



LESSON 1 – OVERVIEW OF ATC

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ATCPRO - AIR TRAFFIC CONTROL SYSTEM BASICS

Air traffic control (ATC) facilities in the U.S. are governed by the Federal Aviation Administration. Control Towers, TRACONS (Terminal Radar Approach Controls), and ARTCCs (Air Route Traffic Control Centers) are facilities that actively control aircraft in the National Airspace System (NAS).

Pilots of general aviation aircraft (a privately owned plane for example) may choose whether to fly in ATC controlled airspace or to limit their flights to that airspace that is not regulated. All commercial aircraft are required to be under ATC control throughout their flights in the United States.

Generally speaking in order for a pilot to fly in ATC controlled airspace he or she must file a flight plan. A flight plan gives the *who*, *what* and *where* of a proposed flight to any part of the ATC system. For example, a commercial aircraft flight plan would include the airline, the flight number, the departure and arrival time, the aircraft type and the route of flight, among other things. The route of flight may be made up of radio navigation beacon locations, airways, fixes, waypoints, published procedures, etc. A pilot flying a general aviation aircraft might not be required to file a flight plan if he was going a short distance, in weather with good visibility, and without flying in regulated airspace, however pilots are always encouraged to file a flight plan. Most military and corporate aircraft also file flight plans that require participation. Even most general aviation choose to fly under ATC control, to take advantage of the increased safety that controllers can provide. At our nation's largest airports, ALL aircraft must be under ATC control.

A TYPICAL FLIGHT

To provide an example of a typical airline operation, let's follow Southwest Airlines flight 232 (callsign SWA232) as it progresses through the ATC system on a flight from Albuquerque Sunport Airport (ABQ) in Albuquerque New Mexico, to Phoenix Sky Harbor Airport (PHX) in Phoenix Arizona.

SWA232 begins loading passengers and contacts the control tower on the clearance delivery frequency at ABQ to request clearance for the filed flight plan.

Note: To contact the controllers there are radio transceivers on the flight deck of the aircraft where the pilot can select numeric frequencies (such as 120.3). The pilot wears a headset and

presses a button on his control yoke to transmit to the “active” frequency to speak over the radio. He can listen to the voice of the controller also speaking over the radio frequency. In ATCpro you will press a keyboard button to “transmit” your commands to the simulated pilots.

ATC gives the pilots approval for the filed route. The pilot listens to a special advisory frequency on the radio called ATIS that provides basic information for the airport such as wind speed and direction, active runways, etc. or warnings such as bird activity. The broadcast recording is updated every hour and identified by a letter of the alphabet.

SWA232 closes the doors, pushes back from the gate and starts up the engines. When the aircraft is ready to taxi, SWA232 calls ground control on the ground frequency for taxi instructions. The ground controller in the tower issues instructions for SWA232 to taxi to the active runway, like driving directions in a car, of where to turn and which road to take or which aircraft to follow to get to the runway.

Note: Runways are usually selected based on wind direction, length of the runway that an aircraft will need to take off and land, and other factors like taxi time to and from the terminal. Aircraft should take off and land into a headwind (the direction the wind is coming from) to obtain the most lift benefit for the aircraft on departure, and to slow the plane down when landing.

The pilot will taxi to the assigned runway, then call the tower on the “local” control frequency. (This is a separate frequency being used by the controller who is responsible for issuing takeoff and landing clearance to all aircraft under tower control). Tower will clear SWA232 for takeoff. When SWA232 is airborne and about one mile past of the end of the runway, the tower will instruct the pilot to contact the radar departure controller on a new frequency.

Note: The radar facility for the airport may be co-located with the tower, or may be in a more centralized facility near the airport. At Albuquerque, the TRACON is located in a building below the control tower.

SWA232 will call departure control and a radar controller will begin providing radar service to the flight. The controller will direct the flight to the correct departure routing, give the command to climb to an initial altitude and ensure separation from aircraft entering the arrival pattern for landing at ABQ.

When SWA232 reaches a point approximately 35 miles west of ABQ, the flight will be “handed off” (control responsibility changed) to an enroute controller at the Albuquerque ARTCC.

This facility is located on the north side of the city and is a very large building housing several hundred control personnel. The “enroute center” provides air traffic control services for flights between airports. Dozens of radar scopes are active in the facility, and the radar coverage encompasses all of the airspace between ABQ and PHX airport, and more of the southwest.

Several controllers will provide service to SWA232 as the flight climbs to cruise altitude, follows a published departure procedure and transition route, and progresses towards Sky Harbor. From a typical cruising altitude of 36 thousand feet SWA232 will begin a descent when about 30 minutes away from the airport. The route of flight will include following a published Standard Terminal Arrival Route (STAR). When SWA232 is approximately 35 miles away from PHX, the center controller will hand off the flight to the PHX TRACON. The TRACON facility will direct SWA232 towards the landing runway, separate the arrival from any departures, give a descent to approach altitude while creating a sequence for landing.

The TRACON facility at PHX is larger than ABQ, employs more controllers, and handles many more arrivals and departures. SWA232 will talk to several arrival controllers as it makes an approach to the assigned active runway.

If the weather and visibility is good, it is likely that SWA232 will be cleared for a “visual” approach, that is, the pilot will keep the airport in sight while maneuvering, line up with the runway and land. If the weather is bad the pilot will be given an “instrument” approach such as an RNAV or ILS approach. The pilot will be given vectors (compass headings to fly) to get in position to be cleared for the approach. He will follow the published procedures that involve using the flight deck instruments and radio navigation aids for guidance to line up with the runway, follow the proper angle of descent or “glideslope” and land.

Aircraft equipped with modern guidance systems can actually make a full approach at a properly equipped airport, and fly all the way to touchdown on the runway while on autopilot (called “autoland”).

SWA232 will be handed off to the Tower local controller, be “cleared to land”, and touch down on the runway. After leaving the runway SWA232 will contact the ground controller for taxi instructions. Once SWA232 pulls up to the gate he will shut down the engines, turn off the seatbelt signs and his flight plan will be closed after completing a routine, safe, one hour flight across the southwest desert.

Similar operations take place throughout the NAS each and every day. Often the same airline flight number is scheduled to fly at the same time every day of the week. As you can imagine, a flight from the east coast to the west coast would talk to many controllers from departure to

arrival. There are 21 ARTCC facilities, and several hundred airports with control towers and /or radar facilities in the U.S. There are also several hundred general aviation airports that do not have control towers. Pilots talk to each other on a common frequency at these airports. On any given afternoon, it is estimated that there are approximately 5000 aircraft under air traffic control, and possibly that many more flying in unregulated airspace.

ATCpro is an accurate portrayal of the operations being conducted at TRACON facilities throughout the ATC system. Enjoy the challenge and thrill of becoming a TRACON radar controller!