ticket by the mileage of the flight. On our 500-mile flight, we have passengers who have paid \$150 for their tickets. That puts the yield for that passenger at .30 cents per mile. To determine an airline's system-wide yield, we divide the total passenger revenue by the total RPMs.

Clearly, airlines make large portions of their ticket revenues off First and Business class seats; in many cases, Economy class tickets are at best a break-even proposition. As you can see, a full aircraft does not automatically mean a profitable flight; a great deal depends on how much the tickets have been sold for. Additionally, the last several years have seen airlines maximize the usage of available cargo space in the belly of their aircraft, generating even more revenue where they can.

DYNAMIC PRICING

Dynamic pricing in commercial aviation refers to the practice of adjusting airfares in real-time based on various factors such as demand, competition, booking patterns, and external conditions. This pricing strategy allows airlines to maximize revenue by selling tickets at different prices to different customers, depending on when and how they book their flights.

Dozens of airlines currently use dynamic pricing, which has become more popular in the last few years. Some studies say it increases airline revenue on fares from seven to 10 percent, which of course means you are paying seven to 10 percent more for your ticket.

When demand for flights is high, such as during holidays, weekends, or special events, airlines often increase ticket prices. The closer it gets to the departure date, especially if the flight is nearly full, the more expensive the remaining seats tend to be.

Conversely, during off-peak times or when a flight is undersold, airlines may lower prices to attract more passengers and fill seats. This helps to ensure that the flight operates with higher occupancy, improving overall revenue.

If multiple airlines operate on the same route, they may adjust their prices based on the fares offered by competitors. For instance, if one airline lowers its prices, others may follow suit to remain competitive. Conversely, if an airline has a monopoly on a particular route, it may set higher prices.

Airlines often use algorithms to monitor competitors' fares in real time. They might automatically adjust their prices to match or beat competitors' offers, especially when targeting price-sensitive customers.

Airlines often offer lower prices to customers who book well in advance. This encourages early sales and helps the airline manage its load factor (the percentage of seats filled). As the departure date approaches and fewer seats remain, prices generally increase.

In some cases, airlines might lower prices at the last minute to sell remaining seats, though this is less common than early discounts. However, if there is high demand for last-minute bookings, prices can spike.

Airlines segment passengers based on various factors, such as booking time, travel class (economy, business, first class), and the purpose of travel (leisure vs. business). Business travelers, who often book closer to the departure date and have less flexibility, are typically willing to pay higher prices, while leisure travelers, who plan further ahead, are more price sensitive.

Airlines use data analytics to personalize offers based on individual customer behavior, preferences, and loyalty status. Frequent flyers or members of loyalty programs might receive special pricing or offers not available to the public. Maybe the algorithm knows you drive a new Mercedes and not a 2009 Dodge – perhaps you can afford a little more for your ticket. The price offered for your fare could be wildly different from that of your neighbor, based on all these factors and more. Higher per capita income in your zip code than the person sitting next to you? The fare you were offered is probably higher than the other guy.

Airfares fluctuate based on seasonal trends. For example, flights to vacation destinations are more expensive during summer or winter holidays, while business travel routes may see price increases during peak conference seasons.

Factors such as fuel prices, economic downturns, or geopolitical events can influence dynamic pricing. For instance, rising fuel costs might lead airlines to increase fares, while economic recessions could force them to lower prices to stimulate demand.

Airlines may adjust prices based on anticipated disruptions, such as severe weather. For instance, if a storm is predicted, prices for flights before or after the event might fluctuate based on expected changes in demand.

Airline revenue management can seem more complicated than rocket science. Two passengers could be sitting next to each other in row 36 adjacent to the lavatory, with one having paid \$500 for his ticket while the person next to him paid \$200. Airlines use sophisticated revenue management systems and algorithms that analyze vast amounts of data, including historical sales trends, current booking rates, and external factors like competitor pricing or economic indicators. These systems automatically adjust fares in real-time to optimize revenue.

Airlines categorize seats into fare classes or "buckets," each with a different price point. As seats in lower-priced buckets sell out, only higher-priced options remain, driving up the average fare as the flight fills up.

Dynamic pricing can make it challenging for consumers to predict the best time to buy a ticket, as prices can fluctuate frequently. Some consumers may experience frustration if they see prices change shortly after booking.

On the flip side, savvy travelers who monitor fares and understand pricing trends can take advantage of dynamic pricing to find good deals, especially during promotions or when airlines reduce prices to fill seats. For passengers, understanding the principles of dynamic pricing can help in making informed decisions about when to purchase airline tickets.

LOYALTY PROGRAMS

Airline loyalty programs began as a post-deregulation experiment to keep passengers from defecting to new competitors. American Airlines launched AAdvantage in 1981, quickly followed by United's MileagePlus, using early customer databases to award miles for flown distance and giving passengers the ability to redeem those miles for free tickets. What started as a marketing tool to reward repeat flying soon proved even more advantageous because it tracked behavior, created switching costs, and gave airlines a direct line to their best customers.

Through the 1990s and 2000s the programs layered in elite status tiers, global alliance earning and redemption, and most importantly cobranded credit cards. The credit cards changed the economics by letting banks buy miles in bulk and award them for everyday spending, which gave airlines a large, steady cash stream that did not depend on seat sales. By 2018 the *Wall Street Journal* was already documenting how banks purchasing miles had become a major revenue source for the largest carriers.

In the early 2010s airlines shifted to revenue-based earning and more dynamic pricing of award seats, tightening benefits while concentrating rewards on higher spend. Co-branded deals grew into multibillion-dollar relationships, with Delta publicly signaling credit-card revenue around the mid-single billions in the early 2020s. The strategic arc was clear: loyalty moved from a marketing perk to a profit center that monetizes traveler spend even when customers are not on an airplane.

The pandemic made the financial value unmistakable. United and Delta raised billions using their loyalty programs as collateral, transactions that implicitly valued these businesses in the tens of billions and supplied crucial liquidity when flying revenue collapsed. Analysts and reporters noted that for some carriers the loyalty unit was worth as much as, or more than, the airline itself.

From an accounting and cash-flow perspective, loyalty programs operate like quasi-banks housed inside airlines. Airlines mint a private currency when they sell miles to banks and other partners, record a liability for future travel under revenue-recognition rules, and earn interest-like float and breakage when miles expire or go unredeemed. During 2020, deferred revenue tied to loyalty swelled across the majors, underscoring the balance-sheet heft of these obligations and the programs' resilience.

Today the largest U.S. airlines rely on loyalty for a material share of profits, to the point that industry coverage has shown carriers eking out overall profitability even when the core business of transporting passengers is pressured, thanks to co-brand economics. At the same time, devaluations, dynamic award pricing, and tighter qualification rules have triggered customer backlash and fresh regulatory scrutiny. The result is a mature ecosystem where loyalty units function as financial businesses that issue, manage, and retire a currency tied to air travel, making them central to airline strategy rather than a side project of marketing.

OVERBOOKING

Overbooking is a common practice in commercial aviation where airlines sell more tickets than there are available seats on a flight. This strategy is used to maximize revenue and ensure that flights depart at full or near-full capacity, even when some passengers do not show up for their booked flight.

Airlines experience a certain percentage of passengers who either cancel their reservations at the last minute or fail to show up for their flight. These no-shows can vary based on the route, time of year, and passenger segment.

To avoid flying with empty seats, which leads to lost revenue, airlines overbook flights by selling more tickets than the actual number of seats available. The assumption is that not all passengers will show up, allowing the airline to fill all seats.

Airlines use historical data, statistical models, and sophisticated algorithms to predict the likelihood of no-shows and cancellations for each flight. This data-driven approach helps determine the optimal number of extra tickets to sell.

Airlines analyze past data on no-show rates for specific flights, considering factors like the time of day, day of the week, season, route, and passenger behavior. For instance, business travelers are more likely to cancel or change flights than leisure travelers.

Based on these predictions, the airline decides how many extra tickets to sell. For example, if historical data suggests that five percent of passengers don't show up on a particular flight, the airline might overbook by selling five percent more tickets than there are seats.

Airlines continuously monitor the booking patterns as the departure date approaches. If bookings exceed expectations, the airline might stop selling tickets earlier or offer incentives for passengers to voluntarily change their travel plans. When passengers start checking in, the airline assesses whether the flight is overbooked. If all passengers with tickets show up and the flight is overbooked, the airline must take steps to address the situation.

The first step is to ask for volunteers who are willing to take a later flight in exchange for compensation, such as travel vouchers, meal vouchers, or cash. Airlines typically make announcements at the gate, offering increasing amounts of compensation until they get enough volunteers. It bears noting that there is a small group of people who track which flights are commonly overbooked and then purchase tickets on those simply to try and obtain vouchers and cash for volunteering to change their plans.

If too few passengers volunteer, the airline may have to involuntarily deny boarding to some passengers. In this case, the airline selects passengers to be bumped based on specific criteria, such as fare class, frequent flyer status, or check-in time. Passengers who are bumped involuntarily are entitled to compensation, rebooking on the next available flight, and sometimes additional benefits like meals or hotel accommodations if the delay is significant.

Regulations vary by country, but in many places, including the United States and the European Union, passengers who are involuntarily bumped are entitled to compensation. The amount of compensation depends on factors such as the length of the delay before they can be accommodated on another flight.

Under Department of Transportation (DOT) regulations, passengers are entitled to compensation based on the delay in arrival at their destination. For example, if the rebooked flight arrives within one hour of the original schedule, no compensation is required. However, for delays of one to two hours (domestic) or one to four hours (international), the compensation is typically 200 percent of the one-way fare (up to a limit). For longer delays, the compensation can be 400 percent of the one-way fare (up to a limit).

ANCILLARY FEES

As the new millennium dawned, airlines were reeling from the devastating impact the September 11, 2001, terrorist attacks had on the industry and were left searching for new forms of revenue.

Enter the era of the ancillary fee. Ancillary fees include anything other than the ticket that an airline will charge you for – baggage fees, frequent flier miles, food, Wi-Fi, and so on, down to even picking your seat or when you board the flight. Airlines are in essence now offering a la carte pricing for services that used to be included with the purchase of your ticket.

Over the past two decades, airlines around the world have increasingly relied on ancillary fees as a significant revenue stream, with an estimated \$118 billion being collected in 2023. The increasing reliance on ancillary fees by U.S. airlines reflects a significant shift in the industry's business model. These fees, which include charges for services that were once included in the price of a ticket, such as baggage handling, seat selection, and in-flight amenities, have transformed the airline industry's revenue model.

In 1990, airlines derived 88.5 percent of their operating revenue from passenger fares. Ancillary fees began to gain prominence in the early 2000s, with low-cost carriers like Spirit Airlines and Allegiant Air pioneering the model. Major carriers soon followed, realizing the revenue potential of these fees. By 2022, airlines were earning just slightly over 70 percent of their revenue from passenger fares.

Types of Ancillary Fees

Checked and Carry-On Baggage: Fees for checked bags, carry-on bags, and overweight luggage.

Seat Selection: Charges for choosing specific seats, especially those with extra legroom or preferred locations.

In-Flight Services: Fees for meals, snacks, beverages, Wi-Fi, and entertainment.

Ticket Changes and Cancellations: Penalties for changing flight dates or canceling tickets.

Priority Boarding and Early Check-In: Charges for boarding early or securing early check-in times.

Ancillary fees have become a substantial part of airline revenues. For some low-cost carriers, ancillary fees can constitute a significant portion of total revenue, while for legacy carriers, these fees provide a critical boost to profitability. In 2024, U.S. airlines took in as much as \$60 billion in ancillary fees, with checked baggage fees alone accounting for \$7.27 billion. (American Airlines became the first U.S. airline to charge for checked bags, when it added a \$15 fee in 2008.)

In the first half of 2024, Las Vegas-based discount carrier Allegiant Air earned an average of \$75.34 per passenger in ancillary fees, which was up five percent over the prior year. All told, ancillary fees accounted for essentially half of Allegiant's revenue. Frontier Airlines earns nearly two-thirds of its revenue from ancillary fees.

Ancillary fees allow airlines to diversify their revenue streams beyond ticket sales, providing a buffer against fluctuations in demand and fare prices. With intense competition in base ticket pricing, airlines use ancillary fees to maintain low advertised fares while generating additional income from passengers who require or desire extra services.

The airline industry is characterized by high operational costs and thin profit margins. Ancillary fees help airlines improve their bottom line, making them more financially stable and able to invest in service improvements and fleet modernization. Many passengers are willing to pay extra for convenience and comfort, such as more legroom, preferred boarding, or additional baggage. This willingness has encouraged airlines to expand their range of ancillary services.

While some argue that unbundling services makes pricing more transparent, others find it complex and frustrating to navigate a

multitude of fees. Airlines can differentiate themselves by offering unique or premium ancillary services. This differentiation helps attract specific customer segments, such as business travelers or families.

I might add one more thing here as well. While airlines aren't charging you a fee to check-in online or at home, as far back as 2009, IATA estimated airlines saved as much as \$3.50 per passenger when they checked in online rather than at the airport. Many carriers now have passengers add the checked baggage tag to their own luggage. All of this allows the airlines to cut more staff positions, saving money, while charging "a la carte" for many other things that were traditionally included with the price of a ticket.

SCHEDULING

Airline scheduling can be a confusing thing for the uninitiated to understand as well. For example, there are flight times, block times, push times, wheels up times and more. What does it all mean?

Flight time refers to the time the aircraft first moves under its own power until it comes to rest after landing. Once the aircraft is pushed back, disconnected from the tug and begins to taxi under its own power that is considered the beginning of the flight time. Block time is the time the airline schedules for the flight, which includes flight time as well as taxi time.

The Department of Transportation (DOT) considers a flight "on time" if it leaves or arrives at its gate within 15 minutes of its schedule.

Push time refers to when the aircraft is pushed back from the gate and is really the time that is considered for recordkeeping purposes.

So, an aircraft that is scheduled to depart at 11:45 may be considered on-time if it "pushes" at 11:57, even if you then sit on the tarmac for another 45 minutes and the "wheels up" time, when you actually take off, isn't until 12:42. As such, airlines certainly pad their schedules a bit, and have been known for scheduling sleight of hand like a two-hour block time for an hour and twenty-minute flight.

Did You Know? The IATA (International Air Transport Association) schedules for the 2025 and 2026 seasons are divided into Winter and Summer seasons. The Winter 2025/2026 season will run from October 26, 2025, to March 28, 2026, while the Summer 2026 season will be from March 29, 2026, to October 24, 2026.

HOW TO READ AN AIRLINE SCHEDULE

Looking at an old airline timetable or even a schedule today can sometimes feel like you are being forced to decipher a strange series of codes. Let's take an example:

AA123 JFK1200 1500LAX 32Q 12467

What does this mean?

The first code, AA123, represents the airline code and the flight number. The code is the carrier's two-character IATA code. In this case, AA represents American Airlines. 123 is the flight number. So now we know we are talking about American Flight 123.

JFK1200 1500LAX is up next. JFK1200 is the departure airport and the time the flight departs. 1500LAX is the arrival airport and the time the flight arrives. All times are in the local time of the airport in question. So now we know that the flight leaves New York (Kennedy) at 12pm and arrives in Los Angeles at 3pm.

32Q is up next, and that is the aircraft code. We will explain aircraft codes later, but 32Q means the aircraft to be used is an Airbus A321neo.

Finally, we have a jumble of numbers -12467. These numbers represent the days the flight operates. Day 1 is Monday; Day 2 is Tuesday and so on. So as Day 3 and 5 are missing, we know this flight operates every day except Wednesday and Friday.

If you saw a D instead of numbers, that would represent a daily flight.

Easy, right?

FLIGHT NUMBERS

Like everything else in commercial aviation, there is a method to the madness of flight numbers. You didn't think that flight numbers were just pulled out of a hat, did you?

In most cases, flights heading east or north are given even numbers, while flights heading west or to the south get odd numbers. Return flights are typically given a number that is one higher/lower than the outbound flight. For example, British Airways Flight 283 departs London and heads west to Los Angeles; Flight 282 is the return flight.

The lower the flight number, the more esteem the airline has assigned to that route. One or two-digit numbers often go to popular (and profitable) long-haul routes. Air France's flagship route from Paris DeGaulle to New York Kennedy is Flight 2, with the return as Flight 1. British Airways' old Concorde service from London to New York was also Flight 2, with 1 on the return.

Flights numbered in the 3000s, 4000s, or 5000s are typically regional flights operated by a regional airline partner and/or a codeshare. Flights in the 6000s, 7000s, and 8000s are usually reserved for code-share flight numbers. 9000 series flights are often ferry flights, delivery flights, or even private charters.

Flight numbers will often remain unchanged for years and years – in fact, some of Delta's European flight numbers can trace their origins to Pan Am – Delta bought Pan Am's European network well nearly 30 years ago. Of course, anytime there is a negative incident or a crash with a particular flight, the airline will usually retire that flight number in short order.

JOINT VENTURES

Airline joint ventures (JVs) are strategic partnerships between two or more airlines that allow them to collaborate closely on certain routes or regions, sharing revenue, costs, and resources. These arrangements, the most comprehensive form of cooperation in the airline industry, are more integrated than typical codeshare agreements and can offer significant benefits in terms of efficiency, market access, and customer experience. Airlines align services and share costs, revenue, profit and risk - almost as if they were merging, but only on certain routes that are part of the JV.

Interestingly, with JVs airlines may be partners on some routes and competitors on others. JVs are "metal neutral," but what does that really mean? Here is an example: British Airways and American Airlines have a wide-ranging JV – at DFW, British Airways operates one daily flight to London Heathrow (LHR) while American offers four daily flights. The total profits or losses are split evenly amongst both carriers. If the British flight is full each day and the American flights are half empty, the profit or loss is still split 50/50 between both airlines.

This all sounds nice, but what are some of the key benefits and features of a JV?

Revenue Sharing

In a joint venture, airlines agree to share the revenue from the routes covered by the agreement. This means that regardless of which airline operates the flight, the revenue is pooled and distributed according to the terms of the JV. This incentivizes both airlines to optimize routes, improve load factors (the percentage of seats filled), and manage costs collectively.

Coordination of Schedules

Airlines in a joint venture often synchronize their flight schedules to offer passengers more convenient connections and reduce overlap between services. This can result in better utilization of aircraft and more seamless travel experiences for passengers.

Aligned Pricing and Marketing

Joint venture partners may align their pricing strategies, allowing them to offer more competitive fares. Marketing efforts are also often coordinated to present a unified product to customers. This can enhance brand perception and customer loyalty, as passengers receive consistent service across the partner airlines.

Shared Costs and Resources

Airlines in a joint venture may share various operational costs, including fuel, maintenance, airport facilities, and staff. They might also share resources such as lounges, check-in counters, and even aircraft, leading to cost savings and increased efficiency.

Regulatory Approval

Because joint ventures involve close coordination between airlines that might otherwise compete, they typically require regulatory approval, especially in regions like the U.S. and the EU. Authorities review these agreements to ensure they do not harm competition or consumer choice. In some cases, regulators may impose conditions on the JV, such as requiring the airlines to maintain certain levels of service on specific routes or to offer slots to competitors.

Antitrust Immunity

For a joint venture to operate fully as intended, airlines often seek antitrust immunity (ATI) from regulators. ATI allows the airlines to collaborate without being subject to antitrust laws that normally prevent competitors from coordinating on pricing, capacity, and schedules.

Additionally, airlines gain access to new markets and customer bases by leveraging their partner's network, which they might not be able to serve as effectively on their own. Passengers benefit from smoother connections, more flight options, integrated loyalty programs, and consistent service standards across the partner airlines. By sharing costs and resources, airlines can operate more efficiently, leading to potential savings that can be passed on to consumers through lower fares or reinvested in improving service.

Now, this all sounds good and well, but it can't all be roses, right? What are some of the drawbacks that airlines face in establishing or operating a JV?

Complexity and Regulatory Hurdles

Managing a joint venture involves coordinating multiple aspects of airline operations, which can be complex and require significant time and resources to implement effectively. Obtaining approval for a joint venture can be a lengthy process, and airlines may face restrictions or conditions imposed by regulators to protect competition. Korean Air has had to work with regulatory agencies and officials in several countries around the globe in its efforts to get its planned merger with rival Asiana Airlines approved.

Note also that differences in corporate cultures, management styles, and operational practices between the partner airlines can pose challenges in achieving seamless integration. Finally, while joint ventures are designed to be mutually beneficial, there is always the potential for one partner to benefit more than the other, leading to tension or reevaluation of the partnership.

In summary, airline joint ventures are powerful tools that allow airlines to collaborate more deeply than traditional partnerships, offering substantial benefits but also requiring careful management and regulatory approval.

HOLDING COMPANIES

A holding company in commercial aviation is a parent corporation that owns, controls, or manages several subsidiaries, often including airlines, related businesses, or other aviation assets. The primary purpose of a holding company is to streamline management, optimize resource allocation, and maximize profitability across its various subsidiaries without being directly involved in their day-to-day operations.

The holding company owns the majority or entirety of the shares in its subsidiary companies, which could include one or more airlines, aircraft leasing firms, maintenance organizations, or other aviation-related businesses. While the holding company provides strategic direction and oversight, the subsidiaries often operate independently, each focusing on their specific business areas.

By structuring operations under separate subsidiaries, a holding company can isolate financial and operational risks. If one subsidiary encounters financial difficulty, the holding company can protect its other assets from being directly affected.

The holding structure allows for the protection of valuable assets, such as aircraft or real estate, from liabilities associated with airline operations, which can be particularly risky due to the highly regulated and competitive nature of the aviation industry.

The holding company can manage capital more effectively by pooling resources and allocating funds where they are needed most across its subsidiaries. This can lead to cost savings and more efficient use of capital. Holding companies may take advantage of tax efficiencies by strategically managing the financial flows between subsidiaries. They can also leverage different tax jurisdictions to optimize overall tax obligations.

In the U.S. there are several major holding companies in the commercial aviation industry:

- Air Transport Services Group which owns ABX Air, Air Transport International, and Omni Air International
- Alaska Air Group owns Alaska Airlines, Hawaiian Airlines, and Horizon Air
- American Airlines Group which owns American Airlines, Envoy Air, Piedmont Airlines and PSA Airlines
- Atlas Air Worldwide Holdings, Inc. owns Atlas
- Delta Air Lines, Inc. owns Delta Air Lines and Endeavor Air
- Republic Airways Holdings owns Republic Airlines
- SkyWest, Inc. owns SkyWest Airlines
- Trans States Holdings owns GoJet Airlines
- United Continental Holdings owns United Airlines

DOING BUSINESS AS (DBA)

If you have been to an airport, you have more than likely seen a "doing business as" carrier.

A Doing Business As or "dba" carrier is typically a regional or "feeder" airline that contracts to provide service for a mainline aircraft operator. For example, an airport may have service from some of these carriers, such as Mesa, Republic, SkyWest and so on, that are "doing business as" Delta Air Lines. In most, but not all cases, the 'dba' airlines will be painted in the livery of the mainline carrier.



Well, that's all good and well, but how can you tell if an aircraft is a "dba" or "feeder" carrier? They look the same as the regular planes; after all, they are painted in the exact same livery.

A good rule of thumb is this – in almost all cases, the "dba" or "feeder" carrier will be utilizing small regional jets. In other words, you will **never** see a SkyWest Boeing 737 or a Republic Airbus A319 aircraft. "DBA" and "feeder" airlines are almost always going to operate a regional jet such as a Canadair CRJ, Dash-8, Embraer E175.

Despite wearing the paint scheme, or livery, of the mainline carrier, you will be able to see a small sticker, typically near the nose or the front door of the aircraft that will say "Operated by [Regional Airline]."

Finally, many of the "dba" or "feeder" airlines will have the name of the mainline aircraft operator, but they'll add in "Connection," "Express" or something along those lines after the mainline aircraft operator name.

CODESHARES

Codesharing is a practice in commercial aviation where two or more airlines share the same flight, allowing them to offer greater connectivity and flexibility to passengers without operating additional flights. It is a strategic partnership between airlines that allows them to offer a broader network of destinations and more convenient travel options without the need to operate additional flights. It benefits passengers by providing greater connectivity and streamlined travel experiences while enabling airlines to optimize their resources and expand their market reach.

Codesharing involves one airline (the marketing carrier) placing its flight number on a flight operated by another airline (the operating carrier). This allows both airlines to sell seats on the same flight under their own airline designators and flight numbers. For example, British Airways. Flight 283 from London Heathrow is also codeshared as Aer Lingus 8983, American 6955, Alaska 5287, Finnair 5523, and Iberia 7441.

The main goal of codesharing is to expand the network reach of airlines, providing more flight options and destinations to passengers without the need for additional aircraft or routes.

Passengers can book flights to a wider range of destinations, often with smoother connections and coordinated schedules. Travelers can book a single ticket for an itinerary that involves multiple airlines, simplifying the booking and check-in process. Passengers can often earn and redeem frequent flyer miles across codeshare partners, enhancing loyalty program benefits. Airlines can optimize their fleet utilization and reduce operational costs by sharing flights rather than duplicating services.

Two or more airlines enter a codesharing agreement, specifying the terms of the partnership, including revenue sharing, operational responsibilities, and marketing strategies. The marketing carrier assigns its flight number to the flight operated by the partner airline. For example, a flight operated by Airline A might also have a flight

number from Airline B. Passengers can book the flight through either airline's reservation system, and the flight will appear in schedules and booking systems under both airlines' designators. Check-in procedures are often streamlined, allowing passengers to check in for the entire journey at one counter and receive boarding passes for all segments of their trip.

There are two main types of codeshares: bilateral and alliance wide. Bilateral codesharing is a direct partnership between two airlines, where each airline can place its code on certain flights operated by the other. Alliance-wide codesharing is a larger agreement within airline alliances (such as Star Alliance, SkyTeam, or Oneworld) where multiple airlines within the alliance codeshare on each other's flights, greatly expanding network connectivity.

Codesharing is especially common on international routes, where one airline may not have extensive service or rights to operate in a particular country. Airlines often codeshare on domestic or regional flights to feed passengers into their longer international routes. For example, a U.S. airline might codeshare with a regional partner to connect passengers from smaller cities to its international hubs.

Differences in service standards between the codeshare partners can affect passenger experience. Airlines must work to align service levels and ensure consistency. Ensuring seamless operations, such as baggage handling and schedule coordination, requires close collaboration between the partnering airlines. Airlines must navigate complex regulatory environments, as codesharing agreements often involve compliance with aviation authorities in multiple countries.

AIRCRAFT LEASES

Airplanes, particularly new ones, are rather expensive – a Boeing 737 MAX 8 on the showroom floor will set you back over \$120 million. So, when you read about airlines ordering dozens or even hundreds of aircraft, you can bet they aren't paying cash for many of these frames. Aircraft leasing is a common practice in the aviation industry, allowing airlines to operate aircraft without owning them outright. As of 2023, more than half of the world's commercial aircraft fleet is leased.

This approach offers flexibility, cost efficiency, and helps airlines manage their fleets according to market demand.

Aircraft leases can be broadly categorized into two main types: dry leases and wet leases.

Dry leases are the simpler of the two and far more common. Think of it this way – a dry lease is about the same as when you are leasing a car. the lessor (the entity that owns the aircraft) provides the aircraft to the lessee (the airline) without crew, maintenance, or insurance. The airline is responsible for operating the aircraft, including providing crew, maintenance, and insurance. It is up to the lessee to provide all of these, in much the same was as it is up to you to insure and register your car, gas it up, change the oil, and so on.

Dry leases are typically used for long-term arrangements, where airlines may lease aircraft for several years. It's also popular for airlines looking to expand their fleet without the capital outlay of purchasing new aircraft. Dry leases usually last several years, but can be shorter, depending on the agreement. At the end of the lease term, the aircraft is returned to the lessor unless the airline decides to renew the lease or purchase the aircraft. A dry lease is like you going down to the Chevrolet dealer and leasing a new Silverado for four years. You are providing the crew (you as the driver), the insurance, and maintenance (oil changes, tire rotations, etc.) of the vehicle.

In a wet lease, the lessor provides the aircraft, crew, maintenance, and insurance (ACMI). The lessee only needs to cover operational costs

like fuel and airport fees. Wet leases are typically used for short-term needs, such as covering peak travel seasons, temporary aircraft shortages, or route testing. They are also used by airlines that do not have the necessary certifications to operate certain types of aircraft or in certain regions. Wet leases are generally short-term, ranging from a few weeks to a few months. They offer more flexibility but come at a higher cost compared to dry leases.

Think of a wet lease as when you've taken an Uber. The lessor is providing the car, the insurance, and the crew (the driver).

There is also something called a damp lease, although that is not as common in the U.S. A damp lease, also known as a moist lease, is like a wet lease but without the cabin crew. The aircraft, maintenance, and insurance are provided by the lessor, but the lessee supplies the flight attendants. Damp leases are used in situations like wet leases but where the lessee prefers to use its own cabin crew.

Now, who are some of the big players in aircraft leasing?

AerCap, which acquired the International Lease Finance Corporation (ILFC) and General Electric Commercial Aviation Services (GECAS) in the past 10 years, is the largest lessor in the world. As of late June 2025, AerCap has around 1,700 aircraft that it leases out to airlines around the world.

SMBC Aviation Capital is another big player in the leasing world, with over 1000 aircraft leased to over 150 airlines around the globe. These companies purchase aircraft from manufacturers and lease them to airlines worldwide.

Lease agreements specify the duration of the lease, payment terms, maintenance responsibilities, return conditions, and other contractual obligations. These contracts are usually detailed and legally binding. The lessee typically pays a monthly lease rental fee. The fee may vary based on the type of aircraft, market conditions, the length of the lease, and the aircraft's age and condition. Leases typically include a set time frame, and a limit on the number of cycles and hours that can be accrued

by the lessee on the aircraft – if an aircraft is returned with more cycles or hours than permitted, a penalty fee will be applied.

Note also that if a lessee just needs engines, these lessors can supply those as well – AerCap has some 1,200 it would be happy to lease to you if you have the money.

Aircraft leasing has its pros and cons. On the plus side, leasing allows airlines to expand or modernize their fleets without the significant upfront capital expenditure required for purchasing aircraft. Leasing provides airlines with the ability to adjust their fleets according to demand, allowing them to scale up or down quickly in response to market conditions. By leasing instead of owning, airlines can reduce the financial risk associated with owning depreciating assets. Leasing also allows for easier fleet replacement with newer, more efficient models. Wet and damp leases offer airlines the ability to rapidly deploy aircraft to meet short-term operational needs without the logistical burden of crew management and maintenance.

Conversely, although leasing reduces upfront costs, it can be more expensive in the long run compared to purchasing aircraft outright, especially with long-term leases. Lease agreements may include operational limitations or restrictions on the use of the aircraft, which can limit an airline's flexibility. Aircraft must be returned in a specific condition as outlined in the lease agreement, which can sometimes lead to disputes or additional costs for the lessee.

SALE / LEASEBACK

You've probably heard this term used in the past to describe aircraft purchases and leases. A sale/leaseback is when an airline purchases a brand-new aircraft and then sells it to a lessor, who immediately leases it back to the airline. What's the point of this?

Airlines, particularly larger carriers, often place big orders and can negotiate large discounts when purchasing aircraft. In fact, they are often able to secure bigger discounts than a lessor, particularly a smaller lessor, may. So, the airline will purchase the aircraft, then sell it to the lessor, who still is able to acquire the aircraft at a cheaper price than they would have been able to purchase it for. The lessor then turns around and leases the aircraft back to the original airline. The airline has now made money by selling the aircraft and the lessor has saved money by buying it at a lower rate.

As for the lease, leasing aircraft often provides better implications for the financial bottom line in many cases, including tax benefits, for the airline. The lessor then has the advantage of leasing the asset (the aircraft) to an airline that, typically, is a decent bet to pay their monthly leases on time. Large, consistently profitable carriers can command very favorable leasing terms.

FUEL HEDGING

Fuel hedging is a risk management strategy used by airlines to protect themselves against the volatility of fuel prices, which is one of the largest and most unpredictable expenses in the aviation industry. Fuel hedging is a critical tool for airlines to manage the financial risks associated with volatile fuel prices. By locking in prices or limiting exposure to price fluctuations, airlines can stabilize their operating costs and protect their profitability. However, fuel hedging is not without its risks and complexities, requiring careful management and a strategic approach to ensure that it adds value rather than increasing financial exposure.

How Fuel Hedging Works

Airlines typically use financial derivatives, such as futures contracts, options, or swaps, to hedge against potential increases in fuel prices. These financial instruments allow airlines to lock in fuel prices or limit their exposure to price increases.

Airlines hedge fuel for specific periods, often ranging from several months to a few years, depending on their risk tolerance and market conditions.

A futures contract is an agreement to purchase fuel at a predetermined price on a specific future date. If fuel prices rise above the agreed price at the time of purchase, the airline benefits by paying the lower, hedged price. However, if fuel prices fall, the airline is still obligated to pay the higher, locked-in price.

An option gives the airline the right, but not the obligation, to purchase fuel at a specified price within a certain period. This strategy provides more flexibility than futures contracts, as the airline can choose not to exercise the option if fuel prices drop below the hedged price.

swap is an agreement between two parties to exchange cash flows or liabilities, such as exchanging variable fuel costs for a fixed price. This allows airlines to stabilize their fuel expenses by converting unpredictable fuel prices into a fixed cost.

By hedging fuel, airlines can predict and stabilize a significant portion of their operating costs, making financial planning and budgeting more accurate.

Fuel hedging protects airlines from sudden spikes in fuel prices, which can occur due to geopolitical events, natural disasters, supply chain disruptions, or changes in global demand. This helps prevent sharp increases in operating costs that could otherwise erode profitability.

Airlines that successfully hedge their fuel costs can maintain more stable ticket prices, even when market fuel prices rise. This can provide a competitive advantage over airlines that have not hedged and are forced to pass on higher fuel costs to passengers through increased fares.

Now, just like when you sit down at the tables in a casino, there are risks. If fuel prices decline after an airline has hedged at a higher price, the airline may end up paying more for fuel than the current market rate. This could lead to higher costs compared to competitors who did not hedge.

Hedging is a complex financial activity that requires expertise and incurs costs, such as premiums for options contracts or fees for executing hedging strategies. The effectiveness of a hedging strategy depends on the accuracy of predictions about future fuel prices. If an airline misjudges the market, it could end up with less favorable pricing than expected.

Dallas-based Southwest Airlines has historically been known for its successful fuel hedging strategies, which allowed the airline to secure lower fuel costs during periods of high oil prices. This gave Southwest a significant cost advantage over its competitors during those times.

Delta took an unconventional approach to fuel hedging by purchasing its own oil refinery in 2012. This vertical integration was intended to give Delta more control over its fuel supply and pricing, although it also introduced new operational risks.

Airlines base their hedging decisions on factors such as current and projected fuel prices, economic forecasts, geopolitical risks, and their own financial health and risk tolerance. Some airlines may choose to hedge a large percentage of their fuel needs, while others may hedge only a small portion or none, depending on their strategies.

Airlines often adjust their hedging strategies based on changing market conditions. For instance, if fuel prices are expected to rise significantly, an airline might increase its hedging activities. Conversely, if prices are expected to fall, the airline might hedge less or allow existing hedges to expire.

Did You Know? One gallon of jet fuel weighs 6.7 pounds. In July 2025, U.S. carriers paid an average of \$2.34 per gallon of jet fuel.

SCOPE CLAUSES

A scope clause in commercial aviation is a contractual provision in pilot union agreements that restricts the size and type of aircraft that regional airlines can operate on behalf of major airlines. The primary purpose of these clauses is to protect the jobs and flying rights of mainline pilots by limiting the outsourcing of flights to regional carriers.

Key Elements of Scope Clauses

Aircraft Size Limitations: Scope clauses often specify the maximum number of seats or weight of the aircraft that can be operated by regional affiliates.

Fleet Composition Caps: These clauses may limit the number of regional aircraft or specify a ratio of regional to mainline aircraft.

Routes and Destinations: Scope clauses can dictate the routes regional airlines are allowed to serve, often restricting them to shorter routes while reserving longer routes for mainline pilots.

Types of Operations: They may define which operations (e.g., international flights, specific domestic routes) must be performed by mainline pilots rather than regional carriers.

Purpose and Impact

Job Protection: By limiting the transfer of flying to regional carriers, scope clauses protect mainline pilot jobs and ensure that larger, more profitable flights remain with the mainline carrier.

Operational Control: They help mainline airlines maintain greater control over their network and service quality by restricting how much flying can be outsourced to regional affiliates.

Labor Relations: Scope clauses are often a major point of negotiation in pilot union contracts, reflecting the balance of power between airlines and their pilot unions.

Examples

In the United States, major airlines like Delta, American, and United have scope clauses in their contracts with pilot unions such as ALPA (Air Line Pilots Association) and APA (Allied Pilots Association).

A common provision might be that any aircraft with more than 76 seats must be flown by mainline pilots, while aircraft with 76 seats or fewer can be operated by regional partners.

Challenges

Competition and Efficiency: Airlines argue that scope clauses can limit their ability to compete effectively and manage costs, as they may be forced to operate smaller jets less efficiently.

Industry Trends: As aircraft technology and market demands evolve, airlines and unions frequently revisit scope clauses to adapt to new economic realities and operational needs.

CROSS MARKET INITIATIVE

The 2023 trial of the now defunct Northeast Alliance between American Airlines and JetBlue Airways yielded some interesting bits of information in open court. Certainly, some were no surprise, even though they have been denied for years by various airlines. One such topic is a Cross-Market Initiative. What is this?

One method used by airlines to punish a rival for competing too intensely is a cross-market initiative. A cross-market initiative occurs when one airline responds to a rival's low fare in one market by filing a low fare in a different market. Airlines often use cross-market initiatives to punish rivals for cutting prices on certain routes, thereby helping to keep prices high.

The court cited testimony by three industry executives stating that "competitor pricing actions sometimes cause cross-market initiatives."

For example, a JetBlue pricing summary reported that for the week ending February 22, 2019, walk-up fares ion the Boston to Los Angeles sector "remained low at \$139" because American had maintained a low price rather than follow its rivals' fare increases. JetBlue responded to this low \$139 fare from American, which targeted JetBlue's focus city of Boston, by filing a \$139 tactical fare in five routes to and from American's hubs. JetBlue intentionally chose a fare of \$139 for Boston to Dallas/Fort Worth and Washington National, Fort Lauderdale to Chicago O'Hare and Philadelphia, and others, identical to American's fare for BOS-LAX.

PART III: THE PASSENGER EXPERIENCE

MEDICAL DIVERSIONS

A passenger on a flight has a stroke. Maybe a brain aneurism. Whatever the reason, a serious medical episode has taken place, and the passenger needs proper medical attention as soon as possible. The aircraft must now divert to offload the passenger. How does this process play out?

Most airlines subscribe to a third-party medical service to handle such incidents. One such service is MedAire, which takes about 100 calls a day and serves over 150 airlines around the world. Sometimes, the calls are for vomiting passengers, or someone with asthma who doesn't have their inhaler. Other times, more serious concerns are at play. Contrary to popular opinion, the airlines would much rather call one of these services than ask "is there a doctor on board?"

When a passenger is ill, a flight attendant, or a nurse or doctor if one is present, will typically fill out a questionnaire and pass it up to one of the pilots. The pilots then work with their flight dispatch office and contact the medical service.

At the medical service, there are physicians on call who take into consideration all the facts at hand and ascertain the passenger's condition. The physician determines exactly what type of care is needed and how soon - and knows the closest airports/cities that can provide it. The airline's flight dispatch office of course is aware of what facilities are available at each airport; for example, maybe it's a small outstation that is not equipped to handle a wide-body aircraft. They also take into consideration flight crew limitations, if the airport can handle the number of passengers on board, and so on. Of course, the passenger's health is always the most important consideration.

