Pilot certification

Pilot certification in the **United States** is under the authority of the Federal Aviation Administration (FAA). *Airman's Certificate* is the proper term, although the word *license* is commonly used, even by the FAA. Certification is regulated under parts 61 and 141 of the Federal Aviation Regulations ("FARs", found in Chapter 14 of the Code of Federal Regulations).

Certification overview

An Airman's Certificate is issued at one of several levels of skill, and one or more *ratings* are placed on the certificate for specific *categories and classes* of aircraft. Examples of categories are *airplane*, *glider*, and *balloon*. Categories may be further subdivided into classes. For example, the airplane category consists of single-engine and multi-engine with classes of land and sea for each. An aircraft may be a member of more than one class. The common Cessna 172 training aircraft is formally a single-engine land airplane.

A pilot may add other ratings to a certificate. Examples of additional ratings are the instrument rating, or one of many *type ratings*, which are required to fly any aircraft defined as "large" (more than 12,500 pounds maximum legal takeoff weight) or any aircraft powered by a jet engine.

To obtain a certificate or add a rating, a pilot must undergo a course of training with a certificated instructor, accumulate and log specific aeronautical experience, and pass a three-part examination: a *knowledge test* (a computerized multiple-choice test, typically called the "written test"), and a combined *oral* and *practical* test carried out by either an FAA inspector or a designated examiner.

Another form of authorization is an *endorsement* from a flight instructor that establishes that the certificated holder has received training in specific skill areas that do not warrant a full test, such as the ability to fly a tailwheel-equipped or pressurized airplane.

Airman certificates other than student pilot certificates do not expire, although they may be suspended or revoked by the FAA. However, a pilot must maintain *currency* — recent flight experience that is relevant to the flight being undertaken. To remain active, every pilot has to undergo a flight review with an instructor every two years (unless he gains a new certificate or rating in that time), and, for most types of certificate, undergo a medical examination at intervals ranging from six months to three years, depending on the pilot's age and desired flight privileges. Other currency requirements apply to the carriage of passengers or to flight under instrument flight rules (IFR).

A medical certificate is not necessary to fly a glider or balloon, or to fly with a sport pilot certificate. An ultralight aircraft can be piloted without a pilot certificate or a medical certificate.

Pilot Training

Most pilots in the U.S. undergo flight training as private individuals with a flight instructor, who may be employed by a flight school. Those who have decided on aviation as a career often begin with an undergraduate aviation-based education. Some pilots are trained in the armed forces, and are issued with civilian certificates based on their military record. Others are trained directly by airlines. The pilot may choose to be trained under Part 61 or Part 141 of the FARs. Part 141 requires that a certified flight school provide an approved, structured course of training, which includes a specified number of hours of ground training (for example, 35 hours for Private Pilot in an airplane). Part 61 sets out a list of knowledge and experience requirements, and is more suitable for students who cannot commit to a structured plan, or for training from freelance instructors.

Becoming a Professional Pilot

In aviation, a pilot's level of income and experience are highly related. There are multiple ways to gain the experience to be hired by a scheduled air carrier. Air carriers generally require that the pilots they hire have hours of experience far in excess of the legal minimum. This experience is often gained using one of three common methods:

- Military Training
- Independent training followed by becoming a part or full-time instructor.
- An Undergraduate Flight Program. Frequently, upperclassmen are flight instructors for new students.

Categories of certificate

There are five categories and various classes of pilot certificates (except Student Pilot):

- airplane (single- or multi-engine, and land or sea classes)
- rotorcraft (helicopter or gyroplane classes)
- powered-lift
- glider
- lighter than air (airship, hot air balloon, or gas balloon).

Pilot certificates

The U.S. offers a progression of pilot certificates, each with its own set of privileges and limitations. All U.S. pilots must be at least 17 years old (16 for a student, or a glider or balloon pilot), and be able to read, write, speak, and understand English.

Student

A student pilot certificate is usually issued by an aviation medical examiner (AME) at the time of the student's first medical examination, which is a pre-requisite for flying alone in the aircraft. The student certificate expires after 24 months and can be renewed by an AME or an FAA official. Once a student

has accrued sufficient training and experience, a CFI can *endorse* the student's certificate to authorize limited solo flying, in a specific type of aircraft under specific flight conditions. A student pilot may not carry passengers or fly in furtherance of a business.

Sport pilot

The sport pilot certificate was created in 2004 to meet demand from pilots flying small, low-powered aircraft, and offers limited privileges. It is the only level that does not require a medical examination; a driver's license can be used as proof of medical competence.

Recreational

The recreational pilot certificate requires less training and offers fewer privileges than the private certificate. It is a little-used certificate level, and will probably be supplanted in time by the sport pilot certificate.

Private pilot

The private pilot certificate is the certificate held by the majority of active pilots. It allows command of any aircraft (subject to appropriate ratings) for any non-commercial purpose, and gives almost unlimited authority to fly under visual flight rules (VFR). Passengers may be carried and flight in furtherance of a business is permitted; however, a private pilot may not be compensated in any way for services as a pilot, although passengers can pay a *pro rata* share of flight expenses, such as fuel or rental costs. Private pilots may also operate charity flights, subject to certain restrictions, and may participate in similar activities, such as Angel Flight.

The requirements to obtain a private pilot certificate for "airplane, single-engine, land", or ASEL, (which is the most common certificate) are:

- Be at least 17 years old
- Be able to read, speak, and write the English language
- Obtain a third class medical certificate from an AME
- Pass a computerized aeronautical knowledge test
- Accumulate and log a specified amount of training and experience, including the following:
    - If training under Part 61, at least 40 hours of piloting time including 20 hours of flight with an instructor and 10 hours of solo flight, and other requirements including "cross-country", i.e. more than 50 nautical miles (93 km) from the departure airport, and three hours of night flight, including 10 takeoffs and landings
    - If training under Part 141, at least 35 hours of piloting time including 20 hours with an instructor and 5 hours of solo flight, and other requirements including cross-country and night flights
- Pass an oral test and flight test administered by an FAA inspector, FAA-designated examiner, or authorized check instructor (Part 141 only)

Commercial

A commercial pilot may be compensated for flying. Training for the certificate focuses on a better understanding of aircraft systems and a higher standard of airmanship. The commercial certificate itself does not allow a pilot to fly in instrument meteorological conditions, although most commercial pilots also have an instrument rating.

