

7. All hydraulic pumps were turned off in accordance with the existing emergency procedures for hydraulic fluid loss.
8. There was no failure of the auxiliary hydraulic systems providing power to the rudder.
9. Power was not restored on the No. 4 engine.
10. The aircraft was not accelerated to the 180-knot, three-engine minimum control airspeed upon discovery of the hydraulic fluid loss. 8//
11. A high degree of sideslip was generated by the loss of rudder power and the continued use of asymmetrical takeoff thrust.
12. The high sideslip angle resulted in loss of lateral control, causing a rapid roll and loss of altitude.
13. The use of the Boeing revised procedure, specifying that only the hydraulic system displaying a low-pressure warning light was to be turned off, in all likelihood would have prevented this accident.

b. Probable Cause

The Board determines that the probable cause of this accident was a loss of directional control, which resulted from the intentional shutdown of the pumps supplying hydraulic pressure to the rudder without a concurrent restoration of power on the No. 4 engine. A contributing factor was the inadequacy of the hydraulic fluid loss emergency procedure when applied against the operating configuration of the aircraft.

3. RECOMMENDATIONS AND CORRECTIVE MEASURES

a. Initial Accident Prevention Measures

- (1) On July 29, 1969, the Federal Aviation Administration,

8// Attaining the 180-knot airspeed, per se, would not have been sufficient to maintain directional control. (See Appendix G.) However, it may have resulted in a less rapid and less severe loss of directional control and a longer period of time for the crewmembers to assess the true nature of the problem and either restore symmetrical power, or return the auxiliary hydraulic systems to service.

after discussions with the National Transportation Safety Board, issued General Notice N8430.107 to all FAA Regional Offices, Air Carrier District Offices, Flight Standards District Offices, and International Field Offices. This notice required FAA Principal Operations Inspectors to assure that all air carriers were aware of the problems incident to concurrent engine-out flight and hydraulic system failure. Attention was called specifically to the requirement to restore engine power prior to troubleshooting the hydraulic system in simulated engine failure situation. (See Appendix G.)

(2) Upon confirmation by the Safety Board that a metal fatigue failure was found in one of the outboard spoiler actuator downlines, the FAA issued General Notice N8340.57 to the above-listed offices. This notice suggested a voluntary, one-time inspection of the spoiler actuating systems on B-707 aircraft. This inspection was to be conducted by the users of Boeing 707 equipment. (See Appendix G.)

(3) The Board, by letter dated August 1, 1969, recommended that the FAA also take the following actions:

(a) A detailed review should be made of the emergency procedures of all operators of Boeing 707 series and like aircraft to clarify troubleshooting of hydraulic system malfunctions with respect to the operation of the hydraulic pump control switches;

(b) The rudder pump low-pressure light circuitry should be modified to remain on any time the rudder pump pressure is lost, regardless of the rudder hydraulic pump switch position.

b. Followup Recommendations and Corrective Measures

(1) As previously noted in Section 1.16(b) of this report, the rudder control system of the Boeing 707-331C aircraft will not automatically revert from hydraulic power mode to manual mode in the event of shutdown or failure of the auxiliary systems pumps. This situation was disclosed by the Safety Board's investigation of this accident, and was a condition previously unknown to most pilots and operators of these aircraft.

Although not a causal factor in this instance, a lack of understanding of this feature and the specific actions necessary to achieve manual reversion could result in a loss of directional control even at the appropriate three-engine minimum control speed.

Accordingly, in the interest of immediate accident prevention measures, the Board discussed this peculiarity of the rudder operation with the FAA, and suggested that the air carrier training programs and emergency operating procedures be revised to alert the pilots to the need for specific actions if engine failure were to be followed by the auxiliary hydraulic system failure. On January 8, 1970, General Notice N8430.115 was issued to all FAA Regional Offices, Air Carrier District Offices, and International Field Offices. This notice required FAA Principal Inspectors to assure that information on powered rudder characteristics be included in air carrier training programs, and that these characteristics be considered in establishing operating procedures related to asymmetrical thrust or directional control problems in particular aircraft. (See Appendix G.)

(2) By letter to the Administrator of the FAA dated December 18, 1969, the Safety Board made the following additional recommendations:

1. All maneuvers requiring simulated engine(s)-out operation of aircraft close to the ground should be conducted in and, to the maximum extent possible, limited to flight simulator training devices.
2. The Administrator should establish a minimum altitude above the terrain for those simulated engine(s)-out maneuvers which must be performed in flight.
3. Equally qualified crewmembers not directly involved in the training operation should be prohibited from the flight deck area on all proficiency flight checks.

The Administrator's response to these recommendations is contained in Appendix H.

By the National Transportation Safety Board:

//s// JOHN H. REED  
Chairman

//s// OSCAR M. LAUREL  
Member

//s// FRANCIS H. McADAMS  
Member

//s// LOUIS M. THAYER  
Member

//s// ISABEL A. BURGESS  
Member

March 25, 1970.