All these facts are weighed to figure out the best option, which is then suggested to the captain. In almost all cases, the captain will follow that advice. Typically, only about two percent of calls made to the medical

service result in the aircraft diverting from its destination. So that, in a nutshell, is how airlines handle medical issues on board, and any possible diversions.

One more thing. Perhaps you wondered, do the airlines ever attempt to bill the unfortunate passenger who caused the diversion? No, that's just considered a cost of doing business. Besides, it probably wouldn't be a good look for an airline to send a bill to a passenger who had a heart attack on board.

UNRULY PASSENGERS



Unruly passengers on commercial flights have become a growing concern for airlines, regulatory bodies, and passengers alike. Unruly passenger behavior poses a significant threat to the safety and well-being of everyone on board a flight. These incidents, where passengers behave in a disruptive or threatening manner, have increased in frequency, leading to serious

safety, security, and operational challenges. Here's an overview:

Unruly passengers are individuals who exhibit disruptive behavior on board a flight. This can range from non-compliance with safety regulations, verbal or physical abuse towards crew members or other passengers, to more severe actions like attempts to interfere with the operation of the aircraft.

What are the symptoms?

Refusal to comply: Ignoring crew instructions, such as refusing to fasten seat belts, not stowing luggage properly, or smoking on board.

Verbal abuse: Shouting, using offensive language, or making threats towards crew or other passengers.

Physical altercations: Fighting with other passengers or crew members or physically resisting crew instructions.

Alcohol-related incidents: Excessive drinking leading to loss of control or aggressive behavior.

Interference with crew duties: Attempts to enter restricted areas like the cockpit, tampering with safety equipment, or disrupting crew in their operational duties.

Unruly behavior can create significant safety hazards, distracting crew members from their duties, and potentially compromising the security of the flight. Delays, unscheduled landings, and the involvement of law enforcement can result from incidents, causing inconvenience and financial losses. and crew members may experience stress, anxiety, or trauma due to the unpredictable and often threatening nature of such incidents.

Consequences

The COVID-19 pandemic saw a significant rise in unruly passenger incidents, often related to mask mandates and other health-related regulations. In 2021, the U.S. Federal Aviation Administration (FAA) received a record number of reports on unruly passengers, leading to more stringent enforcement actions and fines. In 2023, the Federal Aviation Administration noted 2,076 instances of unruly passenger behavior. Out of this, civil enforcement action was taken 402 times, with \$7.5 million in civil penalties assessed against the troublemakers.

Airlines have developed strict protocols for handling unruly passengers, including the possibility of restraining individuals during the flight and handing them over to authorities upon landing. Passengers who exhibit severe unruly behavior can be banned from future flights, either with specific airlines or across multiple carriers.

ELECTRONIC BAG TAGS

Airline electronic bag tags are devices designed to streamline and improve the baggage check-in and tracking process for passengers and airlines. Here's how they generally work:

Tag Setup and Activation

Passengers can purchase electronic bag tags from airlines or third-party providers. These tags are often linked to the passenger's frequent flyer account or an airline app. The tag is typically paired with a mobile app provided by the airline. This involves registering the tag with the passenger's profile, which allows the tag to be associated with specific flights.

Check-in and Bag Drop

During the online check-in process, the passenger can use the mobile app to upload flight information to the electronic bag tag. This includes details such as the passenger's name, flight number, destination, and a unique barcode or QR code. The electronic bag tag, which has an e-paper or similar display, updates to show the relevant flight and baggage information. This display usually includes a barcode or QR code that can be scanned by airport baggage systems.

At the Airport

At the airport, the passenger proceeds to the bag drop area. The airline staff or automated bag drop machines scan the barcode or QR code displayed on the electronic bag tag. The baggage handling system verifies the information, ensuring the bag is linked to the correct flight and passenger. The bag is then loaded onto the correct flight.

Tracking and Updates

Some electronic bag tags come with integrated tracking technology, such as RFID or Bluetooth, allowing passengers to track their bag's location in real time via the mobile app. Passengers receive

notifications about the status of their bag, such as when it is loaded onto the plane, arrives at the destination, or is on the baggage carousel for pickup.

At the Destination

Upon arrival, passengers can use the app to locate their baggage at the claim area. Some advanced tags might even signal to the app when the bag is within a certain range, making it easier for passengers to spot their luggage.

Advantages

Electronic bag tags speed up the check-in and bag drop process, while reducing the risk of lost or misrouted luggage due to improved tracking and automated systems. They allow passengers to bypass long lines at check-in counters and provides real-time updates on baggage status.

Key Components

Electronic bag tags use a low-power display technology that shows the bag's information clearly and can be updated electronically. Typically, a long-lasting battery that powers the tag for extended periods. RFID or Bluetooth modules enable tracking and communication with the airline's baggage handling systems and the passenger's mobile app. The tags themselves are housed in durable casing that is designed to withstand rough handling and varying environmental conditions.

Electronic bag tags are part of the broader trend towards digital transformation in the airline industry, aimed at enhancing the passenger experience and operational efficiency. Alaska Airlines was the first carrier in the U.S. to trial the technology, and several other major airlines around the world are also working with electronic bag tags.

BABIES BORN IN THE AIR

Only 75 births have been recorded on board commercial aircraft in the last century, but perhaps you've wondered - if a baby is born on a flight, how is its citizenship determined? In the U.S., a child born on a plane that is in the air over U.S. territory or airspace is automatically granted U.S. citizenship. Argentina, Brazil, Mexico, and a few others follow the same principle. However, if a child was born on a U.S. registered aircraft over say, the middle of the Pacific, they would not automatically be granted U.S. citizenship.

PART IV: SAFETY AND REGULATION

FEDERAL AVIATION ADMINISTRATION (FAA)



Prior to the September 11, 2001, terrorist attacks, the Federal Aviation Administration (FAA) handled all aspects of aviation safety and security. Security responsibilities were moved over to TSA after its creation, and FAA kept its oversight of aviation safety.

The FAA was established in 1958 to regulate and oversee all aspects of civil aviation in the United States. Its origins

can be traced back to the early 20th century, when the rapid growth of aviation highlighted the need for federal oversight.

In response to several high-profile accidents and the growing complexity of the aviation industry, the Federal Aviation Act was signed into law. This act created the Federal Aviation Agency, an independent body responsible for overseeing and regulating civil aviation in the U.S.

In 1967, FAA became part of the newly formed DOT and was renamed the Federal Aviation Administration. The FAA continued its role in regulating and overseeing civil aviation, now as part of a larger federal transportation network.

The FAA's operations today are multifaceted, covering a wide range of responsibilities aimed at ensuring the safety, efficiency, and sustainability of U.S. civil aviation. Here are the key areas of its operations:

Air Traffic Control (ATC)

The FAA operates the U.S. air traffic control system, managing the safe and orderly flow of aircraft in the national airspace. This includes overseeing takeoffs, landings, and en route traffic across the country.

Regulation and Certification

The FAA certifies the design and airworthiness of all U.S.-registered aircraft, ensuring they meet safety standards. The agency also sets and enforces standards for pilot training, testing, and licensing, ensuring that all pilots meet the necessary qualifications. Finally, FAA certifies commercial airlines and airports, ensuring they adhere to safety regulations and operational standards.

Safety Oversight

The FAA is responsible for developing and enforcing safety regulations that govern all aspects of aviation, including aircraft operation, maintenance, and crew qualifications. The FAA also conducts inspections and investigations to ensure compliance with these regulations.

Airspace Management

The FAA manages the use of U.S. airspace, coordinating civilian, commercial, and military operations. This includes designating airspace classifications, managing flight routes, and ensuring the efficient use of airspace.

NextGen Implementation

The FAA is leading the implementation of the Next Generation Air Transportation System (NextGen), a multi-year initiative to modernize the U.S. air traffic control system. NextGen aims to improve efficiency, reduce delays, and enhance safety by leveraging satellite-based technologies.

Research and Development

The FAA conducts research and development in various areas of aviation, including new technologies, safety enhancements, and environmental impacts. This research supports the agency's mission to improve the safety and efficiency of the aviation industry.

International Collaboration

The FAA works with international aviation authorities and organizations to harmonize safety standards, promote best practices, and enhance global aviation safety. This includes participating in the International Civil Aviation Organization (ICAO) and other global forums.

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB)



The National Transportation Safety Board (NTSB) plays a critical role in civil aircraft accident investigations in the United States. As an independent federal agency, the NTSB is key agency responsible for investigating accidents and incidents involving civil aviation, determining their causes, and making safety recommendations to prevent future occurrences. Through its rigorous investigative process,

transparency, and collaboration with other agencies, the NTSB helps ensure that lessons learned from accidents lead to meaningful changes that enhance the safety of air travel in the United States and globally.

Mission and Authority of the NTSB

The NTSB is an independent agency, which means it operates independently of other government agencies, including the Federal Aviation Administration (FAA) and the Department of Transportation (DOT). This independence is crucial to ensure unbiased investigations.

The NTSB's authority to investigate civil aviation accidents comes from federal law, primarily the Independent Safety Board Act of 1974. This law grants the NTSB the power to investigate all civil aviation accidents and incidents in the U.S., as well as significant accidents involving U.S.-registered aircraft abroad.

Types of Investigations

The NTSB investigates all major civil aviation accidents, including those involving commercial airlines, private aircraft, and other civil

aviation activities. Major accidents typically involve significant damage, serious injuries, or fatalities.

In addition to accidents, the NTSB investigates certain serious incidents that could have led to an accident but did not, such as nearmisses, serious mechanical failures, or runway incursions.

The NTSB may also assist with investigations of aviation accidents involving U.S.-registered aircraft or U.S. citizens in foreign countries, in coordination with local authorities and under international agreements like the International Civil Aviation Organization (ICAO) protocols.

The Investigation Process

When an accident occurs, the NTSB dispatches a "Go Team" to the accident site. The Go Team typically consists of experts in various fields, including airframe structures, powerplants, avionics, human factors, and flight operations. The team's immediate priorities are to secure the accident site, collect perishable evidence, and begin the initial analysis.

The NTSB conducts a thorough on-site investigation, which includes examining the wreckage, interviewing witnesses, reviewing flight data and cockpit voice recorders (often referred to as "black boxes"), and assessing weather conditions, air traffic control communications, and pilot actions.

After the initial on-site investigation, components such as engines, instruments, or electronic devices may be sent to NTSB laboratories for detailed analysis. This phase may involve metallurgical analysis, testing of materials, and examination of flight data.

For significant accidents, the NTSB may hold public hearings to gather additional information, solicit expert testimony, and engage with the public. These hearings are part of the agency's commitment to transparency.

Determining the Cause

The NTSB investigates all possible factors that could have contributed to the accident, including mechanical failures, human errors, environmental conditions, and systemic issues in operations or regulation.

After completing the investigation, the NTSB determines the "probable cause" of the accident. This determination is based on the evidence gathered and analyzed during the investigation and represents the Board's best judgment on what most likely caused the accident.

Safety Recommendations

An old saying in the aviation industry is that most regulations are written in blood. One of the NTSB's most important roles is to issue safety recommendations aimed at preventing future accidents. These recommendations are made to various stakeholders, including the FAA, airlines, aircraft manufacturers, maintenance organizations, and other relevant entities.

While the NTSB can make safety recommendations, it does not have the authority to enforce them. Implementation of these recommendations depends on the actions of the entities to which they are addressed, such as the FAA, which may incorporate the recommendations into new regulations or safety advisories.

Many NTSB recommendations have led to significant improvements in aviation safety, including changes in aircraft design, operational procedures, pilot training, and air traffic control practices.

Reporting and Transparency

The NTSB publishes detailed reports for each investigation, which include the findings, probable cause, and any safety recommendations. These reports are made available to the public and are often used as key reference documents in the aviation industry.

The NTSB maintains a public database of accident reports and safety recommendations, providing valuable information for the aviation industry, researchers, and the public to understand trends and risks in aviation safety.

Collaboration with Other Agencies

Although independent, the NTSB works closely with the FAA, aircraft manufacturers, airlines, and other industry stakeholders during investigations. The FAA plays a crucial role in implementing safety recommendations and making regulatory changes based on NTSB findings.

In cases of international accidents, the NTSB collaborates with foreign investigation bodies and ICAO, sharing expertise and information to ensure thorough and coordinated investigations.

Educational and Preventive Role

Beyond investigations, the NTSB engages in educational outreach and training programs for industry professionals. The Board shares lessons learned from past investigations to improve safety culture and practices across the aviation industry.

The NTSB also issues Safety Alerts to quickly address emerging safety issues identified during investigations, even before a full report is completed.

CIVIL RESERVE AIR FLEET

The Civil Reserve Air Fleet (CRAF) is a program managed by the United States Department of Defense (DoD) in partnership with commercial airlines. It was established to augment the military's airlift capacity during emergencies, such as wartime, humanitarian crises, or other national defense needs. Under this program, commercial airlines commit to providing aircraft to the military when needed, in exchange for peacetime contracts with the government.

The CRAF program was established in 1951 during the Korean War when it became evident that the military's airlift capabilities were insufficient for large-scale operations. Since then, the program has been an essential component of the U.S. national defense strategy.

Airlines voluntarily participate in the CRAF program by signing contracts with the U.S. government. In return for their commitment to provide aircraft during emergencies, these airlines are eligible to bid on government contracts for transporting cargo and passengers during peacetime.

The CRAF has two main segments: international and national. The international segment is further divided into the long-range and short-range sections, and the national segment satisfies domestic requirements. Assignment of aircraft to a segment depends on the nature of the requirement and the performance characteristics needed.

During activation, the DoD assumes operational control of the CRAF aircraft. However, the aircraft remain operated by the airline's crew under DoD direction. In 1990/1991, the CRAF was activated to transport troops and supplies to the Gulf region during the Persian Gulf War. The CRAF was used extensively to support U.S. military operations in Afghanistan and Iraq from 2001-2014.

INTERNATIONAL AVIATION SAFETY ASSESSMENT PROGRAM (IASA)

Under the International Convention on Civil Aviation (Chicago Convention) each country is responsible for the safety oversight of its own air carriers. Other countries can only conduct specific surveillance activities, principally involving inspection of required documents and the physical condition of aircraft.

Since 1992, the Federal Aviation Administration (FAA) has conducted the International Aviation Safety Assessment Program (IASA), assessing the Civil Aviation Authority (CAA) of each country that has carriers operating to the United States. Because of the provisions of the Chicago Convention and national sovereignty, FAA is not permitted to evaluate a foreign carrier within its home country.

An IASA assessment determines if the foreign CAA provides oversight to its carriers that operate to the United States according to international standards prescribed by ICAO in Annexes 1, 6, and 8 of the Chicago Convention.

If the CAA meets standards, FAA gives that authority a Category 1 rating. Category 1 means the air carriers from the assessed state may initiate or continue service to the United States in a normal manner and take part in reciprocal code-share arrangements with U.S. carriers.

If a country fails to meet these standards, they are tagged with a Category 2 rating. This means that the FAA has assessed that they are lacking laws or regulations needed to oversee their airlines in accordance with ICAO minimums.

When this happens, airlines from that country cannot start any new service to the U.S. - they can only operate existing routes. Code sharing with U.S. carriers is not allowed from carriers in Category 2 countries. Finally, carriers from Category 2 countries will be subject to additional inspections at U.S. airports.

These ratings are released to the public, and being named as a Category 2 country can cause great embarrassment for obvious reasons. As of September 2025, Bangladesh, Russia, the Organization of Eastern Caribbean States, and Venezuela have Category 2 ratings.

FREEDOMS OF THE AIR

The "Freedoms of the Air" are a set of commercial aviation rights that grant a country's airlines the privilege to enter and land in another country's airspace. These rights were established by the International Civil Aviation Organization (ICAO) to facilitate international air travel and commerce. While the first five freedoms are generally recognized and widely used in international aviation agreements, the sixth through ninth freedoms are more complex and less commonly granted due to concerns about competition and national sovereignty over domestic air travel markets.

The various freedoms of the air govern the rights of commercial airlines to operate in and over the airspace of another country. These freedoms represent the foundations of international commercial aviation, so let us briefly discuss each one:

First Freedom: The Right of Overflight

This allows an airline to fly over a foreign country without landing. For example, a flight from the U.S. to India might fly over Europe without stopping.

Second Freedom: The Right to Technical Stop

This permits an airline to land in a foreign country for non-traffic purposes, such as refueling or maintenance, without picking up or dropping off passengers or cargo. For instance, a flight from South America to Europe may land in Africa to refuel.

Third Freedom: The Right to Carry Passengers/Cargo from Home Country to Another Country

This allows an airline to carry passengers or cargo from its home country to another country. For example, a Japanese airline flying passengers from Japan to Australia.

Fourth Freedom: The Right to Carry Passengers/Cargo from Another Country to Home Country

This is the opposite of the third freedom, allowing an airline to carry passengers or cargo from a foreign country back to its home country. For example, the same Japanese airline flying passengers from Australia back to Japan.

Fifth Freedom: The Right to Carry Passengers/Cargo Between Two Foreign Countries, with a Stop in the Home Country

This allows an airline to carry passengers or cargo between two foreign countries if the flight originates or ends in its home country. For instance, a European airline might fly from Europe to the U.S., and then on to Canada, picking up passengers in the U.S.

Sixth Freedom: The Right to Carry Passengers/Cargo Between Two Foreign Countries via the Home Country

This allows an airline to carry passengers or cargo between two foreign countries by routing the flight through its home country. For example, a Singaporean airline flying passengers from Australia to the UK via Singapore.

Seventh Freedom: The Right to Carry Passengers/Cargo Between Two Foreign Countries Without Returning to the Home Country

This allows an airline to operate flights between two foreign countries without involving its home country. For example, an American airline flying passengers from Canada to Mexico without the flight passing through the U.S.

Eighth Freedom: The Right to Carry Passengers/Cargo Within a Foreign Country (Cabotage) as Part of a Service Originating or Terminating in the Home Country

This permits an airline to carry passengers or cargo within a foreign country if the service is part of a journey that begins or ends in the airline's home country. For example, a British airline might fly from the UK to Germany and then operate a domestic flight within Germany. Eighth Freedom flights are rare outside of Europe.

Ninth Freedom: The Right to Carry Passengers/Cargo Within a Foreign Country Without Connection to the Home Country (Stand-Alone Cabotage)

This is the right to operate domestic flights within a foreign country, independent of any international service. For instance, a French airline operating flights solely within Brazil without any connection to France. This is extremely rare.

FLIGHT LEVELS

Flight levels are a crucial aspect of aviation that ensure standardized altitude references across different regions and airspaces. They are essential for maintaining safe separation between aircraft and for the efficient management of air traffic.

In commercial aviation, flight levels (FL) are a standardized method of expressing an aircraft's altitude above sea level. They are used to ensure a consistent and clear understanding of an aircraft's altitude, particularly in international operations. Here's a detailed explanation:

Definition and Purpose

Flight Level (FL): A flight level is a standard nominal altitude of an aircraft, expressed in hundreds of feet. It is derived from an international pressure datum known as the standard atmosphere.

Purpose: Flight levels provide a uniform reference for altitude to enhance safety and coordination in air traffic control, especially across different regions and airspaces.

How Flight Levels are Calculated

Reference Pressure: Flight levels are based on the International Standard Atmosphere (ISA), where the pressure at sea level is 1013.25 hPa (hectopascals) or 29.92 inches of mercury (inHg).

Transition Altitude: Below a certain altitude, known as the transition altitude, aircraft altitudes are expressed in feet above mean sea level (AMSL) using the local altimeter setting (QNH). Above this altitude, altitudes are referred to as flight levels.

Transition Level: The transition level is the lowest flight level available for use above the transition altitude. The specific values of transition altitude and transition level can vary by country.

Conversion from Altitude to Flight Levels

Naming Convention: Flight levels are expressed as "FL" followed by a number representing the altitude in hundreds of feet. For example, FL350 corresponds to 35,000 feet.

Example: An aircraft flying at an altitude of 35,000 feet above sea level (with a standard altimeter setting of 1013.25 hPa) would be said to be at FL350.

Use in Air Traffic Control

Vertical Separation: Flight levels help maintain vertical separation between aircraft. Standard separation can be 1,000 feet or more, depending on the airspace and aircraft capabilities.

Cruising Altitudes: Flight levels also determine standard cruising altitudes. For instance, eastbound flights typically use odd flight levels (FL310, FL330), while westbound flights use even flight levels (FL320, FL340).

Important Concepts

QNH: Local altimeter setting, used below the transition altitude.

QFE: Altimeter setting that reads zero when at a specific reference point, usually the airport elevation.

Standard Atmosphere: A model used to ensure consistency in altimeter settings and flight levels, assuming a certain pressure and temperature gradient.

Example Flight Level Transitions

Climbing: As an aircraft climbs, it will transition from using altitude (feet) with the local QNH to using flight levels. For instance, an aircraft climbing through 18,000 feet in the U.S. (where the transition altitude is commonly 18,000 feet) will switch to flight levels, such as FL190.

Descending: When descending, the aircraft will switch from flight levels to altitude (feet) with the local QNH as it passes through the transition level.

METAR

METAR (Meteorological Aerodrome Report) is a routine aviation weather report predominantly used by pilots, issued at airports or permanent weather observations stations, typically on the hour. You'll find temperature, dew point, wind speed and direction, as well as any precipitation, cloud cover and ceilings, visibility and such on a METAR. METARs are issued in a "coded" format which requires some basic knowledge to understand.

KLAX 271853Z 01008KT 10SM FEW003 FEW150 SCT250 21/04 A3018 RMK AO2 SLP216 FU FEW003 SW T02060044 \$

So, how in the heck do I read this? Well, let's break it down. To start we have the station identifier, which in this case is **KLAX**, Los Angeles International Airport. Next, we see the date and time of the report: **271853Z**. The first two numbers are the date of the month in which the report was made, followed by time which is Zulu, or Greenwich Mean Time. We now know that the report was made on the 27th of the month at 1853 Zulu. *METARs will not indicate the actual month or year of the report*.

Moving ahead, let's get further into things. **01008KT** tells us that winds are from the north, at 010 degrees, with gusts up to eight knots. Next is **10SM**, which means visibility is 10 statute miles.

The next section covers the sky conditions: **FEW003 FEW150 SCT250**. FEW means that just 1/8 or ½ of the sky is covered, while SCT means 3/8 or ½ of the sky is covered with clouds. The numbers afterwards represent the height of the clouds in hundreds of feet above the ground. So, at 15,000 feet we have very few clouds, while up to ½ of the sky is covered at 25,000 feet.

21/04 is simply the temperature, in Celsius, and the dew point, also in Celsius.

A3018 is the altimeter setting, or equivalent sea level pressure in inches of Mercury. This is important for pilots to help ensure their altimeter is showing the correct altitude.

Finally, we have the Remarks: RMK AO2 SLP216 FU FEW003 SW T02060044 \$. AO2 notifies us that the KDFW station is automated with a rain/snow sensor, for example, while the rest gets into further information about barometric pressure, as well as temperature and dew points.

Of course, unless you are a pilot, this probably isn't of much value to you! You may as well just check your phone for the current temperature.

Did You Know? A simple way to get a close (but not 100 percent accurate) estimate of a Celsius temperature in Fahrenheit is to double it and add 30. For example, if it is 20°C, the temperature is 68°F. Double 20 to get 40 and add 30 and you are at 70. Not an exact conversion, but close enough to know if you need a sweater or not. Thanks to my late Grandmother in England for that tip many years ago.

THE AVIATION ALPHABET

To help eliminate any confusion between aircraft, air traffic control, and the tower, an "aviation alphabet" was developed by ICAO in the 1950s to help spell out letters more clearly. This is particularly helpful when identifying taxiways, holding points and so on.

Technically, this is called the NATO phonetic alphabet, or the International Radiotelephony Spelling Alphabet, but we can just call it the aviation alphabet.

A = Alpha	J = Juliet	S = Sierra	
B = Bravo	K = Kilo	T = Tango	
C = Charlie	L = Lima	U = Uniform	
D = Delta	M = Mike	V = Victor	
E = Echo	N = November	W = Whiskey	
F = Foxtrot	O = Oscar	X = X-ray	
G = Golf	P = Papa	Y = Yankee	
H – Hotel	Q = Quebec	Z = Zulu	
I = India	R = Romeo		

PART V: SECURITY IN AVIATION (TSA FOCUSED)

A BRIEF HISTORY OF TSA

Any wide-ranging study of aviation security in the U.S. today necessarily includes a closer look at the Transportation Security Administration (TSA). We've just discussed the raw history and development of aviation security through the years but now let's take a more in-depth review of the federal government agency that is responsible for securing our nation's aviation (and transportation) security system.

After the September 11, 2001, attacks, Congress decided that it would be prudent for the federal government to take over passenger security screening functions in the U.S. Having the federal government conduct passenger screening is a practice that differs from many other industrialized nations in the western world; most other countries contract this function out to private companies with government oversight.



Above: The original TSA seal.

The Aviation and Transportation Security Act (ATSA) created the TSA and was signed into law by President Bush on November 19, 2001. TSA was originally formed as a component of the Department of Transportation (DOT), where it remained until its transfer to the then newly created Department of Homeland Security (DHS) on March 9, 2003.

While TSA focuses nearly exclusively on airports, the agency's stated mission is to "protect the nation's transportation systems to ensure freedom of movement for people and commerce."

TSA was hobbled in its first few years with a revolving carousel of senior leadership, including three different administrators in its first two years of existence: John Magaw, James Loy and the late David Stone all held the post from 2002-2003, with Stone staying on board until 2005. As of this writing, TSA has had seven permanent and seven acting administrators in its history.

It was only from 2005 that TSA enjoyed some relative steadiness at the helm, when the fourth administrator, Edmund "Kip" Hawley, took over on July 27, 2005. Hawley remained in the position until the end of the Bush Administration on January 20, 2009. After that, the post of Administrator was technically vacant for another 18 months, albeit filled by an Acting Administrator. John S. Pistole, the former Deputy Director of the Federal Bureau of Investigation (FBI), was unanimously confirmed as Administrator by the U.S. Senate on June 25, 2010. Pistole remained in the position until his retirement on December 31, 2014.



(Above: Then-TSA Administrator John Pistole meets with President Obama and DHS Secretary Janet Napolitano, October 12, 2010.)

After Pistole's departure, an Acting Administrator served for six months until Peter Neffenger, a retired Vice Admiral in the U.S. Coast Guard became the sixth Administrator of TSA on July 4, 2015. Neffenger's relatively brief run ended with the conclusion of President Obama's second term on January 20, 2017.

David Pekoske, like Neffenger a retired Coast Guard Vice Admiral, was nominated by President Trump on June 6, 2017, and confirmed by a voice vote in the U.S. Senate on August 3, 2017; he began work on August 10, 2017. Pekoske was TSA's seventh Administrator and, interestingly, the fourth who was a former high-ranking Coast Guard official.

The TSA Modernization Act, the first reauthorization of TSA since its 2001 inception, was signed into law by President Trump in October 2018. This law provided that the TSA Administrator will have a fixed term of five years; administrators may now outlast the president who appointed them. Pekoske was nominated for a second five-year term by President Biden and approved by the Senate in September 2022.

Additionally, the TSA Modernization Act mandated that the Deputy Administrator be appointed by the president, although Senate confirmation is not required. Previously, the Deputy Administrator position was occupied by a career civil service employee.

Every different Administrator has his (so far) own unique agenda on how to move TSA forward. Kip Hawley was heavily focused on improving screener morale, going so far as to give the screeners a police-like metal badge and rename them "officers" in 2008. Hawley curiously claimed in his post-TSA book *Permanent Emergency* that he spent a good deal of his tenure using the latest intelligence reports to fashion TSA policies and procedures.

John Pistole championed the risk-based security agenda, which accepts that while there is no such thing as "100 percent" security, most passengers today present no threat to aviation security. By accepting

that these travelers pose a limited risk, TSA can provide more commonsense screening programs and focus limited resources on unknown passengers and known threats.

Peter Neffenger spent his relatively brief 18-month tenure focusing primarily on improving and streamlining training standards for TSA employees. Indeed, a permanent "TSA Academy" was set up to do just this at the Federal Law Enforcement Training Center (FLETC) in Glynco, Georgia, providing all screeners with the same baseline training, rather than disparate training provided at various local airports.

David Pekoske long ago became TSA's longest serving Administrator.

initially nominated He was Trump President in 2017 and renominated for a second term by President Biden in 2022. His signature initiative was "pay equity," and under his guidance the agency was finally able to increase TSA pay rates to levels that are commensurate with the government's Schedule (GS) pay scale. Every TSA employee was moved to the new



Transportation Security Compensation Plan, previously referred to as pay equity, in July 2023. The new compensation plan also helped to stem TSA's historically high turnover rates, which have been a drain on TSA's finances. From October 2022 to July 2023, TSA's attrition rate dropped 61 percent. Attrition rates in FY19 and FY22 were 18 percent and 19.1 percent, respectively. Pekoske's term was ended early on January 20, 2025, as of this writing nobody has yet been nominated as the next permanent Administrator.

Above: TSA's current seal, which debuted in June 2020. No explanation has ever been given as to why the original seal was replaced.

ADMINISTRATORS OF TSA

NAME	TYPE	STARTED	ENDED	DAYS
John Magaw	Permanent	January 28, 2002	July 18, 2002	171
James M. Loy	Permanent	July 19, 2002	December 7, 2003	506
David Stone	Acting	December 8, 2003	July 22, 2004	227
David Stone	Permanent	July 23, 2004	June 3, 2005	315
Kenneth Kasprisin	Acting	June 4, 2005	July 26, 2005	52
Edwin "Kip" Hawley	Permanent	July 27, 2005	January 20, 2009	1,273
Gale Rossides	Acting	January 20, 2009	June 24, 2010	520
John Pistole	Permanent	June 25, 2010	December 31, 2014	1,650
Melvin Carraway	Acting	January 1, 2015	June 1, 2015	151
Mark Hatfield	Acting	June 1, 2015	June 4, 2015	3
Francis X. Taylor	Acting	June 5, 2015	July 3, 2015	28
Peter Neffenger	Permanent	July 4, 2015	January 20, 2017	566
Huban A. Gowadia	Acting	January 20, 2017	August 10, 2017	202
David Pekoske	Permanent	August 10, 2017	January 20, 2025	2,720
Melanie Harvey	Acting	January 20, 2025	February 18, 2025	29
Adam Stahl	Acting	February 18, 2025	April 22, 2025	63
Ha Nguyen McNeill	Acting	April 23, 2025		

A indicates Acting Administrator, P indicates Permanent Administrator.

STRUCTURE OF TSA

TSA is headquartered in the Washington, D.C. area in Springfield, Va., a few miles from Washington proper. The agency staffs around 3,000 people at its new 600,000 square-foot headquarters, which opened in late 2020, at 6595 Springfield Center Drive.

TSA's previous headquarters complex was two matching, and aging, 12-story buildings at 601 S. 12th Street in Arlington, Va. in the Pentagon City district.

In terms of employees, with around 60,000 TSA is one of the largest agencies in the federal government. How is it all organized? Luckily, an excellent overview of the agency as it is currently construed was laid out in prepared testimony for a March 2024 hearing at the U.S. House of Representatives' Committee on Homeland Security, Subcommittee on Transportation and Maritime Security.

So, let's use that text which explains the four organizational pillars of TSA.

TSA Modernization Act of 2018

The TSA Modernization Act of 2018 (TSA Modernization Act), enacted in October of 2018, served as the first and only reauthorization legislation since the Agency's creation. Among other things, Section 1905 of the TSA Modernization Act addressed operational leadership and organizational issues, and Section 1906 directed TSA to conduct an Agency-wide review to identify and effectuate spending reductions and administrative savings that could be achieved by streamlining and restructuring TSA divisions.

In accordance with Sections 1905 and 1906 of the *TSA Modernization Act*, Administrator Pekoske and TSA senior leadership conducted a required organizational review, considering congressional and industry feedback, and TSA's strategic priorities and goals. On December 21, 2018, Administrator Pekoske approved realignment of numerous functions within TSA to enhance security effectiveness and efficiency

of the Agency by uniting like functions, reducing stovepipes, and promoting unity of effort throughout the organization. For example, the realignment:

- Established four distinct organizational pillars within TSA: Operations Support (OS), Security Operations (SO), Enterprise Support (ES), and Law Enforcement/Federal Air Marshal Service (LE/FAMS). Each pillar is led by an Executive Assistant Administrator (EAA), who reports directly to the Office of the Administrator.
- Established the Office of the Administrator, which includes the Deputy Administrator and Chief of Staff, along with the offices of Chief Counsel; Chief Finance Office; Civil Rights & Liberties/Office of Traveler Engagement; Diversity, Equity, Inclusion and Accessibility; Inspections; Investigations; Legislative Affairs; Strategic Communications and Public Affairs; and Strategy, Policy Coordination, and Innovation.
- Organized all domestic aviation security, international security, and surface security operations under Security Operations.
- Created the Policy, Plans, and Engagement (PPE) office under Operations Support, responsible for all domestic and international security policy development and industry/stakeholder outreach and engagement.
- Established the Enrollment Services and Vetting Programs (ESVP) office under Operations Support to streamline and create efficiency in credentialing and vetting processes.
- Organized multiple operational risk analysis and innovation functions in the Requirements and Capabilities Analysis (RCA) office under Operations Support.
- Consolidated individual Business Management Offices into streamlined Resource Management Offices (RMO) within each pillar. These changes better aligned TSA's various functional areas into lines of business, minimized duplication of effort, and allowed for delegation

of authority to the optimum level of decision making. In addition, our revised structure created enhanced career paths for employees, streamlined processes and procedures, reduced costs by consolidating functions and eliminating redundancies, enabled more strategic resource allocation, and increased innovation and collaboration Agency-wide. As a result, TSA can more effectively manage risk, identify requirements, deploy resources, and assess operational outcomes.

TSA's Strategic Priorities and Goals

TSA's vision is to remain an agile, world-class security agency embodied by a professional workforce that engages transportation security partners and the traveling public to outmatch dynamic threats. To accomplish this, TSA implemented a comprehensive governance framework that establishes a clear decision-making structure and enables TSA to address current and future threats. TSA sets Agency goals via an end-to-end risk-based, strategic planning process. TSA collaborated with stakeholders across the transportation system to develop the 2018 – 2026 TSA Strategy, eight-year plan highlighting key priorities necessary to fulfill TSA's mission.

To support the TSA Strategy and emphasize and reinforce accountability, TSA issued subsequent execution plans called the Administrator's Intent. The Administrator's Intent describes short- and medium-term objectives to advance TSA toward our strategic priorities. The Administrator's Intent, now in its third edition, focuses on twenty critical issues involving people, partnerships, and technology, and builds on TSA successes. Through 2026, TSA's priorities are: investing in our frontline workforce; maintaining and strengthening partnerships with transportation stakeholders and international partners to raise transportation security standards; and continuing technological innovation to remain ahead of emerging threats.

TSA develops Roadmaps, aligned with the Administrator's Intent, on specific cross- cutting and emerging topics. Roadmaps articulate the Agency's vision for approaching these critical areas and enable us to work together more effectively with our employees and external

partners to achieve shared goals and objectives. Currently, TSA has Roadmaps for Cybersecurity, LE/FAMS, Insider Threat, Open Architecture, Air Cargo Security, Checked Baggage, Identity Management, and Biometrics.

Additionally, these comprehensive strategic planning activities inform TSA's multi-year budget planning process and Capital Investment Plan. TSA publishes its Capital Investment Plan annually and it serves as our guide for determining and prioritizing future investments critical to mission success. The Capital Investment Plan reflects TSA's commitment to continuous and sustained investment in transportation security equipment, technology, and other capital investments necessary to achieve TSA's strategic priorities within the context of its operational environment and threat landscape.

Finally, the TSA Strategy and its supporting Administrator's Intent, Roadmaps, and annual Capital Investment Plan, align with Departmental and National strategies and plans, such as the National Security Strategy, National Strategy for Transportation Security, National Strategy for Aviation Security, and the Department of Homeland Security (DHS) Strategic Plan. This strategic alignment ensures TSA's plans are cohesive and drive activities to execute our mission.

Operations Support

Operations Support (OS) provides innovative solutions and processes to protect U.S. transportation systems and the traveling public. OS has over 1,200 federal employees spanning four program offices. Much of the OS workforce is in the National Capital Region to include TSA Headquarters, the Freedom Center in Virginia, and the Annapolis Junction Operations Center in Maryland. Additionally, OS employees support TSA's mission from around the world, including employees based at the TSA Operations Center in Colorado, Field Intelligence Officers located nationwide, and International Industry Representatives stationed overseas.

OS encompasses the program offices of Intelligence and Analysis; Requirements and Capabilities Analysis; Policy, Plans, and Engagement; and Enrollment Services & Vetting Programs. Their responsibilities include:

- Intelligence and Analysis (I&A) identifies and mitigates threats to the transportation system by leading intelligence activities and conducting 24/7 vetting operations to inform and support U.S. transportation security stakeholders.
- Requirements and Capabilities Analysis (RCA) strengthens TSA's operational capabilities by analyzing the domestic and international risk landscape, assessing capability gaps to develop user requirements, driving optimal performance through innovation, and testing emerging transportation security technologies.
- Policy, Plans, and Engagement (PPE) develops and coordinates domestic and international multimodal transportation security programs, directives, strategies and initiatives, while overseeing engagement with industry stakeholders and multilateral organizations.
- Enrollment Services & Vetting Programs (ESVP) manages TSA's enrollment, vetting, and credentialing programs; ensures end-to-end program management and oversight of technology, operations, and resources supporting TSA's security threat assessment programs; and aligns TSA's enrollment and vetting initiatives with the larger DHS enterprise.

TSA's operations are intelligence-driven and risk-informed. As a result, work performed by OS is integral to all TSA activities and is extremely collaborative in nature. For example, I&A and RCA provide threat intelligence and risk assessments that inform security policies and procedures developed by PPE and ESVP. These policies and procedures are then operationalized by Enterprise Support (ES), to develop TSA's training programs, and Security Operations and Law Enforcement/Federal Air Marshal Service to implement them.

In addition, RCA establishes detection standards and equipment requirements that directly inform actions of Enterprise Support to acquire, deploy, and maintain our transportation security equipment and technology. RCA also coordinates with our International Operations team in Security Operations to harmonize detection standards and testing methodologies to expand TSA's efforts to strengthen transportation security around the globe.

Additionally, ESVP ensures a robust network of enrollment locations across the United States for individuals to apply for TSA PreCheck, a Transportation Worker Identification Credential (TWIC), and a Hazardous Materials Endorsement (HME). ESVP also leads efforts to successfully implement strengthened identity management requirements in the REAL ID Act, working closely with Domestic Aviation Operations in Security Operations to ensure travelers are REAL ID ready.

Finally, every day, results of I&A's vetting of passengers helps inform Security Operation's domestic screening activities and LE/FAMS coverage.

Security Operations

Security Operations (SO) is the Agency's most visible, operational arm. SO is responsible for security screening at nearly 440 domestic airports, regulatory compliance in all modes of transportation, and ensuring security of flights inbound to the United States from over 300 international airports. More than 51,000 TSA frontline employees serve in SO, working 24/7/365, across the globe, to protect people and secure transportation.

The SO workforce is comprised of Transportation Security Officers (TSOs), Lead TSOs, Supervisory TSOs, Explosive Detection Canine Handlers, Transportation Security Specialists in Explosives, Transportation Security Managers, Transportation Security Inspectors, TSA Representatives (TSARs), and support staff.

In 2023, SO conducted the physical screening of more than 858 million passengers (averaging over 2.2 million per day), 484 million checked bags, and 1.9 billion carry-on items. Security Operations prevented

individuals from bringing 6,737 firearms into the secure areas of the airport and onboard aircraft, of which 93 percent were loaded. Internationally, 27 TSARs, five regional operations centers, and over 50 Transportation Security Specialists work with our foreign partners to strengthen international transportation security.