A commercial airplane pilot must be able to operate a complex airplane, as a specific number of hours of complex (or turbine-powered) aircraft time are among the prerequisites, and at least a portion of the practical examination is performed in a complex aircraft.

The requirements are:

- Be at least 18 years of age
- Hold a private pilot certificate
- Be able to read, speak, write, and understand the English language
- Accumulate and log a specified amount of training and experience; the following are part of the ASEL requirement:
    - If training under Part 61, at least 250 hours of piloting time including 20 hours of training with an instructor and 10 hours of solo flight, and other requirements including several "cross-country" flights, i.e. more than 50 nautical miles (93 km) from the departure airport and both solo and instructor-accompanied night flights
    - If training under Part 141, at least 120 hours of training time including 55 hours with an instructor and 10 hours of solo flight, and other requirements including several cross-country, solo, and night flights
- Pass an aeronautical knowledge test
- Pass an oral test and flight test administered by an FAA inspector, FAA-designated examiner, or authorized check instructor (Part 141 only)

By itself, this certificate does not permit the pilot to set up an operation that carries members of the public for hire; such operations are governed by other regulations. Otherwise, a commercial pilot can be paid for certain types of operation, such as banner towing, agricultural applications, and photography, and can be paid for instructing if he holds a flight instructor certificate. To fly for hire, the pilot must hold a second class medical certificate, which is valid for one year.

Often, the commercial certificate will reduce the pilot’s insurance premiums, as it is evidence of training to a higher safety standard.

Airline transport pilot

An airline transport pilot (commonly called an "ATP") is tested to the highest level of piloting ability. The certificate is a prerequisite for acting as a pilot-in-command in scheduled airline operations.

The minimum pilot experience is 1500 hours of flight time; other requirements include being 23 years of age, being able to read, write, speak, and understand the English language, and being "of good moral character."

Medical Certification and Requirements

All licensed pilots, with the exception of those with a sport pilot certificate, are required to maintain a medical certification commensurate with the privileges they intend to exercise as pilot-in-command of an aircraft.

To obtain a medical certification, pilots are required to undergo a medical examination from an Aviation Medical Examiner, or AME. The Aviation Medical Examiner performs an examination based upon the class of certification desired.

Medical certifications are divided into three classes:

Third Class

Third class certifications require the least involved examinations of all medical certifications. They are required for those intending to be pilot-in-command of an aircraft under the Private or Recreational pilot certificates or while exercising solo privileges while a student pilot.

To qualify for a third class medical certificate, pilots must meet the following requirements:

- Distant vision: 20/40 or better in each eye separately, with or without correction
- Near vision: 20/40 or better in each eye separately, with or without correction, as measured at a distance of 16 inches
- Color vision: Demonstrate the ability to perceive the colors necessary for the safe performance of airman duties
- Hearing: Demonstrate the ability to hear an average conversational voice in a quiet room, using both ears, at a distance of six feet, with their back turned to the examiner, or pass an approved audiometric test
- Ear, Nose, and Throat: Exhibit no ear disease or condition manifested by, or that may reasonably be expected to be manifested by, vertigo or a disturbance of speech or equilibrium
- Blood Pressure: Under 155/95
- Mental Stability: No diagnosis of psychosis, bipolar disorder, or severe personality disorders
- Substance Dependence: No dependence on alcohol or any pharmacological substance in the previous two years

For pilots under 40 years of age, third class medical certificates expire on the last day of the month they were issued, three years from the date of issue. For all others, they expire on the last day of the month they were issued, two years from the date of issue.

Second Class

Second class certifications are required for those intending to be pilot-in-command on an aircraft under the Commercial pilot certificate.

To qualify for a second class medical certificate, pilots must meet the requirements for the third class certificate plus:

- Distant vision: 20/20 or better in each eye separately, with or without correction
- Intermediate vision: 20/40 or better in each eye separately, with or without correction, at age 50 and over, as measured at 32 inches

Second class medical certificates revert to third class medical certificates on the last day of the month they were issued, one year after issue. They are then subject to the expiration rules of third class certificates.

First Class

First class certificates are required for those intending to be pilot-in-command of an aircraft under the ATP pilot certificate.

To qualify for the first class medical certificate, pilots must meet the requirements for the third and second class certificates plus:

- Heart Function: Electrocardiogram must show normal heart function annually for those age 40 and over

First class certificates revert to second class certificates on the last day of the sixth month after they were issued. They are then subject to the reversion rules for second class certificates.

Special Issuance

Pilots who do not meet the above requirements may be issued a medical certificate under a "special issuance." A special issuance is essentially a waiver for a disqualifying condition and is evaluated on a case-by-case basis depending on the class of certificate requested. Minor problems can be overcome by a special issuance from the Aviation Medical Examiner, others require a special issuance from the FAA directly.

Restrictions

Restrictions may be placed upon a medical certificate to mitigate any concern for safety. For instance, color-blind pilots are typically issued a restriction reading, "NOT VALID FOR NIGHT FLIGHT OR BY COLOR SIGNAL CONTROL." This mitigates the concern that color-blind pilots may not be able to identify those colors required for the performance of safe airman duties by preventing situations that are considered potentially unsafe.

In many cases, these restrictions can be removed through a "Certificate of Demonstrated Ability" (CODA), or a "Letter of Evidence" from the FAA indicating that the pilot's deficiency is of no concern.Non-Pilot Certifications

- Flight engineer and Navigator are certifications applicable to larger transportation aircraft. Flight engineer licensees are further rated by types of engines they are trained and tested on. All are becoming less common as modern jets move towards two person flight crews. Modern technology has also made the Navigator specialization essentially obsolete.

- **Ground Instructor**, **Parachute Rigger**, **Mechanic**, **Repairman**, **Air-traffic control-tower operator** and **Dispatcher** are also federally certified aviation-related positions. Most of these also have their rating systems. For example, an **A&P** is a licensed mechanic with both airframe and powerplant ratings.

