

"black boxes" to general aviation at so much per flight hour on an "as needed" basis.

It goes without saying that a collision avoidance system must be available and in use for all aircraft if we are to really accomplish the ultimate in air safety. Such a system though must be considered as supplementary to an efficient and competent air traffic control system and not a replacement for it.

TRANSPORT AIRCRAFT CREW REQUIREMENT

The Air Line Pilots Association at its November, 1966 Board of Directors Meeting adopted a resolution which in the main stipulated that a minimum of three flight crew members are needed for flying twin-engine jet airline aircraft in order to assure safe operation. One of the greatest areas of safety concern is the workload *within* the flight compartment distracting the pilot and preventing him from scanning the skies through the windshield to minimize the possibility of mid-air collision.

In its evaluation of flight crew workload the Association has pointed out that the new twin-engine jet airplanes have essentially the same number of flight controls, instruments, systems, switches, etc. as the three and four-engine jets which have a minimum crew of three pilots. Furthermore, these twin-engine jets have approximately the same cruising speed and maneuvering speed. Believing the Committee will benefit from ALPA research which resulted in the Board of Directors' resolution on the minimum flight crew complement, a copy is submitted as attachment B for ready reference.

Another concern relating to flying twin-engine jets with only two pilots is incapacitation of a pilot due to a number of known causes not necessarily either fatal or of long duration, none of which can be forecast by the medical profession. In the event of incapacitation of one of the two pilots on a twin-engine jet, the remaining pilot *may not* be able to safely operate the aircraft, particularly when pilot incapacitation may occur *undetected* close to the ground during a take-off or landing. How to prevent a human being from becoming suddenly incapacitated is something which is not known and which is not likely to ever be. Proper crew complement requirements, flight compartment design and operational procedures, can in combination minimize or eliminate this hazard.

Flying as a mode of public transportation which operates in the third dimension and at high speed requires "fail safe" human and mechanical redundancy to provide for an acceptable level of public safety, both in the air and while the airplane is in motion on the ground.

On June 29, 1967, and August 8, 1967, the Association made a presentation to the Federal Aviation Administration on this subject. This presentation, in book form, is supplied and considered a part of this statement. We think you will find this to be of more than passing interest.

(The publication referred to, "The Need for a Three Man Crew on Jet Transports," has been placed in committee file.)

COMMUNICATIONS FACILITIES AND EQUIPMENT

With the rapid expansion in flying, voice communications have overloaded the available frequencies to the point where it is practically impossible to assure timely communications requirements being accomplished between the pilot and the air traffic controller. The foregoing, it should be pointed out, is not true in low density operational areas but is a glaring fact in high density areas. It is essential that considerable research and development be instituted immediately to provide other means of displaying information, both in the cockpit and on the ground, which will reduce demands for voice communications and operational control can be maintained on a safe level by direct reading information air-to-ground as well as ground-to-air. This would leave the voice communications channels open for the operational areas that require clearance modifications or changes associated with traffic conflicts, changes in altitudes, weather detouring and for those occasions when radar vectoring may become a necessity. As I pointed out in respect to some of the previous subjects, the foregoing does not represent the entire scope of the subject but does point out some examples.