There are five offices under Security Operations: Domestic Aviation Operations, International Operations, Operations Management, Surface Operations, and Compliance. Their responsibilities include:

- Domestic Aviation Operations manages TSA's security operations at approximately 440 domestic airports, including the security screening checkpoint, checked baggage screening, and air cargo screening.
- International Operations manages TSA's work with our foreign partners to raise the international aviation security baseline by analyzing potential vulnerabilities and threats to drive action to mitigate potential attacks.
- Operations Management oversees Security Operation's budget, the Screening Partnership Program, and the National Deployment Force. Additionally, it provides support services to all Security Operations employees, which includes human resources, logistical support, staffing allocation, emergency preparedness, and standards and directives for the frontline workforce.
- Surface Operations leads TSA's work on surface transportation security including pipeline, highway and motor carrier, mass transit, passenger rail, and freight rail transportation systems. They accomplish this through planning, developing, and implementing strategic, risk-based security programs and activities intended to enhance preparedness and minimize vulnerabilities to reduce the risk of a terrorist attack on a surface transportation asset.
- Compliance, comprised of Transportation Security Inspectors and Transportation Security Specialists, ensures that domestic and international transportation industry entities carry out a broad range of statutory, regulatory, and program security requirements.

SO works collaboratively with every TSA pillar.

For example, SO works closely with Operations Support on the creation of policy, testing of emerging technology, monitoring, and reporting current intelligence threats, and conducting vetting operations of passengers prior to arrival at security screening checkpoints or as they transition from an international port of arrival.

SO works closely with Enterprise Support to develop training for our frontline workforce, Human Capital policies, and deployment and support of Transportation Security Equipment. SO also collaborates with LE/FAMS at both headquarters and in the field and assists the FAMS with mitigation of insider threats and screening of high-risk passengers.

Enterprise Support

Enterprise Support (ES) is responsible for delivering a wide array of critical support services and capabilities necessary for TSA to meet its mission. With a focus on making TSA an employer of choice, ES fully supports TSA's mission through unparalleled training, thoughtful human capital programs and practices, and cutting-edge technology. ES also ensures TSA is continuously improving employee morale through accountability, employee empowerment, transparent communication, and fostering an inclusive and collaborative environment where diversity of experience and thought are embraced.

ES has over 1,700 employees and is comprised of the offices of Acquisition Program Management, Contracting and Procurement, Human Capital, Information Technology, Operations Management, Security and Administrative Services, and Training and Development. Their responsibilities include:

• Acquisition Program Management builds TSA's capabilities by managing the acquisition, testing, deployment, and sustainment of security technology and other acquisition programs.

- Contracting & Procurement acquires and maintains TSA's required services, supplies, and technologies by negotiating and awarding procurements and other contractual agreements necessary to support the transportation security mission.
- Human Capital provides strategic, sustainable, and comprehensive programs and services that attract, build, and inspire a talented workforce through positive customer engagements.
- Information Technology provides transformative technology solutions through information technology, information assurance, and information management to secure and safeguard the nation's transportation systems.
- Operations Management provides strategic and tactical leadership, direction, management, and support services to ES employees and programs in the areas of budgetary and financial management, human resource management, and business operations.
- Security and Administrative Services (SAS) delivers agile and effective security and safety services, and strategic, streamlined property and real estate services and solutions.
- Training and Development creates, delivers, and oversees training for all TSA employees including Transportation Security Officers; Federal Air Marshals; management, administrative and professional employees; canine teams; instructors; inspectors; and other specialists.

Collaboration is critical for ES to understand customer needs and successfully develop, deliver, and maintain solutions. For example, ES collaborates with Operations Support to transition requirements into solutions. This occurs through a partnership between Acquisition Program Management and RCA to manage TSA's acquisition lifecycle framework, allowing for faster deployment of solutions to the field, fostering capability growth in technology innovation, and maintaining equipment performance in the field. ES also collaborates extensively with Security Operations and LE/FAMS, on recruitment and hiring, training, and various administrative services to ensure our frontline workforce is equipped to perform its mission.

Law Enforcement/Federal Air Marshal Service

LE/FAMS is responsible for conducting protection, response, detection, and assessment activities in the transportation system. In furtherance of their core mission and based on risk analysis and intelligence, Federal Air Marshals deploy on security missions onboard U.S. commercial aircraft worldwide and can deploy in response to emergent law enforcement requirements. Federal Air Marshals are trained to take decisive action surrounding incidents in the transportation domain and are prepared to appropriately respond to a variety of situations within aircraft cabin, airport, and surface transportation environments.

In June 2023, TSA published the LE/FAMS Roadmap, which was developed with stakeholder input. The LE/FAMS Roadmap lays out the mission, vision, and priorities of LE/FAMS in its role as the principal federal law enforcement organization with the Nation's transportation system. It contains a strategic vision for LE/FAMS focusing on strengthening transportation security by providing greater organizational flexibility, improving operational capabilities, and enabling a more proactive response to future transportation and national security events. The Roadmap outlines LE/FAMS' priorities of fostering leadership, innovation, technology, and training to strengthen detection, assessment, and response capacities around its core mission of in-flight security.

LE/FAMS is composed of three divisions: Field Operations, Flight Operations, and Operations Management. Responsibilities include:

• The Field Operations Division provides direction, leadership, and supervision to twenty Federal Air Marshal Service Field Offices established across the country, ensuring policy and procedures are carried out as intended. Additionally, it is responsible for developing, fostering, and administering programs to include the Visible Intermodal Prevention and Response (VIPR) program, which deploys uniformed Federal Air Marshals throughout the transportation domain in collaboration with local stakeholders.

- The Flight Operations Division is responsible for deployment of Federal Air Marshals on aircraft; daily operational incident management; domain awareness through management of the Transportation Security Operations Center; and management of Federal Air Marshals assigned to multiple federal law enforcement task forces. Additionally, it manages various flight programs which oversee armed security officer training, builds agency expertise for mitigating risk from unmanned aircraft systems, provides training and subject matter expertise for vulnerability and risk assessments within the transportation sector, and hosts the TSA Insider Threat Program.
- The Operations Management Division is responsible for providing leadership, management, and support services to LE/FAMS headquarters, field programs, and employees in the areas of budget and finance, human resources, logistics, staffing, policy coordination, and organizational performance measures.

Furthermore, LE/FAMS manages the Federal Flight Deck Officer Program and Crew Member Self-Defense Training Program. Under the Federal Flight Deck Officer Program, TSA deputizes qualified volunteer pilots and flight crewmembers of passenger and cargo aircraft as law enforcement officers to defend the flight deck of aircraft against acts of criminal violence or air piracy. The Crew Member Self-Defense Training Program provides training to airline crew members that consists of the same self-defense principles taught to Federal Air Marshals and Federal Flight Deck Officers. Techniques learned in the Crew Member Self-Defense Training Program aid crew members in defending themselves should they encounter an in-flight situation.

As an integral part of TSA's layered security, LE/FAMS works collaboratively with other TSA pillars daily to successfully carry out its mission. For example, LE/FAMS relies upon Intelligence & Analysis to inform its risk-based scheduling methodology, prioritizing deployments of Federal Air Marshals on flights with the highest risk passengers; works in collaboration with Security Operations to enhance security throughout airports and surface environments and address field-based emergent and evolving national security priorities; and works in partnership with Enterprise Support on various ways to develop and support the LE/FAMS workforce to meet TSA's mission.

VARIOUS JOBS AT TSA

Federal Security Director (FSD)

The Federal Security Director (FSD) is the highest-ranking TSA official at an airport. While screening operations are the FSD's focus, they are ultimately responsible for all TSA operations at that airport and any spokes that fall under their area of responsibility (AOR). Some FSDs oversee more than one airport within a geographic area; thus, not all FSDs are located at the airports they oversee.

It is a primary function of the FSDs to evaluate screening staffing levels and determine where staffing resources may be effectively moved from one location in the airport to another. In addition to this, there are literally dozens and dozens of responsibilities and tasks that are assigned to an FSD. Of course, as in many organizations, the FSD will have a staff that he or she will then delegate many of these tasks to.

On a day-to-day basis, an FSD will spend a good amount of time interacting with other stakeholders at the airport - particularly the airlines and airport authority. FSDs have multiple balls to juggle attempting to keep all the disparate groups and interests at an airport happy — often this all comes down to wait times at the screening checkpoint.

TSA has around 75 FSDs, and each of them has their own staff comprised of (at larger airports) a Deputy FSD and several Assistant FSDs, each in charge of their own section of operations at that airport and/or its spokes. Human Resources personnel and regulatory Inspectors are also considered FSD staff.

Deputy Federal Security Director (FSD)

The Deputy Federal Security Director (DFSD) is the second-ranking TSA authority, reporting directly to the Federal Security Director. This role is responsible for leading and coordinating TSA security activities

within commercial airports and for the oversight of security in assigned areas of operation. It also includes tactical planning, execution and operating management for coordinated security activities and other duties as prescribed by the Administrator, Transportation Security Administration and the Federal Security Director.

Regional Security Director (RSD)

The Regional Security Director (RSD) serves as the senior management official and technical expert for TSA on matters involving surface transportation security operations within the assigned geographic area of responsibility (AOR). The RSD places particular focus/attention on creating the most effective and efficient adaptive security solutions for the surface transportation network within your AOR. Their oversight will include Mass Transit and Passenger Rail, Freight Rail, Highway and Motor Carrier, Pipeline Sections and a supporting role to the U.S. Coast Guard in Maritime branches.

"Rank and File"

Now let's discuss the employees who really drive the engine of TSA, the people who screen nearly seven million checked and carry-on bags each day, the uniformed screeners. Years ago, screeners were given, somewhat controversially, the official title of Transportation Security Officer (TSO). This is the entry-level job within TSA. Ranking just above a TSO is the Lead TSO position and then the Supervisory TSO. As these are the most common positions within the agency, let's take a quick look at each position a little further.

Upon being hired, all screening personnel must complete the New Hire Training Program (NHTP) which includes at least 40 hours of classroom training focused on their duties as a screener, a minimum of 60 hours of on-the-job training (OJT), and certification tests for the functions they will be performing. TSO candidates performing on-the-job training are supervised by a qualified OJT monitor and cannot make independent decisions to clear passengers or property until after they have completed all OJT requirements.

TSA trains frontline employees at the new state-of-the-art TSA Academy West at Harry Reid International Airport in Las Vegas and TSA Academy East in Glynco, Ga., where the 100,000th TSO graduated in September 2023.

Once on the job, all screening personnel are required to take recurrent training throughout the year to maintain proficiency with skills learned during the NHTP, and to remain up to date with changes in screening standard operating procedures (SOP), as well as emerging threats. Recurrent training is laid out annually in the National Training Plan (NTP), and TSOs must complete all training annually. Most of the recurrent training is comprised of Online Learning Center courses, including X-ray image identification training. Some instructor-led classroom training is also included in the NTP.



Transportation Security Officer (TSO)

The "rank and file" employee is the screener, officially known as a Transportation Security Officer. You will see them in blue shirts with patches on each sleeve and a big, shiny badge on their chest.

Wait a minute, I see a lot of people in blue shirts? Fair enough. Look on their shoulders at the black epaulets with 'TSA' stitched on that they are wearing. If you see one stripe on the bottom, you are looking at a TSO. (Leads have two stripes and Supervisors have three.)

The job of a TSO is hardly glamorous; in fact, it can be a rather redundant position in which an employee does nearly the same thing every day. Looking at the X-ray screen, checking inside bags or patting passengers down is what a TSO spends most of the time doing.

TSOs perform most security functions to screen people and property to mitigate threats. Screening may include pat downs, search of property, and operating technology including walk-through metal detectors, X-ray machines, and explosives detection equipment, among other things.

TSOs also serve in the Travel Document Checker (TDC) position. The TDC is positioned to ensure that boarding passes and IDs match up, and that those IDs are valid and not forged documents. You'll see the TDC at a podium as you enter the screening checkpoint, looking at your ID under an ultraviolet light, marking off your boarding pass and so on.

In addition to all these tasks, TSOs are subjected to what can be an extreme level of open hostility and rudeness from the traveling public, particularly at larger (and busier) airports. It is not uncommon for screeners to be cussed out or mocked daily.

TSOs are the frontline "worker bees" of the agency in many ways.

Lead Transportation Security Officer (LTSO)

Moving up the ladder, our next position is the Lead TSO, whom you can identify by two stripes on their black epaulets. The Lead TSO does nearly all the functions of the TSO but also will serve as the supervisor or senior TSO of an individual screening lane if applicable. A Lead TSO is commonly responsible for establishing the rotation of the work positions on the checkpoint, setting break times, and helping with reams of paperwork and so forth. LTSOs implement security procedures and provide coaching and guidance to TSOs in performing

screening duties, among other things. LTSOs also perform screening functions along with added responsibilities, such as resolving alarms and supervising screening locations when a supervisor is not available.

Supervisory Transportation Security Officer (STSO)

The Supervisory TSO is the person in charge of all the TSOs and LTSOs at a given screening checkpoint. You will most commonly find them towards the back of the checkpoint, overseeing operations and making sure that things are running smoothly. The epaulets on their shoulders will have three stripes. Supervisory TSOs will have the last word in most cases on any disputes a passenger may have over an item that has been deemed unacceptable to pass through a screening checkpoint. A good STSO will be quick to intervene and diffuse any situations with passengers that may be getting too tense. In addition to overseeing the smooth operation of their checkpoint, Supervisors are also responsible for monitoring employee performance, approving leave (at some airports), and recommending corrective or disciplinary actions, among other things. Additionally, STSOs ensure that all necessary training is completed, required daily shift paperwork is documented and turned in, making sure that equipment on the checkpoint is maintained and so forth. STSOs also will perform actual screening operations from time to time as well, depending on the airport and circumstances.

Transportation Security Manager (TSM)

Now we have an overview of the folks who operate the "heavy machinery" of TSA's day-to-day operation. Overseeing the screening workforce are Security Managers, originally known as Screening Managers. These are the folks you may see from time to time in the checkpoints in suits. The Security Managers are the first line managers in the screening organization. They are responsible for the overall management of the screening checkpoints and ensuring they are properly staffed, that all the equipment is up and running and will answer any questions that the screening workforce may have. Security Managers are also responsible to ensure that various information is

collected and fed into TSA's multiple data banks of performance metrics - data which is used to determine average wait times, how many TSOs are needed at a checkpoint and so forth. In an incident, Security Managers will take the lead and coordinate with local airport officials and law enforcement as necessary. Additionally, TSMs may manage various programs as assigned by the FSD.

At the larger airports, there may be an unofficial Terminal Manager, who is officially a Security Manager who has been given final responsibility for the entire terminal. The next level of management is an Assistant Federal Security Director for Screening (AFSD-S), who oversees all screening operations at the airport. The AFSD-S will report directly to either the Deputy Federal Security Director (DFSD) or Federal Security Director (FSD), depending again on the size of an airport. The bigger the airport, the more staff it will have - for better or worse.

Screener proficiency is tested on an ongoing basis. The Threat Image Projection (TIP) system displays fictional threat items, such as guns or explosives, onto X-ray images of actual passengers' carry-on bags to test TSOs' ability to identify prohibited items in a live operational environment. TSOs operating the X-ray machine at the checkpoint are monitored to see if they positively identify the threat image and call for the bag to be searched. TSOs are responsible for positively identifying the threat image and calling for the bag to be searched.

National Deployment Force (NDF)

TSA keeps a National Deployment Force of additional screeners who are available for deployment to airports to support screening operations during emergencies, major events, severe weather conditions, and seasonal increases in passengers. Employees on this team will deploy for periods of time to hard to staff airports that only have seasonal operations as well.

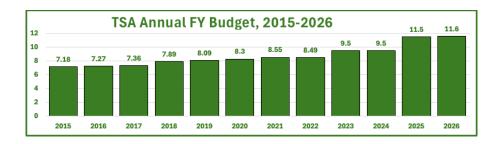
OK, now we've learned about the different types of screeners, but how much work is there to be done for them? In 2024, TSA screened a record 904 million plus passengers, which was an average of 2.47 million every day at airport security checkpoints across the country. Additionally, 494 million checked bags and another two billion carryon bags were screened as well.

Did You Know? Screener uniforms originally featured a white shirt; the current blue shirts were introduced nationwide in September 2008.

BUDGET

Obviously, TSA has a lot of employees - 62,000 in FY 2024 (56,193 of whom were full-time employees) – but what is the agency's overall budget? Let's take a closer look at fiscal year budgets, which run from October 1 through September 30, going back to 2011. You'll note that from 2014-2017, the agency's budget was around \$500 million less than previous years. This was due to the 2013 budget sequester passed by Congress, as well as TSA's own requests at the time.

Note the 2026 budget is proposed as of this writing.



STAFFING

Earlier we touched briefly on the new compensation system that TSA transitioned to in 2023. Historically, TSA has suffered from high rates of turnover and attrition, however, the new compensation system has already changed things. How so?

Attrition among TSA's frontline workforce reached a peak of nearly 20 percent per year in 2018 and 2019, due in large part to a compensation plan that resulted in employees receiving an average of 30 percent less than other federal employees. Recognizing that no agency can function efficiently with such high turnover, TSA's top priority became increasing employee pay to ensure pay is commensurate with federal government counterparts. Appropriately compensating all TSA employees is essential to improving recruitment, retention, morale, and the employee experience and is fundamental to ensuring transportation security. Thanks to the support of Congress, the *Consolidated Appropriations Act of 2023* provided initial funding to place all non-executive TSA employees on a compensation system commensurate with their federal government counterparts.

To successfully implement TSA's new compensation system, Enterprise Support (ES) took the lead working with all pillars to establish policy, provide training, and process thousands of associated personnel actions. ES equipped each program office and airport to issue over 62,000 forecast letters to TSA employees with their new salary upon the onset of the plan. Leveraging Chief Financial Officer and Resource Management Offices across the Agency, these critical letters were created based on the team's development of a TSA employee master pay file, which included current pay, projected new pay, and the next scheduled pay increase. Local Human Resource specialists around the country went line-by-line reviewing every letter to ensure accuracy. The letters were delivered in April 2023, to the entire TSA workforce, with an accuracy rate of over 99 percent (fewer than 100 employees needed adjustments). Success was directly due to team collaboration and tireless work verifying the accuracy of each case.

TSA's new compensation system has a direct impact on TSA's ability to accomplish our mission. We have seen a rise in retention, recruiting, and hiring. TSA's attrition dropped from nearly 20 percent to about 11 percent. With improved employee retention, TSA can be more selective in hiring, moving from needing to hire over 11,000 TSOs in 2018 to only needing to hire 9,000 TSOs in 2023 to keep up with attrition and increased passenger volumes. Furthermore, as reflected in TSA's 2023 Federal Employee Viewpoint Survey (FEVS) scores, implementation of TSA's new compensation plan improved the Agency's morale and overall employee satisfaction.

The Office of Personnel Management (OPM) canceled the 2025 FEVS survey.

COMMON EQUIPMENT IN USE TODAY

So now that we have run through the main players associated with TSA screening, what types of devices are you typically going to see in use today at an airport screening checkpoint?

X-ray



X-rays are used to get a look inside passenger luggage to ensure there are no bombs, guns, or prohibited items inside without having to physically handle the bag. Different materials are displayed in different colors on

the screen the operator analyzes.

Walk-through metal detector (WTMD)



While "the mag" is becoming less common as millimeter wave scanners are more widely used, you still will find it in use at quite a few airports, and it is most used for PreCheck passengers. The device is simple enough – it is designed to detect metal on a person when they walk through.

Advanced Imaging Technology (AIT)



In many cases at airports now, the majority of passengers will not use the older Walk-Through Metal Detectors but a millimeter wave scanner device commonly called an AIT. These devices use electromagnetic radiation and are also known as full body scanners. These machines are far more effective

in detecting non-metallic threats on a person.

The FAA Modernization and Reform Act of 2012 mandated that scanners of this type in use by TSA at airports must show a more generic outline (gingerbread man) of a person.

Hand-held metal detector (HHMD)

The hand-held metal detector is straightforward – it is used to check for metal on a person. If it beeps, it has detected metal, and it is up to the screener to resolve the alarm. To be honest, these aren't used very often anymore at primary screening checkpoints since the AITs came onto the scene.

Explosives trace detector



ETDs are primarily used in airports to detect vapors and residues of explosives on a person or piece of luggage. You may see a screener rubbing a swab along the interior or exterior of an object, or over the inside of a passenger's hands, and then place the swab in the ETD. At this point,

the machine chemically analyzes the swab to identify any traces of explosive materials. At smaller airports without EDS machines, ETDs are used as the primary method for screening checked baggage.

Explosives Detection Systems (EDS)



EDS machines are designed to scan a high quantity of checked baggage (hundreds per hour) using a combination of X-ray scanning and image analysis. An EDS machine uses computed tomography technology to

automatically measure the physical characteristics of objects in baggage. The system automatically triggers an alarm when objects that exhibit the physical characteristics of explosives are detected. Operators can view "slices" of a bag at various angles to ensure it does not contain a threat item. These machines can also automatically assess explosive threats.

Generally, a checked baggage screening system at airports with EDS includes a three-level screening process. First, EDS machines perform automated screening. If the EDS machine determines that a checked bag requires additional screening, it sends an alarm to a TSO who

performs a secondary inspection known as On-Screen Resolution by reviewing an image of the contents of the bag on a computer monitor. If the TSO cannot resolve the alarm using on-screen resolution tools and determines a physical bag search is necessary, the bag goes to the Checked Baggage Resolution Area where a TSO performs a manual inspection of the bag assisted by an ETD machine.

Category 2 (CAT 2) Credential Technology



Category 2 (CAT 2) Credential Technology compares the traveler's photo on the identification credential against the in-person, real-time photo. Once the CAT-2 confirms the match, a TSA officer will verify and the traveler can proceed to security screening, without ever exchanging a boarding pass. CAT 2 credentials typically incorporate biometric data, such as fingerprints or iris scans, to ensure that only authorized individuals can access secure areas. This enhances security by linking the credential directly to the individual's unique biological

traits.

Many CAT 2 credentials are equipped with RFID (Radio Frequency Identification) or NFC (Near Field Communication) capabilities, allowing for contactless access.

Did You Know? As of September 2024, TSA accepts digital IDs from 11 states at CAT 2 readers: Arizona, California, Colorado, Georgia, Hawaii, Iowa, Louisiana, Maryland, New York, Ohio, and Utah.

TYPES OF SCREENING

TSA incorporates unpredictable security measures, both seen and unseen, to accomplish its transportation security mission. Passenger screening at the airport is part of TSA's layered approach to security to get you safely to your destination. TSA's screening procedures are intended to prevent prohibited items and other threats to transportation security from entering the sterile area of the airport and are developed in response to information on threats to transportation security.

TSA currently administers three types of screening for passengers: standard, enhanced (for selectees), and expedited (for low-risk types).

Standard screening is the basic, everyday screening that you are familiar with. TSA uses millimeter wave advanced imaging technology and walk-through metal detectors to screen passengers. Millimeter wave advanced imaging technology safely screens passengers without physical contact for metallic and non-metallic threats, including explosives, which may be weapons clothing. Generally, passengers undergoing screening will have the opportunity to decline AIT screening in favor of physical screening. However, some passengers will be required to undergo AIT screening if their boarding pass indicates that they have been selected for enhanced screening, in accordance with TSA regulations, prior to their arrival at the security checkpoint. This will occur in a very limited number of circumstances. Most passengers will not be affected.

Pat-down procedures are used to determine whether prohibited items or other threats to transportation security are concealed on the person. You may be required to undergo a pat-down procedure if the screening technology alarms, as part of unpredictable security measures, for enhanced screening, or as an alternative to other types of screening, such as advanced imaging technology screening. Even passengers who normally receive expedited screening, such as TSA PreCheck passengers, may at times receive a pat-down.

A pat-down may include inspection of the head, neck, arms, torso, legs, and feet. This includes head coverings and sensitive areas such as

breasts, groin, and the buttocks. You may be required to adjust clothing during the pat-down. The officer will advise you of the procedure to help you anticipate any actions before you feel them. Pat-downs require sufficient pressure to ensure detection, and areas may undergo a pat-down more than once for the TSA officer to confirm no threat items are detected.

TSA officers use the back of the hands for pat-downs over sensitive areas of the body. In limited cases, additional screening involving a sensitive area pat-down with the front of the hand may be needed to determine that a threat does not exist. You will receive a pat-down by an officer of the same gender. TSA officers will explain the procedures to you as they conduct the pat-down.

Expedited screening, determined by Secure Flight or TSA PreCheck, is a process that TSA uses to assess a passenger's risk to aviation security prior to the passenger arriving at the airport.

TSA began providing expedited screening to selected passengers through its TSA PreCheck program in October 2011. The use of expedited screening procedures is intended to allow TSA to devote more time and resources at the airport to screening the passengers TSA deems higher risk. About 99 percent of TSA PreCheck passengers wait less than 10 minutes.

Secure Flight is a risk-based passenger prescreening program that enhances security by identifying low and high-risk passengers before they arrive at the airport by matching their names against trusted traveler lists and watchlists.

To protect privacy, the Secure Flight program collects the minimum amount of personal information, such as full name, date of birth, and gender, necessary to conduct effective matching. Personal data is collected, used, distributed, stored and disposed of according to stringent guidelines.

Secure Flight transmits the screening instructions back to the airlines to identify low-risk passengers eligible for TSA PreCheck; individuals on the Selectee List who are designated for enhanced screening; and

those who will receive standard screening. Secure Flight also prevents individuals on the No-Fly List and Centers for Disease Control and Prevention Do Not Board List from boarding an aircraft.

LOOSE CHANGE

Since 2005, TSA has been permitted to keep all the loose change and money that is left behind by passengers at airport screening checkpoints – a few pennies here, a dime there, all left in the familiar little dog food bowls or grey plastic tubs. Added up, it all ends up being a sizable sum. Since 2012, passengers have left \$26,945,927.67 at checkpoints! So, what are the annual totals? Well, we know that as the FY 2005 DHS Appropriations Act (P.L. 108-334) required the TSA Administrator to report to Congress annually on the collection of unclaimed money at airports and the expenditure of those funds.

2008: \$383,413.79 2009: \$432,790.62 2010: \$409,085.56 2011: \$487,869.50 2012: \$531,395.22 2013: \$638,142.64 2014: \$674,841.06 2015: \$765,759.15 2016: \$787,477.51 2017: \$833,155.44 2018: \$960,105.49 2019: \$926,030.44 2020: \$517,978.74 2021: \$653,687.64 2022: \$835,850.71

2023: \$956,253.38 2024: \$939,814.20



Now of course you might be wondering, wow, just how much was collected at my local airport? The next few pages will fill you in. Please note, some airports have data and then grey boxes. This is due to TSA no longer recording that airport's total individually but adding it to the nearest hub (larger) airport.

Airport Code	Hub Airport	FY2012-2020 TOTALS	FY2021	FY2022	FY2023	FY2024	FY2012-2024 TOTALS
ABE	Allentown, PA	\$1,056.89					\$1,056.89
ABQ.	Albuquerque, NM	\$23,076.50	\$1,874.31	\$3,322.66	\$3,217.72	\$1,882.06	\$33,373.25
ACY	Atlantic City, NJ	\$2,644.44					\$2,644.44
ALB	Albany, NY	\$21,749.47	\$ 5,149.34	\$ 7,252.98	\$ 3,913.71	\$ 6,722.88	\$44,788.38
ANC	Anchorage	\$25,336.69	\$ 2,839.63	\$ 3,672.78	\$ 7,573.96	\$ 6,611.19	\$46,034.25
ATL	Atlanta	\$102,386.09	\$ 10,913.07	\$ 17,634.51	\$ 16,392.77	\$ 21,268.07	\$168,594.51
AUS	Austin, TX	\$56,211.57	\$ 6,227.88	\$ 8,712.90	\$ 8,408.54	\$ 15,580.27	\$95,141.16
BDL	Hartford, CT	\$25,098.08	\$ 2,203.79	\$ 3,678.82	\$ 3,570.81	\$ 3,813.04	\$38,364.54
внм	Birmingham, AL	\$12,671.33	\$ 1540.22	\$ 4284.18	\$ 2421.52	\$ 3847.65	\$24,764.90
BIL	Billings, MT	\$10,844.54	\$ 1,615.62	\$ 2,067.85	\$ 2,487.70	\$ 2,426.64	\$19,442.35
BIS	Bismarck, ND	\$7,345.23	\$ 673.77	\$ 741.75	\$ 1,400.13	\$ 1,513.08	\$11,673.96
BNA	Nashville	\$78,398.17	\$ 18,237.18	\$ 15,032.24	\$ 8,105.57	\$ 5,106.18	\$124,879.34
BOI	Boise, ID	\$14,528.46	\$ 1,369.42	\$ 1,784.25	\$ 721.80	\$ 1,605.26	\$20,009.19
BOS	Boston	\$182,643.69	\$ 15,097.08	\$ 33,010.82	\$ 25,939.20	\$ 32,512.73	\$289,203.52
BTR	Baton Rouge, LA	\$5,091.73					\$5,091.73
BTV	Burlington, VT	\$5,682.30	\$ 348.03	\$ 448.61	\$ 744.24	\$ 700.90	\$7,924.08
BUF	Buffalo, NY	\$5,905.60					\$5,905.60
BUR	Burbank, CA	\$21,732.76	\$ 812.80	\$ 2,913.98	\$ 1,565.09	\$ 3,346.82	\$30,371.45
BWI	Baltimore	\$95,384.06	\$ 9,196.56	\$ 10,464.84	\$ 11,797.98	\$ 9,083.48	\$135,926.92
CAE	Columbia, SC	\$4,713.21					\$4,713.21
CHS	Charleston, SC	\$29,377.72	\$ 4,683.83	\$ 5,933.57	\$ 6,288.94	\$ 6,178.11	\$52,462.17
CLE	Cleveland	\$26,125.36					\$26,125.36
CLT	Charlotte	\$47,196.37	\$6,747.89	\$4,547.39	\$15,981.71	\$7,453.39	\$81,926.75
CMH	Columbus, OH	\$50,697.97	\$6,614.38	\$11,523.34	\$7,747.58	\$11,701.07	\$88,284.34
cos	Colorado Springs	\$1,756.36					\$1,756.36
CPR	Casper, WY	\$3,607.31	\$1,372.19	\$1,445.17	\$209.62	\$312.51	\$6,946.80
CRW	Charleston, WV	\$2,720.64	\$ 167.11	\$ 632.96	\$ 432.28	\$ 224.82	\$4,177.81
CVG	Cincinnati	\$36,494.22	\$ 4,188.43	\$ 6,255.61	\$ 7,431.23	\$ 6,744.65	\$61,114.14
DAL	Dallas Love	\$36,930.85	\$ 739.27	\$ 109.45	\$ 13.13		\$37,792.70
DCA	Washington Nat.	\$106,052.26	\$ 9,494.80	\$ 29,320.40	\$ 10,261.34	\$ 12,597.07	\$167,725.87
DEN	Derwer	\$127,612.58	\$ 17,897.31	\$ 18,290.39	\$ 18,701.40	\$ 18,789.88	\$201,291.56
DFW	Dallas/Fort Worth	\$284,909.08	\$ 34,016.06	\$ 34,807.54	\$ 42,331.71	\$ 43,112.07	\$439,176.46
DSM	Des Moines, IA	\$15,736.63	\$ 1,674.36	\$ 2,354.96	\$ 2,352.42	\$ 3,100.41	\$25,218.78
DTW	Detroit	\$109,972.23	\$15,729.19	\$10,605.15	\$22,843.41	\$19,732.50	\$178,882.48
ELP	El Paso	\$13,827.01	\$2,147.45	\$1,370.99	\$4,668.56	\$2,013.96	\$24,027.97
EWR	Newark, NJ	\$180,924.72	\$33,491.79	\$26,629.41	\$47,132.34	\$14,585.50	\$302,763.76
FAI	Fairbanks, AK	\$4,043.96					\$4,043.96
FAT	Fresno, CA	\$3,063.64					\$3,063.64
FLL	Fort Lauderdale	\$116,855.72	\$19,592.36	\$13,636.18	\$29,602.98	\$26,034.00	\$205,721.24
FSD	Sioux Falls, SD	\$3,592.76	\$594.26	\$504.79	\$298.67	\$755.26	\$5,745.74
GEG	Spokane, WA	\$4,259.50					\$4,259.50
GJT	Grand Junction, CO	\$1,302.72					\$1,302.72
GRB	Green Bay, WI	\$4,578.79					\$4,578.79
GRR	Grand Rapids, MI	\$10,908.94	\$1,612.08	\$833.30			\$13,354.32
GSN	Salpan	\$824.04					\$824.04
HNL	Honolulu	\$88,084.58	\$7,982.64	\$10,641.91	\$26,369.94	\$14,675.55	\$147,754.62

Airport Code	Hub Airport	FY2012-2020 TOTALS	FY2021	FY2022	FY2023	FY2024	FY2012-2024 TOTALS
HOU	Houston Hobby	\$45,678.74	\$1,702.94	\$9,046.16	\$4,628.79	\$5,595.31	\$66,651.94
IAD	Washington Dulles	\$188,071.59	\$5,053.06	\$31,697.22	\$25,807.13	\$20,364.71	\$270,993.71
HAI	Houston Intl.	\$206,227.98	\$18,060.36	\$20,936.18	\$29,618.54	\$38,498.06	\$313,341.12
ICT	Wichita, KS	\$4,399.64	\$877.57	\$1,013.00	\$638.47	\$895.24	\$7,823.92
IND	Indianapolis	\$32,394.88	\$ 6,315.78	\$ 4,418.32	\$ 4,825.78	\$ 8,029.69	\$55,984.45
JAN	Jackson, MS	\$6,543.08	\$ 1009.22	\$ 1031.10	\$ 892.06	\$ 1456.64	\$10,932.10
JAX	Jacksonville, FL	\$36,243.70	\$ 10,931.83	\$ 9,420.74	\$ 8,365.46	\$ 9,965.07	\$74,926.80
JFK	New York Kennedy	\$483,759.11	\$ 54,181.00	\$ 59,980.00	\$ 42,230.92	\$ 55,407.00	\$695,558.03
KOA	Kona, HI	\$5,281.26					\$5,281.26
LAS	Las Vegas	\$306,185.37	\$ 42,497.82	\$ 43,228.80	\$ 39,134.45	\$ 30,610.22	\$461,656.66
LAX	Los Angeles	\$387,638.16	\$ 36,531.72	\$ 35,019.45	\$ 51,805.00	\$ 96,544.65	\$607,538.98
LBB	Lubbock, TX	\$5,046.56					\$5,046.56
LGA	New York LaGuardia	\$178,970.87	\$13,836.47	\$28,667.89	\$25,052.26	\$14,318.37	\$260,845.86
LGB	Long Beach, CA	\$4,688.88					\$4,688.88
LIH	Lihue, HI	\$4,968.22					\$4,968.22
LIT	Little Rock, AR	\$12,160.27	\$1,681.00	\$1,049.00	\$497.00		\$15,387.27
MCI	Kansas City	\$24,187.89					\$24,187.89
MCO	Orlando, FL	\$190,973.88	\$ 19,537.60	\$ 34,914.55	\$ 30,503.06	\$ 33,866.90	\$309,795.99
MDW	Chicago Midway	\$49,947.60					\$49,947.60
MEM	Memphis	\$8,903.64					\$8,903.64
MHT	Manchester, NH	\$8,792.83	\$515.37	\$979.09	\$1,403.59	\$1,031.76	\$12,722.64
MIA	Miami	\$362,764.45	\$ 32,110.39	\$ 22,193.03	\$ 78,950.39	\$ 43,515.35	\$539,533.61
MKE	Milwaukee, WI	\$22,194.64	\$ 2,033.17	\$ 2,967.47	\$ 2,464.83	\$ 2,157.07	\$31,817.18
MLI	Moline, IL	\$4,357.26					\$4,357.26
MOB	Mobile, AL	\$1,587.36					\$1,587.36
MSN	Madison, WI	\$1,845.31					\$1,845.31
MSP	Minneapolis	\$88,540.62	\$ 5,724.00	\$ 9,460.00	\$ 17,018.00	\$ 3,643.00	\$124,385.62
MSY	New Orleans	\$67,321.26	\$ 4,299.49	\$ 7,012.11	\$ 9,761.59	\$ 8,206.86	\$96,601.31
OAK	Oakland, CA	\$55,397.66	\$ 3,512.45	\$ 5,691.23	\$ 13,057.12	\$ 7,947.16	\$85,605.62
OGG	Kahului, HI	\$9,127.31					\$9,127.31
OKC	Oklahoma City	\$16,841.41	\$3,750.98	\$3,489.56	\$4,582.09	\$2,397.68	\$31,061.72
OMA	Omaha, NE	\$19,224.54	\$137.05	\$2,561.13	\$1,862.57	\$2,906.98	\$26,692.27
ONT	Ontario, CA	\$13,677.00					\$13,677.00
ORD	Chicago O'Hare	\$252,108.98	\$ 34,074.06	\$ 39,873.68	\$ 48,152.65	\$ 48,823.11	\$423,032.48
PBI	Palm Beach, FL	\$25,162.93	\$ 2,095.50				\$27,258.43
PDX	Portland, OR	\$42,043.31	\$ 3,740.90	\$ 1,041.50	\$ 1,510.45	\$ 762.50	\$49,098.66
PHL	Philadelphia	\$72,529.83	\$ 8,912.77	\$ 10,540.07	\$ 7,902.11	\$ 11,010.75	\$110,895.53
PHX	Phoenix	\$94,839.49	\$ 13,126.75	\$ 20,213.70	\$ 20,134.49	\$ 18,590.00	\$166,904.43
PIT	Pittsburgh	\$39,251.23	\$ 2,018.63	\$ 4,892.29	\$ 4,264.90	\$ 3,625.65	\$54,052.70
PNS	Pensacola, FL	\$5,422.69					\$5,422.69
PPG	Pago Pago, AS	\$36.26	4				\$36.26
PVD	Providence, RI	\$10,867.35	\$613.93	\$698.36	\$1,204.35	\$2,210.59	\$15,594.58
PWM	Portland, ME	\$4,355.42					\$4,355.42
RDU	Raleigh, NC	\$40,433.95	\$ 4,614.96	\$ 6,311.40	\$ 10,145.82	\$ 7,281.93	\$68,788.06
RIC	Richmond, VA	\$29,995.13	\$ 2,328.04	\$ 1,849.92	\$ 4,401.17	\$ 3,109.75	\$41,684.01
RNO	Reno, NV	\$9,199.72					\$9,199.72

Airport Code	Hub Airport	FY2012-2020 TOTALS	FY2021	FY2022	FY2023	FY2024	FY2012-2024 TOTALS
ROC	Rochester, NY	\$4,783.90					\$4,783.90
RSW	Fort Myers, FL	\$31,274.19	\$3,929.02	\$6,348.00	\$4,726.25	\$2,941.50	\$49,218.96
SAN	San Diego	\$55,572.42	\$ 7,631.74	\$ 7,731.98	\$ 5,166.37	\$ 6,416.90	\$82,519.41
SAT	San Antonio	\$43,315.28	\$ 5,074.88	\$ 7,783.84	\$ 5,601.17	\$ 7,942.59	\$69,717.76
SAV	Savannah, GA	\$10,375.54					\$10,375.54
SBA	Santa Barbara, CA	\$1,327.54					\$1,327.54
SDF	Louisville, KY	\$6,831.87					\$6,831.87
SEA	Seattle	\$104,926.47	\$7,612.25	\$13,780.16	\$16,784.91	\$17,378.42	\$160,482.21
SFO	San Francisco	\$286,626.82	\$10,830.16	\$38,729.92	\$33,690.42	\$56,131.28	\$426,008.60
SJC	San Jose, CA	\$48,385.78		\$4,650.00	\$8,794.50	\$4,738.00	\$66,568.28
SJU	San Juan, PR	\$21,640.45	\$1,270.21	\$432.05	\$3,546.75	\$1,578.09	\$28,467.55
SLC	Salt Lake City	\$39,264.15	\$8,125.51	\$9,799.95	\$13,134.75	\$10,408.77	\$80,733.13
SMF	Sacramento, CA	\$47,890.93	\$6,060.15	\$7,943.00	\$9,211.97	\$8,907.38	\$80,013.43
SNA	Santa Ana, CA	\$16,765.66					\$16,765.66
STL	St. Louis, MO	\$56,126.73	\$10,514.55	\$4,740.78	\$8,336.43	\$8,467.09	\$88,185.58
STT	St. Thomas, VI	\$3,254.22					\$3,254.22
SYR	Syracuse, NY	\$2,439.24					\$2,439.24
TLH	Tallahassee, FL	\$1,027.66					\$1,027.66
TPA	Tampa	\$77,037.46	\$9,970.26	\$13,232.26	\$15,516.76	\$14,622.96	\$130,379.70
TUL	Tulsa, OK	\$6,588.60					\$6,588.60
TUS	Tucson, AZ	\$3,623.63					\$3,623.63
TVC	Traverse City, MI	\$956.32					\$956.32
U.S. TO	TAL OF ALL AIRPORTS	\$6,724,905.27	\$653,687.64	\$835,850.71	\$956,253.38	\$939,814.20	\$10,110,511.20

FIREARMS IN AVIATION SECURITY

Screeners find all sorts or prohibited items in passengers' carry-on bags, and of course, they often come across handguns. In fact, about 18 times a day in the U.S., TSA catches a handgun in a passenger's carry-on bag. The number of guns that TSA screeners have found has increased significantly over the past decade.