Pilots do not need FCC licenses to use the radio within the United States; however, other countries (such as Canada) may require that the pilot and/or the radio be licensed.

- Federal Aviation Administration
  - How to Become a Pilot
  - Types of Licenses
  - How to Get Your Commercial Pilot License
  - FAA regulation library — pilot certification regulations can be found at Parts 61 and 141.

- Aircraft Owners and Pilots Association
  - AOPA page describing the basics of obtaining a pilot certificate
  - AOPA aviation statistics page

- US Private Pilot Knowledge Test Preparation Sites
  - Sporty's Online FAA Knowledge Tests
  - PrepareToTest.com Pilot and Aviation Maintenance Technician test prep
  - Gleim's Online Ground school

Other Certificates and Ratings

- A **flight instructor** certificate authorizes the holder to instruct another person who is training for a certificate, rating, endorsement or flight review. Only an authorized flight instructor can give and document the training required by regulations.
- An **instrument rating** is required to fly under instrument flight rules (IFR). This allows the pilot to fly in instrument meteorological conditions (IMC): in (or near) clouds and low visibility. Flying under IFR almost invariably means flying under the direction of air traffic control (ATC). To get an instrument rating, the pilot must learn how to control the aircraft using only instruments and how to operate within the national airspace system (NAS), and gain a better understanding of weather and its effects on the airplane and its systems.
- A **multiengine** rating is the most common example of a class rating; it is required to fly an airplane with more than one engine. Both single- and multi-engine class ratings are further divided into **land** and **sea** depending on whether the training was in a conventional land airplane or a seaplane. *Airplane Single-Engine Land* is by far the most common primary rating.

United States military pilots are issued an Aviator Badge upon completion of flight training and issuance of a pilot's certificate. Badges for crew or ground positions are also issued to qualified applicants.

Instrument rating

Instrument Rating refers to the qualifications that a pilot must have in order to fly under Instrument Flight Rules (IFR). It requires additional training and instruction beyond what is required for a Private Pilot certificate, including rules and procedures specific to instrument flying, additional instruction in meteorology and more intensive training in flight solely by reference to instruments. Testing consists of a written exam and a practical test (known more commonly as the check ride). The check ride is divided into an oral part and a flight part.

For most Private Pilots, the most significant value of flying under IFR is the ability to fly in instrument meteorological conditions (such as inside clouds). Additionally, all flights operating in in Class A airspace must be conducted under IFR. In the United States, an instrument rating is required when operating under Special visual flight rules (SVFR) at night.

Flight training

Flight training is a course of study used when learning to pilot an aircraft.

Although there are various types of aircraft, many of the principles of piloting them have common techniques, especially those aircraft which are **heavier than air** types.

In addition to learning how to control the particular aircraft, the following subjects are usually covered regardless of the type of aircraft:

- Principles of Flight
- Flight Regulations
- Meteorology
- Navigation
- Radio Communications
- Flight Instruments
- Human Factors
- Medical Certification

For powered aircraft:

- Airframes, Engines and Systems

Visual flight rules

Visual flight rules (VFR) are a set of aviation regulations under which a pilot may operate an aircraft, if weather conditions are sufficient to allow the pilot to visually control the aircraft's attitude, navigate, and maintain separation with obstacles such as terrain and other aircraft.

Under VFR, the pilot generally controls the attitude of the aircraft by relying on what can be seen out the window (see visual flight), although this may be supplemented by referring to the instrument panel. A pilot flying under VFR is usually required to stay at least a specified distance away from clouds and must stay in areas where the visibility meets minimum requirements. There may be other requirements which vary by country, such as not flying over a solid layer of clouds, or not flying at night. The pilot is responsible for seeing and avoiding other aircraft, terrain, and obstructions such as buildings and towers. Being in contact with air traffic control is optional in most airspace, and the pilot is usually allowed to select the course and altitude to be flown even when in contact with ATC. The pilot may navigate either visually (using *pilotage*), or by reference to instruments and electronic aids to navigation.

The minimum meteorological requirements for VFR are called visual meteorological conditions (VMC) minima. If they are not met then the flight must be flown under instrument flight rules (IFR), the pilot must have an instrument rating and meet recency of experience requirements pertaining to instrument flight, and the aircraft must be equipped and type-certified for instrument flight. In some types of airspace, generally at higher altitudes, a flight must be flown under IFR regardless of the meterological conditions, as aircraft fly at high speeds at higher altitudes and the "see and avoid" method of avoiding conflicting traffic is less successful.

Instrument meteorological conditions

Instrument meteorological conditions (IMC) is an aviation term that describes weather conditions that normally require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references under Visual Flight Rules (VFR). The weather conditions required for flight under VFR are known as Visual Meteorological Conditions (VMC). IMC and VMC are obviously mutually exclusive. The boundary criteria between VMC and IMC are known as the VMC minima.

With good visibility, pilots can determine the attitude of the aircraft by utilising visual cues from outside the aircraft, most significantly the horizon. Without such external visual cues, pilots must use an internal cue of attitude, which is provided by gyroscopically-driven instruments such as the Attitude Indicator (or "Artificial Horizon"). The availability of a good horizon cue is controlled by meteorological visibility, hence minimum visibility limits feature in the VMC minima. Visibility is also important in the avoidance of terrain.

Since the basic traffic avoidance principle of flying under Visual Flight Rules (VFR) is "see and avoid", it also follows that distance from cloud is an important factor in the VMC minima: as aircraft in cloud cannot be seen, a buffer zone from cloud is required.

ICAO recommends the VMC minima internationally; they are defined in national regulations, which rarely significantly vary from ICAO. the main variation is in the units of measurement as different states often use different units of measurement in aviation. The criteria tend to be stricter in controlled airspace, where there is a lot of traffic therefore greater visibility and cloud clearance is desirable. The degree of separation provided by Air Traffic Control is also a factor: for example in Class A and B airspace where all aircraft are provided with standard separation, the VMC minima feature visibility limits only, whereas in classes C-G airspace where some or all aircraft are not separated from each other by Air Traffic Control, the VMC minima also feature distance from cloud minima.

