12/5/90

Log # 2209

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: December 19, 1990
In reply refer to: A-90-181 and A-90-182

Honorable James B. Busey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On December 1, 1989, a Construcciones Aeronauticas, S. A. (CASA) C-212 operated by the U.S. Army crashed while on approach to Patuxent River Naval Air Station, Maryland. The five crewmembers were fatally injured. The U.S. Army Safety Center investigation of the accident is continuing. Preliminary indications by the Army Safety Center team are that the airplane's propellers may have been placed in the beta mode before impact.

The Safety Board has investigated two similar fatal accidents involving the CASA C-212:

> On March 4, 1987, a Northwest Airlink flight crashed at the Detroit-Wayne County Airport in Romulus, Michigan. Of the 19 persons on board, 9 were killed. The Safety Board determined that the probable cause of the accident was "the captain's inability to control the airplane in an attempt to recover from an asymmetric power condition at low speed following his intentional use of the beta mode of propeller operation to descend and slow the airplane rapidly on final approach for landing."
>
> On May 8, 1987, a American Eagle flight crashed short of the runway while on a visual approach to the airport at Mayaguez, Puerto Rico. Two crewmembers were fatally injured. The Safety Board determined that the probable cause of the accident was "improper maintenance in setting the propeller flight idle blade angle and engine fuel flow resulting in the pilot's loss of control from an asymmetric power condition."

The Safety Board is also aware of accidents that may have involved in-flight loss of control of the CASA C-212 in Reykjavik, Iceland, Caracas, Venezuela, and Costa Rica. The probable causes of these accidents have not been determined, and the accident reports are not yet available.

In the CASA C-212, the pilot controls the propeller with power levers and the engine speed with rpm levers. With the power levers set at or above the flight idle gate, the propeller governor regulates the blade angles as a function of airspeed and load on the engine to maintain a desired constant engine rpm. With the power levers set in the beta range--below the flight idle gates--the pilot has direct control over the pitch of the propeller because the propeller governor is mechanically locked out of the propeller pitch control system in this configuration. Beta and propeller reverse operation is approved only for ground operation, for decelerating after landing and for taxiing.

During the investigations of the accidents in Michigan and Puerto Rico, the Safety Board examined the function of the power levers and the beta lockout mechanisms incorporated into those levers. In the Michigan accident, the Safety Board found that the captain intentionally placed the power levers in the beta mode to slow the airplane rapidly while on final approach and to make a short field landing. The Board found that the design of the beta lockout mechanisms on the power levers permitted use of the beta mode in flight. The CASA-approved flight manual contains the warning "Power lever must not be retarded aft of F.I. [flight idle] when in flight. Excessive drag may result." In the Puerto Rico accident, the Safety Board ruled out the intentional or inadvertent use of beta in flight. Interviews with CASA C-212 crews indicated that in-flight beta operation was possible but its planned or inadvertent use was rare.

As a result of the FAA's participation in the investigation of t. Patuxent River Naval Air Station accident, the FAA issued AD 90-04-11, effective on February 26, 1990, requiring the following revision to CASA C-212 FAA-approved airplane flight manuals: "Do not retard the power lever of an operating engine aft of FLIGHT IDLE while airborne. WARNING: An immediate out-of-control situation may develop from which recovery cannot be accomplished."

The Board endorses the AD. The Board also endorses the FAA's NPRM 4910-13, (docket No. 90-NM-17-AD) that proposes modification of the CASA C-212 to prevent movement of the power levers into pitch settings below flight idle while in flight.

As a result of its investigations of the accidents in Michigan and Puerto Rico, the Safety Board recommended that the FAA require a positive means to prevent inadvertent operation of the propellers at blade pitch settings below the flight regime (A-88-105). The FAA responded that a study was in progress to review the items noted by the Safety Board. The status of the recommendation is currently classified "Open-Acceptable Action."

The design of the beta lockout mechanism on the CASA C-212 power levers is not unlike that found on other turbopropeller airplanes. Federal regulation governing the design criteria, 14 CFR 25.1155, states:

> Each control for reverse thrust and for propeller pitch settings below the flight regime must have means to prevent its inadvertent operation. The means must have a positive lock or stop at the flight idle position and must require a separate and distinct operation by the crew to displace the control from the flight regime.

However, Safety Board investigators have observed that in the CASA C-212, movement of the power levers below the flight idle stop and into the beta range was possible in some cases without lifting or touching the beta lockout mechanisms. The Safety Board is concerned that current Federal regulations and previously approved airplane certifications have not provided adequate protection against unapproved inadvertent or intentional operation of the beta mode while the airplane is in flight. If in-flight use of the beta mode is not to be permitted, then a more positive means of "locking out" beta mode use must be required on all turbopropeller airplanes.

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

> Issue an Airworthiness Directive applicable to the CASA C-212, to require the design and installation of a system that provides a positive means of preventing the power levers from being placed below the flight idle position while the airplane is airborne. (Class II, Priority Action)(A-90-181)

> Conduct a directed safety investigation of all Garrett TPE-331 engine powered turbopropeller airplanes. This investigation should evaluate the potential for in-flight use of the beta mode, and the effects of incorrectly adjusting the blade pitch angle of the propeller during maintenance activities and, following the directed safety investigation, take appropriate action to preclude in-flight beta operation on airplanes not approved for such operation.(Class II, Priority Action)(A-90-182)

The National Transportation Safety Board also reiterates the following recommendation issued to the Federal Aviation Administration in 1988:

> **A-88-105**
>
> Amend Title 14 Code of Federal Regulations 25.1155 and 23.1155 to provide for a positive means to prevent inadvertent operation of the propellers at blade pitch settings below the flight regime in those airplanes where such operation of the propellers is prohibited.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and LAUBER, BURNETT, and HART, Members, concurred in these recommendations.

By: James L. Kolstad
Chairman