Every year since 2008 (except for 2020 when COVID significantly curtailed flights) has established a new record for firearms caught, and as of this writing, TSA finds an average of 18 guns per day nationwide in carry-on bags.

How does this trend continue to increase exponentially each year? I'm afraid I don't have an answer for that. Perhaps it can be attributed to many states relaxing their gun laws in recent years, but what is true is that almost every passenger caught with a handgun "forgot it was there." Since 2005, TSA has caught over **60,000 guns** in carry-on bags at airport screening checkpoints.

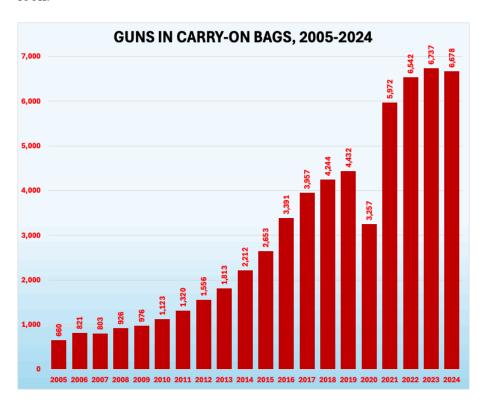
In addition to potential criminal citations or arrest by local law enforcement, travelers face civil penalties for bringing firearms to the security checkpoint. Among the factors TSA considers when determining the civil penalty amount includes whether the firearm was loaded and whether there was accessible ammunition. The civil penalty can go up to a maximum of nearly \$15,000 per violation.

Individuals who violate rules regarding traveling with firearms will also have TSA PreCheck eligibility revoked for a period of up to five years and will receive enhanced screening during future travels.

Passengers may transport unloaded firearms in a locked hard-sided container as checked baggage only. Declare the firearm and/or ammunition to the airline when checking your bag at the ticket counter. The container must completely secure the firearm from being accessed. Locked cases that can be easily opened are not permitted. Be aware that

the container the firearm was in when purchased may not adequately secure the firearm when it is transported in checked baggage.

So, just how many guns are we talking about each year? Let's have a look.



CHICAGO CONVENTION



The seed for every modern rule and regulation in international air travel that exists today was planted at the Chicago Convention in 1944. Officially known as the Convention on International Civil Aviation, but more commonly known as the Chicago Convention as the meetings were held there, the International Civil

Aviation Organization (ICAO) was established at this gathering. ICAO is a specialized agency of the United Nations which is responsible for coordinating and regulating international air travel.

So, what exactly are we talking about here, regarding international aviation rules and regulations? The Convention established several articles that cover various topics. These articles provide a broad framework and set forth some "norms" to be followed. For example, signatories agree that they will not use weapons against civil aircraft and all signatory countries must render aid and hospitality to aircraft in distress, despite any other differences that may exist between the two.

A good example of this would be a June 2005 incident in which a Northwest Airlines Douglas DC-10 on its way from Bombay, India to Amsterdam, Netherlands had to make an emergency landing in Tehran, Iran due to a technical issue with the aircraft. Despite long standing hostilities between the U.S. and Iranian governments, local mechanics helped to resolve the issue, and the plane was back underway several hours later.

Nineteen annexes to the Convention have been established, and these contain standards and recommended practices that all signatories must follow. The annexes are the "nuts and bolts" in which Standards and Recommended Practices (SARPs) are written. Signatory states to the

Chicago Convention must follow all Standards, while Recommended Practices are just that, recommended.

Annex 17, Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference is the most applicable to TSA and the area in which TSA's international Inspectors review at foreign locations. It is this Annex, adopted in March 1974, which outlines basic aviation security requirements that are to be followed worldwide.

Did You Know? The Chicago Convention set forth that commercial aviation fuel for foreign carriers in any location other than their home state is non-taxable.

ICAO AND IMPACT ON TSA

The International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations that plays a crucial role in the development and regulation of international civil aviation. Established in 1944, ICAO's primary objective is to ensure the safe, efficient, secure, and environmentally sustainable development of civil aviation worldwide.

ICAO develops and publishes Standards and Recommended Practices (SARPs) that are detailed in 19 annexes to the Chicago Convention, which is the foundational treaty of international civil aviation. These SARPs cover all aspects of aviation, including aircraft operations, safety, security, air traffic management, and environmental protection. By setting these standards, ICAO ensures that aviation practices are consistent across the world, which is essential for the safe and efficient operation of international flights.

ICAO conducts regular audits of member states to assess their adherence to safety standards and regulations. This program helps identify safety gaps and encourages states to improve their aviation safety oversight systems. ICAO provides guidance and assistance to member states to help them implement and comply with international standards, thus enhancing global aviation safety.

ICAO organizes global conferences and forums where member states, industry stakeholders, and experts can collaborate, share knowledge, and address common challenges in civil aviation. ICAO serves as a neutral platform for resolving disputes between states related to civil aviation, helping to maintain harmonious international relations.

ICAO establishes international security standards to protect civil aviation from acts of unlawful interference, such as terrorism. These standards cover areas like airport security, passenger screening, and cargo security. ICAO works to simplify and harmonize procedures for the processing of passengers and cargo across borders, aiming to facilitate the smooth movement of people and goods while ensuring security.

ICAO develops and maintains a framework for the evolution of air navigation systems worldwide. This plan includes the modernization of air traffic management to accommodate the growing demand for air travel while enhancing safety and efficiency. ICAO's work in air navigation includes the development of standardized procedures for air traffic control, navigation, communication, and surveillance, ensuring that aircraft can operate safely and efficiently in international airspace.

ICAO provides guidance on economic policies related to air transport, including issues like air carrier ownership, competition, and consumer protection. The organization supports the development of a fair and transparent global aviation market. ICAO collects and publishes data on global aviation activities, including traffic statistics, economic performance, and trends. This information helps member states and industry stakeholders make informed decisions.

ICAO supports the training and capacity building of aviation professionals around the world. The organization offers training programs, workshops, and seminars to help member states build the necessary expertise to comply with international standards. ICAO provides technical assistance to member states, particularly developing countries, to help them enhance their aviation infrastructure and regulatory frameworks.

The Assembly is ICAO's sovereign body, comprising representatives from all 193 member states. It meets every three years to set policies and priorities for the organization. Major changes to international policy take place at occasional Conventions, of which there have been six since 1944. International aviation security measures were first put in place by Annex 17 to the Chicago Convention in 1974, with 16 updates since then.

The Council is ICAO's governing body, responsible for adopting international standards and regulations. It consists of 36 member states elected by the Assembly, representing different regions of the world. The Secretariat is the administrative arm of ICAO, led by the Secretary General. It is divided into several bureaus, each responsible for different aspects of civil aviation, such as safety, security, and environmental protection.

As a signatory nation, the U.S. is compelled to implement policies that ICAO agrees to. While it is up to individual member states to incorporate new statutes and requirements into their own national legislation, the nexus of most of the rules in place today come from ICAO rather than some "bureaucrat" sitting at FAA or TSA headquarters in Washington, D.C. dreaming random things up.

CODE OF FEDERAL REGULATIONS (CFR)

Much of the framework that establishes aviation security in the U.S. today is public record, and has been for many years, as it is codified in the Code of Federal Regulations (CFR).

Chapter 12 of Title 49 of the Code of Federal Regulations features regulations for the TSA. For our purposes, we will focus on the meaty section - Subchapter C, which deals with Civil Aviation Security.

Once we get into this area, you will see the baseline for aviation security in the U.S. today. All the basics are here; more detailed requirements or practices can be found in other documents, particularly the various security programs. Those programs are not publicly available, for good reason. The CFRs are the "what" of aviation security, as in, what is required. The security programs are the "how," as in how the regulated party, i.e. the airport or air carrier, meets the requirements. Think of the security programs as the instruction guides.

So, what exactly are we getting at here insofar as the **what** and the **how**? Let's take a quick review: 49 CFR 1542.201(b) is the what, and it states that airport operators "must prevent and detect the unauthorized entry, presence, and movement of individuals and ground vehicles into and within the security area..."

OK, that's easy! The airport must keep unauthorized people from entering the secured area at the airport. But wait, the CFR doesn't say how. There is **no requirement**, for instance, for the airport to put a fence up. Maybe there are guards stationed every few hundred yards in a field as in some African airports, or maybe there is a moat with crocodiles is in place instead. Yes, those airports do exist in the world! The main requirement for the airport is to "prevent and detect unauthorized entry," and yes, fences are certainly the most common tool used to do that. In the end, the airport's security program will state just how an airport is going to prevent unauthorized access to its grounds.

Each section of the CFRs is set up in a similar manner. 1540 deals with individual responsibilities — this is the section that allows the government to fine a person who brings a gun to the airport. 1542 covers airports; 1544 domestic carriers; 1546 foreign carriers; 1548 indirect air carriers and so on and so forth. In fact, let's list them all:

1540 Individuals

1542 Airports

1544 U.S. carriers

1546 Foreign carriers

1548 Indirect air carriers

1549 Certified cargo screening

1550 General aviation

1552 Flight schools

1560 Secure Flight

1562 Maryland Three airports

Now that we have a basic understanding of the CFRs, let's start looking at some of the other programs and processes in place today as they relate to commercial aviation security.

CBP PRECLEARANCE



Customs and Border Protection (CBP) Preclearance is the strategic stationing of CBP personnel at designated foreign airports to inspect travelers prior to boarding U.S.-bound flights. With Preclearance, travelers then bypass CBP and TSA inspections upon U.S. arrival and proceed directly to their connecting flight or destination.

The program has been around for over 70 years as the first preclearance facility was opened at Toronto Pearson in 1952. Preclearance facilities are U.S. customs and immigration foreign inspections stations that are located on foreign soil. The purpose of these preclearance facilities is to allow passengers to pass through U.S. customs and immigration checks before boarding their U.S. bound flight in the host nation. Subsequently, when these passengers arrive in the U.S., they are treated in the same manner as domestic passengers arriving from other U.S. airports. If you are entering the U.S., preclearance certainly makes things easier, especially if you have a connecting flight, as you have already cleared U.S. customs.

Today, CBP has more than 600 officers and agriculture specialists stationed at 15 Preclearance locations in 6 countries: Dublin and Shannon in Ireland; Aruba; Bermuda; Abu Dhabi in the United Arab Emirates; Nassau in the Bahamas; and Calgary, Toronto, Edmonton, Halifax, Montreal, Ottawa, Vancouver, Victoria, and Winnipeg in Canada.

Collaboration

Upon sufficient fulfillment of requirements necessary for implementing Preclearance, CBP and partners engage in three fundamental agreements.

- Bilateral Agreement An agreement between CBP and the host government establishing the parameters of Preclearance operations, including CBP authorities, protections, infrastructure requirements, etc.
- Memorandum of Understanding An agreement between CBP and the airport operator outlining roles and responsibilities and cost sharing.
- Memorandum of Cooperation An agreement between TSA and the host government that outlines adherence to TSAcommensurate aviation security screening for precleared flights.

The host government, airport, and airlines must engage with CBP consistently for successful completion of Preclearance agreements.

Preclearance costs include capital expenditures, for which the applicant is responsible, and operational expenditures, which are shared between the applicant and U.S. Government. Total cost is broken into two categories: Capital Expenditures, which are the applicant's responsibility, and Operational Expenditures, which are the applicant's responsibility. Operational expenditures are shared costs between CBP and the applicant.

Did You Know? The preclearance agreement with Canada is reciprocal; however, the Canadian government has so far declined to open a Canadian preclearance facility in the U.S.

Did You Know? In 2024, over 22 million passengers precleared, which was nearly 16 percent of all commercial air travelers arriving in the U.S.

ADVANCED PASSENGER INFORMATION SYSTEM (APIS)

Another CBP initiative is the Protection) Advanced Passenger Information System (APIS). This program is an important of the U.S. government's efforts to enhance border security and facilitate the efficient processing of travelers entering and exiting the United States. By requiring the advance submission of passenger and crew data, APIS allows CBP to screen individuals for potential security risks before they arrive in or depart from the United States. This enhances the safety and efficiency of border operations, while also contributing to the broader global effort to improve aviation security.

Purpose of the APIS Program

The primary goal of the APIS program is to enhance border security by allowing CBP to screen passengers and crew members before they arrive in or depart from the United States. This pre-arrival and pre-departure information helps CBP identify potential security threats and persons of interest.

APIS also helps to streamline the entry and exit processes by allowing CBP to conduct pre-arrival screenings, reducing wait times and improving the overall efficiency of customs and immigration processing at U.S. ports of entry.

Key Components of the APIS Program

Airlines, cruise lines, and other commercial carriers operating flights or voyages to or from the United States are required to collect and submit certain information about all passengers and crew members to CBP before departure or arrival.

The information that must be provided through APIS includes full name (as it appears on the passport or travel document), date of birth, gender, nationality, passport number and country of issuance, country of residence, travel itinerary, and U.S. destination address.

APIS data is transmitted to CBP in real-time, typically through electronic systems integrated with the carriers' reservation and checkin processes. This allows CBP to analyze the data quickly and efficiently.

Pre-Arrival and Pre-Departure Screening

Once APIS data is received, CBP uses automated systems and databases to conduct a risk assessment of each passenger and crew member. This screening process checks against various watchlists and databases, including those related to terrorism, criminal activity, immigration violations, and other security concerns.

Based on the risk assessment, CBP can take several actions, such as clearing the passenger for entry, flagging the individual for additional screening upon arrival, or denying boarding if a significant threat is identified.

Compliance and Penalties

Airlines and other carriers are responsible for collecting and submitting accurate APIS data. Failure to comply with APIS requirements can result in penalties, including fines and delays in processing.

CBP enforces APIS compliance through regular audits and checks. Carriers that fail to provide accurate or timely data may face enforcement actions, including financial penalties.

Benefits of the APIS Program

By screening passengers before they arrive in or depart from the U.S., APIS significantly enhances the ability of CBP to prevent potential security threats from reaching U.S. borders.

APIS helps to reduce congestion and wait times at ports of entry by allowing CBP to pre-screen passengers. This enables faster processing upon arrival, benefiting both travelers and border security personnel.

The program helps ensure that the information CBP has about incoming and outgoing passengers is accurate and up to date, improving the overall effectiveness of border security operations.

International Cooperation and Standards

The APIS program is part of a broader international effort to standardize passenger data collection and sharing for security purposes. ICAO has developed guidelines that many countries, including the U.S., follow for the implementation of APIS-like systems.

While APIS involves the collection and transmission of personal data, the program is designed to comply with data protection regulations.

Challenges and Considerations

The collection of personal data through APIS has raised concerns among privacy advocates about how the data is used and stored. CBP is required to handle this data in accordance with privacy laws, but the balance between security and privacy remains a topic of discussion.

Carriers must have the necessary technology and systems in place to collect and transmit APIS data accurately and in real-time. This requires ongoing investment in technology and collaboration between carriers and CBP.

Ongoing Developments

As security threats continue to evolve, the APIS program is regularly updated to address new risks and incorporate the latest technological advancements. This includes improvements in data analysis and the integration of biometric data.

The data collected through APIS is increasingly used in conjunction with other security programs and technologies, such as the Electronic System for Travel Authorization (ESTA) and biometric entry/exit systems, to enhance overall border security.

FEDERAL AIR MARSHALS (FAM)



Tracing its roots back to the early 1960s, the Federal Air Marshal (FAMs) Service is the law enforcement arm of TSA. Originally known as "Sky Marshals," FAMs are covertly deployed on flights within, to and from the U.S. as an additional layer of security. The exact number of FAMs and the percentage of flights they are on-board are kept secret, although there were just 33 on September 11, 2001.

The primary responsibility of FAMs is to ensure the security of commercial flights. They

operate covertly, blending in with passengers while being ready to respond to any threats that may arise during a flight. FAMs are trained to observe and identify suspicious behavior, assess potential threats, and take appropriate action to prevent terrorist acts or other criminal activities on board. FAMs work closely with other law enforcement agencies, intelligence services, and international counterparts to share information, conduct investigations, and enhance security measures.

Candidates for the Federal Air Marshal Service must undergo a thorough selection process, including background checks, psychological evaluations, and physical fitness tests. Only those who meet the stringent requirements are accepted into the training program.

Air Marshals undergo a rigorous 16-week training program conducted at FLETC facilities in Artesia, New Mexico and Atlantic City, New Jersey. FAMs receive comprehensive training in various areas, including marksmanship, close-quarters combat, defensive tactics, aviation security, and emergency medical procedures. They are also trained in behavioral detection and situational awareness to effectively respond to in-flight incidents.

One of the most critical aspects of FAM training is firearms proficiency. Marshals must maintain a high level of accuracy and control, particularly given the confined and crowded environment of an

aircraft. FAMs have historically been some of the most accurate shots in the federal government.

FAMs operate covertly, meaning their presence on a flight is typically unknown to passengers and crew. They do not wear uniforms and carry concealed firearms. Their goal is to remain inconspicuous while maintaining constant vigilance.

FAMs are deployed on flights based on a combination of random selection and targeted intelligence. High-risk flights, such as those on certain international routes or those with specific security concerns, are more likely to have FAMs on board. While the primary focus of FAMs is on U.S. domestic flights, they also operate on international flights to and from the United States, providing security on a global scale.

FAMs may deploy on flights for which a known or suspected terrorist is ticketed. Flights like this are referred to as Special Mission Coverage (SMC). FAMs may not be deployed on foreign-flagged airlines.

Interestingly, the FAMs have seen several organizational transfers since 2001. Originally under FAA within the Department of Transportation (DOT), they were transferred within DOT to TSA once that agency was created. In March 2003, TSA was moved from DOT to the newly created Department of Homeland Security (DHS). In November 2003, FAMS were moved within DHS from TSA to Immigration and Customs Enforcement (ICE), before being returned to TSA in October 2005.

Did You Know? The U.S. is not the only country that utilizes air marshals. Several countries have their own air marshal programs, operating on both domestic and international flights.

FEDERAL FLIGHT DECK OFFICER (FFDO)



The Federal Flight Deck Officer (FFDO) program was established by the Arming Pilots Against Terrorism Act (APATA) as Title XIV of the Homeland Security Act (Pub. L. 107-296, Nov. 25, 2003, 116 Stat. 2300), codified at 49 U.S.C. 44921. Under this program, TSA deputizes qualified volunteer pilots and flight crewmembers of passenger and cargo aircraft as law enforcement officers to defend the flight deck of aircraft against acts of criminal violence or

air piracy. Participants in the program, known as Federal Flight Deck Officers (FFDOs), are trained and authorized to transport and carry a firearm and to use force, including deadly force. Through this program, TSA collects data on pilots to assess the qualification and suitability of prospective and current FFDOs through an online application, and to administer the program.

The FFDO program is administered by the Federal Air Marshal Service. FAMs provide training and guidance to FFDOs on the use of force and firearms, defensive tactics and other topics. The first FFDOs were sworn in on April 19, 2003.

The FFDO program is a voluntary program for which pilots are not compensated. The goal of the program is to train and arm flight crewmembers to defend the flight deck of commercial aircraft from takeover. The identity of an FFDO is strictly controlled to reduce endangerment to the individual or the air transport system. Thus, privacy is a key ingredient to the success of the program.

SCREENING PARTNERSHIP PROGRAM (SPP)

The Screening Partnership Program contracts security screening services at commercial airports to qualified private companies. These companies run screening operations under federal oversight and must comply with all TSA security screening procedures.

When ATSA created TSA in 2001, five airports remained staffed with private contractors conducting screening operations under federal oversight as part of a pilot program. Of the five, Kansas City and San Francisco were the two largest. In 2004 this pilot program ended, and the Screening Partnership Program was officially born, with the original five airports included. The program has slowly expanded since then, and as of July 2024 there are just 21 (mostly small) airports included. The program seems particularly popular in Montana, with eight airports participating.

When airports convert from TSA to private contractors, the contract companies that end up running screening operations must adhere to the **exact** same rules and procedures that are employed by TSA. Privatized screeners at SPP airports attend the same training as TSA screeners. There is no change in the security measures in place at an airport staffed with TSA employees or one with private security contractors. Even the uniforms are nearly identical. The screeners must be compensated at an amount commensurate with their TSA counterparts as well.

To join the SPP, airports that wish to "opt-out" of TSA screening must apply. Critics, including some vocal members of Congress, have charged that TSA has either dragged its feet on applications or simply ignored them outright. In March 2012, the SPP application was amended to comply with requirements in the FAA Modernization and Reform Act of 2012. Some of the key changes included:

TSA must approve or deny the application within 120 days after receiving it. TSA must approve the application if it does not compromise security, negatively affect budget efficiencies or

screening effectiveness. Finally, within 60 days of any denials, TSA essentially must explain itself to the airport as well as applicable committees in both the House of Representatives and the Senate whenever an application is denied.

To date, only a small handful of airports have expressed an interest in replacing TSA with private contractors, although as TSA encountered staffing shortages and difficulties in screening increased passenger volume in 2016, several large airports including Atlanta, New York (both JFK & LGA), and Seattle, threatened to investigate privatizing their screening personnel.

Current SPP Airports as of September 2025:

Atlantic City, N.J. (ACY)

Glacier Park, Mont. (GPI)

Glasgow, Mont. (GGW)

Glendive, Mont. (GDV)

Great Falls, Mont. (GTF)

Havre City, Mont. (HVR)

Jackson Hole, Wyo. (JAC)

Kalispell, Mont. (FCA)

Kansas City (MCI)

Orlando Sanford (SFB)

Portsmouth, N.H. (PSM)

Punta Gorda, Fla. (PGD)

Roswell, N.M (ROW)

San Francisco (SFO)

Sarasota, Fla. (SRQ)

Sidney, Mont. (SDY)

Sioux Falls, S.D. (FSD)

Sonoma County, Calif. (STS)

Tupelo, Miss. (TUP)

Wolf Point, Mont. (OLF)

Yellowstone, Mont. (WYS)

KNOWN CREWMEMBER PROGRAM (KCM)

The Known Crewmember (KCM) program is a joint initiative between Airlines for America (A4A) and the Air Line Pilots Association, Int'l (ALPA). KCM ties airline employee databases together in a seamless way and enables TSA officers to positively verify the identity and employment status of crewmembers. Once that is completed, eligible crew could bypass standard passenger screening, although they were still subject to random checks.

Airlines must be KCM program participants for their crewmembers to gain entry through designated access points. All KCM participants must be employed by an aircraft operator participating in a TSA-approved security program; authorized to perform crewmember duties on full all-cargo flights, scheduled passenger or public/private charter passenger flights operated under a TSA-approved security program; and have completed the aircraft operator's crewmember security training, as applicable. Additionally, to enter KCM access points, crewmembers must not be on a leave of absence greater than 30 days, including furloughs and military duty.

Let's look at how it works.

Entry

Only KCM participants may enter the airport sterile area through a KCM access point. KCM access points may be used for business and personal use except when on personal international travel. KCM participants must present and scan their KCM barcode card to enter access points. KCM participants with a boarding pass showing SSSS are not permitted to use KCM access points. If a KCM participant has a boarding pass with SSSS printed on it, the crewmember must proceed to a standard passenger screening checkpoint and undergo screening, as directed. KCM participants cannot bring other individuals (such as spouses, dependents, minor children) through KCM access points.

Identification

KCM participants in uniform must present two forms of identification (ID) for the TSA officer to confirm the crewmember's identity. KCM participants out of uniform must present three forms of ID for the TSA officer to confirm the crewmember's identity. If TSA cannot confirm a KCM participant's identity or status in the KCM program at the KCM access point, the individual will be directed to a standard passenger screening checkpoint.

Property

Crewmembers cannot bring personal property belonging to others (including family members). KCM participants are permitted to bring personal property through KCM access points if that property does not contain any item listed on the TSA's prohibited items list. KCM participants cannot bring pets or pet carriers through KCM access points.

Additional Screening

The KCM program does not exempt a KCM participant from complying with any additional screening conducted beyond KCM access points. KCM participants selected for random screening must proceed directly to the appropriate screening lane, as directed. If a KCM participant is referred to a standard passenger screening checkpoint, failure to proceed directly to and submit to screening at the passenger screening checkpoint (e.g., using a Secure Identification Display Area badge to avoid screening or proceeding to another location before the screening checkpoint) is considered circumventing screening. TSA may take enforcement action, including potential civil penalties as well as disqualification from the KCM program in accordance with the KCM Disqualification Protocols.

While the KCM program has greatly improved convenience for crews, it has faced growing criticism after repeated cases of misuse, including smuggling of drugs, cash, and weapons, which raised security concerns.

To replace it, the TSA is developing the Crewmember Access Point (CMAP) program, which will be fully managed by the agency rather than by industry groups. CMAP is expected to incorporate biometric verification, such as fingerprint scans, and to provide more tightly controlled screening through TSA-monitored lanes. The intent is to maintain the efficiency that crews rely on while reducing vulnerabilities seen under KCM. Although the program was originally slated to launch in late 2025, implementation has been delayed indefinitely, and KCM remains active until the transition is complete.

TERRORIST WATCHLISTS

Many people mistakenly assume that the TSA compiles and/or maintains "the list" of terrorists that the government has. But what exactly is "the list" and who oversees it?

Terrorist Screening Database (TSDB)

The Terrorist Screening Database (TSDB), known colloquially as the "terrorist watch list" is the U.S. Government's consolidated database maintained by the Federal Bureau of Investigation's (FBI) Terrorist Screening Center (TSC). It is used to facilitate DHS mission-related functions, such as counterterrorism, law enforcement, border security, and inspection activities.

The TSDB contains records with identifying and/or biographical information of both foreign and U.S. citizens who are known or suspected to have links to terrorism.

On September 16, 2003, Homeland Security Presidential Directive (HSPD) 6 was issued, which provided for the establishment of what would become the Threat Screening Center (TSC). The TSC has been under the administration of the FBI since it stood up in December 2003. The TSC maintains and operates the TSDB.

The No-Fly and Selectee lists are basically subsets of the TSDB, although not everyone listed in the TSDB is necessarily on either the No-Fly or Selectee lists.

The TSC does not collect intelligence itself but rather serves as a type of aggregator or repository for information collected from various government agencies and entities. The TSC consolidates this into a watch list that is available for review by appropriate parties.

Terrorist Identities Datamart Environment (TIDE)

The Terrorist Identities Datamart Environment (TIDE) is the US Government's (USG) central repository of information on international terrorist identities. TIDE supports the USG's various terrorist screening systems or "watchlists" and the US Intelligence Community's overall counterterrorism mission.

The TIDE database includes, to the extent permitted by law, all information the U.S. government possesses related to the identities of individuals known or appropriately suspected to be or have been involved in activities constituting, in preparation for, in aid of, or related to terrorism, except for purely domestic terrorism information. This information is available to counterterrorism professionals throughout the Intelligence Community, including the department of Defense, via the web-based, read-only "TIDE Online."

NO-FLY AND SELECTEE LISTS

The No-Fly and Selectee lists, which premiered in 2002, are subsets of the TSDB that is managed by TSC. It is a common misperception that the TSA creates and manages these lists when in fact the No-Fly and Selectee lists are forwarded by the TSC to TSA daily.

If someone is on the No-Fly list, they are, unsurprisingly, not allowed to board a commercial aircraft for travel to, from, or within the U.S., or on a U.S. carrier that may be operating in foreign countries.

In general, persons who are deemed to be a threat to civil aviation or national security but do not meet the criteria of the No-Fly List are placed on the Selectee List and are to receive additional screening prior to being permitted to board an aircraft. This additional screening generally includes, in addition to the procedures applied during a typical standard screening experience, a pat-down and an explosives trace detection or physical search of the interior of the passenger's accessible property, electronics, and footwear.

In years past, it was the responsibility of the air carriers to check their passenger manifests against the No-Fly and Selectee lists and ensure that any No-Fly passengers were denied boarding and any Selectee passengers were subjected to additional security measures. In July 2004, the 9/11 Commission recommended that the federal government take over this role, and the subsequent Intelligence Reform and Terrorism Prevention Act of 2004 (IRTPA) made this recommendation a requirement. By November 2010, TSA had accomplished the task, and since then TSA has conducted watch list vetting of all passengers on U.S. and foreign air carrier flights to, from, and within the U.S. as well as flights operated by U.S. carriers in foreign countries.

How do you end up on these lists?

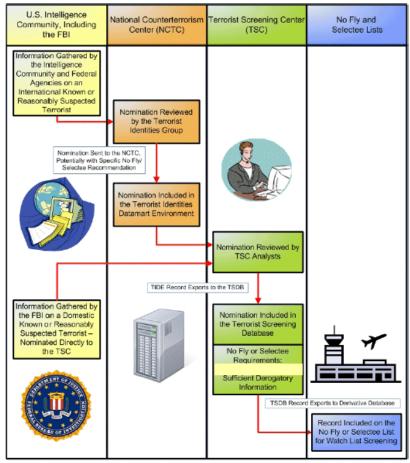
We've all probably heard a relative, friend or neighbor who insists he or she "must be on the list" because "every time" they go to the airport, they "get searched." No. Let's not indulge ourselves in exaggeration

but look to the facts: if your relative, friend or neighbor is actually "on the list," you might want to start hanging out in different circles.

You've already learned that TSA receives the No-Fly and Selectee lists from the TSC each day. Contrary to the belief of some, TSA certainly cannot add anyone to a watch list in retaliation because they somehow irritated an agency employee; to be included on the No-Fly or Selectee lists there must be some rather solid suspicion and evidence that the person could pose a threat to the civil aviation system.

So, unless your acquaintance has been planning or committing a terrorist attack, it is highly doubtful they will find themselves on the No-Fly or Selectee lists, or any other terrorist watch list.

On the next page is an illustrated version of the process for inclusion onto the lists:



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What if I am mistakenly on one of these lists and want to get off?

If you have been denied or delayed boarding at the airport or found yourself repeatedly referred for additional or secondary screening, you may want to file an inquiry and seek redress. DHS has a Traveler Redress Inquiry Program (TRIP) for people with watch list issues.

When you apply for Redress, you will be given a seven-digit Redress Number. A Redress Control Number, which you can use to track the status of your inquiry or use after your inquiry is completed when making an airline reservation. If you've bought tickets online, you've probably noticed a box for Redress Numbers to be entered. This is where you would put this, which would help expedite things in the future if you had been indeed mistakenly added to a list.

Historically, the government has not revealed if a person is or is not on a watch list, although the Department of Justice stated in documents filed in a federal court in April 2015 that people who have been denied boarding will now receive a letter informing them of their status on the No-Fly list.

Did You Know? The Expanded Selectee List includes all records in the Terrorist Screening Database with a full name (first name and surname) and full date of birth that meet the Terrorist Screening Center's standard to be considered a known or suspected terrorist, but that are not included on the No-Fly or Selectee Lists.

SECURE FLIGHT

We've now learned how in the "old days" it was the airline's responsibility to check passenger names against the No-Fly and Selectee lists. IRTPA subsequently required this function to be removed from the purview of the airlines and given to TSA. This was accomplished by late 2010:

- 1. June 22, 2010 100 percent watch list matching for domestic flights
- 2. November 30, 2010 100 percent watch list matching for foreign flights

But what exactly is Secure Flight?

Let's get an official explanation from TSA's website, which tells us that "the mission of the Secure Flight program is to strengthen the security of commercial air travel into, out of, within, and over the U.S. through the use of expanded watch list matching using risk-based security measures."

More simply, Secure Flight is an over \$100 million (annually) program that checks every passenger (nearly 900 million every year) against various government watch lists to make sure that nobody on the No-Fly List is allowed to board an aircraft. Secure Flight checks passenger manifests for all domestic and international commercial flights to, from, and within the U.S., as well as certain flights overflying the continental U.S. (overflights) and international point-to-point flights that are flown by U.S. flagged airlines. Additionally, Secure Flight matches passenger data against the Centers for Disease Control and Prevention's (CDC) Do Not Board List, which includes individuals who pose a significant health risk to other passengers and are not permitted to board aircraft or enter the sterile area of an airport.

When making a flight reservation, every passenger is required to provide (to the airline) their full name (as it appears on the government issued ID they will use when traveling), date of birth, gender, and passport information (if they have one). This information is known as

Secure Flight Passenger Data (SFPD). Note that Secure Flight does not use any commercial data like your bank account or credit card numbers to help in watch list matching.

The airline will then submit the SFPD to Secure Flight 72 hours prior to the scheduled departure. Secure Flight in turn will vet the passenger's information against the various lists we have discussed and, once completed, send the results back to the airlines so they can issue the passenger's boarding pass.

TSA also maintains a Cleared List, which contains names of individuals who have applied and been cleared via the DHS Redress program. If you make a reservation online for a ticket, you may have seen a box when you are entering your personal information that says, "Redress Number." That's for people on the Cleared List.

Now this all sounds complicated, but it is not, nor does it take very long. Secure Flight can perform real-time matching for all flights - in fact; watch list matching takes just a few seconds. This covers all those folks who buy their tickets less than 72 hours before departure.

Everything you are reading here talks about the airlines collecting and submitting passenger data; what about people who buy their tickets on Orbitz or a similar website? The Secure Flight Final rule doesn't regulate travel agents or any other third parties, but it is up to the airline to ensure that they are submitting all required information, so the reality is the airlines have all planned with third party reservation sites to do just this.

Since Secure Flight began in 2009, the program has changed from a program that identifies passengers as high risk solely by matching them against federal government watch lists to one that uses additional lists and risk-based criteria to assign passengers to a risk category. Specifically, Secure Flight now identifies passengers as high risk if they are matched to watch lists of known or suspected terrorists or other lists developed using certain high-risk criteria and as low risk if they are deemed eligible for expedited screening through TSA PreCheck, or through the application of low-risk rules. Secure Flight identifies

passengers as unknown risk if they do not fall within the other two risk categories.

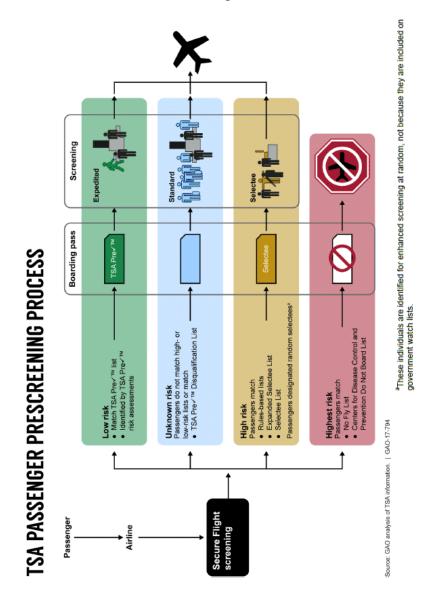
To separate passengers into these risk categories, TSA utilizes lists in addition to the No-Fly and Selectee Lists, and TSA has adapted the Secure Flight system to perform risk assessments, a system functionality that is distinct from both watch list matching and matching against lists of known travelers. At airport checkpoints, those passengers identified as high risk receive enhanced screening, passengers identified as low risk are eligible for expedited screening, and passengers identified as unknown risk generally receive standard screening. Passengers matched to the No-Fly List or the Centers for Disease Control and Prevention's Do Not Board List—a list which includes individuals who pose a significant health risk to other travelers and are not allowed to fly—are considered highest risk, and thus are not to receive boarding passes, and should not be allowed entry into the sterile area.

Silent Partner List

As part of Secure Flight, TSA leverages CBP information and targeting capabilities to create the Silent Partner List, which began in April 2010. Specifically, TSA leverages (1) data CBP collects regarding passengers traveling internationally (such as citizenship, passport country of issuance, and address information), and (2) CBP's Automated Targeting System. CBP uses the Automated Targeting System to identify potentially high-risk passengers arriving or departing the United States by comparing passenger information with law enforcement, intelligence, and other enforcement data using risk-based targeting scenarios and assessments. As of May 2012, TSA has limited the use of the Silent Partner List to screen only those passengers on flights bound for the United States

The next page features a nice little graphic that shows the TSA Passenger Prescreening Process. I lifted this from a September 2017 GAO report.

Did You Know? Secure Flight pre-screens an average of six million passengers daily – approximately two million each 72 hours, 48 hours, and 24 hours out from scheduled flights.



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TRUSTED TRAVELER PROGRAMS

Currently, DHS has several Trusted Traveler programs available, which if you travel with any regularity, are well worth a look at. These programs accept a fundamental truth - most people traveling have no ill intent and simply want to get to their destination safely and quickly.

Let's crack on then and take a deeper look on the next few pages at what is currently available as of this writing.

TSA PRECHECK

We will begin with TSA PreCheck because it is almost certainly the program that you have heard the most about.

TSA PreCheck is probably considered to be the "crown jewel" of TSA's risk-based security programs that are in place. TSA PreCheck is a program that moves away from the old style "one size fits all" mentality and towards a more intelligence-driven and risk-based security model. In plain English, TSA realizes that Grandma probably isn't a huge security risk and would rather spend more time focusing on bigger perceived, and unknown, risks. PreCheck is designed to expedite the security screening process for pre-approved, low-risk travelers.

As of late 2025, over 22 million people have been enrolled in the program, and PreCheck is available at over 200 airports in the U.S. with Around 100 airlines are currently participating.

Purpose and Benefits

Expedited Screening: TSA PreCheck allows enrolled travelers to use dedicated security lanes at airports, which are generally faster than regular security lines. Of course, it is important to remember that even as a member of TSA PreCheck, or any trusted traveler program, you are not guaranteed access to expedited screening processes each time. Sometimes you will still be directed to the "old fashioned" standard screening lane. This is all part of TSA's random and unpredictable security measures. Enrollment is good for five years.

Participants are not required to remove shoes, belts, light jackets, laptops, or compliant liquids from their carry-on bags. The average wait time for TSA PreCheck lanes is typically shorter compared to standard security lanes.

Eligibility

U.S. Citizens and Lawful Permanent Residents, U.S. military members.

Anyone who has a Known Traveler Number or is a member of CBPs trio of trusted traveler programs - Global Entry, SENTRI, and NEXUS is automatically granted PreCheck membership. After all, the government has already vetted your background, checked your fingerprints and done all that stuff.

Note that membership is not limited to U.S. citizens. Canadians who are members of NEXUS are welcome to join, as are foreign nationals who are members of Global Entry.