It is important not to confuse IMC with Instrument flight rules (IFR) -- "IMC" describes the actual weather conditions, while "IFR" describes the rules under which the aircraft is flying. Aircraft can (and often do) fly IFR in clear weather, for operational reasons, or by flying in airspace where flight under VFR is not permitted.

Undergraduate

In some educational systems, an **undergraduate** is a post-secondary student pursuing a Bachelor's degree. Students of higher degrees are known as postgraduates (or often simply graduates).

In the United States, most undergraduate education takes place at four-year colleges or universities. Students in their first, second, third, and fourth years of study are often called, respectively, freshmen, sophomores, juniors, and seniors (although some institutions, such as many women's colleges, substitute "first-year" for "freshman" in an attempt to remain more gender-neutral). Some institutions (e.g. liberal-arts colleges) offer primarily or exclusively undergraduate education, while most universities offer graduate study as well. Successful completion of undergraduate work generally requires the completion of many courses of varying subject and difficulty, and a concentration or "major" that focuses on a particular academic discipline.

In many other, particularly continental European systems, something like an "undergraduate" degree in the American sense does not exist. Other than in the US, where students engage in general studies during the first years of tertiary education and only specialize in a "major" during the last years of college, European students enroll in a specific course of studies they wish to pursue right from the beginning, as they are expected to have received a sound general education already on the secondary level, in a school such as a gymnasium or lycée. At university, which they can enter at an age as early as 18 in many countries, they specialize in a subject field which they pursue in a curriculum of, in most cases, four or five years of studies. The fields available include those which are only taught as graduate degrees in the US, such as law, medicine or business administration. After completing the first degree, students can move on to doctoral studies. In many countries, the English distinction between a bachelor's and master's degree is only now being introduced by the Bologna process, meaning that the old first degree would roughly correspond to a master's degree in the US or the UK.

Federal Aviation Administration

The **Federal Aviation Administration** (**FAA**) is the entity of the United States government which regulates and oversees all aspects of civil aviation in the U.S.

Activities

Along with the European Joint Aviation Authorities, the FAA is one of the two main agencies worldwide responsible for the certification of new aircraft.

The FAA issues a number of awards to holders of its licenses. Among these are demonstrated proficiencies as a mechanic, an instructor, a 50-year aviator, or as a safe pilot. The latter, the FAA "Wings Program", provides a series of ten badges for pilots who have undergone several hours of training since their last award. A higher level can be claimed each year. For more information see "FAA Advisory Circular 61-91H".

History

The Air Commerce Act of May 20, 1926, is the cornerstone of the Federal Government's regulation of civil aviation. This landmark legislation was passed at the urging of the aviation industry, whose leaders believed the airplane could not reach its full commercial potential without federal action to improve and maintain safety standards. The Act charged the Secretary of Commerce with fostering air commerce, issuing and enforcing air traffic rules, licensing pilots, certificating aircraft, establishing airways, and operating and maintaining aids to air navigation. A new Aeronautics Branch of the Department of Commerce assumed primary responsibility for aviation oversight.

In fulfilling its civil aviation responsibilities, the Department of Commerce initially concentrated on such functions as safety rulemaking and the certification of pilots and aircraft. It took over the building and operation of the Nation's system of lighted airways, a task that had been begun by the Post Office Department. The Department of Commerce improved aeronautical radio communications and introduced radio beacons as an effective aid to air navigation.

The Aeronautics Branch was renamed the Bureau of Air Commerce in 1934 to reflect its enhanced status within the Department. As commercial flying increased, the Bureau encouraged a group of airlines to establish the first three centers for providing air traffic control (ATC) along the airways. In

1936, the Bureau itself took over the centers and began to expand the ATC system. The pioneer air traffic controllers used maps, blackboards, and mental calculations to ensure the safe separation of aircraft traveling along designated routes between cities.

In 1938, the Civil Aeronautics Act transferred the federal civil aviation responsibilities from the Commerce Department to a new independent agency, the Civil Aeronautics Authority. The legislation also expanded the government's role by giving them the authority and the power to regulate airline fares and to determine the routes that air carriers would serve.

President Franklin Roosevelt split the authority into two agencies in 1940, the Civil Aeronautics Administration (CAA) and the Civil Aeronautics Board (CAB). CAA was responsible for ATC, airman and aircraft certification, safety enforcement, and airway development. CAB was entrusted with safety rulemaking, accident investigation, and economic regulation of the airlines. Both organizations were part of the Department of Commerce. Unlike CAA, however, CAB functioned independently of the Secretary.

On the eve of America's entry into World War II, CAA began to extend its ATC responsibilities to takeoff and landing operations at airports. This expanded role eventually became permanent after the war. The application of radar to ATC helped controllers in their drive to keep abreast of the postwar boom in commercial air transportation. In 1946, meanwhile, Congress gave CAA the added task of administering the federal-aid airport program, the first peacetime program of financial assistance aimed exclusively at promoting development of the nation's civil airports.

The approaching era of jet travel, and a series of midair collisions, prompted passage of the Federal Aviation Act of 1958. This legislation gave the CAA's functions to a new independent body, the Federal Aviation Agency. The act transferred air safety rulemaking from the CAB to the new FAA, and also gave the FAA sole responsibility for a common civil-military system of air navigation and air traffic control. The FAA's first administrator, Elwood R. Quesada, was a former Air Force general and advisor to President Eisenhower.

The same year witnessed the birth of the National Aeronautics and Space Administration (NASA), created in the wake of the Soviet launching of the first artificial satellite. NASA assumed NACA's role of aeronautical research while achieving world leadership in space technology and exploration.

In 1967, a new U.S. Department of Transportation (DOT) combined major federal responsibilities for air and surface transport. FAA's name changed to the Federal Aviation Administration as it became one of several agencies within DOT. At the same time, a new National Transportation Safety Board took over the CAB's role of investigating aviation accidents.

