NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:
Honorable John L. McLucas
Administrator
Federal Aviation Administration
Washington, D. C. 205941

SAFETY RECOMMENDATION(S)

A-76-29 and 30

The National Transportation Safety Board recently reviewed several fatal general aviation accidents which occurred in instrument flight rules (IFR) conditions during the period 1969 to 1973. These accidents involved instrument-rated pilots of small airplanes. In these accidents, the vacuum systems or flight instruments were determined to be either a cause or a factor. Moreover, the same elements or circumstances might also have been causally related to other accidents as well, but extensive physical destruction necessarily precluded such a determination.

As a result of its review, the Safety Board found the following IFR-related areas which warrant remedial action by the FAA: (1) The IFR instrument and equipment requirements of 14 CFR 91.33, (2) inadequate instrument crosschecks and untimely detection of instrument and equipment malfunctions, and (3) operations with deficient flight instruments.

The IFR Instrument Requirements of 14 CFR 91.33

The instruments required by 14 CFR 91.33, for IFR flight include: A gyroscopic rate-of-turn indicator, a gyroscopic bank and pitch indicator (artificial horizon), and a gyroscopic direction indicator (directional gyro). On some older airplanes, these instruments are powered by a single vacuum source. Consequently, certain system malfunctions could render the three instruments inoperative simultaneously--a situation which in actual IFR conditions would be catastrophic.

The fatal accident at Fairview, North Carolina, on May 16, 1969, involving a Piper PA-28 was caused by these circumstances. The instrument-rated pilot reported failure of the vacuum system and subsequently lost control of the airplane since no separately powered turn and bank instrument was installed. The four persons aboard perished.

A review of FAA's computerized, general aviation service difficulty reports for 1972 to 1974 disclosed significant numbers of vacuum system or pump malfunctions, particularly as a result of broken or sheared vacuum pump drive shafts or couplings.

Most newer general aviation airplanes now have a source of energy for the rate-of-turn indicator separate from that used to power the bank and pitch indicator, e.g., vacuum-operated attitude indicators and directional gyros, and electrically operated turn indicators or turn coordinators. Nonetheless, many older, vacuum-operated turn indicators exist which may replace original equipment in older aircraft, or may be substituted for an electrical-turn instrument in newer airplanes. Therefore, in order to assure that pilots flying in IFR conditions will always have an alternate emergency means of orientation, that portion of 14 CFR 91.33 applicable to instrument flight rules should require a source of energy for the rate-of-turn indicator separate from that used to power the pitch indicator. Since many airplanes are already so equipped, the costs relating to such a regulation would be minimal.

Inadequate Instrument Crosschecks and Untimely Detection of Instrument and Equipment Malfunctions

Pilots must be able to detect promptly instrument and equipment malfunctions. A successful transition from routine IFR flight to an emergency situation using only a partial instrument panel is compromised if the failure or malfunction is not recognized quickly.

The Safety Board's investigation of an accident which occurred at Musella, Georgia, on October 19, 1970, involving a Beech J 35 disclosed that both the artificial horizon and the directional gyro had malfunctioned for an undetermined reason. Although the rate-of-turn indicator operated satisfactorily, both persons aboard the airplane were killed as a result of an uncontrolled collision with the ground.

If a pilot relies too heavily on the pitch indicator, he may not crosscheck his other instruments as frequently or as efficiently as he should. Pilots, therefore, should be reminded of the importance of maintaining a high degree of proficiency in instrument crosschecks and partial panel emergency operations.

Operations with Deficient Flight Instruments

A determination of the operational status of gyroscopic instruments is obviously a prime safety consideration in preparing for IFR flight and, as 14 CFR 91.33 infers, pilots, themselves, are responsible for routinely assuring the operability of instruments required under this regulation. Pilots, therefore, should be given methods and guidelines for doing so based on those contained in FAA Advisory Circular 91-26, "Maintenance and Handling of Air-Driven Gyroscopic Instruments."

The Safety Board found a number of other fatal accidents in which deficient flight instruments were found. These included the accident at Valdosta, Georgia, on December 9, 1969, involving a Cessna 210G., the accident near Gorman, California, on November 30, 1973, involving a Beech 23; and the accident at Millboro, Virginia, on December 11, 1973, involving a Piper PA-23.

Since instrument crosschecks and partial panel emergency operation are related critically to instrument operability, the Safety Board believes that a single, comprehensive Advisory Circular should be issued containing an integrated discussion of these areas. Such guidelines should emphasize the intent of 14 CFR 91.33 regarding the adequacy of required instruments and provide appropriate criteria for assuring compliance with this regulation.

The Safety Board recognizes that information relating to fundamental instrument skills is included in Advisory Circular 61-27B, Instrument Flying Handbook. However, the Board believes that this document cannot serve as a substitute in fulfilling the continuing requirement to disseminate timely, pertinent safety messages. In addition, since AC 61-27B contains 227 pages, information relating to the above problems is obscured. A shorter AC is more desirable since the safety message could be more easily perceived and could be related to current operational or accident experience.

Accordingly, the National Transportation Safety Board recommends that the Federal Aviation Administration:

1. Amend that portion of 14 CFR 91.33 applicable to instrument flight rules to require a source of energy for the rate-of-turn indicator separate from that used to power the bank and pitch indicator. (Class III --Longer-Term Followup)

2. Issue an Advisory Circular to inform pilots of (1) procedures they should use to determine the operability of gyroscopic instruments, (2) the importance of instrument crosschecks during IFR flight, and (3) the importance of staying proficient in partial-panel emergency operation. (Class III--Longer-Term Followup)

Personnel from our Bureau of Aviation Safety will be made available in the event that any further information or assistance is required.

TODD, Chairman, McADAMS, THAYER, BURGESS, and HALEY, Members, concurred in the above recommendations.

By: Webster B. Todd, Jr.
Chairman

THESE RECOMMENDATIONS WILL BE RELEASED TO THE PUBLIC ON THE ISSUE DATE SHOWN ABOVE. NO PUBLIC DISSEMINATION OF THE CONTENTS OF THIS DOCUMENT SHOULD BE MADE PRIOR TO THAT DATE.