Enrollment Process

Interested travelers can apply online via the TSA website. After the initial online application, applicants must schedule an in-person appointment at an enrollment center. The appointment includes a background check and fingerprinting. There is a non-refundable application fee (currently \$78 as of 2024) that covers a five-year membership. Once approved, travelers receive a Known Traveler Number (KTN), which they can enter when booking flights to receive TSA PreCheck privileges.

Usage

When booking a flight, TSA PreCheck members enter their KTN into the reservation. This ensures the PreCheck indicator is printed on their boarding pass. At the airport, travelers with TSA PreCheck proceed to the designated PreCheck lanes for expedited screening.

Renewal

TSA PreCheck membership must be renewed every five years. Members can renew online up to six months before their membership expires. Renewal requires another fee (currently \$70 as of 2024).

Did You Know? A portion of the PreCheck enrollment fee is remitted by TSA to the Federal Bureau of Investigation (FBI) for their work in conducting background checks on passengers who have applied.

GLOBAL ENTRY



If you travel internationally, you know there is nothing worse than taking a long flight only to then find a colossal line in the customs hall that you must wait in. Global Entry eases those pains. In fact, in my personal experience as a Global Entry participant, I have made it through both customs and immigration in less than five minutes for nearly all my hundred plus international trips over the past decade.

Global Entry is administered by U.S. Customs and Border Protection (CBP) and allows expedited clearance for pre-approved, low-risk travelers upon their arrival in the U.S.

At airports, program members proceed to the Global Entry lanes where processing technology will be used to expedite the members by capturing a photo to verify their membership. Once the photo has been captured, the member will receive on-screen instructions and proceed to a CBP officer who will confirm that you have successfully completed the process.

Eligibility

U.S. Citizens and Lawful Permanent Residents: The program is open to U.S. citizens, U.S. lawful permanent residents, and citizens of select foreign countries:

Argentina, Brazil, Bahrain, Colombia, Dominican Republic, Germany, India, Mexico, Netherlands, Panama, Singapore, South Korea, Switzerland, Taiwan, United Kingdom.

Canadian citizens and residents enrolled in NEXUS may also use the Global Entry kiosks. but are not eligible to join the program itself.

Enrollment Process

Applicants must undergo a rigorous background check and interview process. Interested travelers can apply online through the Trusted Traveler Programs (TTP) website. There is a non-refundable application fee (currently \$100 as of 2024) that covers a five-year membership. After submitting the application, CBP reviews the information and provides conditional approval if the applicant meets the eligibility criteria.

Conditionally approved applicants must schedule an in-person interview at a Global Entry Enrollment Center, which includes fingerprinting and a background check. If a traveler was unable to schedule an interview at an Enrollment Center prior to their international travel, they have an option to complete their interview via Enrollment on Arrival upon their arrival to the United States.

Final Approval: If the interview is successful, the applicant is granted Global Entry membership.

Did You Know? As of July 2024, there are more than eight million members in the Global Entry program, which is available at 60 U.S. airports and 15 Preclearance locations.

NEXUS

If most of your travels are between the U.S. and Canada, you may want to take a closer look at NEXUS. Jointly run by the CBP and the Canada Border Services Agency (CBSA), NEXUS allows pre-screened travelers expedited processing when entering the U.S. and Canada. Program members use dedicated processing lanes at designated northern border ports of entry, NEXUS kiosks when



entering Canada by air and Global Entry kiosks when entering the U.S. via Canadian Preclearance airports.

Participants are issued a photo ID card with a RFID chip.

What are the benefits?

Like all trusted traveler programs, NEXUS provides members with a quicker and easier time of things, in this case, at all land, sea, and air border crossings between the U.S. and Canada. You can expect to receive a minimum number of questions from customs and immigrations officials - again, your background has been previously vetted.

NEXUS members are also eligible to participate in TSA PreCheck.

How can I apply?

You can apply online at the CBP Trusted Traveler Programs websitebe ready for a \$50 non-refundable application fee. If you are a U.S. or Canadian citizen or permanent resident, and are legally admissible to both nations, you are eligible to apply. After applying, your background will be checked against various watch lists from the U.S., Canada, United Kingdom and more. If you come through that with no issue, you will be directed to schedule an interview at a NEXUS enrollment

center. Once all that is done and you are finally approved, you can expect to receive your NEXUS card, which is valid for five years, in the mail within seven to ten business days.

Hey, wait a minute...

NEXUS is \$50 and Global Entry is \$100, but if I am enrolled in NEXUS I can still use the Global Entry lanes at U.S. airports? Yes, you can. A person can enroll in NEXUS for half the price of Global Entry and still enjoy all the benefits of Global Entry and TSA PreCheck as well as NEXUS.

BIOMETRIC INITIATIVES AND CONCERNS

TSA has been exploring the use of facial recognition technology (FRT) for airport security since 2017. Starting in 2023, the TSA began stationing devices with FRT capabilities at security checkpoints. These devices, which are now deployed at more than 250 U.S. airports, are used to determine the identity of travelers before they are allowed to proceed through security and into the boarding areas.

Each of us grapples daily with the tradeoffs of biometric technology, often without pausing to think about it. From unlocking phones with a fingerprint or face scan to boarding flights or accessing bank accounts, biometrics provide unmatched ease and speed, removing the need for passwords or physical documents. This convenience makes them deeply integrated into modern life, but it also raises profound privacy concerns. Biometric data cannot be changed if compromised, and its storage and use by corporations or governments spark questions of surveillance, security, and consent. Ultimately, the balance between effortless access and personal privacy remains an ongoing challenge for individuals everywhere.

FRT is an example of a class of artificial intelligence (AI) applications that detects, analyzes, and/or recognizes human faces in digital images. Face detection allows software to locate the presence of faces in an image; once located, face capture algorithms can extract the portion (or portions) of the image containing only faces. Face analysis attempts to identify or measure attributes of faces, such as age or emotion. Face recognition is a technology that "compares an individual's facial features," often captured live by a camera as part of the FRT system, "to available images for verification or identification purposes." Typically, FRT systems calculate a similarity score between the new image of the person and one or more reference images.

TSA's mission includes securing aviation transportation, including preventing persons who may pose a danger to aviation safety or security from boarding an aircraft. Starting in 2017, TSA conducted a series of pilot tests—some in partnership with Customs and Border

Protection (CBP)—to assess the feasibility of using FRT to automate traveler identity verification at airport security checkpoints.

In 2018, TSA signed a policy memorandum with CBP on the development and implementation of facial recognition capabilities at airports and released its strategy for deploying biometrics for aviation security, called the "Biometrics Roadmap." In 2019, TSA began a series of projects (initially also described by TSA as "pilots" or "proofs of concept") to test multiple configurations of FRT using Credential Authentication Technology (CAT) devices at passenger security checkpoints in U.S. airports.

In 2020, after performing these tests, TSA acquired a new generation of CAT device (CAT-2) with, among other features, a camera and software that can algorithmically compare an image of a traveler with the image in their presented identification document. A separate TSA technology program employed at checkpoints uses CBP's Traveler Verification System (TVS) to compare the live images of certain travelers with a pre-staged gallery of images of travelers expected at that airport on that day. Participation in these TSA systems is currently option, either as opt-in or opt-out depending on the specific technology program.

A May 2025 report from the Privacy and Civil Liberties Oversight Board (PCLOB) regarding TSA's use of FRT focused on TSA's use of FRT at airports and identity verification during the security screening process. The review aimed to assess the potential impact on privacy and civil liberties. TSA has been deploying FRT to verify travelers' identities, comparing their faces to their passport or boarding pass photos. This technology is used to enhance security and improve efficiency.

The board's review found that TSA's use of FRT raises several concerns. These include potential biases in the technology, data security and storage, transparency, and traveler awareness. While TSA has taken steps to address some concerns, the board recommends further actions to ensure the technology is used fairly and responsibly. The report highlights the need for TSA to provide more detailed information about FRT's performance and potential errors.

The PCLOB report includes recommendations to improve TSA's use of FRT. These recommendations focus on enhancing transparency, ensuring data security, and mitigating potential biases. The board emphasizes the importance of traveler awareness and consent, suggesting that TSA should provide clear information about FRT use and offer opt-out options. By implementing these recommendations, TSA can work to balance security needs with respect for individual privacy and civil liberties.

The report's findings and recommendations are intended to help TSA improve its use of FRT and ensure that the technology is used in a way that respects travelers' rights while maintaining security. By addressing the concerns and implementing the board's suggestions, TSA can work towards a more responsible and transparent use of facial recognition technology in airports.

PASSPORTS



While we are discussing entry documents, let's take a quick detour and learn a bit about passports. The first U.S. passports were issued during the Revolutionary War and were designed by none other than Benjamin Franklin. (You may remember him from such currency as the \$100 bill.)

Today, there are four types of passports issued by the U.S. government. Standard U.S. passports (the ones with the navy-blue covers) are valid for ten years; with the expiration date being one day prior to the date of issue, ten years later. Passports today measure 4 7/8" by 3 3/8", but prior to World War I, they were as large as 11" x 17"!

The blue passport is of course the most common, issued to all citizens and non-citizen nationals. The government also issues a maroon-colored Official Passport and black Diplomatic Passports. The maroon Official Passports are for U.S. government employees (not in the diplomatic corps) who are traveling overseas on official business. The black Diplomatic Passports are for, of course, diplomats and their immediate families as well as some U.S. government employees who are stationed overseas.

There is a fourth type, a grey service passport issued on an extremely limited basis to third party contractors traveling to support the U.S. government whose travel cannot be accomplished using a regular passport. This one is very, very rare.

There were just under 170 million valid U.S. passports in circulation in 2024; there are 341 million people living in the U.S. Over 24.5 million new and renewed passports were issued in 2024. Times have certainly changed – in 1989, only three percent of the U.S. population had a passport! There were 7.26 million passports in circulation then while the U.S. population stood at 246.8 million people.



Passport cards are issued for people who don't want or need a full passport but still need to be able to travel by land and sea to/from Canada, Mexico, the Caribbean and Bermuda. (If you travel by air to these places, you will need the passport book.)

Three million of these were issued in 2023.

Did You Know? TSA Inspectors who conduct foreign inspections receive the Official Passport, while TSA Inspectors and others stationed overseas are issued the Diplomatic Passport.

Did You Know? The president receives a Diplomatic Passport, but he certainly doesn't wait in line at customs when he lands overseas. Instead, State Department employees will take his passport, along with those accompanying him, and get them stamped through the host country's customs procedures. As an added perk of the presidency, the president is issued a Diplomatic Passport for life.

Did You Know? What's the green passport in the photo? U.S. passports issued in 1993 featured a green cover in commemoration of the 200th anniversary of the U.S. Consular Service.

TSA REGULATORY PROGRAM



TSA has a regulatory program in place that represents one of the most important parts of the agency's overall layered security approach. Regulatory Inspectors have often been described as the professional arm of TSA and with good reason; it can take two to three years for an Inspector to really feel completely comfortable and confident in knowing and understanding the regulations they are tasked with enforcing.

Inspectors were originally known as Special Agents when the FAA managed the program; after moving to TSA they were then called Aviation Security Inspectors.

Known today as Transportation Security Inspectors, TSIs have one of the most complex jobs within the agency. While TSA screeners are charged with screening bags at an airport checkpoint, TSIs are responsible becoming knowledgeable and enforcing a dizzying array of constantly evolving aviation security regulations and functions. TSIs must be familiar with the intricacies of the Aircraft Operations Area (AOA), the Security Identification Display Area (SIDA), access control measures, security programs, procedures and amendments, as well as airport and airline operations in general.

As if that wasn't enough, TSIs provide oversight of and inspect security functions at Fixed Base Operators (FBO), flight schools, repair stations and conduct full-fledged investigations into security violations. In their remaining time, TSIs conduct any additional investigations that may be needed and may help assist with the processing of civil penalties (fines) against passengers who are caught with guns and knives at the airport. Additionally, TSIs can write enforcement actions or civil penalties against airlines or airports as warranted.

Put more simply, TSA Regulatory offices, also known as Compliance, are where you will find a lot of the everyday work being done that

makes things function as they are intended. TSIs working at domestic (and foreign) airports are certifying that airlines and airports are heeding security regulations that have been put in place. Ensuring regulatory compliance isn't always the most glamorous of jobs - after all, just think how many times you have heard over the years of "regulatory overreach" by the government, or "regulations that are strangling" business. However, the rules are in place, and it is up to TSIs to ensure compliance with them.

So how is that accomplished? Let's take a closer look at these TSIs.

Transportation Security Inspectors (TSI)

When most people think of TSA and its employees, they automatically think of the blue-shirted screeners, and why not? That is whom you are most likely to see and interact with every time you are at an airport. While there are over 50,000 TSA screeners, TSIs are a force of employees that you most often do not see, and, unless you are employed as one, probably haven't heard of.

TSIs are arguably the most important group of employees TSA has at each airport. Why?

While screeners guard the front door at the airport, it is the TSI who is checking the back and side doors. Working in plain clothes behind the scenes, TSIs go out and actively look for vulnerabilities and threats that may exist so that they can be dealt with quickly and efficiently.

So what exactly do TSA Inspectors do?

TSA conducts inspections of air carriers throughout the year as part of regular inspection cycles based on annual inspection plans. These inspections are based on inspection guidelines known as PARIS prompts, which address a broad range of regulatory requirements (including airport perimeter security and cargo security, as well as screening of employees, baggage, and passengers).

TSIs are responsible for a multitude of TSA related activities, including conducting inspections and investigations of airports and

air carriers, monitoring compliance with applicable civil aviation security polices and regulations, resolving routine situations that may be encountered in the assessment of airport security, participating in testing of security systems in connection with compliance inspections, identifying when enforcement actions should be initiated, and providing input on the type of action and level of penalty commensurate with the nature and severity of a violation that is ultimately recommended to TSA's Office of Chief Counsel (OCC).

Aviation TSIs primarily conduct inspections of commercial airports (which we will discuss in the next few pages) and all domestic and foreign commercial carriers, as well as flight schools. Cargo TSIs are most often found at Indirect Air Carriers (IAC), freight forwarders and all cargo operators, reviewing airway bills and checking security procedures. K-9 TSIs are teamed of course with a dog that is trained to sniff out explosives in cargo shipments, while Surface TSIs work with rail and mass transit systems.

All told, TSIs conduct inspections on thousands of domestic and international carriers that operate in the U.S., as well as over several thousand IACs that require periodic inspections.

TSIs are trained and must pass a five-week training course that is conducted at the TSA Academy West in Las Vegas. Previously, the course was conducted at an FAA training center in Oklahoma City and FLETC in Glynco, Ga.

Of course, TSA's inspection activity is not limited to domestic airports only. Let's look at the foreign aspect of TSA's regulatory program next.

INTERNATIONAL INSPECTIONS

Shortly after the hijacking of TWA Flight 847 in June 1985, Congress decided that the U.S. government should begin conducting assessments of the security posture at foreign airports that hosted flights to the U.S. from both foreign and domestic carriers.

49 U.S.C. 44907 establishes the foreign airport assessment program, which is now the responsibility of the TSA to implement. Like the domestic TSIs that conduct domestic airport inspections and tests, international Transportation Security Specialists (TSS), who are essentially TSIs, conduct assessments at foreign airports to determine if they are meeting minimum International Civil Aviation Organization (ICAO) standards. These Inspectors also conduct inspections of both foreign and domestic carriers that provide service to the U.S.

Within TSA, the international Inspectors are currently housed in the international division of TSA's SO Compliance office. So, let's take a closer look at TSA's international inspections program, which is sort of a "boutique shop" within TSA.

When are foreign airports assessed?

TSA uses a risk-informed approach to schedule foreign airport assessments, generally every 1 to 3 years, with high-risk airports assessed more frequently than medium and low risk airports. Tier 1 airports are low risk and are assessed every three years. Tier 2 airports are determined to present medium risk and are assessed every two years. Finally, we have Tier 3 airports, which are considered high risk and are assessed every year.

Overall, TSA assesses approximately 300 foreign airports.

Wait, foreign countries just let TSA walk in and poke around their airports?

Well, no, of course not. Although TSA is authorized under U.S. law to conduct foreign airport assessments at intervals it considers necessary,

it may not perform an assessment of security measures at a foreign airport without permission from the host government. (That seems kind of obvious, does it not?)

There is a well-defined process for requesting, scheduling, and ultimately assessing a foreign airport. Specifically, the Transportation Security Administration Representative (TSAR) must obtain approval from the host government to allow TSA to conduct an airport assessment and schedule the date for the on-site assessment. After conducting an entry briefing with State, host country officials, and airport officials, the team conducts an on-site visit to the airport.

Who does what?

Inspectors are the main engine of TSA foreign inspection and assessment program. Inspectors are primarily responsible for performing and reporting the results of foreign airport assessments and air carrier inspections and will provide on-site assistance and make recommendations for security enhancements. They are also deployed in response to specific incidents and to monitor for identified threats. TSA has approximately 100 international Inspectors, each of whom is based in one of TSA's six Regional Operations Centers (ROC).

The six ROC managers have responsibility for the overall planning and conducting of air carrier inspections and foreign airport assessments, including the scheduling and coordination of personnel and resources. ROC managers supervise and direct the work of the inspector workforce and administrative support personnel within their assigned geographical area.

TSA's ROCs are in Abu Dhabi, Dallas, Frankfurt, Los Angeles, Miami, and Singapore. Each ROC has a geographic area assigned to it that the inspectors visit.

International industry representatives (IIR) are the primary point of contact between TSA and U.S. and foreign-flagged air carriers with last point of departure flights to the U.S. IIRs provide guidance to air carriers on TSA regulations and help them meet their TSA-approved security programs. IIRs counsel the air carriers and provide

clarification regarding TSA security requirements when necessary. For example, they provide air carriers with clarification on the requirements contained in security directives and emergency amendments issued by TSA. In other instances, when an air carrier cannot comply with a TSA security requirement - such as when complying with a TSA security requirement would cause the air carrier to violate a host government security requirement - the air carrier works with its IIR to develop alternative security procedures in a manner consistent with TSA regulations. glob

The Assistant Administrator for Compliance carries out the statutory mandate of the Secretary of Homeland Security and the TSA Administrator to assess the adequacy of civil aviation security at foreign airports. The Deputy Assistant Administrator supervises and directs work of the ROC managers and assigned desk officers.

What does TSA look for on a foreign airport assessment?

There are several ways to determine a foreign airport's compliance with ICAO standards, and TSA employs them all. (An ICAO standard is a specification for the safety or regularity of international air navigation, with which contracting states agree to comply.) Interviews with airport officials and a review of documents that discuss airport security measures are two key components of a foreign airport assessment.

Of course, it is one thing to talk and read about procedures, but it is vital to see them in action. International Inspectors will conduct physical reviews of an airport's security measures as well. Walking or driving the grounds and perimeter of an airport will allow a more complete review of security measures that are in place. Inspectors will also observe access control procedures such as employee and vehicle identification methods and look at passenger and baggage screening procedures as they take place. Additionally, Inspectors are to examine the integrity of fences, lighting, and locks, and will make observations on access control procedures, such as examining employee and vehicle identification methods in secure areas, as well as monitoring passenger and baggage screening procedures in the airport.

Typically, it takes 3 to 7 days to complete a foreign airport assessment. However, the amount of time and number of team members required to conduct an assessment varies based on several factors, including the size of the airport, the number of air carrier inspections to be conducted at the airport, and the threat level to civil aviation in the host country.

TSA may conduct air carrier inspections separately from airport assessments because foreign airports are generally assessed no more than once per year by TSA, while some air carriers are inspected twice per year by TSA.

What ICAO Standards does TSA use to Assess Security Measures at Foreign Airports?

Inspectors conduct foreign airport assessments in accordance with ICAO standards, although please remember that they are **not ICAO** auditors nor is a TSA foreign airport assessment an ICAO audit. Inspectors review several dozen Standards and Recommended Practices (SARPs) during these assessments; to get an idea of what is asked you might review Appendix III of GAO-12-163.

The graphic on the next page spells things out a little more.

Multistep Process for Conducting Foreign Airport Assessments The TSAR is to communicate with the host government to obtain approval to conduct an assessment and to schedule an on-site visit to the foreign airport.

The assessment team leader is to hold a pre-trip briefing to prepare for the on-site visit to the foreign airport.

The assessment team is to conduct an entry briefing with Department of State, host government officials, and host airport officials.

The assessment team is to conduct an on-site visit to the foreign airport to assess security measures in place by using ICAO standards, which takes about 3 to 7 days.

The assessment team is to provide a synopsis of the results from the assessment during an exit briefing with Department of State officials, host government officials, and host airport officials.

The assessment team is to return to the ROC to write a report summarizing findings on the foreign airport's overall security posture and security measures.

The TSAR, ROC manager, and TSA headquarters official are to review the report findings to ensure that inspectors addressed and properly identified all relevant ICAO standards.

Source: GAO analysis of information provided by TSA.

Source: GAO-12-163, Appendix IV

Assessment team is to conduct interviews with airport officials.

Assessment team is to examine documents regarding a foreign airport's security measures.

Assessment team is to conduct a physical inspection of the airport.

What happens when a foreign airport does not maintain or carry out effective measures?

Travel Advisory

United States of America Department of Homeland Security Washington, D.C.

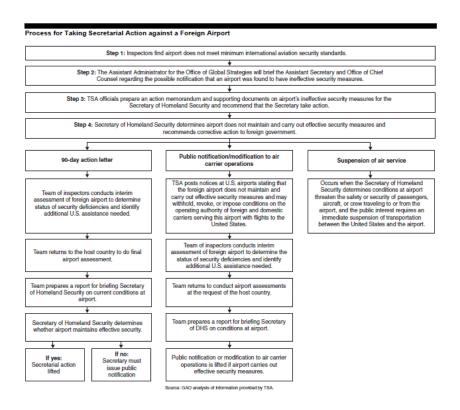
Passengers are advised that the Secretary of Homeland Security has determined that Ninoy Aquino International Airport (MNL) in Manila, Republic of the Philippines, does not maintain and carry out effective aviation security measures.



For more information, visit dhs.gov

When conducting a foreign airport assessment. imperative to remember **TSA** that has authority to mandate changes otherwise or enforce security requirements; after all, Inspectors are operating in a foreign country as of the host guests government. However, recommendations improvement can undoubtedly be made. In extreme (and rare) cases when foreign a government and/or airport are not meeting international standards,

there are a few options available. Foreign government officials are given 90 days to address security deficiencies that were identified. If, after that time, the security measures are still not meeting ICAO standards, the public will be notified that said airport does not maintain and carry out effective security measures. This notification will be placed in the Federal Register, but more importantly, prominently displayed at U.S. airports – usually in and around the screening checkpoint. Above is an example of a previously used sign concerning Manila (MNL).



Did You Know? Foreign countries also send their own teams to U.S. airports to conduct assessments as well from time to time.

TSA REPRESENTATIVE (TSAR)

If issues are identified during a foreign airport assessment, it typically falls upon the they TSA Representative (TSAR) to follow up and work things out with the host government after the foreign Inspectors have departed. TSARs who provide an on-site liaison and representation at U.S. embassies and consulates around the globe. They communicate with foreign government officials to address transportation security matters and to conduct foreign airport assessments.

Specifically, the 27 TSARs serve as on-site coordinators for TSA responses to terrorist incidents and threats to U.S. assets at foreign transportation modes. TSARs also serve as principal advisors on transportation security affairs to U.S. Ambassadors and other embassy officials responsible for transportation issues to ensure the safety and security of the transportation system.

For the foreign airport assessment program, TSARs are sometimes involved in arranging pre-assessment activities, assessment visits, and follow-up visits, although they do not conduct any inspections or assessment activity. Additionally, TSARs are responsible for completing portions of the airport assessment reports and reviewing completed assessment reports. TSARs also help host government officials address security deficiencies that are identified during assessments.

TSARs are involved in analyzing intelligence related to potential threats against transportation infrastructure. They receive and disseminate threat information to local stakeholders and help assess the level of risk to specific transportation assets. They facilitate the exchange of intelligence and security-related information between the TSA and other foreign entities, including airports, airlines, and federal law enforcement. This helps ensure that all parties are informed and prepared to respond to emerging threats.

TSARs often provide or coordinate training programs for foreign airport security personnel, federal law enforcement officers, and other stakeholders. These programs may cover a wide range of topics, including threat detection, emergency response, and the latest TSA regulations and procedures. TSARs offer support to transportation stakeholders by providing guidance on TSA policies, helping with the implementation of new security measures, and offering expertise on complex security issues.

Where are these TSARs located?

TSARs are currently located in Abu Dhabi, Bangkok, Beijing, Berlin, Brasilia, Brussels, Dakar, The Hague, Istanbul, Johannesburg, London, Manila, Mexico City, Miami, Nairobi, Nassau, Ottawa, Panama City, Paris, Rabat, Rome, Santiago, Singapore, Sydney, Tokyo, and Warsaw.

PART VI: AIR CARGO AND AIPORTS

AIR CARGO SECURITY

We've gone over quite a bit so far regarding aviation security policies and procedures, but we still have another huge section to discuss – the air cargo system.

A lot of people may simply assume that cargo transported by air is limited to cargo operators and their aircraft: FedEx, UPS, and other dedicated cargo carriers. However, passenger aircraft carry a tremendous amount of cargo in their belly as well. For example, American Airlines moved more than two billion pounds of cargo and earned over \$1 billion in cargo revenue in 2018 – not bad for an airline that has no dedicated cargo aircraft.



Indeed, some passenger routes are not profitable on their own but may still be flown if the airline is making plenty of money on the route with the cargo in the belly of the aircraft.

So, with all that being said, let's talk a little bit about air cargo security. For several years now, 100 percent of all air cargo transported on passenger aircraft, both domestic and foreign, has been required to be screened.

There is no comparable 100 percent screening requirement in regulations for cargo transported to the U.S. on all-cargo air carriers. However, TSA requires that all cargo transported on U.S.-bound flights be screened or subjected to security controls that prevent the introduction of explosives, incendiaries, or other destructive devices. If the cargo comes from known consignors or regulated agents, TSA's all-cargo security program does not require any additional screening unless the cargo piece exceeds a certain weight. On the other hand, all-cargo air carriers must screen all cargo that they accept from unknown consignors or nonregulated agents.

Now, who might some of the main players be in the air cargo system? Participants in the air cargo shipping process can include shippers, such as individuals or manufacturers; freight forwarders or regulated agents, who consolidate shipments and deliver them to air carriers; air carrier cargo handling agents, who process and load cargo onto aircraft on behalf of air carriers; and passenger and all-cargo carriers that store, load, and transport air cargo.

A known consignor is a company who originates cargo or mail for its own account and whose procedures meet common security rules and standards sufficient to allow the carriage of cargo or mail on any aircraft. According to ICAO, the purpose of the known consignor concept is to place the emphasis for the practical implementation of security controls on the actual shipper or originator of the goods and to ensure the security of air cargo and mail as it moves throughout the supply chain. This requires goods to be produced, packaged, stored, transported, and handled in a manner that ensures their integrity and protects them from unauthorized interference from the point of origin and throughout the secure supply chain.

To secure cargo, a known consignor is required to produce, package, store, and transport goods in a manner that ensures their integrity and protect them from unauthorized interference from the point of origin. After cargo is secured, subsequent supply chain entities must apply security measures accepted or required by the appropriate national authority, including measures to ensure the secure transport of cargo. Upon arrival at the air carrier's sorting center, the air carrier or cargo

handling agent must verify the known consignor/regulated agent status, and that the cargo was transported securely before accepting it.

Regulated agents are freight forwarders or any other entity that conducts business with an operator and provides security controls that are accepted or required by the appropriate authority in respect of cargo or mail. Regulated agents, if allowed by a country's applicable laws, may screen cargo before delivering it to an airline.

Freight forwarders are companies that consolidate cargo from multiple shippers onto a master air waybill and deliver the shipment to air carriers for transport.

A master air waybill (MAWB) of course is a manifest of a consolidate shipment, containing cargo from either one shipper or, typically, from multiple shippers.

So, how does it all work?

Air carriers are responsible for implementing TSA security requirements predominantly through TSA-approved security programs that describe the security policies, procedures, and systems the air carriers are to implement and maintain to comply with TSA security requirements. These requirements include measures related to the acceptance, handling, and screening of cargo; training of employees in security and cargo screening procedures; testing employee proficiency in cargo screening; and access to cargo areas and aircraft. If threat information or events indicate that additional security measures are needed to better secure the aviation sector, TSA may issue revised or new security requirements in the form of security directives or emergency amendments when more immediate action on behalf of air carriers is necessary. Air carriers must implement the requirements set forth in applicable security directives or emergency amendments (unless otherwise approved by TSA to implement alternative security measures) in addition to requirements already imposed and enforced by TSA to remain compliant with their respective security programs.

Under TSA regulations, air carriers are responsible for ensuring the security of the air cargo they transport, and TSA requirements specify methods and technologies that may be used to secure U.S-bound air cargo through screening procedures. Specific screening methods outlined in the 9/11 Commission Act, for example, include X-ray systems, explosives detection systems (EDS), explosives trace detection (ETD), explosives detection canine teams certified by TSA, and physical search together with manifest verification. The 9/11 Commission Act, however, requires that screening involve a physical examination or non-intrusive method of assessing whether cargo poses a threat to transportation security and not solely performing a review of information about cargo contents or verifying the identity of the cargo's shipper, when not performed in conjunction with the screening methods outlined above.

U.S.-bound air cargo can vary widely in size and include such disparate items as electronic equipment, automobile parts, clothing, medical supplies, fresh produce, and cut flowers.

The international air cargo shipping process involves a complex network of business entities that include individual shippers, manufacturers, transportation companies, freight forwarders, warehouses and air carriers. Entities within the supply chain may provide all services (warehousing, consolidation, and loading of air cargo, for example) or only certain services. The standards set by ICAO focus on four primary types of entities: known and unknown consignors (i.e., individual shippers, manufacturers, other shipping entities), regulated agents (i.e., freight forwarders, handling agents), and commercial air carriers. Various other air cargo supply chain entities also have responsibilities for applying specific types of security controls in accordance with the international standards.

Let's look briefly at a few crucial TSA air cargo security programs.

Certified Cargo Screening Program

The Certified Cargo Screening Program (CCSP) is a voluntary program that allows screening to take place earlier in the shipping process, prior

to delivering the cargo to the air carrier. Under the CCSP, facilities at various points in the air cargo supply chain, such as shippers, manufacturers, warehousing entities, distributors, third-party logistics companies, and freight forwarders that are in the U.S., may voluntarily apply to TSA to become certified cargo screening facilities (CCSF).

The CCSP allows air cargo industry stakeholders, such as an air cargo handling agent, to establish independent cargo screening facilities to provide screening services for shippers or freight forwarders that have not joined the program and do not want the air carriers to screen their cargo. These independent facilities screen cargo for a fee, according to CCSP guidelines. Under the CCSP, TSA certifies cargo screening facilities located throughout the U.S. to screen cargo prior to providing it to airlines for shipment on passenger flights.

Certified cargo screening facilities must carry out a TSA approved security program and adhere to strict chain of custody requirements. Cargo must be secured from the time it is screened until it is placed on passenger aircraft for shipment. Any facility that tenders cargo directly to an air carrier or indirect air carrier may apply for the program. Facilities included in this requirement are warehouses, manufacturer centers, distribution centers, third party logistics providers, indirect air carriers, airport cargo handlers, and independent cargo screening facilities.

The CCSP program is a practical, supply chain solution, which provides security while ensuring the flow of commerce.

Indirect Air Carrier (IAC) Program

An indirect air carrier refers to any person or entity within the U.S., not in possession of a Federal Aviation Administration air carrier operating certificate, which undertakes to engage indirectly in air transportation of property and uses for all or any part of such transportation the services of an air carrier. Each IAC must adopt and carry out a security program that meets current TSA requirements and is renewed annually. TSA principal security Inspectors are responsible for the application process and approval of certification, and IACs are inspected by

domestic TSA Inspectors to ensure they are continuing to follow their security programs.

Known Shipper Management System (KSMS)

Through the Known Shipper Management System, TSA identifies and approves the known shipper status for qualified shippers in the U.S. Carriers (indirect air carriers and air carriers) must comply with a range of specific security requirements to qualify their clients as known shippers. Shippers interested in transporting goods by air may contact their transportation service provider and request to become a known shipper.

National Cargo Security Program (NCSP)

Earlier in this book you read that ICAO prescribed international aviation security policies that signatory countries are expected to follow. One of these is a National Cargo Security Program (NCSP). The TSA has developed a program to formally recognize a foreign country's air cargo supply chain to determine if it provides a level of security that is commensurate with TSA's air cargo security standards.

TSA has recognized the passenger air cargo security programs of the European Union, which covers the 28 European Union member states, and 12 other countries. NCSP recognition is a voluntary agreement between TSA and a foreign government.

The NCSP recognition process involves comparing foreign countries' air cargo security program requirements to TSA air cargo security requirements and conducting visits to the foreign countries to observe the security programs in operation and determine if they can be validated as commensurate with TSAs. The recognition decision is based on whether the other country's NCSP is commensurate in six pillars of cargo supply chain security that TSA has identified, which are:

Facility Security. Procedures and mechanisms to prevent unauthorized entry to facilities where cargo is screened, prepared, and stored.

Chain of Custody/Transit Procedures. Methods or procedures to prevent and deter unauthorized access to cargo while stored or in transit between facilities prior to loading onboard aircraft.

Screening. Screening of cargo through the application of technical or other means that are intended to identify weapons or explosives.

Personnel Security. Processes to vet individuals with unescorted access to air cargo at any point in the air cargo supply chain.

Training. Training of personnel who screen, handle screened cargo, or perform other duties related to air cargo screening, preparation, or storage.

Compliance and Oversight Activities. Clearly established requirements that regulated entities must satisfy in order to participate in the security program, and routine audits of such entities for compliance by appropriate authorities.

TSA first approved the NCSP recognition process for passenger aircraft operations in FY 2011 and made subsequent changes to the process in FY 2013. According to TSA, the NCSP Recognition Program increases its visibility into recognized governments' air cargo security requirements and air cargo supply chains, facilitates the identification of air cargo industry vulnerabilities, and is a key component of TSA's efforts to achieve 100 percent screening of U.S.-bound air cargo and enhance global supply chain security. Within Global Operations, the Mitigation Plans and Programs (MPP) directorate is responsible for the NCSP Recognition Program.

So, how does TSA inspect all this?

TSA's procedures for conducting air cargo inspections are quite like how passenger airline inspections are conducted. TSA Inspectors, both domestically and internationally, use standardized, cargo-specific job aids that assess air carriers against security program requirements in all six pillars of supply chain security. If a TSA Inspector finds that an air carrier is not in compliance with any applicable security requirements, additional steps are to be taken to correct and record those specific violations, which can include providing on-the-spot counseling for minor violations or opening an investigation if the violation is potentially more serious. Upon conclusion of the investigation, TSA will decide whether to issue a warning notice, letter of correction, or notice of proposed civil penalty

TSA Inspectors identified fewer violations during air carrier cargo inspections in NCSP countries because air carriers only need to implement one air cargo security program (the host government's) and, therefore, were less likely to make errors. Additionally, TSA Inspectors identified fewer non-compliance issues in NCSP countries because TSA officials meet with foreign officials in recognized countries on a regular basis, and this helps to improve compliance.

AIR CARGO ADVANCE SCREENING (ACAS)

In October 2010, the global counter-terrorism community disrupted an attempt by al-Qaeda in Yemen to conceal and ship explosive devices in cargo onboard U.S.-bound aircraft. Five days after the attempted attack, CBP and TSA began meeting with industry partners to better understand business practices and to collectively develop a mechanism to collect cargo data as soon as possible in the supply chain. The result of this public/private cooperation was the Air Cargo Advance Screening (ACAS) program.

ACAS was created to enhance the security of international air cargo shipments to the U.S. The program's genesis lies in the need for earlier and more detailed information about cargo being transported on passenger and all-cargo aircraft. This requirement emerged as a response to evolving global threats and the recognition that traditional customs procedures might not sufficiently address security concerns.

The program's evolution has been marked by pilot programs, stakeholder feedback, and regulatory adjustments. Over time, from its June 2018 start to today, ACAS has become a critical component of the U.S. air cargo security framework.

Here's how ACAS works today: The program mandates that air carriers or their authorized agents submit advance cargo information to CBP via the Automated Broker Interface (ABI) or the Air Cargo Manifest (ACM) system. This information must be transmitted no later than the time of departure of the flight or, if earlier, when the flight's departure information is known. The data required includes details about the shipment, such as the shipper, consignee, cargo description, and Harmonized System (HS) code.

Upon receiving this advance information, CBP and TSA analyze the data using the Air Cargo Advance Screening rules to identify potential security risks. If a shipment raises concerns, CBP may issue a Do Not Load message to prevent the cargo from being loaded onto the aircraft.

The ACAS program represents a critical component of the U.S. strategy to secure the global supply chain and protect the country from threats posed by air cargo. By requiring advance screening of cargo data, the program enhances security while facilitating the efficient flow of goods into the United States.

SECURITY RESTRICTED AREAS AT AIRPORTS

As the regulatory authority for civil aviation security, TSA inspects airports, air carriers, and other regulated entities to ensure they are following federal aviation security regulations, TSA-approved security programs, and other requirements. As you know, these inspections are conducted by TSA Inspectors, who also provide guidance to airports and airlines to maintain and improve the security of their facilities and access control measures.

With all that being said, let's talk a little bit about how airports establish and control access to their security restricted areas (SRA) as this is an important topic.

TSA oversees security operations at airports through compliance inspections, covert testing, and vulnerability assessments to analyze and improve security, among other activities. TSA must on an ongoing basis, assess and test for compliance with access control requirements.

Airport operators have direct responsibility for implementing security requirements in accordance with their TSA-approved airport security programs. Airport security programs generally cover the day-to-day aviation operations and implement security requirements for which commercial airports are responsible, including the security of perimeters and access controls protecting security-restricted areas.

Airport security programs must include descriptions of the security-restricted areas—that is, areas of the airport identified in their respective security programs for which access is controlled, and the public is generally not permitted entry—including a map detailing boundaries and pertinent features of the security-restricted areas.

Although, pursuant to regulatory requirements, the components of airport security programs are generally consistent across airports, the details of these programs and their implementation can differ widely based on the individual characteristics of airports.

TSA generally characterizes airport perimeter security at commercial airports to include protection of the fence line—or perimeter barriers—vehicle and pedestrian gates, maintenance and construction gates, and vehicle roadways, as well as general aviation areas.

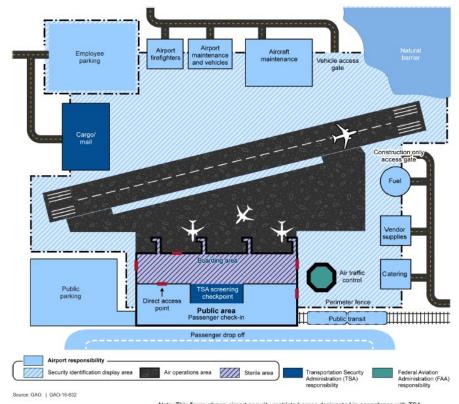
Access control security generally refers to security features that control access to security-restricted areas of the airport that may include baggage makeup areas, catering facilities, cargo facilities, and fuel farms. Specifically, airport perimeter and access control security measures are designed to prevent unauthorized access onto the airport complex and into security-restricted areas. For example, airport operators determine the boundaries for the security-restricted areas of their airport based on the physical layout of the airport and in accordance with TSA requirements.

Security programs for commercial airports generally identify designated areas that have varying levels of security, known as secured areas, security identification display area (SIDA), Air Operations Area (AOA), and sterile areas (referred to collectively in this report as "security-restricted areas"). For example, passengers are not permitted unescorted access to secured areas, SIDAs, or the AOA, which typically encompass baggage loading areas, areas near terminal buildings, and other areas close to parked aircraft and airport facilities.