The FAA gradually assumed additional functions. The hijacking epidemic of the 1960s had already brought the agency into the field of civil aviation security, a responsibility now primarily taken by the Department of Homeland Security. The FAA became more involved with the environmental aspects of aviation in 1968 when it received the power to set aircraft noise standards. Legislation in 1970 gave the agency management of a new airport aid program and certain added responsibilities for airport safety. During the 1960s and 1970s the FAA also started to regulate high altitude (over 500 feet) kite and balloon flying.

By the mid-1970s, the FAA had achieved a semi-automated air traffic control system using both radar and computer technology. This system required enhancement to keep pace with air traffic growth, however, especially after the Airline Deregulation Act of 1978 phased out the CAB's economic regulation of the airlines. A nationwide strike by the air traffic controllers union in 1981 forced temporary flight restrictions but failed to shut down the airspace system. During the following year, the agency unveiled a new plan for further automating its air traffic control facilities, but progress proved disappointing. In 1994, the FAA shifted to a more step-by-step approach that has provided controllers with advanced equipment.

- In the 1990s, satellite technology received increased emphasis in the FAA's development programs as a means to improvements in communications, navigation, and airspace management. In 1995, the agency assumed responsibility for safety oversight of commercial space transportation, a function begun eleven years before by an office within DOT headquarters.

Federal Aviation Regulations

The **Federal Aviation Regulations**, or **FAR**s, are rules prescribed by the Federal Aviation Administration (FAA) governing all aviation activities in the United States. The FARs are part of Title 14 of the Code of Federal Regulations (CFR). A wide variety of activities are regulated, such as airplane design, typical airline flights, pilot training activities, hot-air ballooning and even model rocket launches. The rules are designed to promote safe aviation, protecting pilots, passengers and the general public from unnecessary risk. They are also intended to protect the national security of the United States, especially in light of the September 11, 2001 attacks.

Organization

The FARs are organized into sections, called *parts* due to their organization within the Code of Federal Regulations (CFR). Each part deals with a specific type of activity. For example, *14 CFR Part 141* contains rules for pilot training schools. The sections most relevant to aircraft pilots and AMTs (Aviation Maintenance Technicians) are listed below.

- Part 1 – Definitions and Abbreviations.
- Part 13 – Investigation and Enforcement Procedures
- Part 21 – Certification Procedures for Products and Parts.
- Part 23 – Airworthiness Standards: Normal, Utility, Acrobatic and Commuter Category Airplanes.
- Part 25 – Airworthiness Standards: Transport Category Airplanes.
- Part 27 – Airworthiness Standards: Normal Category Rotorcraft
- Part 33 – Airworthiness Standards: Aircraft Engines.
- Part 34 – Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes
- Part 35 – Airworthiness Standards: Propellers
- Part 39 – Airworthiness Directives
- Part 43 – Maintenance, Preventive Maintenance, Rebuilding, and Alteration.
- Part 45 – Identification and Registration Marking
- Part 47 – Aircraft Registration

- Part 61 – Certification: Pilots, Flight Instructors, and Ground Instructors.
- Part 65 – Certification: Airmen Other Than Flight Crewmembers
- Part 67 – Medical Standards and Certification.
- Part 71 – Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points.
- Part 73 – Special Use Airspace.
- Part 91 – General Operating and Flight Rules.
- Part 97 – Standard Instrument Approach Procedures.
- Part 101 – Moored Balloons, Kites, Unmanned Rockets and Unmanned Free Balloons
- Part 103 – Ultralight Vehicles.
- Part 105 – Parachute Operations.
- Part 119 – Certification: Air Carriers and Commercial Operators.
- Part 121 – Operating Requirements: Domestic, Flag, and Supplemental Operations.
- Part 125 – Certification and Operations: Airplanes Having a Seating Cpacity of 20 or More Passengers or a Payload Capacity of 6,000 Pounds or More
- Part 135 – Operating Requirements: Commuter and On Demand Operations.
- Part 137 – Agricultural Aircraft Operations.
- Part 141 – Flight Schools.
- Part 142 – Training Centers.
- Part 145 – Repair Stations
- Part 147 – Aviation Maintenance Technicians Schools
- Part 183 – Representatives of The Administrator

Biennial flight review

The **flight review** (previously the Federal Aviation Administration referred to this as a biennial flight review, usually abbreviated **BFR**) is a review required of every active holder of a US pilot certificate at least every two years. The flight review consists of at least 1 hour of ground instruction and 1 hour in-flight with a qualified instructor.

Before being able to act as pilot-in-command (PIC) a pilot must have completed a flight review within the previous 24 calendar months. The FAA and instructors are quick to point out that it is **not** a test. There is no pass or fail criteria, although the instructor giving it can decline to endorse your log-book that a flight review has been completed.

A flight test (administered by an FAA representative or Designated Pilot Examiner) that leads to a new certificate or rating may be substituted for the flight review. Completing a phase of the FAA's safety-oriented "Wings" program can also be used, as can completion of a proficiency check administered by a check airman (typically air carrier pilots).

The United States **Code of Federal Regulations (CFR)** is the codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the Federal Government.

Angel Flight

Angel Flight is a non-profit organization in the United States and in Australia, British Columbia, Canada that helps arrange free, non-emergency transportation for patients who require medical treatment but can not afford to pay for a commercial flight. Transportation is provided by volunteer pilots, often using their own private general aviation aircraft. In most of Canada, the Volunteer Pilot Program of Hope Air provides a similar service.

How Angel Flight Works

The Angel Flight organization itself does not provide transportation. Instead, it acts as a "matchmaker" between people who have a compelling need for transportation but can not afford it, and individual pilots who are willing to provide free flights as a charity.

Angel Flight typically serves patients who require specialized medical treatment from a facility far from their homes -- for example, a clinic that has expertese in the treatment of a particular form of a disease. In some cases, other compelling human needs are served, such as transportation to visit a hospitalized family member.

The Angel Flight process begins when a referring Health Professional, usually a Social Worker, contacts the Angel Flight organization. The referrer describes the points between which transportation is needed, the total number of people and weight, and the condition of the patient. Not every patient is eligible for transportation. For example, patients must be medically stable, capable of walking on their own and sitting upright unassisted. The flight must also not be for treatment of a medical emergency, because weather or other factors may cause last-minute cancellation of the flight.

