

3. RECOMMENDATIONS AND CORRECTIVE MEASURES

On January 17, 1969, the Chairman of the Safety Board sent a letter to the Administrator of the FAA dealing with aircraft accidents which occur during the approach and landing phase of flight. It was therein noted that this type of accident continued to be among the most numerous, as highlighted by some of the events of the month preceding the date of the letter. After discussing the numerous and varied factors which might be involved in landing and approach accidents, the letter went on to state:

"In this light, and with the number and frequency of approach and landing accidents under similar weather and operating environments, we believe that certain immediate accident prevention measures need to be taken. We believe that preliminary to the successful completion of our investigations into the factors and causes of the recent rash of accidents, renewed attention to, and emphasis on recognized good practices will tend to reduce the possibility of future accidents."

The Safety Board's letter thereafter listed a number of specific recommendations. On February 6, 1969, the Administrator responded to these recommendations. Each Safety Board recommendation is set forth below, followed by the FAA response.

1. NTSB Pilots, operators and regulatory agencies should renew emphasis on, and improve wherever possible, cockpit procedures, crew discipline and flight management.

FAA Expressed concern and has initiated followup action directed to the areas of adherence to established procedures, altitude awareness, winter operating procedures, and cockpit discipline and vigilance.

2. NTSB Both the air carrier industry and the FAA should review policies, procedures, practices, and training toward increasing crew efficiency and reducing distractions and nonessential crew functions during the approach and landing phase of a flight.

FAA Inspectors have been instructed to review cockpit checklist and procedures on a continuing basis to assure that minimum checking will be done during the more critical periods of flight such as departures, approaches, and landings.

3. NTSB Crew functions not directly related to the approach and landing should be reduced or eliminated, especially during the last 1,000 feet of descent.

FAA Although it is believed the airlines require all cockpit check procedures, particularly the in-range checklist, to be completed well before the final 1,000 feet of descent, inspectors will be requested to doublecheck and take action where warranted.

4. NTSB During the final approach, one pilot should maintain continuous vigilance of flight instruments inside the cockpit until positive visual reference is established.

FAA Inspectors have been instructed to assure that cockpit check procedures are arranged so that the pilot flying devotes full attention to flight instruments. 16/

5. NTSB During approaches where less than full precision facilities exist, there should be a requirement that during the last 1,000 feet of final approach, the pilot not flying call out altitude in 100-foot increments above airport elevation.

FAA Instructions have been issued to inspectors to assure airlines emphasize in training and include in training manuals altitude awareness procedures to be used during climbs, descents, and instrument approaches. The FAA-recommended procedures require callouts at 500 feet above field elevations, 100 feet above minimums, and minimums. Such a procedure keeps cockpit conversation at a minimum and reduces pilot workload, while at the same time assuring pilot altitude awareness.

6. NTSB There should be a requirement to report indicated altitudes to Air Traffic Control at various points in the approach procedure, such as the outbound procedure turn and at the outer marker position.

FAA Such a requirement would significantly increase frequency congestion and increase crew and controller workload. Efforts in the areas of pilot training and education will prove to be the most beneficial course of action.

16/ Crew vigilance and cockpit discipline was one of the areas stressed in a telegram sent by the FAA Administrator to all airline presidents on December 30, 1968, expressing concern with the rash of accidents.

7. NTSB The aviation community should consider expediting development and installation of audible and visible altitude warning devices and the implementation of procedures for their use.

FAA A rule became effective on September 28, 1968, which will require by February 28, 1971, both visual and aural altitude alerting signals to warn pilots of jet aircraft when approaching selected altitudes during climbs, descents, and instrument approaches.

8. NTSB Altimetry systems should be reassessed with particular regard to their susceptibility to insidious interference by forms of precipitation.

FAA FAA plans to participate with NASA and the aviation industry in an assessment of possible failure modes of altimeter static systems. At this time, FAA is unaware of any practical replacement for the barometric altimeter.

9. NTSB The possibility of development of additional altitude warning systems, external to the aircraft, should be explored. One possibility is a high-intensity visual warning red light beam, projected up along and slightly below the desired approach glide slope, to warn of flight below the desired path.

FAA The suggested device would not provide complete information concerning the optimum glidepath as does the Visual Approach Slope Indicator (VASI) systems, which are or will be installed at many runways throughout the country.

10. NTSB Development is needed in the fields of radio/radar, and inertial altimetry and CRT/microwave pictorial display approach aids as possible improved replacements for the barometric altimetry system in the near future.