Airport operators are to perform background checks on individuals prior to granting them unescorted access to secure areas of an airport and TSA relies on airport operators to collect and verify applicant data, such as name, place of birth, and country of citizenship, for individuals seeking credentials.13 Background checks for individuals applying for credentials to allow unescorted access to secure areas of commercial airports include (1) a security threat assessment from TSA, including a terrorism check; (2) a fingerprint-based criminal history records check; and (3) evidence that the applicant is authorized to work in the U.S. The criminal history records check also determines whether the applicant has committed a disqualifying criminal offense in the previous ten years.

Aviation workers may access the sterile area through the security checkpoint (at which time they undergo screening similar but not identical to that experienced by a passenger) or through other access points secured by the airport operator in accordance with its security program.

The following image will hopefully tie things together a bit and provide a detailed overview of a typical commercial airport in the U.S. and its security-restricted areas:



Note: This figure shows airport security-restricted areas designated in accordance with TSA requirements. Pursuant to 49 C.F.R. § 1542.205, each airport area defined as a secured area in a security program must be a SIDA, though other areas of the airport may also be designated as SIDAs by the airport operator. For example, some airport operators designate all AOAs as SIDAs.

HOW DO AIRPORTS MAKE MONEY?

Commercial airports generate revenue through a variety of streams, which can be broadly categorized into aeronautical and non-aeronautical sources.

Most airports in Asia, Africa, and the Middle East are typically still state-owned, where earning extra revenue or a profit is not the foremost concern. In fact, around two-thirds of airports around the world lose money.

In the U.S. and Europe, things are different, and airports are on their own in most cases. U.S. airports typically make their money from a variety of sources, with the biggest two being parking and airline landing fees. Remember that FAA regulations prohibit an airport from earning a profit on aviation activities.

Aeronautical Revenue

Aeronautical revenue is directly related to the operation of aircraft and the handling of passengers and cargo. This category includes fees and charges paid by airlines and other aviation-related services.

Landing Fees: Airports charge airlines landing fees based on the weight of the aircraft. Heavier aircraft typically incur higher fees. These fees contribute to the maintenance of runways, taxiways, and other airfield infrastructure.

Passenger Facility Charges (PFCs): These are fees added to airline tickets, collected by the airport, and used to fund infrastructure improvements like terminal expansions or runway repairs. PFCs are capped by the government in many countries, including the United States.

Terminal Rental and Gate Fees: Airlines pay airports to use terminal facilities, including gates, check-in counters, and baggage handling

systems. These fees are typically based on the space occupied, and the services used.

Aircraft Parking Fees: Airports charge airlines for parking aircraft at gates, remote stands, or hangars. The fee structure can vary depending on the duration of parking and the location within the airport.

Security Fees: Airports may collect fees from airlines or passengers to cover the cost of security services, such as passenger screening, baggage inspection, and the deployment of security personnel.

Cargo Handling Fees: Airports generate revenue from the handling of air cargo, including the use of cargo terminals, storage facilities, and customs processing areas.

Non-Aeronautical Revenue

Non-aeronautical revenue comes from activities that are not directly related to aircraft operations. This has become an increasingly important revenue stream for airports, with Airports Council International estimating that non-aeronautical earnings account for 40 percent of airport revenues.

Retail and Concessions: Airports lease space to retail stores, restaurants, and other concessionaires within the terminal. Airports often earn a percentage of sales (a concession fee) in addition to rent. Duty-free shops, food and beverage outlets, and other retail operations are significant contributors. In the first half of 2024, Denver has averaged \$59 million a month in concession sales.

Parking and Ground Transportation: Revenue from parking facilities is a major source of income for many airports. This includes long-term and short-term parking, valet services, and fees charged to ride-sharing services, taxis, and shuttle buses for access to the airport. Dallas/Fort Worth, the third busiest airport in the world, took in nearly \$158 million from parking fees in Fiscal Year 2023.

Advertising: Airports earn money by selling advertising space in terminals, on digital screens, and on airport property. These ads target a captive audience of travelers, making them a lucrative source of revenue.

Real Estate and Property Leasing: Airports often lease land and facilities for various purposes, such as hotels, office buildings, and logistics hubs. Long-term leases for cargo facilities, maintenance hangars, and other aviation-related businesses are common. Anchorage (ANC) is working out a \$530,000 annual lease, for 55 years, on a piece of undeveloped land with Atlas Air, for example.

Car Rentals: Airports typically earn a percentage of the revenue generated by car rental companies that operate on-site. This includes both direct rental fees and concession fees paid by the car rental companies. It has been estimated that rental cars and their facilities earn around one-fifth of all non-aeronautical revenue for airports in the U.S. and Canada.

Lounge Access and Premium Services: Airports may generate income from the operation of premium services, such as VIP lounges, fast-track security lanes, and concierge services. These services are often provided by third parties who pay the airport a fee.

Other Revenue Streams

Airport Improvement Fees (AIFs): Like Passenger Facility Charges, AIFs are fees levied on passengers to fund airport development projects. These fees are typically included in the cost of an airline ticket.

Government Grants and Subsidies: Airports, especially those in smaller or remote locations, may receive government funding to support operations, improve infrastructure, or ensure service continuity.

Consulting and Management Services: Some larger airports provide consulting and management services to smaller airports, both domestically and internationally, generating additional revenue.

Profitability Factors

The profitability of an airport depends on various factors, including its size, location, passenger traffic, and the diversity of its revenue streams. Major hub airports with high passenger volumes and a wide range of non-aeronautical services tend to be more profitable. Conversely, smaller regional airports may rely more heavily on aeronautical revenue and government subsidies.

Conclusion

Commercial airports generate revenue through a combination of aeronautical charges, non-aeronautical business activities, and other income streams. The balance between these revenue sources can vary significantly depending on the airport's size, location, and passenger traffic. As competition and operational costs rise, airports increasingly focus on expanding non-aeronautical revenue streams, such as retail, parking, and real estate, to enhance profitability and support ongoing infrastructure development.

Did You Know? Las Vegas (LAS) makes a little bit extra income by way of some 1,300 slot machines that entice travelers in the airport. In recent years, these slots brought in \$35 million in revenue to the airport each year on average.

AIRPORT IMPROVEMENT PROGRAM

Airports have access to a large amount of funding from the Airport Improvement Program (AIP), which is administered by the FAA to help fund public-use airport infrastructure projects. These grants can help finance airport projects to rehabilitate aging infrastructure, meet current FAA standards for airport design, or help accommodate larger aircraft or growth in passenger activity. Runway extensions, taxiway improvements, airport signage, lighting and markings – all can be funded via AIP grants.

For all AIP-funded projects, the airport must provide a share of matching funds. The federal share is from 75 to 90 percent depending on the size of the airport or type of project.

Beyond standard AIP funding, the 2021 Bipartisan Infrastructure Law allocated \$25 billion for modernizing U.S. airports. Signed into law by President Biden on November 15, 2021, this funding is designated for various projects aimed at enhancing airport infrastructure, improving safety, expanding capacity, and upgrading facilities to better accommodate future growth in air travel. The investment includes:

Terminal Renovations and Expansions: Upgrading outdated terminals and expanding facilities to increase capacity and improve passenger experience.

Runway and Taxiway Improvements: Enhancing runways and taxiways to ensure safety, reduce delays, and increase efficiency.

Environmental and Sustainability Projects: Implementing initiatives to reduce the environmental impact of airports, such as adopting energy-efficient technologies and promoting sustainable practices.

Security Enhancements: Investing in advanced security technologies to streamline screening processes and improve safety.

Ground Transportation Upgrades: Improving access to airports through better public transit connections, upgraded roadways, and enhanced parking facilities.

So, how is that money divvied up? To start, the Bipartisan Infrastructure Law provides \$15 billion in airport infrastructure funding. The money can be invested in runways, taxiways, safety and sustainability projects, as well as terminal, airport-transit connections and roadway projects. For a third year, FAA has made \$2.89 billion available to U.S. airports in Fiscal Year 2024. To date, nearly \$9 billion in Airport Infrastructure Grant (AIG) funding has been made available to airports across the country.

Second, \$5 billion has been allocated (\$1 billion annually from 2022-2026) to provide competitive grants for airport terminal development projects that address the aging infrastructure of the nation's airports. These grants will fund safe, sustainable and accessible airport terminals, airport-owned airport traffic control towers, and on-airport rail and bus projects that improve multimodal connections.

Finally, \$5 billion in funding (\$1B per year over five years) to upgrade the foundation of the FAA's air traffic control system. These funds will reduce a heavy backlog of needed maintenance, updates, upgrades and replacement of critical buildings and equipment needed to operate our nation's airspace safely.

The FAA periodically publicly releases comprehensive lists of projects at airports that have received money from the latest tranche of grants, with the information posted on the agency's website at www.faa.gov. These investments are part of a broader effort to modernize the nation's transportation infrastructure, stimulate economic growth, and enhance the overall travel experience for passengers.

ESSENTIAL AIR SERVICE (EAS) PROGRAM

One of the lesser-known programs in the public eye is the Essential Air Service (EAS) program, which sees the federal government spend tens of millions of dollars each year to send, in many cases, mostly empty planes back and forth from small, out of the way ("podunk") towns, to larger hub airports.

The program was established in response to the Airline Deregulation Act, which, when passed in 1978, gave airlines nearly total freedom to determine which routes to serve. As such, many cities that are served today would most likely not see commercial service without these government subsidies, as they are not profitable.

Today, the program serves 163 rural communities with an average of three round trip flights per day on 19 seat aircraft. Subsidies provided for passenger range from a few dollars to several hundred each. The budget for the program in FY 2014 was \$246 million and \$261 million in FY 2015.

How does it work?

The DOT issues a request for proposal 90 days prior to the termination of a current contract on a route. Carriers will then submit their bids, which are reviewed against four factors, including the preferences of the local community. After all of this is completed, a contract is awarded, typically for a two-year term. Once up and running, the carrier will submit an invoice to the government showing which flights were completed, and the government then cuts them a check. It doesn't matter how many passengers were on the flight - if the flight is operated, the carrier will be paid.

If this seems strange to you, you are not alone. Many people have wondered aloud why people who live in rural areas simply cannot drive to the nearest large airport, and in recent years, members of Congress have begun to question the need for the program.

In 2012, with fiscal concerns in mind, some changes came to the EAS with the passage of the FAA Modernization and Reform Act. This law stated that communities must maintain at least ten passengers per flight per day, and that no new communities can enter the program.

For the carriers, EAS can be quite lucrative as they get paid for every flight completed, regardless of the number of passengers on board.



Case Study: SkyWest was awarded an EAS contract to service Alpena, Michigan (APN) several years ago at an annual subsidy of \$2,348,781. SkyWest provided 13 round trips per week from Alpena to Detroit (DTW) on Canadair CRJ-200 equipment. That totaled 650 seats per week, or 33,800 per year.

For the first year, Alpena had 19,025 passengers on 858 scheduled flights, all to Detroit; 22.17 passengers for flight.

With the contract, SkyWest was paid \$3,613.51 per flight, with each flight seeing just 45 percent of its seats filled. The drive from Alpena to Detroit takes a little over four hours.

AIRFIELD RUBBER REMOVAL

When an aircraft lands on the runway, its wheels are not spinning — they land and skid at first before getting their grip and then rolling normally. This process is known as the "spin up time." With hundreds of planes weighing hundreds of thousands of pounds landing each day on major airports' runways, layers of rubber residue from the tires slowly builds up on the runway. Removing rubber buildup from airport runways is a crucial maintenance task that ensures the safety of aircraft during landing and takeoff. Over time, the repeated landing of aircraft causes rubber from the tires to accumulate on the runway surface. This rubber buildup can reduce the friction between the aircraft's tires and the runway, making it slippery, especially in wet conditions, and potentially leading to dangerous situations like hydroplaning.

So, how exactly is the water blasting to chemical removal and sandblasting.

Water Blasting

High-pressure water jets are used to blast the rubber off the runway surface. Water is sprayed at pressures of up to 40,000 psi (pounds per square inch), which is powerful enough to remove the rubber without damaging the runway's surface.

Chemical Removal

Specially formulated chemicals are sprayed onto the runway to break down the rubber deposits. After allowing time for the chemicals to work, the softened rubber is removed using high-pressure water or mechanical scrubbing.

Shot Blasting

This method uses high-speed steel or abrasive pellets (known as shot) to mechanically remove rubber from the runway surface. The pellets are blasted onto the surface, breaking up and dislodging the rubber. The debris is then vacuumed up by the machine.

Mechanical Scrubbing

Specialized machinery equipped with rotating brushes or abrasive pads is used to scrub the runway surface, physically removing the rubber. This method is often combined with water or chemical application to improve effectiveness.

Cryogenic Removal

This less common method involves using liquid nitrogen or other cryogenic substances to freeze the rubber, making it brittle and easier to remove. The frozen rubber is then broken up and vacuumed away.

Now, after the rubber is removed from the runway, airports often conduct friction testing to ensure the runway surface meets safety standards. This testing is done using specialized vehicles that measure the runway's skid resistance. To prevent excessive rubber buildup, airports typically follow a regular maintenance schedule, balancing safety with operational needs. The frequency of rubber removal depends on factors like runway usage, weather conditions, and aircraft types.

In summary, rubber removal from runways is essential for maintaining safe landing and takeoff conditions. Airports use various methods, often in combination, to effectively remove rubber while minimizing disruption to airport operations.



Did You Know? While we are on the topic of rubber and tires, did you know that the Michelin Man's "given" name is Bibendum? This has little to do with aviation, but I wanted to pass along, nonetheless.

PASSENGER FACILITY CHARGE

Established by Congress in 1990, the Passenger Facility Charge (PFC) is a fee that U.S. airports are allowed to collect from passengers to fund airport improvements and infrastructure projects. The PFC program is administered by the Federal Aviation Administration (FAA) and is intended to help airports finance a wide range of projects that enhance safety, security, capacity, noise reduction, and overall airport infrastructure.

PFCs are used to fund airport infrastructure projects, such as the construction of new runways, taxiways, terminal expansions, and upgrades to baggage handling systems. These improvements are essential for increasing airport capacity, improving efficiency, and enhancing the passenger experience.

The funds collected through PFCs can also be allocated to projects that enhance airport safety and security, including advanced security screening systems, fire and rescue equipment, and upgrades to airfield lighting and signage.

Funds can also support noise abatement programs designed to reduce the impact of airport noise on surrounding communities. This might include soundproofing nearby homes and schools or altering flight paths to minimize noise exposure. If you are thinking, the government pays for this? Yes, in fact, the FAA in September 2024 announced a nearly \$16 million grant to Los Angeles International Airport to purchase and install sound installation treatments for 400 homes near the airport.

Airports may use PFC funds to improve ground access, such as constructing roads, parking facilities, or public transit connections to the airport. Additionally, PFCs can be used to invest in environmentally sustainable airport practices.

The FAA allows airports to charge a PFC of up to \$4.50 per enplaned passenger per flight segment, with a maximum of \$18 per round trip.

This means that if a passenger's itinerary includes multiple segments, they may be charged a PFC for each segment, up to the cap.

Airlines collect the PFC on behalf of the airports at the time of ticket purchase. The fee is typically itemized on the ticket as a separate charge, like other taxes and fees. Airlines are allowed to keep eight cents of each they remit to the collecting airports. Keep in mind; the \$4.50 fee is imposed at each airport on an itinerary. If you were flying from Buffalo, New York to Omaha, Nebraska, with a connection in Chicago, you may pay the fee three times! That's \$13.50 on top of your base fare, while \$18 is the maximum allowable charge.

Airports must apply to the FAA for approval to impose or increase a PFC. The application process requires airports to demonstrate the need for the proposed projects and how the PFC funds will be used.

PFCs have been a critical source of funding for many U.S. airports, enabling them to undertake significant capital improvement projects that might otherwise be unaffordable. This has helped airports keep pace with growing passenger numbers and evolving industry standards.

SEPTEMBER 11 SECURITY FEE

The September 11 Security Fee, also known as the "9/11 Security Fee" or the "Passenger Civil Aviation Security Service Fee," is a fee that passengers are charged when purchasing airline tickets in the United States. This fee was implemented as a response to the terrorist attacks on September 11, 2001, to fund enhanced aviation security measures.

The fee is typically \$5.60 per one-way trip per passenger. This means that for a round-trip ticket, a passenger would pay \$11.20 in September 11 Security Fees. If a trip involves multiple flight segments (with connections), the fee applies to each segment. However, the maximum charge is capped at \$11.20 per one-way trip, even if there are multiple flight legs within that one-way journey.

The fee is collected by airlines at the time of ticket purchase and is then remitted to the U.S. government; the total of all fees each calendar month must be sent to TSA by the last calendar day of the following month.

Since 2013, Congress has diverted up a large chunk of these collected fees to pay down the national debt; indeed, 60¢ of the one-way fee and up to \$1.20 for the total itinerary gets diverted from TSA and sent instead to national debt payments in past years.

How much has been collected via this fee since its inception? Nearly \$60 billion! Here are the amounts per FY, since 2002:

2002:	\$ 995,400,000
2003:	\$1,199,700,000
2004:	\$1,600,200,000
2005:	\$1,866,300,000
2006:	\$1,855,800,000
2007:	\$1,959,800,000
2008:	\$1,920,100,000
2009:	\$1,756,000,000
2010:	\$1,808,000,000
2011:	\$1,847,500,000

2012:	\$1,877,700,000
2013:	\$1,878,900,000
2014:	\$2,087,000,000
2015:	\$3,508,200,000
2016:	\$3,694,217,000
2017:	\$3,882,602,000
2018:	\$4,098,503,000
2019:	\$4,263,225,000
2020:	\$2,456,587,000
2021:	\$2,510,808,000
2022:	\$3,786,997,000
2023:	\$4,286,109,000
2024:	\$4,490,471,000

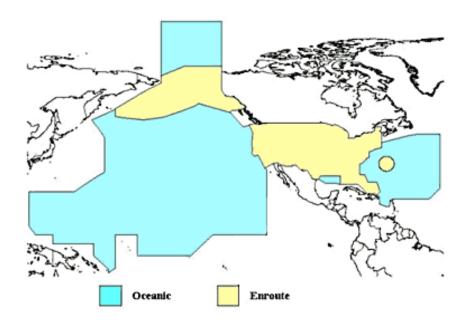
Total: \$59,630,119,000

OVERFLIGHT FEES

Carriers that neither takeoff nor land in the US but fly over US airspace are charged overflight fees by the FAA. After all, FAA air traffic controllers must still handle these flights, and they like to be paid as well. Since January 2019 these rates are, per every 100 nautical miles, \$61.75 over land and \$26.51 over water. The minimum billing threshold is \$400, and airlines can pay these bills online at pay.gov.

Overflight fees were initially authorized by the Federal Aviation Reauthorization Act of 1996 and were implemented in their current form in 2001.

An Air Canada flight from Toronto to Mexico City would travel around 1000 miles over the continental US, and another 400 miles over US waters before heading into Mexico. A quick estimate shows that Air Canada would be charged around \$720 for the overflight of the US.



SLOT PAIRS

Slot pairs are a crucial element in the operation of commercial aviation, particularly at congested airports where demand for takeoff and landing rights exceeds available capacity. In simple terms, a slot is a permission granted by an airport or air traffic authority to an airline, allowing it to schedule a takeoff or landing at a specific time. A slot pair refers to the combination of one takeoff slot and one landing slot, necessary for a round-trip flight.

In the context of airport coordination, a slot is an authorization to either take-off or land at a particular airport on a particular day during a specified time frame. This authorization is for a planned aircraft operation and is distinct from air traffic control clearance or similar authorizations. Slots, or limits on the planned aircraft operations, are a tool used in the United States and around the world to manage air traffic at extremely busy airports, and to prevent repeated delays that result from too many flights trying to take off or land at the same time.

Slot allocation is usually overseen by regulatory bodies, such as the FAA or the European Union's Slot Regulation under the European Commission. These bodies ensure that slots are allocated in a fair and non-discriminatory manner.

Airlines that have historically operated flights at a particular airport often have the right to retain their slots year after year, provided they use them according to the "use it or lose it" rule, typically requiring 80 percent usage during a scheduling season. Airlines negotiate slots during biannual meetings organized by the International Air Transport Association (IATA) or similar bodies, where airlines and airports discuss and confirm slot timings.

In some regions, airlines can buy, sell, or trade slots in a secondary market. This practice is common at congested airports where slots are valuable assets. For example, an airline might purchase a prime-time slot from another airline that no longer needs it. Airlines may also lease slots to other carriers, typically for a short period or specific season. This allows airlines to generate revenue from slots they temporarily do

not need. Airlines sometimes engage in slot swaps, where two airlines exchange slots to optimize their schedules. For instance, one airline might prefer a morning slot while another prefers an evening slot, so they agree to swap.

In some countries, slot trading is heavily regulated or prohibited, while in others, such as the U.K., a more open market for slots exists, allowing for trading and leasing. In 2016 Persian Gulf carrier Oman Air paid the Air France-KLM Group \$75 million for a pair of take-off and landing slots at London Heathrow (LHR). The arrival slot was good only for a 5:30 a.m. time as well!

Around the world, airports are designated at levels indicating their degree of congestion. Level 1 airports have sufficient capacity to meet demand. Level 2 airports may have some periods when demand approaches one or more capacity limits, but a voluntary schedule-facilitation process prevents systemic delays. Level 3 airports have demand for airport infrastructure that significantly exceeds the airport's capacity during the relevant periods and without controls, would have unacceptable systemic delays. Level 3 airports are under slot control and require advance approval to operate during slot-controlled hours.

In the U.S., New York Kennedy (JFK), New York LaGuardia (LGA), and Washington National (DCA) are the only Level 3 slot restricted airports. JFK has been operating under slot restrictions since 1968. In contrast, Europe has many slot-controlled airports due to higher traffic density and smaller airport capacities.

PART VII: AIRCRAFT OPERATIONS AND TECHNOLOGY

WINGLETS

Winglets are aerodynamic structures (the point things) located at the tips of an aircraft's wings, and they offer several significant benefits to modern commercial aircraft. Winglets provide a range of benefits that make them a valuable addition to modern commercial aircraft. They improve fuel efficiency, reduce environmental impact, enhance aircraft performance, and offer economic advantages for airlines. By mitigating drag and optimizing aerodynamics, winglets play a crucial role in the efficiency and sustainability of the aviation industry.

Let's take a closer look at the various factors in play that make winglets so advantageous:

Reduced Drag

Winglets are designed to reduce a type of drag called induced drag, which occurs when high-pressure air beneath the wing spills over the wingtips into the low-pressure area above the wing, creating vortices. These vortices increase drag, which in turn requires more engine power and fuel to maintain flight. Winglets reduce the intensity of these vortices by redirecting the airflow at the wingtips, effectively minimizing induced drag.

Improved Fuel Efficiency

By reducing drag, winglets allow aircraft to fly more efficiently, leading to lower fuel consumption. Airlines benefit from significant fuel savings, which can be substantial over the lifespan of an aircraft. This not only reduces operational costs but also makes flights more economical for airlines and passengers.

With improved fuel efficiency, aircraft equipped with winglets can often fly longer distances without needing to refuel. This extended range opens new routes and allows airlines to operate more direct flights, reducing travel time and increasing convenience for passengers.

Environmental Benefits

Since winglets improve fuel efficiency, they also contribute to lower carbon dioxide (CO2) emissions. This is increasingly important as the aviation industry seeks to reduce its environmental impact. Airlines using winglet-equipped aircraft can operate more sustainably, aligning with global efforts to combat climate change.

Winglets can also contribute to noise reduction. The reduction in drag allows for quieter engine operations, which can be particularly beneficial during takeoff and landing in noise-sensitive areas near airports.

Enhanced Aircraft Performance

Winglets can improve an aircraft's climb performance by making the wings more aerodynamically efficient. This allows the aircraft to reach cruising altitude more quickly, reducing the time spent in the less efficient lower altitude airspace.

Winglets can enhance the overall stability and handling of an aircraft, particularly in turbulent conditions. The improved aerodynamics provided by winglets can make the aircraft more responsive and easier to control.

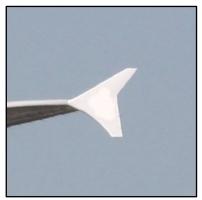
Economic Advantages

With reduced drag and better fuel efficiency, some aircraft can carry more passengers or cargo without requiring additional fuel. This increased payload capacity translates directly into higher revenue potential for airlines. Winglets can help reduce the structural stress on the wings by distributing aerodynamic loads more evenly. This can extend the lifespan of the wings and reduce maintenance costs over time.

Aesthetic Appeal and Branding

Winglets add a sleek, modern look to aircraft, which can enhance the visual appeal of an airline's fleet. Some airlines even use the winglet surface for branding purposes, applying logos or unique designs that contribute to their visual identity.

Let's look at five of the most common winglets you will see on commercial aircraft today.



Fenced Wingtips

Airbus has historically been a big proponent of the fenced wingtip, and you will see it across their entire range of commercial aircraft. A fenced wingtip has surfaces above and below the wingtip. In recent years, Airbus has now adopted the more conventional Blended Winglet, although they call their version a "sharklet."



Blended Winglets

Blended Winglets rise eight feet or more, with the width being four feet at the base and two feet at the top. Blended Winglets provide up to a six percent increase in fuel efficiency at cruise over aircraft that are equipped with "regular" wings.



Split Scimitar Winglets

Split Scimitar winglets are a further modification and improvement over blended winglets and can save over 45,000 gallons a year on a typical 737-800 equipped solely with blended winglets.



Raked Wingtips

With reduced drag, raked winglets increase fuel efficiency and climb performance. These can be seen on the Boeing 787, 747-800, 767-400, as well as 777-200/LR and-300/ER aircraft.



Split Tip Winglets

With the introduction of the 737 MAX series of aircraft, Boeing has introduced the "split tip" winglet, which they market as "the most efficient winglet on any airplane." The two airfoils are said to maximize the overall efficiency of the wing, with the lower half of the winglet generating more vertical lift.

ETOPS



You may have already come across this written on a few aircraft, particularly heavies, which you've encountered on the ramp. ETOPS. What does it stand for? Extended-range Twin-engine Operational Performance Standards.

ETOPS is a set of regulations and procedures in commercial aviation that allows twin-engine aircraft to fly routes that are a certain distance from the nearest suitable airport for an emergency landing. ETOPS is essential for the operation of long-haul flights over remote areas like oceans, polar regions, and deserts, where alternate airports may be far apart.

ETOPS certification allows aircraft to operate on routes that are beyond 60 minutes of flying time from the nearest suitable airport. Without ETOPS certification, twin-engine aircraft would be limited to routes that keep them within this 60-minute distance, severely restricting long-haul operations over sparsely populated areas or large bodies of water.

ETOPS certifications are often referred to by the number of minutes an aircraft can be from the nearest diversion airport. The Boeing 767 was the first large aircraft to obtain ETOPS certification, with a 120-minute certification in 1985.

This meant that the aircraft could operate up to 120 minutes away from the nearest airport. Today, several aircraft models are certified for ETOPS-180, while newer aircraft like the Boeing 787 and Airbus A350 have been certified for ETOPS beyond 180 minutes, allowing them to fly even more direct, efficient routes.

Both the aircraft model and the airline operating it must be ETOPS-certified. The aircraft must meet specific reliability and safety standards, while the airline must demonstrate rigorous maintenance practices, crew training, and operational procedures.

ETOPS allows airlines to operate more direct and fuel-efficient routes, reducing flight times and operational costs. Without ETOPS, twinengine aircraft would be forced to take longer, less direct routes that stay closer to airports, increasing fuel consumption and travel time.

ETOPS opens new route possibilities, particularly for transoceanic flights. Airlines can offer non-stop services between city pairs that might not have been economically or operationally feasible without ETOPS certification.

By allowing more direct routes, ETOPS-certified flights can reduce fuel consumption and carbon emissions, contributing to more environmentally sustainable operations.

When ETOPS was first introduced, there was skepticism about the reliability of twin-engine aircraft for long-haul flights over remote areas. The idea of flying long distances without access to a nearby airport in case of an engine failure was initially met with resistance. Over time, advancements in engine technology, rigorous testing, and a strong safety record helped overcome these concerns. The reliability of modern jet engines has proven to be extremely high, leading to the gradual increase in ETOPS approval times.

Did You Know? Government-owned aircraft, including military, do not adhere to ETOPS regulations, nor do private jets in the U.S. ETOPS standards are international and apply to all carriers, both U.S. and foreign.

Did You Know? One slang term for ETOPS is Engines Turning or Passengers Swimming.

AUTOMATIC DEPENDENT SURVEILLANCE — BROADCAST (ADS-B)

ADS-B, which stands for Automatic Dependent Surveillance—Broadcast, is a modern aviation technology that allows aircraft to be tracked more accurately and efficiently than traditional radar. ADS-B is becoming the global standard for air traffic surveillance. In the United States, for example, ADS-B Out has been mandatory for most aircraft flying in controlled airspace since January 1, 2020. Other regions have similar mandates or are in the process of implementing them.

ADS-B represents a significant advancement in aviation safety and efficiency by providing more accurate, real-time data on aircraft positions and movements, thus improving both air traffic control operations and in-flight situational awareness. So, how does it all work?

Automatic means that the system operates without the need for pilot input or external interrogation. The aircraft continuously broadcasts its position and other relevant data.

Dependent refers to the system's reliance on data from the aircraft's onboard sensors. The primary data sources include the GPS (Global Positioning System) for precise positioning, and other avionics systems for additional information like speed, altitude, and identification.

Surveillance indicates the technology's role in monitoring aircraft movements. ADS-B provides real-time data on the aircraft's location, altitude, velocity, and more, which is essential for air traffic control and situational awareness.

Broadcast means that the aircraft transmits its data to anyone within range, including air traffic controllers, other aircraft, and ground stations. This data is sent out via a radio frequency, typically 1090 MHz or 978 MHz.

ADS-B Out

This is the part of the system that broadcasts the aircraft's position, velocity, altitude, and other information. All equipped aircraft continuously send out this data, which can be received by ground stations, other aircraft, and satellites.

ADS-B In

This allows the aircraft to receive ADS-B data from other aircraft and ground stations. Pilots can see traffic information and weather data, improving situational awareness and safety.

The aircraft's GPS system determines its precise position in terms of latitude, longitude, altitude, and speed. This positional data, along with other information like flight number, direction, and speed, is automatically broadcast from the aircraft via a transponder. The data is sent over radio frequencies, mainly 1090 MHz in most regions, or 978 MHz in the U.S. (for general aviation aircraft flying below 18,000 feet).

Ground stations receive the broadcasted data and relay it to air traffic control centers, where it is used to monitor and manage air traffic. Other ADS-B-equipped aircraft in the vicinity can also receive this data, which helps with collision avoidance and situational awareness.

The data is integrated into the air traffic control system, providing controllers with a more accurate and real-time picture of aircraft positions. This enhances safety and efficiency in managing airspace.

Advantages of ADS-B

ADS-B provides more precise position data than traditional radar. It covers areas where radar is ineffective, like remote or oceanic regions. Pilots and controllers receive up-to-date information, improving decision-making and it's less expensive to install and maintain compared to radar systems. By providing better situational awareness, ADS-B reduces the risk of mid-air collisions and enhances overall flight safety.

Challenges

The implementation of ground stations and integration into existing systems can be costly. Since ADS-B broadcasts are unencrypted, there's a risk of data spoofing or unauthorized tracking. Not all aircraft are equipped with ADS-B, especially in regions where it's not yet mandatory.

NEXTGEN

The FAA's NextGen (Next Generation Air Transportation System) is a comprehensive initiative aimed at transforming the U.S. air traffic control system to enhance the efficiency, safety, and environmental sustainability of air travel. By leveraging modern technology, NextGen aims to transition from a ground-based radar system to a satellite-based system, improving how air traffic is managed across the nation.

Purpose and Goals of NextGen

Modernization of Air Traffic Control (ATC): NextGen is designed to modernize the National Airspace System (NAS) by incorporating advanced technologies and procedures. The goal is to move away from the traditional radar-based ATC system, established after World War II, to a more efficient, satellite-based system. In a nutshell, NextGen replaces vintage radar with precision satellite guidance.

Increased Efficiency: By improving the precision and flexibility of air traffic management, NextGen aims to reduce flight delays, optimize flight paths, and increase the capacity of the NAS, allowing more flights to operate safely in the same airspace. For decades there have been a limited number of "highways" in the air that are open to aircraft - with NextGen the FAA has been able to open scores of new flight paths at Metroplexes – large metropolitan areas with multiple airports. As a result, air traffic controllers can move another 8 to 12 aircraft off the ground per hour, and it now takes just one minute to clear a flight for departure rather than the two minutes that have been traditionally necessary.

Enhanced Safety: NextGen technologies provide more accurate tracking of aircraft, improving situational awareness for both pilots and controllers. This reduces the risk of mid-air collisions, runway incursions, and other safety incidents.

Environmental Benefits: By enabling more direct flight paths and reducing fuel consumption, NextGen helps decrease greenhouse gas

emissions and noise pollution, contributing to a more sustainable aviation industry.

Key Components of NextGen

Automatic Dependent Surveillance-Broadcast (ADS-B): ADS-B is a cornerstone of NextGen. It uses GPS signals to determine an aircraft's position and broadcasts that information to other aircraft and ground stations. This provides more accurate tracking compared to radar and enables more efficient routing and spacing of aircraft.

Performance-Based Navigation (PBN): PBN allows aircraft to follow more precise flight paths using satellite-based navigation rather than ground-based beacons. This results in more efficient routing, reduced fuel consumption, and the ability to navigate in more congested airspace. You may notice this as well when you are flying. If you are sitting on an aircraft that is descending and approaching to an airport, you won't hear and feel the repeated engine adjustments – throttling up and throttling down – as the aircraft works down the altitude ladder. With NextGen, the approach is a smooth and consistent descent.

Data Communications (Data Comm): Data Comm replaces traditional voice communication between pilots and air traffic controllers with digital messaging. This reduces communication errors, speeds up clearances, and allows for more complex instructions to be conveyed more efficiently.

Collaborative Decision Making (CDM): CDM is a set of procedures and tools that enhance coordination between airlines, airports, and the FAA to optimize the flow of air traffic, particularly during disruptions like weather events.

System Wide Information Management (SWIM): SWIM is an information-sharing platform that integrates data from various sources, providing a real-time, common view of the airspace. This helps improve decision-making for all stakeholders in the NAS.

Implementation Phases

Initial Phase (2007-2012): The early years focused on foundational research, development of new technologies, and initial deployments. Key milestones included the implementation of ADS-B in select areas and early PBN procedures.

Mid-Term Phase (2013-2020): This phase saw wider implementation of ADS-B across the U.S., the expansion of PBN routes, and the introduction of Data Comm at key airports. The FAA also began integrating SWIM into the NAS.

Current and Future Phases (Present Day): The ongoing phase focuses on expanding NextGen capabilities across the entire NAS, including full nationwide coverage of ADS-B, further enhancements to PBN, and the broader use of Data Comm. Future initiatives aim to incorporate emerging technologies, such as unmanned aircraft systems (UAS) and urban air mobility (UAM), into the NextGen framework.

Challenges and Considerations

Funding and Budget Constraints: Implementing NextGen has required significant investment, and funding has been a challenge, leading to delays in some aspects of the program.

Technology Integration: Integrating new technologies into an already complex air traffic system without disrupting operations has been challenging. Ensuring compatibility with legacy systems while phasing in new technologies is a delicate balance.

Stakeholder Coordination: The successful implementation of NextGen requires close coordination between various stakeholders, including airlines, airports, air traffic controllers, and the FAA. Differences in priorities and capabilities among these groups have sometimes slowed progress.

Training and Workforce Adaptation: Transitioning to NextGen technologies requires significant training for air traffic controllers,

pilots, and other aviation professionals. Ensuring the workforce is adequately prepared for these changes has been a key focus.

Benefits of NextGen

Reduced Delays: NextGen's ability to manage air traffic more efficiently helps reduce delays, particularly in congested airspace and at busy airports. Using more accurate navigation, NextGen allows planes to fly more direct routes, getting to their destinations in less time while using less fuel. Some reports have even indicated a reduction of 300-500 pounds of fuel used per flight.

Increased Capacity: By enabling more precise control of aircraft spacing and routing, NextGen allows the NAS to handle more flights without compromising safety.

Improved Safety: Enhanced surveillance and communication capabilities reduce the risk of accidents and improve overall safety in the NAS.

Environmental Improvements: More efficient flight paths and reduced fuel burn lead to lower emissions and less environmental impact.

Current Status and Future Outlook

ADS-B Mandate: As of January 1, 2020, ADS-B Out (broadcasting aircraft position data) became mandatory for most aircraft operating in controlled U.S. airspace, marking a significant milestone in the NextGen program.

Ongoing Enhancements: The FAA continues to roll out enhancements, such as expanding PBN routes, increasing the use of Data Comm, and further integrating SWIM.

Next Steps: Future phases of NextGen will focus on integrating new aviation technologies, such as drones and advanced air mobility solutions, into the NAS, ensuring that the U.S. air traffic system remains at the forefront of global aviation.

NextGen represents a significant transformation of the U.S. air traffic management system, aiming to enhance the safety, efficiency, and environmental sustainability of air travel. While the implementation has faced challenges, the progress made so far has already delivered substantial benefits, with more improvements expected as the program continues to evolve.

PART VIII: REFERENCE SECTION (APPENDICES)

REFERENCE CHART FOR U.S. AIRLINES

Yes, it can be a bit confusing to keep up with the various codes and call signs for all the carriers. Here are a few charts of the most common airlines to get you started, first for U.S. carriers and then for foreign carriers.

Airline	Airline IATA IC		TSA/FAA	Call Sign		
Air Wisconsin	ZW	AWI	A6WA	Wisconsin		
Alaska	AS	ASA	ASAA	Alaska		
Allegiant	G4	AAY	WX0A	Allegiant		
American	AA	AAL	AALA	American		
Avelo	XP	VXP	BJNA	Avelo		
Breeze	MX	MXY	BAGA	Моху		
CommutAir	C5	UCA	JJBA	CommutAir		
Delta	DL	DAL	DALA	Delta		
Endeavor Air	9E	FLG	REXA	Flagship		
Envoy	MQ	ENY	SIMA	Envoy		
Frontier	F9	FFT	F3LA	Frontier Flight		
GoJet	G7	GJS	N6WA	Lindbergh		
Hawaiian	HA	HAL	HALA	Hawaiian		
Horizon	QX	QXE	QXEA	Horizon		
JetBlue	B6	JBU	YENA	JetBlue		
Mesa	YV	ASH	MASA	Air Shuttle		
Piedmont	PT	PDT	HNAA	Piedmont		
PSA Airlines	ОН	JIA	VNAA	Blue Streak		
Republic	YX	RPA	R61A	Brickyard		
Silver	3M	SIL	29GA	Silver Wings		
SkyWest	00	SKW	SWIA	Skywest		
Southwest	WN	SWA	SWAA	Southwest		
Spirit	NK	NKS	GTIA	Spirit Wings		
Sun Country	SY	SCX	SCNA	Sun Country		
United	UA	UAL	CALA	United		

REFERENCE CHART FOR FOREIGN AIRLINES

The next two pages have the various codes for 90 foreign flagged airlines. You will notice that all foreign airline TSA/FAA designator codes end with F.

The two with black boxes under the TSA/FAA column do not presently operate U.S. flights or maintain a TSA security program.