If the flight request is appropriate, the date, source, destination, and total passenger are added to an "available mission list" on the Angel Flight web site. Pilot volunteers periodically check the mission list and can assign themselves to a mission that is appopriate to their aircraft and schedule.

Angel Flight Pilots

Angel Flight is made possible by pilots who volunteer both their time and money for aircraft operating expenses. Many pilots provide Angel Flights in their own personal aircraft, although some do so using rental aircraft. Pilots must meet certain minimum flight experience requirements before they are allowed to command an Angel Flight mission. They also receive training on the special procedures required for Angel Flight.

Pilots have a variety of reasons for volunteering for Angel Flight missions. Most do so simply because they enjoy flying, and providing charity transportation is more constructive than getting a $100 hamburger or "drilling holes in the sky" (flying just for the sake of flying). The aircraft operating expenses are also tax-deductible.

Instrument meteorological conditions

Instrument meteorological conditions (IMC) is an aviation term that describes weather conditions that normally require pilots to fly primarily by reference to instruments, and therefore under Instrument Flight Rules (IFR), rather than by outside visual references under Visual Flight Rules (VFR). The weather conditions required for flight under VFR are known as Visual Meteorological Conditions (VMC). IMC and VMC are obviously mutually exclusive. The boundary criteria between VMC and IMC are known as the VMC minima.

With good visibility, pilots can determine the attitude of the aircraft by utilising visual cues from outside the aircraft, most significantly the horizon. Without such external visual cues, pilots must use an internal cue of attitude, which is provided by gyroscopically-driven instruments such as the Attitude Indicator (or "Artificial Horizon"). The availability of a good horizon cue is controlled by meteorological visibility, hence minimum visibility limits feature in the VMC minima. Visibility is also important in the avoidance of terrain.

Since the basic traffic avoidance principle of flying under Visual Flight Rules (VFR) is "see and avoid", it also follows that distance from cloud is an important factor in the VMC minima: as aircraft in cloud cannot be seen, a buffer zone from cloud is required.

ICAO recommends the VMC minima internationally; they are defined in national regulations, which rarely significantly vary from ICAO. the main variation is in the units of measurement as different states often use different units of measurement in aviation. The criteria tend to be stricter in controlled airspace, where there is a lot of traffic therefore greater visibility and cloud clearance is desirable. The degree of separation provided by Air Traffic Control is also a factor: for example in Class A and B airspace where all aircraft are provided with standard separation, the VMC minima feature visibility limits only, whereas in classes C-G airspace where some or all aircraft are not separated from each other by Air Traffic Control, the VMC minima also feature distance from cloud minima.

It is important not to confuse IMC with Instrument flight rules (IFR) -- "IMC" describes the actual weather conditions, while "IFR" describes the rules under which the aircraft is flying. Aircraft can (and often do) fly IFR in clear weather, for operational reasons, or by flying in airspace where flight under VFR is not permitted.

Physical examination

In medicine, the **physical examination** or **clinical examination** is the process by which the physician investigates the body of a patient for signs of disease. It generally follows the taking of the medical history — an account of the symptoms as experienced by the patient. Together with the medical history, the physical examination aids in determining the correct diagnosis and devising the treatment plan. This data then becomes part of the medical record.

Although doctors have varying approaches as to the sequence of body parts, a systematic examination generally starts at the head and finishes at the extremities. After the main organ systems have been investigated by inspection, palpation, percussion and auscultation, specific tests may follow (such as a neurological investigation, orthopedic examination) or specific tests when a particular disease is suspected (e.g. eliciting Trousseau's sign in hypocalcemia).

With the clues obtained during the *history* and *physical examination* the doctor can now formulate a differential diagnosis, a list of potential causes of the symptoms. Specific diagnostic tests (or occasionally empirical therapy) generally confirm the cause, or shed light on other, previously overlooked, causes.

Whilst the format of examination as listed below is largely as taught and expected of medical students, a specialist will focus on their particular field and the nature of the problem described by the patient. Hence a cardiologist will not in routine practice undertake neurological parts of the examination other than noting that the patient is able to use all four limbs on entering the consultation room and during the consultation become aware of there hearing, eyesight and speech. Likewise an Orthopaedic surgeon will examine the affected joint, but may only briefly check the heart sounds and chest to ensure that there is not likely to be any contraindication to surgery raised by the anaesthetist.

A complete physical examination includes evaluation of general patient appearance and specific organ systems. It is recorded in the medical record in a standard layout which facilitates others later reading the notes. In practice the Vital signs of Temperature examination, Pulse and Blood pressure are usually measured first.

Vital Signs

Temperature

Temperature recording gives an indication of core body temperature which is normally tightly controlled (thermoregulation) as it affects the rate of chemical reactions. It does though vary with time of day and body conditions but prolonged significant temperature elevation (hyperthermia) or depression (hypothermia) are incompatible with life.

Blood pressure

The blood pressure is recorded as two readings, a high systolic pressure which is the maximal contraction of the heart and the lower diastolic or resting pressure. Usually the blood pressure is taken in the right arm unless there is some damage to the arm. The difference between the systolic and diastolic pressure is called the pulse pressure. The measurement of these pressures is now usually done with an aneroid or electronic sphygmomanometer. The classic measurement device is a mercury sphygmomanometer, using a column of mercury measured off in millimeters. In the United States and UK, the common form is millimeters of mercury, whilst elsewhere SI units of pressure are used. There is no natural 'normal' value for blood pressure, but rather a range of values that on increasing are associated with increased risks. The guideline acceptable reading also takes into account other co-factors for disease. Elevated blood pressure hypertension therefore is variously defined when the systolic number is persistently over 140-160 mmHg. Low blood pressure is hypotension. Blood pressures are also taken at other portions of the extremities. These pressures are called segmental blood pressures and are used to evaluate blockage or arterial occlusion in a limb (see Ankle brachial pressure index).

