21 ARTCC's in the United States. [Figure 2-5] Any aircraft operating under IFR within the confines of an ARTCC's airspace is controlled by air traffic controllers at the Center. This includes all sorts of different types of aircraft: privately owned single engine aircraft, commuter airlines, military jets, and commercial airlines.

The largest component of the NAS is the ARTCC. Each ARTCC covers thousands of square miles encompassing all or part of several states. ARTCCs are built to ensure safe and expeditious air travel. All Centers operate 7-days a week, 24-hours a day, and employ a combination of several hundred ATC specialists, electronic technicians, computer system specialists, environmental support specialists, and administrative staff. Figure 2-6 is an example of the Boston ARTCC. The green lines mark the boundaries of the Boston Center area, and the red lines mark the boundaries of Military Operations Areas (MOAs), Prohibited, Restricted, Alert, and Warning Areas.

Safe Separation Standards

The primary means of controlling aircraft is accomplished by using highly sophisticated computerized radar systems. In addition, the controller maintains two-way radio communication with aircraft in his or her sector. In this way, the specialist ensures that the aircraft are separated by the following criteria:

- · Laterally—5 miles
- Vertically—
- 1,000 feet (if the aircraft is below FL 290, or between FL 290 and FL 410 for RVSM compliant aircraft)
- 2,000 feet (if the aircraft is at FL 290 or above)

The controllers can accomplish this separation by issuing instructions to the pilots of the aircraft involved. Altitude assignments, speed adjustments, and radar vectors are examples of instructions that might be issued to aircraft.

En route control is handled by pinpointing aircraft positions through the use of flight progress strips. These strips are pieces of printed paper containing pertinent information extracted from the pilot's flight plan. These strips are printed 20 minutes prior to an aircraft reaching each Center's sector. A flight progress strip tells the controller everything needed to direct that aircraft. If the flight progress strips of each aircraft approaching a sector are arranged properly, it is possible to determine potential conflicts long before the aircraft are even visible on the Center controller's display. In areas where radar coverage is not available, this is the sole means of separating aircraft.

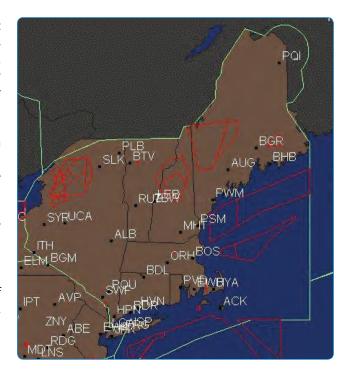


Figure 2-6. Boston Air Route Traffic Control Center.

The strips, one for each en route point from which the pilot reports his or her position, are posted on a slotted board in front of the air traffic controller. [Figure 2-7] At a glance, he or she is able to see certain vital data: the type of aircraft and who is flying it (airline, business, private, or military pilot), aircraft registration number or flight number, route, speed, altitude, airway designation, and the estimated time of arrival (ETA) at destination. As the pilot calls in the aircraft's position and time at a predetermined location, the strips are removed from their slots and filed. Any change from the original flight plan is noted on the strips as the flight continues. Thus, from a quick study of the flight progress board, a controller can assess the overall traffic situation and can avoid possible conflicts.



Figure 2-7. Flight progress strips.