Airline	IATA	ICAO	TSA/FAA	Call Sign	
Aer Lingus	EI	EIN	MEDF	Shamrock	
Aero Mexico	AM	AMX	ASMF	Aero Mexico	
Aeroflot	SU	AFL	SOVF	Aeroflot	
AeroMexico Connect	5D	SLI	LVQF	Costera	
Air Canada	AC	ACA	ARNF	Air Canada	
Air Canada Rouge	RV	ROU	6CDF	Rouge	
Air Century	Y2	CEY	OD0F	Century Flight	
Air China	CA	CCA	CAAF	Air China	
Air Europa	UX	AEA	ESQF	Europa	
Air France	AF	AFR	CNFF	Airfrans	
Air India	Al	AIC	AINF	Air India	
Air New Zealand	NZ	ANZ	ANZF	New Zealand	
Air Pacific	FJ	FJI	APFF	Fiii	
Air Premia	YP	APZ	ARPF	Air Premia	
Air Serbia	JU	ASL	1LZF	Air Serbia	
Air Transat	TS	TSC	ATFF	Air Transat	
All Nippon Airways	NH	ANA	ANPF	All Nippon	
Asiana	OZ	AAR	77LF	Asiana	
Austrian	os	AUA	AUXF	Austrian	
Avianca	AV	AVA	ANCE	Avianca	
Azul	AD	AZU	2ZLF	Azul	
Bahamas Air	UP	BHS			
BermudAir	2T	BHS BHLF BMA 10UF		Gosling	
British Airways	BA	BMA 10UF BAW BRAF		Speedbird	
Caribbean Airlines	BW	BWA TTAF		Caribbean	
Cathay Pacific	CX	CPA	VHCF	Cathay	
Cayman Airways	KX	CAY	CAYF	Cayman	
China Airlines	CI	CAL	SAJF	Dynasty	
China Eastern	MU	CES	NZXF	China Eastern	
China Southern	CZ	CSN	C4XF	China Southern	
Condor	DE	CFG	CFGF	Condor	
Copa Airlines	CM	CMP	DCIF	Copa	
Discover Airlines	4Y	OCN	EWDF	Ocean	
Edelweiss Air	WK	EDW	88DF	Edelweiss	
EgyptAir	MS	MSR	EGYF	Egyptair	
El Al	LY	ELY	EILF	ELAL	
Emirates	EK	UAE	ZCQF	Emirates	
Ethiopian	ET	ETH	ETIF	Ethiopian	
Etihad	EY	ETD	YY6F	Etihad	
EVA Airways	BR	EVA	QOCF	Eva	
Finnair	AY	FIN	FIOF	Finnair	
Flair Airlines	F8	Carlo Carlo State Control Cont	F8RF	Flair	
French Bee	BF			French Bee	
Gol	G3	GLO	55SF 2GOF	Gol	
Hainan Airlines	HU	CHH	3HAF	Hainan	
riaman Antines	110	Onn	JI IMF	Hallall	

Airline	IATA	ICAO	TSA/FAA	Call Sign	
Iberia	IB	IBE	ILAF	Iberia	
Icelandair	FI	ICE	ILRF	Iceair	
ITA Airways	AZ	ITY	ITAF	Itarrow	
Japan Airlines	JL	JAL	JACF	Japanair	
Jazz Aviation	QK	JZA	NZAF	Jazz	
Jet Airways	9W	JAI	J9QF	Jet Airways	
KLM	KL	KLM	KRDF	KLM	
Korean Air	KE	KAL	KALF	Korean Air	
Kuwait Airways	KU	KAC	KACF	Kuwaiti	
LATAM	JJ	TAM	LANF	TAM	
LOT Polish	LO	LOT	LOPF	LOT	
Lufthansa	LH	DLH	DLAF	Lufthansa	
Mexicana	XN	MXA		Mexicana	
Norse Atlantic	N0	NBT	NNAF	Longship	
Norse Atlantic UK	Z0	UBT	TBUF	Longboat	
Philippine Airways	PR	PAL	SCOF	Philippine	
Porter Airlines	P3	PTR	P54F	Dash Port	
Porter Airlines Canada	PD	POE	POCF	Porter	
Qantas	QF	QFA	QLMF	Qantas	
Qatar Airways	QR	QTR	QYCF	Qatari	
Royal Air Maroc	AT	RAM	RMRF	Royal Air Maroc	
Royal Jordanian	RJ	RJA	RJAF	Jordanian	
Saudia	SV	SVA	SAFF	Saudia	
Scandinavian	SK	SAS	SCSF	Scandinavian	
Singapore Airlines	SQ	SIA	SBOF	Singapore	
Sky Regional	RS	SKV 6SYF		Maple	
South African	SA	SAA			
Starlux Airlines	JX	SJX			
Sunwing	WG	SWG	U6WF	Sunwing	
Swiss	LX	SWR	UCSF	Swiss	
TAP Portugal	TP	TAP	TAPF	Air Portugal	
Thai Airways	TG	THA		Thai	
Turkish	TK	THY	TQKF	Turkish	
Uzbekistan Airways	HY	UZB	UZAF	Uzbek	
Vietnam	VN	HVN	VA2F	Viet Nam Airlines	
Virgin Atlantic	VS			Virgin	
Viva Aerobus	VB	VIV	V80F	Viva	
Volaris	Y4	VOI	Z5XF	Volaris	
Volaris Costa Rica	Q6	voc	4VUF	Costa Rican	
Volaris El Salvador	N3	vos	6V1F	Jetsal	
Westlet	WS	WJA	WJOF	Westjet	
Westlet Encore	WR	WEN	5WJF	Encore	
Xiamen	MF	CXA	88MF	Xiamen Air	
ZipAir	ZG	TZP	ZP1F	Zippy	

REFERENCE CHART FOR CARGO AIRLINES

Airline	IATA	ICAO	TSA/FAA	Call Sign
ABX Air	GB	ABX	ABXA	A Bex
Aerologic	3S	BOX	4ALF	German Cargo
AeroUnion	6R			Aero Union
Air China Cargo	CA	CAO C45F Air China F		Air China Freight
Air Transport Intl.	8C			Air Transport
AirBridgeCargo	RU	71111		Air Bridge Cargo
Amerijet	M6	AJT	PCSA	Amerijet
Atlas Air	5Y	GTI	UIEA	Giant
Avianca Cargo	QT	TPA	TAMF	Tampa
CargoJet	W8	СЛ	W29F	CargoJet
Cargolux	CV	CLX	CISF	Cargolux
Cargolux Italia	C8	ICV	5CUF	Cargolux Italia
Centurion Air Cargo	WE	CWC	CLCA	Challenge Cargo
China Cargo	CK	CKK	10GF	Cargo King
China Southern Cargo	CZ	CSG	China Southern	
DHL Air	D0			World Express
Estafeta	E7			Estafeta
FedEx	FX	FDX	FDEA	FedEx
Florida West	RF	FWL FWTA Flo Wes		Flo West
IFL Group	IF	IFL	VGCA	Transauto
Kalitta Air	K4	CKS	KCSA	Connie
Kelowna Flightcraft	FK	KFA	UKFF	Flightcraft
LAN Cargo	UC	LCO	FCLF	LAN Cargo
LATAM Cargo	UC	LCO	FCLF	LAN Cargo
Lufthansa Cargo	LH	GEC	LU7F	Lufthansa Cargo
Maersk Air Cargo	DJ	SRR	MKRF	Whitestar
Mas Cargo	M7	MAA	OTZF	Mas Carga
National Air Cargo	N8	NCR	U2RA	National Cargo
Nippon Cargo	KZ	NCA	NIPF	Nippon Cargo
Northern Air Cargo	NC	NAC	NACA	Yukon
Polar Air Cargo	PO	PAC	P5CA	Polar Tiger
Silk Way	ZP	AZQ	7YIF	Silk Line
Silk Way West	7L	AZG	7KWF	Silk West
Singapore Cargo	SQ	SQC O3YF Singcargo		Singcargo
Sky Lease Cargo	GG	KYE WRNA Sky Cube		Sky Cube
Southern Air	98			Southern Air
Suparna Airlines	Y8	,		Yangtze River
UPS	5X	UPS	IPXA	UPS
Western Global	KD	WGN	9WGA	Western Global

REGISTRATION PREFIXES

N668UA

Much like cars, aircraft also have "license plates" in the form of registrations. You've probably heard it referred to as

the "N-Number," as all aircraft registrations in the U.S. start with N.

Article 20 of the Convention of International Civil Aviation requires that "every aircraft engaged in international air navigation shall bear its appropriate nationality and registration marks." This is why commercial aircraft all have a unique registration and their country's flag affixed to each side of the fuselage.

Each signatory country has been assigned its own unique prefix, which will be detailed on the next page. An aircraft can only be registered in one country at a time.

The international norm is for registration to have five digits/letters, although there are some exceptions. For those who are fascinated by this topic, the next page contains a good listing of the more common countries and their prefixes. The FAA's N-Number registry allows you to research U.S. registered aircraft online.

FAA N-Numbers may be one to five numbers (N12345), one to four numbers followed by one letter (N1234Z), or one to three numbers followed by two letters (N123AZ). The FAA states that to avoid confusion with the numbers one and zero, the letters O and I are not to be used. Additionally, an N-Number may never begin with a zero. Registration numbers N1 through N99 are reserved for FAA internal use.

Spotters: Hard core aviation spotters will mark down the registration, date, and airport of every aircraft they've seen. They can then add it to their electronic logbooks and review how many times, when, and where, they've seen a particular aircraft. Admittedly, it is a very peculiar hobby.

REGISTRATION PREFIXES BY COUNTRY

Country	Reg.	Country	Reg.	Country	Reg.	Country	Reg.
Afghanistan	YA-	Djibouti	J2-	Liberia	A8-	Senegal	6V-
Albania	ZA-	Dominica	J7-	Libya	5A-	Seychelles	S7-
Algeria	7T-	Dominican Republic	HI-	Lithuania	LY-	Sierra Leone	9L-
Andorra	C3-	Dutch Antilles	PJ-	Luxembourg	LX-	Singapore	9V-
Angola	D2-	Ecuador	HC-	Macedonia	Z3-	Slovakia	OM-
Anguilla	VP-A	Egypt	SU-	Madagascar	5R-	Slovenia	S5-
Antigua	V2-	Eire	EI-	Malawi	7Q-	Soloman Islands	H4-
Argentina	LV-	El Salvador	YS-	Malaysia	9M-	Somalia	60-
Armenia	EK-	Equatorial Guinea	3C-	Maldives	8Q-	South Africa	ZS-
Aruba	P4-	Eritrea	E3-	Mali	TZ-	South Korea	HL
Australia	VH-	Estonia	ES-	Malta	9H-	Spain	EC-
Austria	OE-	Ethiopia	ET-	Marshall Islands	V7-	Sri Lanka	4R-
Azerbaijan	4K-	Falkland Islands	VP-F	Mauritania	5T-	St Kitts & Nevis	V4-
Bahamas	C6-	Fiji	DQ-	Mauritius	3B-	Sudan	ST-
Bahrain	A9C-	Finland	OH-	Mexico	XA-	Surinam	PZ-
Bangladesh	S2-	France	F-	Micronesia	V6-	Swaziland	3D-
Barbados	8P-	Gabon	TR-	Moldova	ER-	Sweden	SE-
Belarus	EW-		4L-	Monaco	3A-	Switzerland	HB-
		Georgia					
Belgium	00-	Germany	D-	Mongolia	MT-	Syria	YK-
Belize	V3-	Ghana	9G-	Montserrat	VP-M	Tajikistan	EY-
Benin	TY-	Gibraltar	VP-G	Morocco	CN-	Tanzania	5H-
Bermuda	VP-B	Greece	SX-	Mozambique	C9-	Thailand	HS-
Bhutan	A5-	Grenada	J3-	Myanmar	XY-	The Gambia	C5-
Bolivia	CP-	Guatemala	TG-	Namibia	V5-	The Netherlands	PH-
Bosnia	T9-	Guinea	3X-	Nauru	C2-	The Philippines	RP-
Botswana	A2-	Guinea-Bissau	J5-	Nepal	9N-	The Vatican	HV-
Brazil	PR-, PS-	Guyana	8R-	New Zealand	ZK-	Togo	5V-
Brunei	V8-	Haiti	HH-	Nicaragua	YN-	Tonga	A3-
Bulgaria	LZ-	Honduras	HR-	Niger	5U-	Trinidad & Tobago	9Y-
Burkina Faso	XT-	Hungary	HA-	Nigeria	5N-	Tunisia	TS-
Burundi	9U-	Iceland	TF-	North Korea	P-	Turkey	TC-
Cambodia	XU-	India	VT-	Norway	LN-	Turkmenistan	EZ-
Cameroon	TJ-	Indonesia	PK-	Oman	A40-	Turks & Caicos	VQ-T
Canada	C-	Iran	EP-	Pakistan	AP-	Tuvalu	T2-
Cape Verde	D4-	Iraq	YI-	Panama	HP-	Uganda	5X-
Cayman Islands	VP-C	Israel	4X-	Papua New Guinea	P2-	Ukraine	UR-
Central African Rep.	TL-	Italy	I-	Paraguay	ZP-	United Arab Emirates	A6-
Chad	TT-	Ivory Coast	TU-	Peru	OB-	United Kingdom	G-
Chile	CC-	Jamaica	6Y-	Poland	SP-	United States	N
China	B-	Japan	JA	Portugal	CS-	Uruguay	CX-
Colombia	HK-	Jordan	JY-	Qatar	A7-	Uzbekistan	UK-
Comores	D6-	Kazakhstan	UN-	Romania	YR-	Vanuatu	YJ-
Congo	9Q-	Kenya	5Y-	Russia	RA-	Venezuela	YV-
Congo	TN-	Kiribati	T3-	Rwanda	9XR-	Vietnam	VN-
Costa Rica	TI-	Kuwait	9K-	Saint Helena	VQ-H	British Virgin Islands	VP-L
Croatia	9A-	Kyrgyzstan	EX-	Saint Lucia	J6-	Western Samoa	5W-
Cuba	CU-	Laos	RDPL-	Saint Vincent	J8-	Yemen	70-
Cyprus	5B-	Latvia	YL-	San Marino	T7-	Yugoslavia	YU-
	OK-	Latvia	OD-	San Marino Sao Tome	S9-	Zambia	9J-
Czech Republic	OK-	Lebanon	7P-	Sao Iome Saudi Arabia	S9- HZ-	Zambia	9J- Z-

GLOSSARY

Above wing – Above wing services include ticket counter and gate operations, passenger service, aircraft cleaning/grooming and even catering operations.

ACARS – Aircraft Communications Addressing and Reporting System. Essentially, ACARS is an electronic message system that is used to send and receive information to and from aircraft. Updated weather reports, flight plans, revised flight plans and such are commonly sent.

ADS-B - Automatic Dependent Surveillance - Broadcast. *There is a whole page discussing ADS-B earlier in this book.*

Aircraft utilization – A measure of aircraft productivity which shows how much time an aircraft spends in the air, per day. Aircraft don't make money sitting on the ground.

Airport Code - This is the short code used to identify an airport. There are two common systems: the most common is the IATA code, which is a three-letter code used for reservations, ticketing and such. A second code, the ICAO code, is a four-letter code more commonly used by air traffic control and airline operations flight planning departments.

Airspace – The air over the land of sea area occupied by a state or country, and subject to the authority of that state or country.

Air Carrier Operating Certificate – Known as an Air Operator's Certificate in most of the world, the Operating Certificate is granted by a national aviation authority and grants an airline the right to operate commercial aircraft.

Air Operator's Certificate – The AOC is an approval granted by the national aviation authority to an aircraft operator that allows it to operate aircraft for commercial purposes.

Air Pocket – A euphemism for a bit of turbulence.



Air Stairs - Some smaller airports don't have jet bridges, so a modified truck with a flight of stairs attached to the bed will pull up to the plane so you can walk off.

Air Waybill (AWB) – A document made by a shipper which is the contract between the shipper and the carrier of the goods. The AWB shows the items being shipped and where it is heading.

AIT – Advanced Imaging Technology. When you go through the airport, get into a roundish looking pod and raise your arms while a door swings around, you are being scanned by a millimeter wave AIT machine. AIT uses automated target recognition software that eliminates passenger-specific images and instead auto-detects potential threats by indicating their location on a generic outline of a person. Non-metallic threats can be detected via AIT. AITs provide enhanced security benefits compared to WTMD because they can identify nonmetallic objects and liquids as well as metallic objects that may pose a threat.

All Call – A variation of the crosscheck, all the cabin crew is reporting to the purser or lead flight attendant that aircraft doors and slides are properly armed or disarmed.

Alliance – Many of the major airlines in the world today have joined up one of the various airline alliances. The three major alliances in existence today are the Star Alliance, Oneworld and Sky Team. These alliances provide several benefits, such as an extended route networks and reduced costs by sharing operational facilities and staff.

AOA - Air Operations Area. Any portion of an airport that is used for take-offs, landings or taxiing of aircraft.

AOG – Aircraft on Ground. Airline term for when an airplane is out of service and requiring maintenance or technical work.

AOSSP – Aircraft Operator Standard Security Program. A TSA issued security program used by U.S. registered airlines.

APIS – Advance Passenger Information System. A CBP electronic data interchange system that allows carriers to transmit traveler data to CBP. APIS data includes passenger information that would be found on the face of a passport, such as full name, gender, and country of passport issuance. The APIS program is recognized by commercial carriers and the international community as the standard for passenger processing and enhanced security in the commercial air and vessel environment.

Apron – The apron is most commonly the area near the terminal building where airplanes load and unload passengers, take on cargo, get serviced, refueled etc.

Area of weather – Have you been on a flight and heard the pilot come on the microphone and say there is an "area of weather" up ahead? That's just a fancy way of saying there is a storm of heavy rain, and the plane will soon fly around it.

ARFF – Aircraft rescue and firefighting.

ATC - Air Traffic Control.

ATIS – Automatic Terminal Information Service. ATIS plays a recorded message on a set frequency detailing current weather conditions, active runways, and other information at major airports.

ATSA – The Aviation and Transportation Security Act of 2001 is the law that created the TSA.

AT X-ray – Advanced Technology X-ray. A fancy term to denote the latest generation, more advanced X-ray systems.

Auxiliary Power Unit – APUs provide power for an aircraft to start the main engines. While on the ground, an APU will run and provide power to run electrical systems and heat or cool the aircraft cabin.

Average Stage Length – The average distance of a non-stop flight between take-off and landing.

Avgeek – A fan of commercial aviation, one who may enjoy aviation artwork, collectibles, spotting, aviation photography, and keeps up with industry news and information.

Avionics – Aviation electronics.

AVOD - Audio/Video on Demand. AVOD is how you can watch a movie, TV show or listen to music at any time you want, rather than wait for it to be shown on the main system in the aircraft.

AVSEC – Aviation Security.

Base – The home airport of a flight crew is their base.

Belly – The cargo holds in the bottom of the plane where luggage and cargo are stored.

Below wing – Below wing services include ramp operations such as pushback and marshaling of aircraft, applying ground power, fueling, lavatory service, baggage handling, cargo and the like.



Belt Loader - This is the little car with the conveyor belt that comes up to the cargo door on an aircraft. You'll see luggage and boxes on the belt being loaded to/from the belly of the plane.

Black box – The cockpit voice recorder (CVR) or flight data recorder (FDR) is commonly called the black box, a vital item to recover after an incident or accident to help investigators determine what went wrong.

Blue juice - The blue liquid you see in the lavatory.

Boarding pass – Your boarding pass is your ticket.

BOB – Abbreviation for "buy-on board" and used mainly between flight crew. Refers to meals and drinks that passengers can buy in flight.

Boneyard – The boneyard is essentially a graveyard for airplanes that are retired from service, most typically for good before they are scrapped.

Bottle to throttle – The number of hours that a crew member has between the time they can't have a drink and their next flight.

Brown – Slang term for United Parcel Service.

Bulkhead – The dividing wall between two different cabins on an aircraft.

Bumped - Anyone who has seen their seat on a flight taken from them, either for weight and balance, or when a flight is oversold, will find himself or herself "bumped" to the next available flight.

Buttoned Up – All the aircraft doors are closed and locked.

Cabotage – The practice of allowing a foreign carrier to operate domestic flights is known as cabotage. As an example, Qantas operates a flight from Sydney to Los Angeles and then on to New York. As a foreign carrier, they cannot sell tickets to a passenger solely for the Los Angeles to New York portion of the flight. Not surprisingly, there aren't too many countries that allow cabotage.

Callsign – The callsign is used in radio transmission to identify an aircraft. For example, "Speedbird 192" would indicate British Airways Flight 192, while "American 2466" would identify American Airlines Flight 2466.

Captain – The captain is legally in charge of everything and everyone on the plane while in air. You'll see them wearing four stripes on their shoulder epaulets and they sit in the left seat of the cockpit.

Carrier - A carrier is an airline.

CASS - The Cockpit Access Security System (CASS) is a security protocol used by airlines to control and monitor access to the cockpit of an aircraft. The system is part of broader security measures to prevent unauthorized individuals from entering the cockpit. CASS allows airlines to verify the identity and credentials of pilots and other authorized personnel before they are granted access to the cockpit. This system cross-references the individual's information with a centralized database, often maintained by the airline or a governing aviation body. The system ensures that only authorized crew members, typically pilots and sometimes other essential flight crew, can gain entry to the cockpit.

Catchment area – A catchment area is the geographic area around an airport in which it can reasonably expected to draw passengers from. Typically this is the number of people living within a two-hour car or train ride to an airport.

C.A.T.S.A. – The Canadian Air Transport Security Authority. Established on April 1, 2002, CATSA is responsible for passenger and baggage screening, as well as the screening of airport workers at airports in Canada.



C.B.P. – U.S. Customs and Border Protection. As the United States' first unified border entity, CBP takes a comprehensive approach to border management and control, combining customs, immigration, border security, and agricultural protection into one coordinated and supportive activity.

C.B.S.A. - Canada Border Services Agency. Canada's version of the CBP.

Ceiling – The ceiling is essentially the elevation of the lowest layer of clouds, or the highest altitude at which an aircraft can fly.

Cheatlines – Commonplace on airline liveries up until the late 1990s or so, a cheatline is a long, painted line running horizontally across the



fuselage of an aircraft. Think of the classic red, white, and blue stripes in the middle of the old American Airlines planes; that is a cheatline.

Checkride – Checkride is a slang term for the FAA Practical Test that all applicants must complete to receive a pilot's certification, or to be endorsed for additional flight privileges. In addition to the checkride, an oral test must also be passed.

Check airman – Check airmen are usually captains who perform line checks. The check airman will be observing (from the jumpseat) the captain in how he or she handles their duties, knowledge of procedures and checklists, as well as overall efficiency – all during a revenue flight. Every two years a captain is required to be observed by a check airman.

Chief pilot – Sometimes known as "God," the Chief pilot oversees the pilots at their base and mediates any disputes. The Chief pilot will generally oversee the flight assignments and supervise pilots in their base. Generally, line pilots don't want to be called to see the Chief pilot!

City Pair – Your departure and arrival city are your city pair.



Chocks – Chocks are wood or rubber parking bricks, for lack of a better term, used in front and back of the landing gear wheels to keep an aircraft from rolling away when parked.

Coach roach – A flight attendant who enjoys working the economy/coach cabin.

COMAT – Company Material. COMAT is non-revenue cargo, such as aircraft parts, printed materials or anything else an airline may send from one station to another on its aircraft.

Commuter – A crewmember who lives in one city but is based in another; they take a plane to get to work.

Commuter flight – A commuter flight is basically a flight on a smaller regional jet operated by a regional airline, where demand does not warrant mainline service.



Completion Factor – The percentage of scheduled flights completed in a day.

Concourse – The concourse is a wide area in the airport for people or passengers to walk.

Concourse shoes – Fancy shoes, high-heels, etc., that flight attendants wear while walking through the airport that are promptly ditched for more comfortable shoes once on board.

Connecting flight – A connecting flight will take at least two different planes with two different flight numbers to get you to your destination.

Cookie sheet – Large (commonly 8'x10') sheets of aluminum that various air cargo shipments and pallets are placed on prior to being loaded onto the aircraft.

Crash pad – A shared house or apartment that is used by multiple airline employees who live in one city but are based in another. Rather than moving or paying for a second residence, a group will pitch in on a small place and share the rent. In many cases, the sparsely furnished crash pad may just be a bed and a shower with little other in the way of accommodations.

Crew rest area – Crew rest areas are small spaces where cabin crew can catch a quick nap on board. On long haul aircraft, these can be small bunks often squeezed into the ceiling space of a cabin. On smaller aircraft, a row of seats may be curtained off for crew to use.

Crosscheck – You've heard this on nearly every flight you've ever taken at some point. Crosscheck simply means that a pilot of flight attendant has verified the work of another person. In the cabin it basically means verifying that the aircraft doors are armed or disarmed.

Crosswind – Winds that are perpendicular to the motion of the aircraft.

Crotch watch – When the flight attendants walk up and down the aisle prior to departure to ensure passengers have their seat belts on. Also known as a groin scan.

Crumb crunchers – Slang term for passengers who are young children.

CUTE – Common Use Terminal Equipment systems are used at airports where airlines share gates; Delta may be at the gate at 10am and American may be operating a flight at the same gate at 1130am. Rather than each airline having their own computer and system installed, they operate a common use terminal, where various carriers can log in and handle their gate operations.

CVR – Cockpit Voice Recorder. Also known as one of the 'black boxes," the CVR typically records the last 30 minutes of audio inside the cockpit, including conversations, radio transmissions and other background noises.

CX - Cancelled.

Cycle – A cycle for an aircraft is one takeoff and landing.

Dangerous Goods – Items that can cause a serious risk to health, safety, or the aircraft itself when transported on an airplane.

Deadhead - You may have seen a pilot or flight attendant sitting in a passenger seat on your plane. In this case, it is entirely possible, and quite likely, that this person is deadheading, or simply repositioning to another duty location and assignment. For example, a pilot may have flown a Chicago to Dallas leg and then will 'deadhead' to Houston the next day to fly a Houston to Los Angeles flight.

De-icing – The process of removing ice or snow from an aircraft. When you see huge nozzles spraying down an aircraft on a cold day, it is being de-iced.

Deplane – To get off the aircraft.

D.G.C.A. – Directorate General for Civil Aviation. The DGCA, sometimes DGAC, serves as the national body in many countries for civil aviation regulation and oversight.



D.H.S. – Department of Homeland Security, the parent agency of the T.S.A., established on November 25, 2002. 22 federal agencies operate under the DHS umbrella.

Diesel – Older term for a Douglas aircraft; a DC-9 would be referred to as a Diesel Nine.

Dinosaur – A very senior flight attendant.

Direct flight – A direct flight is different from a non-stop flight in that the direct flight may indeed have stops. Southwest Airlines may run a direct flight, with the same flight number, from Houston to Los Angeles that will stop in El Paso before landing in Los Angeles. Direct and nonstop are **not** interchangeable terms.

Disembark – To get off the aircraft.

Dry Lease - A leasing arrangement where the owner of the aircraft (the lessor) leases the aircraft without crew to another person (the lessee). This is like how you may be leasing your car from a dealership.

Dwell time – Industry term used to discuss the time passengers have before a flight departs that can be spent shopping or dining inside the airport.

E.A.S.A. – The European Aviation Safety Agency. Basically, this is the equivalent of the FAA for countries in the European Union (EU).

E-AWB – Electronic Air Waybill. The electronic version of the cargo air waybill.

EMAS – Engineered Materials Arresting System, an arrester bed at the end of a runway that reduces risk of a runway excursion or overrun. Typically, a lightweight, crushable concrete that will catch and slow down an aircraft. Second generation EMAS is a foamed silica bed made from recycled glass and a plastic mesh system.

Enplane – Getting on the aircraft.

ESTA – Electronic System for Travel Authorization. ESTA is an automated system that determines the eligibility of visitors to travel to the U.S. under the Visa Waiver Program (VWP). Authorization via ESTA does not determine whether a traveler is admissible to the U.S. U.S. Customs and Border Protection officers determine admissibility upon travelers' arrival. The ESTA application collects biographic information and answers to VWP eligibility questions. ESTA applications may be submitted at any time prior to travel, though it is recommended that travelers apply as soon as they begin preparing travel plans or prior to purchasing airline tickets.

ETA – Estimated Time of Arrival, when the flight is estimated to arrive at its destination.

ETOPS – Extended-range Twin-Engine Operational Performance Standards.

Equipment – An airplane.

Equipment change/swap – When an airline changes out the airplane used for a flight; an equipment change has taken place. This typically occurs after a maintenance issue has taken the original plane out of service.

Eurowhite – Derogatory term for an airline livery that is painted mostly all white.

FA – Flight attendant.

F.A.A. – The Federal Aviation Administration, the U.S. government agency responsible for ensuring civil aviation safety. The FAA was

created on August 23, 1958, as the Federal Aviation Agency, switching to Administration in 1966.

FAM – Federal Air Marshal.

Fare basis code – Fare basis codes are alpha-numeric codes used by airlines to identify the fare type on a ticket. F is first class, J is business class, W is premium economy and Y is basic economy.

FARs – Federal Aviation Regulations, or the laws which govern airmen in the U.S.

F.B.O. – Fixed Base Operator. FBOs are commercial businesses that typically provide fueling, hangar services, parking, aircraft rental and maintenance, flight instruction and so on. You will see FBOs most usually at General Aviation airports, but also at larger commercial airports where they cater typically to business and private jet operations, often to well-heeled customers.

Feeder - A feeder carrier is the same as a commuter carrier - these are the smaller regional jet operators who run passengers from smaller cities to, in most cases, larger hub airports where the mainline carrier can them fly them onwards. *Related* – *Regional airline*, *Virtual carrier*.

Feeder traffic – Regional jet flights into a large, hub airport are known as feeder traffic as they "feed" the mainline aircraft with additional passengers.

FFDO – Federal Flight Deck Officer. An armed pilot.

Ferry - A 'ferry' flight is basically a positioning flight, with no passengers, from one city to another.

FIDS – Flight Information Display System. FIDS are the television screens in the terminal which list all the arriving and departing flights, their times, gate assignments, boarding status, and such.

FIS – The FIS, or Federal Inspection Service, is where arriving passengers on international flights are cleared through customs and

immigration. These passengers cannot be allowed into the public portion of the terminal until they are cleared.

FL – Flight Level. Used mostly above 18,000 feet, there is a more official definition that gets into barometric settings and such. For us, look at it this way; FL280 is a flight operating at 28,000 feet, FL390 is operating at 39,000 feet.

Flag Carrier - Historically, flag carriers were owned and operated, predominantly, by a national government. In recent years though, a flag carrier could also be



considered as a company that receives preferential rights and privileges in their country. The U.S. has never had an official flag carrier, although Pan American was considered the "unofficial" flag carrier during its heyday.

Flight deck – The cockpit.

Focus city – A focus city is not a hub, but a station from which an airline will have non-stop flights to various destinations other than its hub.

FO – First officer. FO's have three stripes on their shoulder epaulets and sit in the right seat of the cockpit.

FOD - If you ever see a big metal barrel or garbage can on the tarmac or anywhere on the airport marked "FOD,' that stands for Foreign Object Debris. Any trash floating around on the ramp is called FOD, and should be collected and put into a FOD container, before it gets sucked into an aircraft engine.

Fortress Hub - A fortress hub exists at an airport where one carrier operates over 70 percent of the flights. In the U.S. alone there are several fortress hubs: Dallas/Fort Worth (American), Detroit (Delta), Houston (United).

Fuel Farm – An area near the airport where several large tanks are maintained, each holding aviation fuel.

Fuselage – Take the wings and tail off an aircraft and you are left with the cockpit and cabin, the long metal tube. This is the fuselage.

FY – Fiscal Year. As referenced throughout this book, the federal government operates on a calendar that starts on October 1 and ends on September 30 the following year. It is **not** called a "physical year."

Galley Queen – A flight attendant who is working the galley and doesn't like for passengers or other crew to enter his or her "office' area.

Gate – Your gate is where you go to get on an aircraft. The gate is the entrance to the jet-bridge or stairs that let you board.

Gate Check - When the overhead space is full or you just change your mind at the gate and want to check your bags and not bother with them, you can gate check them. They will then go in the belly of the aircraft, and you can pick them up after the flight.

Gate Lice – You've seen these folks any time you walk through a terminal – the horde of people who rush up and crowd the gate area as soon as an announcement is made that a flight will start boarding in a few minutes. Gate Lice rush up to the front of the gate and get in the way, standing around waiting for 20 minutes before their Group Five seat is called to board.

GDS – The Global Distribution System is often used by travel agents for booking airline tickets and such. Basically, dozens and dozens, sometimes hundreds, of various airline schedules are loaded into a GDS. Amadeus and Sabre are two of the largest GDS systems.

General Aviation (GA) – All civil aviation except scheduled passenger and cargo operations and excludes military flights. General aviation traffic ranges from small propeller planes flying from private runways to large jets based at major airports.

Global Distribution System (GDS) – Networks operated for the benefit of third-party companies to review available ticket inventory. Basically this is what travel agents use to book tickets.

Glycol – Glycol is a fluid used for aircraft deicing and anti-icing. There are a few different types and mixtures, but in the end, it is all glycol. Glycol is usually seen in a yellowish color.

Go-Around - When an aircraft aborts its landing attempt and "goes around" back into the pattern to try again.

GRADS – The Global Risk Analysis and Decision Support system, used by TSA to input the results of TSA's foreign airport assessments. GRADS also tracks efforts taken by TSA and host governments to address noncompliance issues identified during TSA foreign airport assessments.

Ground Handler – A ground handler is a company that handles most "below wing" operations, such as baggage loading & unloading, for an airline. In many cases airlines will contract with third party ground handlers at smaller stations as it is quite often cheaper than doing these tasks in house.

Ground load – If you are walking on the ramp to board an aircraft, and not using a jet bridge, then you are boarding via a ground load gate.

Ground Power Unit (GPU) – Small vehicles that can supply power to parked aircraft; GPUs may also be built into a jet bridge.

Ground Security Coordinator (GSC) - GSCs exist at every U.S. airline but are not required at foreign carriers. The main functions of a GSC, mandated by 49 CFR 1544.215, are to review all security-related functions and make sure the airline follows these requirements, and to immediately correct any issues of noncompliance.

Ground stop – When there is a ground stop, nothing is taking off or landing from a particular airport. Ground stops can be the result of bad weather or air traffic control trying to get a traffic backlog sorted out.

Ground Support Equipment (GSE) - All the little tugs, belt loaders, vehicles, tow bars, fuel trucks and so on that you will see in action on the ramp.

Hangar – The "garage" where aircraft are parked and receive maintenance.

Hangar Queen - An aircraft that spends too much time undergoing maintenance or repairs; in other words, it is always in the hangar getting work done.

Heavy – A U.S. Air Traffic Control term for any aircraft with a takeoff weight or 300,000 pounds or more - most commonly a large, wide-body aircraft. The Airbus A380 and Antonov An-225 are two even larger aircraft that are given the term "super."



Hidden city ticketing – You wish to fly from City A to City B, but the ticket is too pricey. You then find a cheaper ticket from City A to City C, with a connection in City B, where you get off the plane and skip the flight to City C. This is hidden city ticketing – a practice airlines frown upon; they may even cancel the rest of your ticket if they catch you doing it.

Holding – Airplanes in holding patterns are essentially making large ovals in the sky while they wait out a storm or work out another issue. Holding is sort of like pulling to the side of the road in your car while you fiddle with the GPS.

HSIN – The Homeland Security Information Network (HISN) is a secure web portal that federal, state, local, international, and private sector homeland security partners use to share Controlled Unclassified Information, analyze data, and send alerts.

Hub - An airline hub is an airport that is used primarily as a connecting airport to move passengers around the country. Perhaps you live in an

area where your nearest airport is a small field, with only a few flights a day, but you are going to Paris for a vacation. You would jump on a flight here to the nearest hub airport and connect to a larger aircraft that will take you directly to Paris.

Hybrid livery – You may see an aircraft with the logo and/or title of one airline but the livery of another. Perhaps there was a merger, or maybe an aircraft is being leased for a short period of time. In this case, you may come across a hybrid livery.

I.A.T.A. – The International Air Transport Association is the trade association for the world's airlines, with well over 200 members. IATA helps to form industry policy and standards.

I.C.A.O. - International Civil Aviation Organization. Formed following the 1944 Convention on International Civil Aviation (also known as the Chicago Convention). ICAO became a specialized agency of the United Nations (UN) in 1947. One of the primary objectives for ICAO is to provide for the safe, orderly, and efficient development of international civil aviation. There are currently 191 signatory nations to the ICAO convention, all of whom agree to cooperate with other member states to meet standardized international aviation security measures. International security standards and recommended practices are detailed in Annex 17.

IFE – In-Flight Entertainment. The audio, TV, movies and whatever else you have available on your flight, either on the screens above you or in the little TV in the back of the headrest in front of you.

IFR – Instrument Flight Rules discuss how to operate an aircraft in instrument, or often less than ideal, conditions.

Illegal – When a crewmember crosses over the maximum hours they are allowed to work per flight, day, or schedule without sleep or a rest period.

ILS – Instrument Landing System. The ILS has a localizer, glide scope transmitter, and various markers all to aide pilots in landing during instrument flight rules (IFR) operations.

IROP – Irregular operations are events which disrupt flight schedules and adversely affect the normal flow of passengers. Typically found after heavy storms move through an area or an airport.

IRTPA - Intelligence Reform and Terrorist Prevention Act of 2004 (Public Law 108-458).

Interline - A voluntary agreement between airlines to handle passengers traveling on itineraries that include multiple airlines. For example, you are traveling from Los Angeles to Dallas on American and then transferring to Delta to travel on to Atlanta. American will issue you both tickets in Los Angeles as they have an interline agreement with Delta.



Jet Bridge - The enclosed metal (in most cases) bridge you walk on from the gate to the aircraft.

Jump Seat – The uncomfortable fold down seats in an aircraft that flight attendants sit in are known as jump seats.

Jungle jet – An Embraer aircraft; built in Brazil.

Kiosk – Kiosks are the small little computers near the ticket counter where you can check in for your flight, pay for your checked bags, get your boarding pass printed out, and so on.

Knot – A nautical mile (nm) per hour, which is 1.15 miles per hour. For example, an aircraft travelling at 450 knots would be going at 518 mph.

KTN – A Known Traveler Number is provided to passengers who have been approved as eligible for TSA PreCheck. It is basically an ID number that shows you are enrolled in the program – you should enter it in the KTN field when making reservations.

Last Point of Departure (LPD) - The final airport outside of U.S. territory from which a flight departs to U.S. territory.

Lavatory - The "lav" is the bathroom on an aircraft.

Layover – Time spent at a connecting airport before your next flight.

Leakage – Leakage is what happens when passengers from one airport's local market or catchment area drive to another airport to catch a flight.

Legacy carrier – In the U.S., a legacy carrier is one which had interstate routes before the Airline Deregulation Act of 1978. American Airlines, Delta Air Lines, and United Airlines are the "big three" legacy carriers, although Alaska and Hawaiian may also be considered legacy carriers as well.

LEO – Law enforcement officer.

Line – A flight attendant's monthly schedule of trips is known as the line.

Line check – A revenue flight in which the captain of the aircraft is observed by a check airman to verify that company standards and FAA regulations are being followed as expected.

Line holder – A flight attendant who has bid on and won a line and isn't working reserve.

Livery - The livery is the paint scheme on an aircraft.

Load factor – The percentage of seats filled on a flight or route.

Lounge – Small rooms in the terminal with couches, (maybe) vending machines, and computers for flight crew to rest, sign in and get briefings before a trip.

Lounge lizard – A flight crew member who is a known commuter and hangs out in the lounge between trips (being too cheap to pay for a hotel or crash pad) is known as a lounge lizard.

Low-cost carrier – An LCC is a "budget" airline that offers less perks and comforts on board in exchange for lower ticket fares. LCCs typically operate in an all-economy class configuration. Think Southwest Airlines.