Pulse

The pulse is the physical expansion of the artery. Its rate is usually measured either at the wrist or the ankle and is recorded as beats per minute. The pulse commonly is taken is the radial artery at the wrist. Sometimes the pulse cannot be taken at the wrist and is taken at the elbow (brachial artery), at the neck against the carotid artery (carotid pulse), behind the knee (popliteal artery), or in the foot dorsalis pedis or posterior tibial arteries. The pulse rate can also be measured by listening directly to the heart beat using a stethescope.

Basic biometrics

Height

Height is the anthropometric longitudinal growth of an individual. A statiometer is the device used to measure height although often a height stick is more frequently used for vertical measurement of adults or children older than 2. The patient is asked to stand barefoot. Height declines during the day because of compression of the intervertebral discs. Children under age 2 are measured lying horizontally.

Weight

Weight is the anthropometric mass of an individual. A scale is used to measure weight. The English system uses pounds and ounces; the SI system uses kilograms. Body mass index or BMI is used to calculate the relationship between healthy height and weight and obesity or being overweight or underweight.

Pain

Because of the importance of pain to the overall wellness of the patient, subjective measurement is considered to be a vital sign. Clinically pain is measured using a FACES scale which is a series of faces from '0' (no pain at all showing a normal happy face) to '5' (the worst pain ever experienced by the patient). There is also an analog scale from '0' to maximum '10'. It is important to allow patients to make their own choices on a pain scale. Physicians and health care workers frequently understate patient pain.

Structure of the written examination record

General appearance

- Obvious apparent features as the patient enters the consulting room and in the course of taking the history (e.g. mobility problem or deafness)
- JACCOL, a mnemonic for Jaundice, suggestion of Anaemia (pale colour of skin or conjunctiva), Cyanosis (blue coloration of lips or extremities), Clubbing of fingernails, Oedema of ankles, Lymph nodes of neck, armpits, groins.

Organ systems

- Cardiovascular system
  - Blood pressure, pulse rate and rhythm.
  - Jugular venous pressure (JVP), peripheral oedema and evidence for pulmonary oedema.
  - Precordial exam (cardiac exam)
- Lungs
  - Respiratory rate, chest expansion, lung auscultation
- Breasts
- Abdomen
  - Abdominal examination notes in particular any tenderness, bloating, organ enlargement, or aortic aneurysm.
  - No abdominal examination is complete without a Anus and rectum
- Genitalia
- Musculoskeletal system
- Nervous system, including mental status
- Head and neck (HEENT a menonic for head, eyes, ears, nose and throat.)
- Skin
  - Check of the hair to see if the hair growth is receding or there is loss of hair, alopecia.
  - Check of the skin will tell if there are marks such as hemangioma or strawberry marks or changes to the skin. Dark spots on the skin, nevi are also places where cancerous changes can appear because the face, head and neck are most usually sun exposed.
  -

Medical record

A **medical record**, **health record**, or **medical chart** is a systematic documentation of a patient's medical history and care [1][2]. The term 'Medical record' is used both for the physical folder for each individual patient and for the body of information which comprises the total of each patient's health history. Medical records are intensely personal documents and there are many ethical and legal issues surrounding them such as the degree of third-party access and appropriate storage and disposal. Although medical records are traditionally compiled and stored by health care providers, personal health records maintained by individual patients have become more popular in recent years.

Purpose

The information contained in the medical record allows health care providers to provide continuity of care to individual patients. The medical record also serves as a basis for planning patient care, documenting communication between the health care provider and any other health professional contributing to the patient's care, assisting in protecting the legal interest of the patient and the health care providers responsible for the patient's care, and documenting the care and services provided to the patient. In addition, the medical record may serve as a document to educate medical students/resident physicians, to provide data for internal hospital auditing and quality assurance, and to provide data for medical research. Personal health records combine many of the above features with portability, thus allowing a patient to share medical records across providers and health care systems. [3].

Format

Traditionally, medicals records have been written on paper and kept in folders. These folders are typically divided into useful sections, with new information added to each section chronologically as the patient experiences new medical issues. Active records are usually housed at the clinical site, but older records (eg those of the deceased) are often kept in separate facilities.

The advent of electronic medical records has changed not only the format of medical records, but has increased accessibility of files.

Contents

Although the specific content of the medical record may vary depending upon specialty and location, it usually contains the patient's identification information; the patient's health history (what the patient tells the health care providers about his or her past and present health status); and the patient's medical examination findings (what the health care providers observe when the patient is examined). Other information may include lab test results; medications prescribed; referrals ordered to health care providers; educational materials provided; and what plans there are for further care, including patient instruction for self-care and return visits[4]. In some places, billing information is considered to be part of the medical record [5].

Demographics

Demographics include information regarding the patient which is not medical in nature. It is often information to locate the patient including identifying numbers, addresses, and contact numbers. It may contain information about race and religion as well as workplace and type of occupational information. It may also contain information regarding the patient's health insurance.

Medical history

The medical history is a longitudinal record of what has happened to the patient since birth. It chronicles diseases, major and minor illnesses as well as growth landmarks. It gives the clinician a feel for what has happened before to the patient. As a result, it may often give clues to current disease states. It includes several subsets detailed below.

- *Surgical history*

  The surgical history is a chronicle of surgery performed for the patient. It may have dates of operations, operative reports, and/or the detailed narrative of what the surgeon did.

- *Obstetric history*

  The obstetric history lists prior pregnancies and their outcomes. It also includes any complications of these pregnancies.

- *Medications and medical allergies*

  The medical record may contain a summary of the patient's current and previous medications as well as any medical allergies.

- *Family history*

  The family history lists the health status of immediate family members as well as their causes of death (if known). It may also list diseases common in the family or found only in one sex or the other. It may also include a pedigree chart. It is a valuable asset in predicting some outcomes for the patient.

- *Social history*

  The social history is a chronicle of human interactions. It tells of the relationships of the patient, his/her careers and trainings, schooling and religious training. It is helpful for the physician to know what sorts of community support the patient might expect during a major illness. It may explain the behavior of the patient in relation to illness or loss. It may also give clues as to the cause of an illness (ie occupational exposure to asbestos).

