and, if the forecast of aircraft utilization is anywhere near accurate, will soon be in a saturated condition. The most critical areas of the enroute functions now appear to be in the hand-off from one facility to another. Although many others will disagree, we do not believe that the addition of the alpha numerics and altitude reporting beacon can provide as much relief as is necessary by the time it is implemented. These systems to give a perhaps overly simplified explanation of the reasons for this belief, produce on the controller's radar scope light, small block numbers and signals which identify the aircraft radar target. At the root of the problem is the fact that radar scopes are actually cathode ray tubes very similar to your television screens with the aircraft target being a source of light as is the alpha numerics grouping. In high-density areas, these sources of light tend to conflict with one another and may, in fact, obliterate necessary intelligence.

There is little doubt that in the future the demand for air service by the citizens of the country will, in and of itself, create pressure for some reduction in separation between aircraft being flown under instrument flight rules. In fact, such pressures have already been created but the air line pilots have successfully resisted efforts by some segments of the industry to reduce separation until adequate safety devices are available. One example of this was the effort to reduce lateral separation over the North Atlantic last year. Another example is the current effort to reduce separation between aircraft approaching parallel runways during low visibility conditions in the same airport. The speed of today's aircraft, to say nothing of the future supersonics, is such that it just isn't possible to make significant reductions in IFR radar separation and still be able to avoid collisions should something untoward occur. This is due to the physical aspects of the current radar program under which a controller on the ground must first observe some deviation, then evaluate it and transmit information to the pilot of the aircraft who in turn must evaluate it and take appropriate action. When we are operating airplanes a mile or so apart at 150 knots, there simply is not time for two independent minds to assimilate information and take appropriate action. The Air Line Pilots Association has, therefore, concluded that we must have an electronic or other automatic device which is able to perform the function of extending the pilot's normal vision to a point where an aircraft on a potential collision course can be noted in time to execute an avoiding maneuver. The device must provide warning sufficiently in advance to avoid injuring passengers through abrupt maneuvers or entering the vortices wake of the other aircraft.

In addition to the preceding, the Association has long recommended increasing the safety and efficiency of air traffic control by more installations and commissioning of facilities such as: (a) ILS's, (b) control zones, (c) control towers, (d) other approach facilities.

The foregoing are broad areas each of which could be gone into in considerable detail. No research is required to gain the safety provided by the preceding items, but additional funds are vitally needed to expedite action for installing them.

We do not feel that we can stress too strongly that with the increased use of the common airspace by transport and military aircraft, as well as all types of general aviation aircraft, it is clear that air traffic control problems and the collision threat are on the increase.

Again, funding to make immediate use of all *known* ways and means to improve air traffic control will help, but funding for research and development is also required to complete the job of providing safe air traffic control.

The foregoing draws only a broad general picture of the over-all air traffic control problem. We have not attempted to set forth specifically detailed solutions to all aspects of it for the simple reason that no one knows all of the answers necessary to provide the solutions. Advancements must come necessarily through evolutionary rather than revolutionary processes.

COLLISION AVOIDANCE

The industry has spent considerable time, money and effort to try to develop a collision avoidance system. It appears that such a system can bear fruit in the foreseeable future (approximately three to five years) for those who fly and can afford equipment costs that are estimated to range from $30,000 to $50,000 per aircraft. Obviously, such a system is beyond the reach of the general aviation segment of the industry with the possible exception of some corporate users of the airspace. Much more development is required—first, to prove the system and second, to develop a system that will meet the economic level for general aviation. It may be possible, once a collision avoidance system is developed and proved satisfactory to wire all aircraft to utilize the system and then rent the