(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the continued operation of the left engine at climb power after an unwanted in-flight deployment of the left engine thrust reverser, which resulted in a deterioration of aircraft performance.

3. RECOMMENDATIONS AND CORRECTIVE ACTION

(a) Corrective Actions

Soon after the accident, the Federal Aviation Administration (FAA) issued a telegraphic Airworthiness Directive (AD) to all owners of North American Rockwell Model NA-265-40, - 60, and -70 airplanes. The AD required the thrust reversers to be stowed and locked in the forward thrust position. The telegram stated that this was an interim measure and that final disposition of the restriction would depend on the results of tests and investigations then in process.

Rockwell International issued a "Sabre Gram" dated May 2, 1973, to all Sabreliner operators bringing to their attention the results of the flight tests in relation to the controllability of the aircraft with unwanted thrust reverser deployment in flight. The Sabre Gram stated, in part:

> "The flight test evaluation . . . has been completed using a Series 60 Sabreliner in Type Design configuration except for rewiring to permit thrust reverser deployment with gear up for the tests. This airplane was chosen as representative of all three models. Test /sic/ were flown in a representative series of conditions: gear extended, gear retracted, wing flaps up, and wing flaps fully extended. Test speeds covered the range of 110 to 200 knots, with test points at 20 knot intervals between 140 and 200 knots. Tests were conducted in the altitude range of 10,000 to 6,000 feet. The tests resulted in Sabreliner Flight Test Pilot, Russ Scott, terming controllability EXCELLENT at any speed from 140 knots upward. A selected heading could be held, or could be trimmed hands off, and 30° bank turns into and away from the reverse thrust engine could be made at will, with ample control movement in reserve. Below 140 knots, control requirements progressively increase, full rudder deflection being required to hold a heading at 110 knots."

The FAA issued AD 73-12-9, Amendment 39-1664, which became effective June 16, 1973. This AD required accomplishment of one of three alternatives prior to further flight of Model NA-265 thrust reverser equipped airplanes:

1. The aircraft can be operated if the reversers are stowed and locked as required by the telegraphic AD.

2. The aircraft can be operated if:

   (a) Revisions dated May 16, 1973, are incorporated in the NA-265 series Sabreliner Airplane Flight Manuals approved by the FAA. These revisions require: a visual inspection of each thrust reverser "s" hook for proper engagement before each flight; the thrust reverser control switch be in the EMERG STOW position before takeoff, and remain in that position until the aircraft reached 1,500 feet above ground level; the thrust reverser control switch be placed in the EMERG STOW position before placing the landing gear handle at DOWN for landing; and operational check of the thrust reverser system should be made after each flight. The emergency procedures section (Section II, page 19) contains these notes: "An inadvertent thrust reverser deployment in flight will result in heavy buffet which decreases as the respective engine thrust is decreased. The aircraft is readily controllable, however, altitude cannot be maintained until thrust is reduced on the engine with the deployed thrust reverser. If the thrust reverser fails to stow after placing the thrust reverser control switch in the EMERG STOW position, shut down the respective engine and land as soon as practicable."

   (b) Certain preflight inspections are performed.

   (c) Certain inspections of the thrust reverser system are performed at 100- and 300-hour intervals.

   (d) The dimming circuit is modified so that the T/R advisory lights cannot be dimmed.

3. The aircraft can be operated if equivalent inspections, maintenance procedures, and installations are approved by the Chief, Aircraft Engineering Division, FAA Western Region.

(b) Recommendations

A review of the Rockwell International Sabreliner Model 60 thrust reverser system and regulations governing thrust reverser systems was initiated as a result of this accident. Since certain proposals which resulted from this review exceeded the scope of the measures required by AD 73-12-9, Amendment 39-1664, the National Transportation Safety Board recommends that the Federal Aviation Administration amend Airworthiness Directive 73-12-9 to:

1. Require modification of the thrust reverser system for the Rockwell International Sabreliner Model 60 which would minimize

reverser system dependence upon rigging tolerances to insure proper indicator light operation. In any modification, serious consideration should be given to:

(a) Incorporation of a microswitch in the thrust reverser actuator to control the unlock light.

(b) Relocation of the present unlock light microswitch from the secondary latch solenoid to a position which results in unlock light deactivation only upon positive physical engagement of secondary latch and reverser door strikes. (A-73-107)

2. Incorporate a stowing function in the Sabreliner reverser system which would automatically stow a deployed thrust reverser when the throttle is not in the idle position. (A-73-108)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

November 7, 1973