FAA The use of inertial altimetry must be considered as a long-range research and development program. CRT/microwave pictorial display has been evaluated by the military, and the FAA will look into this matter further when it gets additional information.

11. NTSB Modified use of existing approach radar should be further studied with regard to its adaptability as a surveillance (accident prevention) tool for nonprecision instrument approaches (e.g., to monitor automatically and warn against the descent below desired glidepath of any aircraft in the final descent mode).

- FAA A more effective and less expensive alternative to the use of radar as a monitor for nonprecision approaches is the installation of Instrument Landing Systems. 17/
12. NTSB There should be increased surveillance and more frequent and more rigorous inspection and maintenance of altimetry systems by both the air carriers and the FAA.
- FAA FAA has met with the Air Transport Association (ATA) to review and discuss altimetry problems. Although few altimetry troubles are being experienced by flightcrews, ATA has agreed to further explore this area.
13. NTSB Certification requirements and procedures should be re-examined to determine if there is a possibility of a single failure mode of nominally dual systems which, when combined with an already existent passive failure or inadequate cockpit procedures, can invalidate dual failure protection features.
- FAA A Notice of Proposed Rule Making was issued on August 16, 1968, proposing to require in systems design means to assure continued safe operation following any single failure or combination of failures not shown to be extremely improbable. Industry comments are now being reviewed and analyzed. 18/

The FAA has also reported that an Instrument Landing System (ILS) was installed at the Bradford Regional Airport in the fall of 1969. Bradford Airport met the criteria necessary to qualify for the installation of such a system for several years prior to its installation. However, budgetary restrictions have limited the rate at which ILS's can be installed even at those airports which qualify therefor.

ILS is a precision instrument approach and landing system which allows aircraft to operate into airports under weather conditions which are more adverse than the minimums established for nonprecision approaches. In other words, since the ILS provides a greater degree of precision, a lower obstruction clearance and visibility are approved than those associated with nonprecision approaches, such as a VOR.

17/ The Safety Board's recommendation on this matter, and the Administrator's response thereto, are more fully set forth in letters dated June 19, 1969, (NTSB) and July 28, 1969, (FAA).

18/ Copies of the letters summarized above are contained in the Public Docket of Recommendations, which is maintained in the Safety Board's office in Washington, D. C.

It can thus be seen that one of the intents of requiring different sets of minimums for precision and nonprecision approaches is to afford equivalent levels of safety. Accordingly, it might be said that the installation of an ILS is not a "corrective measure" in terms of safety. Nevertheless, the Board believes that a precision approach system such as an ILS provides a significant addition to safety by affording the pilots of an aircraft making an approach not only vertical guidance, but also a valuable and reliable cross-check of the aircraft altimetry down to an altitude close to the ground. Accordingly, the Board urges that the FAA expedite, to the extent possible within the limits of available resources, the installation of ILS at qualified fields currently equipped only with nonprecision approaches.

As noted in the Analysis section, it is our understanding that approach light systems are usually installed only in conjunction with an ILS. We believe, however, that approach light systems provides a significant safety feature, even apart from an ILS, by increasing the conspicuity of the runway environment during low visibility conditions. We are also informed that new approach light systems are becoming available, including systems 1,500 feet in length, which might be appropriate for use without an ILS. In view of the foregoing, the Board recommends that the FAA consider, again within the limits of the available resources and equipment, the installation of approach lights to improve the safety of non-precision instrument approaches at those airports where the installation of a full ILS is not feasible.

Finally, with respect to landing and approach accidents in general, the Board wishes to reiterate its concern with the problem and to re-emphasize our interest in the progress of the various remedial measures that are currently underway. To this end, the Board held a series of meetings with other segments of the aviation community in the early part of 1969 in which particular attention was devoted to the subject of altimetry. Measures initiated by these meetings included the collection and assimilation of statistical information necessary to provide a sound basis for corrective action. We will continue to work in close cooperation with these groups in order to explore to the fullest extent all appropriate steps which might prove useful in reducing the rate of this type of accident.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/	<u>JOHN H. REED</u>	Chairman
/s/	<u>OSCAR M. LAUREL</u>	Member
/s/	<u>FRANCIS H. McADAMS</u>	Member
/s/	<u>LOUIS M. THAYER</u>	Member
/s/	<u>Isabel A. Burgess</u>	Member

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