- *Habits*

  Various habits which impact health, such as tobacco use, alcohol intake, recreational drug use, exercise, and diet are chronicled, often as part of the social history. This section may also include more intimate details such as sexual habits and sexual preferences.

- *Immunization history*

  The history of vaccination is included. Any blood tests proving immunity will also be included in this section.

- *Growth chart and developmental history*

  For children and teenagers, charts documenting growth as it compares to other children of the same age is included so that health care providers can follow the child's growth over time. Many diseases and social stresses can affect growth and longitudinal charting can thus provide a clue to underlying illness. Additionally, a child's behavior (such as timing of talking, walking, etc) as it compares to other children of the same age is documented within the medical record for much the same reasons as growth.

Medical encounters

Within the medical record, individual medical encounters are marked by discrete summations of a patient's medical history by a physician, nurse practicioner, or physician assistant and can take several forms. Hospital admission documentation (ie when a patient requires hospitalization) or consultation by a specialist often take an exhaustive form, detailing the entirity of prior health and health care. Routine visits by a provider familiar to the patient, however, may take a shorter form such as the *problem-oriented medical record* (POMR), which includes a problem list of diagnoses or a "SOAP" method of documentation for each visit. Each encounter will generally contain the aspects below:

- *Chief complaint*

  This is the problem that has brought the patient to see the doctor. Information on the nature and duration of the problem will be explored.

- *History of the present illness*

  A detailed exploration of the symptoms that the patient is experiencing which have caused the patient to seek medical attention.

- *Physical examination*

  The physical examination is the recording of observations of the patient. This includes the vital signs and examination of the different organ systems, especially ones which might directly be responsible for the symptoms that the patient is experiencing.

- *Assessment and plan*

  The assessment is a written summation of what are the most likely causes of the patient's current set of symptoms. The plan documents the expected course of action to address the symptoms (diagnosis, treatment, etc.).

Orders

Written orders by medical providers are included in the medical record. These detail the instructions given to other members of the health care team by the primary providers.

Progress notes

When a patient is hospitalized, daily updates are entered into the medical record documenting clinical changes, new information, etc. These often take the form of a SOAP note and are entered by all members of the health care team (doctors, nurses, respiratory therapists, etc). They are kept in chronological order and document the sequence of events leading to the current state of health.

Test results

The results of testing, such as blood tests (eg complete blood count) radiology examinations (eg X-rays), pathology (eg biopsy results), or specialized testing (eg pulmonary function testing) are included. Often, as in the case of x-rays, a written report of the findings is included in lieu of the actual film.

Other information

Many other items are variably kept within the medical record. Digital images of the patient, flowsheets from operations/intensive care units, informed consent forms, EKG tracings, outputs from medical devices (such as pacemakers), chemotherapy protocols, and numerous other important pieces of information form part of the record depending on the patient and their set of illnesses/treatments.

Administrative issues

Medical records are legal documents and are subject to the laws of the country/state in which they are produced. As such, there is great variability in rule governing production, ownership, accessibility, and destruction.

Production

In the United States, written records must be marked with the date and time and scribed with indelible pens without use of corrective paper. Errors in the record should be struck with a single line and initialed by the author. Orders and notes must be signed by the author. Electronic versions require an electronic signature.

Ownership

In the United States, the data contained within the medical record belongs to the patient, whereas the physical form the data takes belongs to the entity responsible for maintaining the record. Therefore, patients have the right to ensure that the information contained in their record is accurate. Patients can petition their health care provider to remedy factually incorrect information in their records. In the United Kingdom, the NHS's medical records belong to the Department of Health.

Accessibility

In the United States, the most basic rules governing access to a medical record dictate that only the patient and the health care providers directly involved in delivering care have the right to view the record. The patient, however, may grant consent for any person or entity to evaluate the record. The full rules regarding access and security for medical records are set forth under HIPAA guidelines. The rules become more complicated in special situations.

- *Capacity*

  When a patient does not have capacity (is not legally able) to make decisions regarding their own care, a legal guardian is designated (either through next of kin or by action of a court of law if no kin exists). Legal guardians have the ability to access the medical record in order to make medical decisions on the patient's behalf. Those without capacity include the comatose, minors (unless emancipated) and patients with incapacitating psychiatric illness or intoxication.

- *Medical emergency*

  In the event of a medical emergency involving a non-communicative patient, consent to access medical records is assumed unless written documentation has been drafted previously (such as an advance directive)

- *Research, auditing, and evaluation*

  Individuals involved in medical research, financial or management audits, or program evaluation have access to the medical record. They are not allowed access to any identifying information, however.

- *Risk of death or harm*

  Information within the record can be shared with authorities without permission when failure to do so would result in death or harm, either to the patient or to others. Information cannot be used, however, to initiate or substantiate a charge unless the previous criteria are met (ie, information from illicit drug testing cannot be used to bring charges of possession against a patient). This rule was established in the United States Supreme Court case Jaffe v. Redmond[6].

In the United Kingdom, the Data Protection Acts and later the Freedom of Information Act 2000, gave patients or their representatives the right to a copy of their record, except where information breaches confidentiality (e.g. information from another family member or where a patient has asked for information not to be disclosed to third parties) or would be harmful to the patient's well-being (eg some psychiatric assessments). Also the legislation gives patients the right to check for any errors in their record and insist that amendments be made if required.

Destruction

In general, entities in possession of medical records are required to maintain those records for a given period of time. In the United Kingdom, medical records are required for the lifetime of a patent and legally for as long as the time that complaint action can be brought. Generally in the UK any recorded information should be kept legally for 7 years, but for medical records additional time must be allowed for any child to reach the age of responsibility (20 years). Medical records are required many years after a patient's death to investigate illnesses within a community (e.g. industrial or environmental disease or even of doctors committing murders, e.g. Harold Shipman). [7]

Abuses

- The outsourcing of medical record transcription and storage has the potential to violate patient-physician confidentiality by possibly allowing unaccountable persons access to patient data.
- Governments have often refused to disclose medical records of military personnel who have been used as experimental subjects.

See also

- Medical history
- Physical examination
- Electronic medical record
- Electronic Health Record
- Physician-patient privilege