

Victor 123, Robbinsville. Climb and maintain 5000 ft." This means that the airplane has separation protection only as far as the Robbinsville VOR fix north of Maguire Air Force Base. It cannot proceed further into the New York area until it receives an additional ATC Clearance. In ATC lingo the Robbinsville limitation is known as its Clearance Limit. The pilot reads the message back to the controller so that there can be no misunderstanding, then contacts the Tower and receives his takeoff clearance. Immediately after take off the tower instructs him to contact Departure Control (radar) on a specific frequency, which will steer him (vector him) to a point out of the terminal area, at which time the Departure controller will inform the pilot to "contact Washington Center" on a specific frequency. This is known as a radar "hand off." Washington Center would continue to vector the aircraft until it intersected the assigned airways at Churchill intersection, identified by radio navigation equipment in the aircraft. In a few minutes Washington Center would notify the pilot to contact New York Center on a specified frequency as he proceeds up the airways past Woodston, N.J., towards Robbinsville.

In the ATCC's teams of controllers sit around large horizontal radar screens resembling glowing card tables—the great tools of ATC. Crawling across the face of these screens are many glowing points of light known as "blips," each representing an airplane, showing its position and movement over the surface of the earth. Altitude reporting equipment is not yet in service. Under actual Instrument Flight conditions every *one* of these aircraft would necessarily have to be on an Instrument Flight Clearance, meaning that they all would have to be identified and their altitude communicated by radio to the Center controllers. Alongside each blip being controlled would be a small piece of plastic upon which would be written in grease pencil the aircraft number, altitude, and flight route. These would be continually moved by hands as the blip progresses across the face of the scope. These plastic tags are known as "shrimp boats." On a console next to the controllers is a stack of Flight Progress Slips containing more detailed information on the flight than can appear on the little shrimp boat. As the airplane approaches New York Center's area of responsibility, a New York controller, watching a similar radar screen, is notified by Washington Center on a direct line communication system that an aircraft is arriving which he must handle. The pilot is then told to "contact New York Center" on the frequency that the New York controller is using. The usual way of completing the hand off is for the pilot to transmit: "New York Center: This is November 1 2 3 4 Poppa maintaining 5,000." The center identifies the aircraft and merely replies "Radar contact."

In the meantime the New York terminal air traffic situation has eased so that before the aircraft reaches Robbinsville, where the pilot would expect to go into a holding pattern he receives an additional clearance: "November 1 2 3 4 Poppa cleared to La Guardia Airport. Expect ILS# approach." At Queensberg intersection (just west of Sandy Hook) he is told, "Contact La Guardia Approach Control now," on a designated frequency. At that time the pilot contacts Approach Control, is identified, and, when cleared to do so, initiates his instrument approach.

The Instrument Approach. Under the present state of the art, there is no such thing as a "blind" landing.¹⁶ Under conditions of reduced visibility and ceiling, instrument approaches are made on clearly and definitely prescribed regulations and criteria, the theory being that an airplane shall be delivered precisely by the system to a position approximately $\frac{1}{2}$ mile from the runway threshold, at which time the pilot must be able to see the ground and to complete the landing visually. The type of approved instrument approach and the ground based equipment assigned with it may change the landing minima criteria. The final stages of an instrument approach and landing are made with reference to a special terminal chart, called an Approach Plate, which contains all the information needed for the specific type of approach to be made. Some approved instrument approaches are based on low frequency non-directional radio beacons, the position of which can be ascertained by an automatic direction finder (ADF). Other approaches are based on a combination of ADF in conjunction with a radar assist and are popularly known as Ground Controlled Approaches (GCA). This is the type of approach historically used by the military. There are VOR approaches emanating from a nearby VOR facility, localizer approaches which are

¹⁶ The British are using automated approaches under conditions of no visibility and no ceiling ("zero zero"). However, zero zero landings have not been approved by the FAA for either air carriers or general aviation.