Mad Dog - A Mad Dog is a McDonnell Douglas MD-80 or MD-90 series aircraft. A mainstay of many fleets in the 1980s through early 2000s, no U.S. airlines operate them any longer.

Mag – "The Mag" is a slang term for the magnetometer, or walk-through metal detector.

Mainline - This refers to the main operations of an airline group. American Airlines is a mainline carrier, while any American Eagle branded flights are not.

Managed inclusion – A older practice that saw non-PreCheck travelers being placed into PreCheck security lanes to ease congestion at TSA screening checkpoints. Managed inclusion was discontinued in September 2015.

Marshaling – Visual signaling between ground crew and the pilots of an aircraft. Marshalers will help guide an airplane to and from the gate and tell the pilots when to turn off the engines.

Mayday – The international radio distress call, indicating imminent danger to the life of all onboard; immediate assistance requested.

Metal – The aircraft of the airline operating the flight – basically, what airline is operating the flight. For example, you may be on a Delta Connection flight and the plane is painted up in Delta's livery. However, as the flight is operated by Endeavor Air, the "metal" is Endeavor, not Delta.

Metroplex – A large metropolitan area with multiple airports.

Mileage run – A trip that is set up to get the most miles possible from one destination to the next. For example, rather than a direct flight from San Francisco to Houston (1,635 miles), a passenger on a mileage run

may book the trip with a stop in Denver, for a total of 1,829 miles on the San Francisco – Denver – Houston ticket. Mileage runs are essentially obsolete now as most airlines, starting in 2010 or so, have rewarded dollars spent rather than miles flown.

Minimum Equipment List – The MEL is an aircraft-specific document that lists which pieces of equipment are allowed to be inoperable while the aircraft still maintains its airworthiness. Basically, the MEL lists which parts are allowed to be broken and not cause the cancellation of a flight.

Miracle flight – When there are passengers who need assistance or wheelchairs prior to boarding but later they can deplane on their own upon arrival, a miracle flight is said to have occurred.

Movement – A movement, for statistical purposes, is a landing or a takeoff of an aircraft. In 2023, Atlanta was the busiest airport in the world in terms of aircraft movements, with 775,818.

MRO – Maintenance/Repair/Overhaul. Aircraft maintenance services that are sometimes performed by one carrier for another and then charged via an electronic invoice.

MSP – Model Security Program, a TSA issued security program used by foreign carriers operating to or from the U.S.

MTOW – Maximum Take-Off Weight for an aircraft.

MX - Maintenance.

N-Number - Every aircraft in the U.S. must be registered with the FAA. The N-Number is basically the license plate for each aircraft; you will see it (N123XX) in large font somewhere on the rear of the plane's fuselage.

National Airspace System (NAS) – The NAS is a shared network of U.S. airspace; air navigation facilities, equipment, and services; airports or landing areas; aeronautical charts, information, and services;

regulations and procedures; technical information; and manpower and material.

Narrow Body - A single aisle aircraft, such as an Airbus A319/320, Boeing 737 or McDonnell Douglas MD-80/90 series.

Net margin – The net income or loss as a percentage of operating revenue.

Network – Airlines call all the destinations they fly to their network.

Non-Rev – A person who is travelling and not paying for his or her ticket. Non-Revs are almost always airline employees who are flying, usually for personal business.

Nonstop – Differing from a direct flight, a nonstop flight is pretty cut and dry, a single flight between two airports with no stops.

Nose Number - This is the airline's internal number for the aircraft. Most airlines don't use the FAA N-Number to identify planes internally. For example, N951AA is the N-Number of a Boeing 737 with American Airlines, but its nose number is 3CF. So, American will refer to this aircraft internally as 3CF (for dispatch, maintenance, etc) rather than 951.

No-Show – A passenger with a confirmed reservation who fails to check-in or board on time.

NOTAM – Notice to Air Missions. *Previously known as Notice to Airmen*. A NOTAM is a notice containing information essential to personnel concerned with flight operations but not known far enough in advance to be publicized by other means. It states the abnormal status of a component of the National Airspace System (NAS) – not the normal status.

N.T.S.B. – The National Transportation Safety Board, a government agency tasked with investigating all civil aviation accidents in the U.S.

O&D - Originating and Destination passengers. This term essentially refers to the amount of passenger traffic that can be generated in the areas nearby an airport. Los Angeles International Airport (LAX) has some of the highest O&D numbers in the industry, while a large connecting hub like Dallas or Denver may see most of its passenger traffic generated by passengers arriving from smaller cities and then connecting onwards.

OAG – Originally known as the Official Aviation Guide, the OAG now maintains a database of airline schedules for over 900 airlines and 4,000 airports. This database maintains future and historical flight information. After nearly 100 years, the final print edition was distributed in December 2025; OAG is all online now.

Offline city – A city to which an airline doesn't fly.

Offloaded – When a passenger has been removed from a flight just before departure, they have been offloaded.

On property – If an aircraft is said to be "on property" it simply means it is in the airline's active fleet.

Open-jaw ticket – An open-jaw ticket is a round-trip ticket in which the passenger departs to return home from a different city from where he or she first landed. An itinerary of PHL-JFK-LHR and then CDG-PHL would be an example of an open-jaw ticket.

Operating margin – The operating profit or loss as a percentage of operating revenue.

Oversold - Airlines typically oversell their flights; in other words, sell more tickets than they have seats available. Why? Quite a few people don't show up for their flight. Rather than fly empty seats, the airlines would of course prefer to fly their planes as full as they can. In the event everyone shows up and there are more passengers than seats, they'll usually offer a few hundred dollars for a volunteer to take a later flight. If that doesn't work, someone is likely to be involuntarily bumped onto a later flight.

PARIS – The Performance and Results Information System (PARIS) is the primary database used for maintaining information associated with TSA's regulatory investigations, security incidents, and enforcement actions, as well as for recording the details of security incidents involving passenger and property screening.

Part 121 – Part 121 refers to the section of the Federal Aviation regulations that deal with scheduled commercial carriers in the U.S. When you hear the term "121 carrier" that is a reference to a commercial airline.

Paperwork – When you hear the pilots talking about "paperwork" they are referring to various logs or the weight and balance records that need to be completed before the aircraft can push back.

Pax – Shorthand for passengers.

Payload – The combined weight of revenue passengers and/or cargo.

Penalty box – When an aircraft needs to be parked somewhere for a short period of time and get out of the way of other aircraft, it is placed in an out of the way area known as the "penalty box." This saves the aircraft from taking up a gate needlessly.

PFC – Passenger facility charge is a fee collected by the airline and remitted to the airport that the airport then uses for capital improvements.

PIDS – Perimeter intrusion detection systems. Multi-faceted systems that can employ radar, video motion detection, infrared cameras, and face sensors, among other things.

Pitch - The distance from a spot on one row to the same place on the next one. So, the more seat pitch, the more space and legroom you are going to have.

PMIS – Performance Measurement Information System. This is a TSA system used internally to record various performance metrics.

PNR - Passenger Name Record. This will contain the itinerary of a passenger or group of passengers who are traveling together.

Positive Space – A person holding a positive space ticket is guaranteed a seat on the flight.

Power plants - The engines of an aircraft.

Powerback - You won't see this much anymore if at all, and certainly not in the U.S. In the old days, some aircraft, particularly DC-9s and Super 80s, would push themselves back from the gate using reverse thrust.

PPBM – Positive Passenger Bag Match.

PRASM – Passenger Revenue per Available Seat Mile is a typical way to measure how much profit an airline is making per seat mile and is often shown in cents per mile.

Pre-board – A few minutes before general boarding begins, pre-boarding allows families with young children, passengers with disabilities, elderly folks, or anyone who might need a little more time boarding to get on the plane before the masses.

Public area – An area of an airport where entry is not restricted – typically the ticketing halls and baggage claim areas.

Purple – Slang term for FedEx.

Purser - The purser is basically the chief flight attendant. They are responsible for making sure passengers are well looked after, and often complete various reports and paperwork for a flight.

Pushback - When an aircraft is pushed backwards away from the gate.

Quick Turn – When a wide-body aircraft is in and out of the gate in less than 60 minutes, a quick turn has occurred.

Queen of the Skies – The Boeing 747 is affectionately known as the Queen of the Skies.

RAIC – Restricted Area Identity Card. Used in Canada, the RAIC system uses iris and fingerprint biometric identifiers to allow non-passenger access to restricted areas of airports.

Ramp – The ramp is basically the tarmac where planes park and taxi.

Ramper / **Ramp Rat** - 'Rampers' are the guys you see on the tarmac loading and unloading the bags onto an aircraft.

Ramp Rash - Little bumps and scuffs from jet way bridges, air stairs, baggage loaders and other service vehicles that can be seen generally around cabin doors and cargo compartment doors.

Ramp workers should always report any bumps or nicks into aircraft, no matter how minor. On December 26, 2005, a "ramper" bumped an Alaska Airlines MD-80 with a baggage loader and failed to report it. That small crease opened into an 18-inch hole in the fuselage in flight, causing cabin depressurization. Luckily, the event was not catastrophic.

Red-eye – An overnight flight.

Regional airline – Regional airlines operate in two ways: as an affiliated airline with a major airline, flying under the major's brand; as an independent airline operating under their own brand. Most independent airlines operate in small and isolated areas.

Regulatory capture – When government agencies that have regulatory oversight responsibilities become dominated by or beholden to the industry they are supposed to be regulating. If a regulatory agency is seemingly controlled by the industry they are charged with regulating, that agency may be considered a "captured agency." Captured agencies often ignore industry regulatory violations and may seem to be working more to advance industry interests than that of the public good.

Remote stand – When an aircraft is parked at a location that is not adjacent to the terminal, it is parked at a remote stand.

Retired – When an aircraft is withdrawn from the fleet and active revenue service.

Repositioning – Moving an aircraft from one airport to another, done without any passengers or cargo. For example, an airline operates a charter from Boston to Reno, Nevada, then repositions the aircraft to Las Vegas for its next revenue flight.

Revenue Service - Any flight that is being operated for commercial reasons, i.e. a scheduled flight with paying passengers.

Risk – TSA defines risk as a function of threat, vulnerability, and consequence.

RJ – Regional Jet. Any Embraer or Canadair is an RJ.

Roll-aboards - The carry-on baggage a lot of people have that they stick up in the overhead luggage compartment.



RON – Remain Overnight aircraft. If an aircraft is parked overnight at an airport, it is considered a RON aircraft. RON aircraft typically are cleaned and have maintenance performed on them while they sit.

Rotate – When the aircraft lifts off the ground.

Runner – A passenger running down the concourse to the gate at the last minute.

Runway – the long concrete "street" where aircraft take-off and land.

Runway Safety Area – The RSA is the surface surrounding the runway prepared or suitable for reducing the risk of damage to airplane in the event of an undershoot, overshoot, or excursion from the runway.

Rush bag – A bag that has missed its original flight and is flying unaccompanied is known as a rush bag.

S1 – The Secretary of Homeland Security is known internally as S1.

SARPs – Standards and Recommended Practices developed by ICAO to help deter and prevent acts of unlawful interference (terrorism) against civil aviation around the world.

Scarebus – Derogatory slang term for an Airbus aircraft.

Scrapped - The sad process when an aircraft is cut up into little pieces which are sent for to be recycled.

Scope Clause – Part of contracts between major airlines and their pilots unions that limit how many, as well as the size of, aircraft that are operated by the mainline carrier's regional airline partners. In the U.S., most scope clauses limit regional jet seats to 76, with aircraft themselves being allowed a maximum take-off weight (MTOW) of 86,000 pounds – basically an Embraer E175 or CRJ900.

Screening Partnership Program (SPP) - This is a program that allows airports to "opt-out" of TSA provided screening and replace them with private contractors. As of September 2017, there are 22 (mostly small) airports that are participating.

Secured Area – A secured area is where aircraft operators with security programs enplane and deplane passengers and sort and load baggage and any adjacent areas that are not separated by adequate security measures, a SIDA is an area in which appropriate identification must be worn, and an AOA is an area providing access to aircraft movement and parking areas.

Secure Flight – A program designed "to strengthen the security of commercial air travel into, out of, within, and over the U.S. through the use of expanded watch list matching using risk-based security measures."

Security threat assessment (STA) – An intelligence-related check conducted by TSA that searches domestic and international government databases against information submitted by an applicant seeking authorization to perform various security functions.

Segment – If you are traveling from Seattle to New York via Denver, you are flying two segments, or flights, on your journey.

Senior Mama – A veteran female flight attendant.

SENTRI - Secure Electronic Network for Travelers Rapid Inspection.

Shower of Affection – Airport fire trucks will position on either side of an aircraft and use the water cannons to spray a stream of water in an arch over the aircraft as it taxis by. This is most done on the initiation of a new route or a pilot's retirement flight.

SIDA - (Security Identification Display Area). The SIDA is the area designated by an airport operator where an ID must be always displayed. Most typically, this includes the ramp and other sensitive operational (secured) areas.

Silent airport – An airport where only a limited number of announcements are made over the terminal's public address system. Flight announcements, gates changes, etc. are all made via the FIDS television screens

Skycap - These are the guys who you drop your bags with when you are checking in at the curb. You should tip them, because their salaries aren't that great as the airlines expect them to be tipped.

Slam-clicker – A flight attendant who stays in the hotel room on the road and skips the night out on the town with everyone else.

Slot – A slot is granted by an airport and allows an airline to schedule a take-off or landing during a specific time frame. Slots may be worth a lot of money at certain busy airports and can be bought, sold, or traded between airlines.

Speaker - A 'speaker' is airline lingo (at least for American Airlines) for an employee who speaks a different language, typically the predominant language of the destination for a flight. For example, the German-speaking gate agent working the flight to Frankfurt would be called the 'speaker.'

Spinner – A passenger who spins around, looking confused, while boarding and trying to find their seat. Spinners also can be observed after deplaning as they try and get their bearings in the terminal.

Spoke - A spoke airport is a smaller airport that typically feeds into a hub airport. For example, Tyler, Texas would be a spoke of the hub at Dallas/Fort Worth.



Spotter - Spotters are people who like to take photographs and/or record the tail numbers of airplanes at the airport. Harmless people who are more "avgeek" than threat. Like a "foamer" in rail parlance.

Squawks – An airplane's transponder will send out responses, or squawks, from time to time that help communication with air traffic control. Squawks are numeric codes that indicate different situations. A squawk of 7500 indicates an aircraft hijacking; a squawk of 7700 is sent in an emergency.

Stage length – Stage length is essentially the length of an average flight for an airline or a fleet of that carrier. Typically, with longer stage lengths come reduced costs.

Standby – A person on standby status has a reservation but not a confirmed seat on the plane. They can fly once everyone else is boarded if there is still an open seat.

Station - A station is an airline's operation at any given airport.

Station Manager - The employee who oversees an airline's operations at a given station.

Sterile area – The sterile area is the area of an airport that provides passengers access to boarding aircraft and is an area to which access is generally controlled by TSA or a private screening entity under TSA oversight.

Stewardess - Older (now politically incorrect) term for flight attendant, now considered by many to be derogatory in nature.

Super – Beyond heavy is the relatively new term "super," which is used by Air Traffic Control to describe the Airbus A380 and the Antonov An-225 (a six-engined Soviet-era freighter of which only one frame was built; it was sadly destroyed shortly after Russia's 2022 invasion of Ukraine).

Tag flight – A continuation of an international flight, or the preliminary segment of an international flight, where neither end of the flight is within the carrier's home country. Tag flights are most often operated under Fifth Freedom rights.

Tail number – The tail number is the "license plate" of the aircraft, as it is the registration number of the frame. In the U.S., these all start with N.

Tannoy – A public address system.

Tarmac – The tarmac is the ramp; the word itself comes from the "tarpenetration macadam" surfacing material, even though it is rare to find any actual tarmac at an airport.

Taxi – When an airplane is moving around the airport under its own power, without a tug or tractor.

Taxiway – An area on which aircraft can taxi when entering or departing from a runway.

Technical Standard Order (TSO) – Issued by the FAA, a Technical Standard Order (TSO) is a minimum performance standard for specified materials, parts, and appliances used on civil aircraft. When authorized to manufacture a material, part, or appliances to a TSO standard, this is referred to as TSO authorization. Receiving a TSO authorization is both design and production approval. These are in place partly to deter against fraudulent or sub-standard parts being used in commercial aircraft.

TFR – Temporary Flight Restriction. A TFR is a short-term, geographically limited airspace restriction in the U.S. There may be a TFR around the Super Bowl stadium which prohibits aircraft from flying in the area at a certain date and time, for example.

Throughput – The average number of flights that pass through an airport daily. For TSA, throughput is the average number of passengers that pass through the screening checkpoints daily.

Timetable – Increasingly rare, if not extinct, airline timetables are/were small booklets that airlines published which showed their full schedules at all stations. Timetables can now be found mostly in PDF form.

Touchdown – When the wheels hit the runway upon landing, the aircraft has touched down.

Tower – The super tall building at an airport where air traffic controllers typically sit and direct aircraft.

Transfer passenger – A passenger who arrives at one airport and then continues another flight on a different aircraft.

Transit flight – A transit flight is a flight from Point A to Point B with a stopover at Point C, usually for refueling or cleaning of the aircraft. Some transit flights allow passengers to disembark and relax in a transit lounge, although they are not allowed into the terminal itself. Transit flights may also pick up additional passengers on the way at the stopover location. For example, Air New Zealand previously operated a flight from Auckland to Los Angeles that continued to London. Passengers were allowed to disembark and stretch their legs in the transit lounge in Los Angeles, but they did not clear U.S. Customs before they re-boarded the flight and head on to London; officially, they never entered the U.S. Additionally, passengers may purchase a ticket for the Los Angeles to London leg alone.

Transit passenger – A passenger who arrives at one airport and then continues the same flight on the same aircraft.

Transport Canada – TC is the equivalent to TSA in Canada and employs Inspectors to check airlines and airports for compliance with Canadian aviation security regulations.

Trijet – An aircraft powered by three engines, also sometimes known as a "three-holer." More common "back in the day" when Boeing 727s, Lockheed L-1011s, and Douglas DC-10s were plying commercial passenger routes. Today, the only trijets you may expect to encounter at an airport in commercial service are McDonnell Douglas MD-11/Fs carrying cargo, and even these are a vanishing breed.

Trunk Route – Basically, a trunk route is a route with high demand. Every airline has trunk routes, and some of these can be quite profitable. New York to Los Angeles would be a trunk route, while Charlotte to Richmond would not be. Dallas to Houston would be a trunk route, while Dallas to Waco would not be.

TSOC – The Transportation Security Operations Center is where TSA connects with the Department of Homeland Security, Federal Aviation Administration, FBI and other law enforcement and security agencies to analyze and monitor security-related operations, incidents and crises in aviation and all surface modes of transportation.



Tug - the small little Jeep-like looking cars you see on the tarmac, usually carrying several baggage carts behind it. These are named after the company that produces them.

Turn - Flight crews will often work a 'turn,' which is basically a flight from their base and back in the same day. For example, if you were based in Los Angeles and were assigned a Houston 'turn,' that would mean you were flying from Los Angeles to Houston and then back to Los Angeles.

TRACON – Terminal Radar Approach Control is part of the air traffic control system.

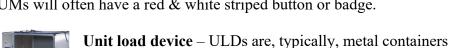
Transcon – A flight across a continent; Los Angeles to Washington, Sydney to Perth.

T.S.A. – The Transportation Security Administration, the U.S. government agency responsible for ensuring civil aviation security.

UAV – Typically known as a drone, an unmanned aerial vehicle is piloted by remote control on onboard computers.

ULCC – Ultra-low-cost carrier. The cheapest of the cheap.

Unaccompanied minor – A "UM" is a child, ages 5-14, who is traveling without their parent or legal guardian. The airline will look after the UM on the flight and escort them through immigration and customs, if necessary, before they are released to an adult listed on previously completed authorizations. UMs will often have a red & white striped button or badge.



used to load luggage or freight onto aircraft.

Utilization – Operating hours per day per operating aircraft.

Virtual airline – A virtual airline is one that has outsourced as many operations and functions as possible, while retaining overall control of the business. In many cases, the branding of feeder or regional carriers are virtual airlines: American Eagle, Delta Connection, United Express could all be considered virtual airlines in that they have outsourced nearly everything – ground handling, ticketing, marketing, flight operations, etc – to other entities.

Visa Waiver Program (VWP) – Established in 1986, the Visa Waiver Program allows nationals from the 38 VWP countries to travel to the U.S. for tourism or business for up to 90 days without a visa. In return, those 38 countries must permit U.S. citizens and nationals to travel to their countries for a similar length of time without a visa for business or tourism purposes.

Wake turbulence – Turbulence that forms behind an aircraft as it passes through the air, and includes wingtip vortices and jetwash, is

known as wake turbulence. Wake turbulence is most dangerous for nearby aircraft that are taking off or landing as it can lead to a sudden loss of control.

Wet Lease - A leasing arrangement where the owner of the aircraft (the lessor) leases the aircraft and at least one crewmember to another person (the lessee) for a defined period or number of flights. Please note that the FAA prohibits a foreign carrier from wet leasing to a U.S. carrier.

wfu - Withdrawn from use, term used for an aircraft that has been retired from active service.

Whale jet – The Airbus A380.



Wheels Up Time - This is the time the aircraft actually takes off.

Whitetail aircraft – A whitetail aircraft is one which has been built for an airline but not taken up. Perhaps the airline that ordered it went bankrupt, or the order was later canceled, for example. The manufacturer looks to get rid of these as soon as possible.

Wide Body - A twin aisle aircraft, such as an Airbus A330/340/380 or Boeing 747, 767, 777 or 787.

Winglets – The small, tilted up bits of metal at the end of a wing. Winglets help reduce drag and increase fuel economy.

Wing-Walker – A wing-walker is a ramper who helps guide a plane in and out of the gate, making sure it doesn't bump into other planes, buildings, or ground equipment on the way.

Working the village – A flight attendant who is assigned to the economy (coach) cabin is said to be "working the village."

WX - Weather

Yield – Yield is the revenue generated per passenger mile – the higher the better.

Zulu – Greenwich Mean Time or Universal Coordinated Time.

U.S. AIRPORT CODES

ALABAMA		AMERICAN SAMOA	<u>\</u>
Birmingham	BHM	Pago Pago	PPG
Dothan	DHN		
Huntsville	HSV	ARIZONA	
Mobile	MOB	Bullhead City	IFP
Montgomery	MGM	Flagstaff	FLG
		Grand Canyon	GCN
<u>ALASKA</u>		Mesa	AZA
Anchorage	ANC	Page	PGA
Aniak	ANI	Peach Springs	GCW
Barrow	BRW	Phoenix	PHX
Bethel	BET	Tucson	TUS
Cordova	CDV	Yuma	YUM
Deadhorse	SCC		
Dillingham	DLG	<u>ARKANSAS</u>	
Fairbanks	FAI	Fayetteville	XNA
Galena	GAL	Fort Smith	FSM
Gustavus	GST	Little Rock	LIT
Haines	HNS	Texarkana	TXK
Homer	HOM		
Hoonah	HNH	CALIFORNIA	
Juneau	JNU	Arcata / Eureka	ACV
Kenai	ENA	Bakersfield	BFL
Ketchikan	KTN	Burbank	BUR
King Salmon	AKN	Carlsbad	CLD
Kodiak	ADQ	Chico	CIC
Kotzebue	OTZ	Crescent City	CEC
Nome	OME	Fresno	FAT
Petersburg	PSG	Long Beach	LGB
Sitka	SIT	Los Angeles	LAX
St. Mary's	KSM	Mammoth Lakes	MMH
Unalakleet	UNK	Modesto	MOD
Unalaska	DUT	Monterey	MRY
Valdez	VDZ	Oakland	OAK
Wrangell	WRG	Ontario	ONT
Yakutat	YAK	Palm Springs	PSP
		Redding	RDD
		Sacramento	SMF
		San Diego	SAN
		•	

San Francisco	SFO	Tampa	TPA
San Jose	SJC	Valparaiso	VPS
San Luis Obispo	SBP	West Palm Beach	PBI
Santa Ana	SNA	West Lann Beach	1 1
Santa Barbara	SBA	GEORGIA	
Santa Maria	SMX	Albany	ABY
Santa Rosa	STS	Atlanta	ATL
Stockton	SCK	Augusta	AGS
Stockton	SCIC	Brunswick	BQK
COLORADO		Columbus	CSG
Aspen	ASE	Savannah	SAV
Colorado Springs	COS	Valdosta	VLD
Denver	DEN	v aldosta	V LD
Durango	DRO	CHAM	
Eagle	EGE	GUAM Agana / Tamuning	GUM
Grand Junction	GJT	Agana / Tamuning	GUM
Gunnison	GUC	TT A 337 A TT	
Hayden	HDN	HAWAII	ITO
Montrose	MTJ	Hilo, Hawaii	ITO
Monuose	IVI I J	Honolulu, Oahu	HNL
CONNECTICUT		Kahului, Maui	OGG
Hartford	BDL	Kona, Hawaii	KOA
New Haven	HVN	Kaunakakai, Maui	MKK
New Haven	11 V IN	Lanai City, Lanai	LNY
FLORIDA		Lihue, Kauai	LIH
Daytona Beach	DAB	TD / TIO	
Fort Lauderdale	FLL	<u>IDAHO</u>	
Fort Myers	RSW	Boise	BOI
Gainesville	GNV	Hailey	SUN
Jacksonville	JAX	Idaho Falls	IDA
Key West	EYW	Lewiston	LWS
Melbourne	MLB	Pocatello	PIH
Miami	MIA	Twin Falls	TWF
Orlando	MCO		
Orlando Sanford		<u>ILLINOIS</u>	
	SFB	Belleville	BLV
Panama City Beach Pensacola	ECP	Bloomington	BMI
Pensacoia Punta Gorda	PNS	Champaign / Urbana	CMI
	PGD	Chicago O'Hare	ORD
Sarasota / Bradenton	SRQ	Chicago Midway	MDW
St. Augustine	UST	Marion	MWA
St. Petersburg Tallahassee	PIE	Moline	MLI
1 ananassee	TLH	Peoria	PIA

Onin	LIINI	Danagana Inta	DOI
Quincy Rockford	UIN RFD	Presque Isle Rockland	PQI RKD
		Rockiand	KKD
Springfield	SPI	MADVI AND	
INDIANA		MARYLAND Baltimore	BWI
Evansville	EVV	Salisbury	SBY
Fort Wayne	FWA	Hagerstown	HGR
Indianapolis	IND	Hageistown	HOIC
South Bend	SBN	MASSACHUSETTS	
South Delia	SDN	Boston	BOS
IOWA		Hyannis	HYA
Cedar Rapids	CID	Nantucket	ACK
Des Moines	DSM	Provincetown	PVC
Dubuque Dubuque	DBQ	Vineyard Haven	MVY
Sioux City	SUX	Worcester	ORH
Waterloo	ALO	WOICESIEI	OKH
w aterroo	ALO	MICHIGAN	
KANSAS		Alpena	APN
Garden City	GCK	Charlevoix	CVX
Manhattan	MHK	Detroit	DTW
Wichita	ICT	Escanaba	ESC
w icilita	101	Flint	FNT
KENTUCKY		Grand Rapids	GRR
Cincinnati/Covington	CVG	Hancock / Calumet	CMX
Lexington	LEX	Iron Mountain	IMT
Louisville	SDF	Kalamazoo	AZO
Owensboro	OWB	Lansing	LAN
Paducah	PAH	Marquette	MQT
1 addcair	17111	Muskegon	MKG
LOUISIANA		Pellston	PLN
Alexandria	AEX	Saginaw	MBS
Baton Rouge	BTR	Sault Ste. Marie	CIU
Lafayette	LFT	Traverse City	TVC
Lake Charles	LCH	Traverse City	1 1 0
Monroe	MLU	MINNESOTA	
New Orleans	MSY	Bemidji	ВЛ
Shreveport	SHV	Brainerd	BRD
Sineveport	SIIV	Duluth	DLH
MAINE		Hibbing	HIB
Bangor	BGR	International Falls	INL
Bar Harbor	BHB	Minneapolis	MSP
Portland	PWM	Rochester	RST
1 Ornana	1 44 141	ROCHESTEI	I/O I

St. Cloud	STC	NEW JERSEY	A CM
MICCICCIDDI		Atlantic City	ACY
MISSISSIPPI Columbus	CTD	Trenton Newark	TTN
Columbus	GTR	Newark	EWR
Gulfport / Biloxi	GPT	NEW MEVICO	
Hattiesburg	PIB	NEW MEXICO	A DO
Jackson	JAN	Albuquerque	ABQ
MICCOLIDI		Farmington	FMN
MISSOURI C. 1. 1.	COLL	Hobbs	HOB
Columbia	COU	Roswell	ROW
Joplin	JLN	Santa Fe	SAF
Kansas City	MCI		
Springfield	SGF	NEW YORK	
St. Louis	STL	Albany	ALB
		Binghamton	BGM
MONTANA		Buffalo	BUF
Billings	BIL	Elmira	ELM
Bozeman	BZN	Islip	ISP
Butte	BTM	Ithaca	ITH
Great Falls	GTF	New York	JFK
Helena	HLN	New York	LGA
Kalispell	FCA	Newburgh	SWF
Missoula	MSO	Niagara Falls	IAG
		Plattsburgh	PBG
<u>NEBRASKA</u>		Rochester	ROC
Grand Island	GRI	Syracuse	SYR
Kearney	EAR	Watertown	ART
Lincoln	LNK	White Plains	HPN
Omaha	OMA		
Scottsbluff	BFF	NORTH CAROLINA	
		Asheville	AVL
<u>NEVADA</u>		Charlotte	CLT
Boulder City	BLD	Fayetteville	FAY
Elko	EKO	Greensboro	GSO
Las Vegas	LAS	Greenville	PGV
Reno	RNO	Jacksonville	OAJ
		New Bern	EWN
NEW HAMPSHIRE		Raleigh	RDU
Lebanon	LEB	Wilmington	ILM
Manchester	MHT		
Portsmouth	PSM	NORTH DAKOTA	
		Bismarck	BIS

Dickinson	DIK	State College	SCE
Fargo	FAR	Wilkes-Barre/ Scranton	AVP
Grand Forks	GFK	Williamsport	IPT
Minot	MOT	Williamsport	11 1
Williston	ISN	PUERTO RICO	
WIIISTOII	1511	Aguadilla	BQN
NORTHERN MARI	ANAS	Ceiba	NRR
ISLANDS	ANAS	Ponce	PSE
	SPN	San Juan Carolina	SJU
Saipan Rota Island	ROP	San Juan Caronna San Juan Miramar	
Rota Island	KOP		SIG
OIIIO		Vieques	VQS
OHIO	CAL	DHODE ICL AND	
Akron / Canton	CAK	RHODE ISLAND	DIAD
Cincinnati	LUK	Providence	PVD
Cleveland	CLE	Westerly	WST
Columbus	CMH	COLUMN CAROL NA	
Columbus	LCK	SOUTH CAROLINA	~~
Dayton	DAY	Charleston	CHS
Toledo	TOL	Columbia	CAE
Youngstown	YNG	Florence	FLO
		Greer	GSP
<u>OKLAHOMA</u>		Hilton Head Island	HHH
Lawton	LAW	Myrtle Beach	MYR
Oklahoma City	OKC		
Stillwater	SWO	SOUTH DAKOTA	
Tulsa	TUL	Aberdeen	ABR
		Pierre	PIR
<u>OREGON</u>		Rapid City	RAP
Eugene	EUG	Sioux Falls	FSD
Klamath Falls	LMT		
Medford	MFR	TENNESSEE	
North Bend	OTH	Bristol	TRI
Portland	PDX	Chattanooga	CHA
Redmond	RDM	Knoxville	TYS
		Memphis	MEM
PENNSYLVANIA		Nashville	BNA
Allentown	ABE		
Erie	ERI	TEXAS	
Harrisburg	MDT	Abilene	ABI
Latrobe	LBE	Amarillo	AMA
Philadelphia	PHL	Austin	AUS
Pittsburgh	PIT	Beaumont	BPT

Brownsville	BRO	Roanoke	ROA
College Station	CLL	Staunton	SHD
Corpus Christi	CRP	Washington National	DCA
Dallas Love	DAL	Washington Dulles	IAD
Dallas-Fort Worth	DFW		
Del Rio	DRT	WASHINGTON	
El Paso	ELP	Bellingham	BLI
Fort Hood/ Killeen	GRK	Friday Harbor	FRD
Fort Worth Alliance	AFW	Pasco	PSC
Harlingen	HRL	Port Angeles	CLM
Houston Intl	IAH	Pullman	PUW
Houston Hobby	HOU	Seattle	BFI
Laredo	LRD	Seattle Tacoma	SEA
Longview	GGG	Spokane	GEG
Lubbock	LBB	Walla Walla	ALW
McAllen	MFE	Wenatchee	EAT
Midland	MAF	Yakima	YKM
San Angelo	SJT	Tunnin	11111
San Antonio	SAT	WEST VIRGINIA	
Tyler	TYR	Charleston	CRW
Waco	ACT	Clarksburg	CKB
Wichita Falls	SPS	Huntington	HTS
	212	Lewisburg	LWB
U.S. VIRGIN ISLANI	OS	Morgantown	MGW
St. Thomas	STT	Wioiguntown	MO W
St. Croix	STX	WISCONSIN	
St. CIOIA	5171	Appleton	ATW
<u>UTAH</u>		Eau Claire	EAU
Provo	PVU	Green Bay	GRB
Salt Lake City	SLC	La Crosse	LSE
St. George	SGU	Madison	MSN
Wendover	ENV	Milwaukee	MKE
vv chuo v ch	LINV	Mosinee	CWA
VERMONT		Rhinelander	
Burlington	BTV	Kninelander	RHI
Durinigion	DIV	WWOMING	
VIDCINIA		WYOMING	CDD
<u>VIRGINIA</u> Charlottesville	СНО	Casper	CPR
		Cheyenne	CYS
Lynchburg	LYH	Cody	COD
Newport News	PHF	Gillette	GCC
Norfolk	ORF	Jackson	JAC
Richmond	RIC	Riverton	RIW

Rock Springs RKS Sheridan SHR

AIRCRAFT IDENTIFICATION

Now let's take a few pages to review some of the more common commercial aircraft out there today and help you get familiar with them.

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Airbus A320 Family



One of the most common narrow-body aircraft in the world is the Airbus A320 family, which includes the A318, the A319, the A320, and the A321, as seen in this photo. The easiest way to tell the difference between an A319 and an A320 is the over-wing doors; the A320 has two while the A319 just has one. The A321 is quite a bit longer than its two siblings and will have four full size doors on each side of the fuselage.

Airbus A330



The Airbus A330 is Airbus' twin-engine entry into the wide-body market. It essentially shares the same fuselage cross section with the four-engined A340.

Airbus A340



The A340 comes in two main variants: the -300 and the -600 (*top*). The -300 is known for its four small "hair-dryer" engines, while the -600 will be around forty feet longer and have much larger engines. These aircraft are rapidly being retired from commercial service.

Airbus A350



The A350 is Airbus' newest twin-engine wide-body aircraft, utilizing carbon-fibers for the fuselage and wing structures. Designed to replace the A340 and compete with the Boeing 777 and 787, the A350 entered revenue service in early 2015. The nose of the A350 is distinctive from all other Airbus commercial aircraft.

Airbus A380



The A380 is the largest passenger airline in the world, and the only frame to boast two seating decks for the entire length of the fuselage. The A380 can seat up to 853 passengers in an all-economy layout, although no carrier has yet configured the aircraft in this manner yet. If you see an A380 it will assuredly be flown by a foreign carrier as no U.S. carriers operate, or have even ordered, the A380.

Did You Know? The A380 can hold 84,500 gallons of fuel.



For nearly 40 years until around September 2025 when it was surpassed by the Airbus A320 family, the Boeing 737 was the top selling jet in history. Nowadays, the most common variants are the -700, -800, and -900 series. Each of course is a progressively longer version. The easiest way to note the difference between a -700 and an -800 is that the -800 will have two exit doors over the wing, rather than the single door seen on the -700s. With the current 737 MAX frames you will notice the fuselage sits slightly higher, of course, the easiest difference to spot is the winglets as the MAX has a split rather than a blended winglet.



Arguably the most well-known outline in commercial aviation history is that of the iconic Boeing 747. This four-engine wide-body sports an upper deck near the forward section of the fuselage and is fondly known as the "Queen of the Skies."

747s built as freighters (as seen below) will have a shorter "hump" or upper deck as compared to their passenger brothers. The freighter will also have a hinged nose, which can lift to take on cargo through the front of the aircraft. Finally, there will be a large cargo door on the left side of the fuselage, behind the wing.



Did You Know? The Maximum Take Off Weight (MTOW) of the Boeing 747-8 is 987,000 pounds. The average weight of a male African bush elephant is 13,230 pounds; thus, 74 elephants would equal the weight of one fully loaded 747-8.



The Boeing 757-200 is a mid-sized narrow body with two engines. You will notice it sits considerably higher off the ground than the 737. There are also a handful of stretched -300 variants in U.S. service with Delta and United.

Boeing 767



The Boeing 767 is a mid-sized wide-body designed for long haul routes. The -300 variant is the most common type in operation today, although both Delta and United operate a small batch of longer -400 variants.

Did You Know? The Boeing 767-300 is 21 feet longer than the original -200 variant, and the -400 is 21 feet longer than the -300.



The Boeing 777 is the largest twinjet in the world and can immediately be differentiated by the substantially larger than normal engines hanging under its wings. You can also check the landing gear to differentiate between the 767 and 777: the main gears on the 767 will have four wheels while the mains on the 777 will have six. The stretched 777-300 has essentially replaced the 747-400 as the "go to" aircraft for airlines looking for large, long-haul aircraft. How can you tell a -200 and a -300 apart? The -200 will of course be shorter, with four large exit doors on each side of the fuselage, while the -300 will be 33 feet longer and have five full-size exit doors on each side of the fuselage.

Boeing 787



The first aircraft to use composite materials in the airframe, the Boeing 787 is quite similar in size to the 767 it was essentially designed to replace. How can you differentiate it with the 767? First, look at the two engines – they have a chevron pattern on the end of them. Secondly, the cockpit has four large windows and a much different nose contour. Finally, the wings are designed with a large curve to them, different than nearly all other commercial jets. Also, as 787s are made

from composite materials; you will never see any bare metal as part of its livery.

Embraer E175/190



Brazil's Embraer is the manufacturer of the popular E175 and E190 series of regional jets. The E175, pictured above, is the more common variant; the E190 looks essentially the same except it has a longer fuselage.

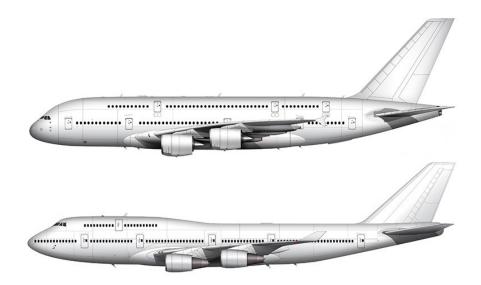
Canadair CRJ-200/500/700/900



Another common series of regional jet are the Canadair CRJ frames. Pictured above is the CRJ700, you can easily guess that the main difference between this and the smaller CRJ200 and CRJ500s are a shortened fuselage, while CRJ900s are longer. The main difference between the CRJs and the E175/190s are that the CRJs are a "t-tail" concept while the Embraer frames are a more "traditional" style with the engines under the wings.

Remember that both the E175 and the CRJ frames will **only** be operated by regional carriers and not mainline operators. American Airlines does operate a handful of E190 frames under the mainline operation.

Comparison: Airbus A380 vs. Boeing 747



The easiest way to tell the difference between an A380 and a 747 is the fact that the A380 is a double decker for the entire length of the fuselage, whereas the 747 has a double deck only in the forward half of the fuselage.