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5. The No. 1 engine failed in flight as a result of a first-stage ($N_2$) turbine blade failure.

6. The No. 2 fuel pump drive shaft failed at impact of the engine.

7. The No. 2 engine was operating until it impacted the ground.

8. The aircraft was airborne and above $V_2$ speed at the time of the engine failure.

9. The flightcrew did not properly utilize the engine and aircraft instruments to determine the condition of the engines, altitude, and airspeed.

10. Company procedures and applicable flight manuals dictate that the flight should have been continued with one engine inoperative.

11. The captain discontinued the takeoff and landed back on the runway.

12. The captain erroneously decided power to both engines had been lost.

13. The No. 2 engine reverse thrust was selected and power was applied after touchdown.

14. The captain had satisfactorily accomplished an engine-out takeoff in the simulator and two in the aircraft since March 12, 1968.

15. The first officer remained on the controls after the captain took over the control of the aircraft.

*(b) Probable Cause*

The National Transportation Safety Board determines that the probable cause of this accident was the termination of the takeoff, after the No. 1 engine failed, at a speed above $V_2$ at a height of approximately 50 feet, with insufficient runway remaining to effect a safe landing. The captain's decision and his action to terminate the takeoff were based on the erroneous judgment that both engines had failed.

## 3. RECOMMENDATIONS

During its deliberations, the National Transportation Safety Board found that important safety lessons were evident from the facts, conditions, and circumstances of this and similar accidents. The Board, therefore, recommends to the Federal Aviation Administration the following:

1. Reassess the respective duties and responsibilities of the captain and the first officer during critical phases of flight. In so doing, the "captain in command" concept should be reexamined with its applicability in situations where time may not permit the captain to countermand effectively the decision of the first officer who is flying the aircraft.

2. Reappraise the current training manuals and instructions provided by all airlines with a view toward a positive approach toward emergency procedures. Such an evaluation would include an amplification and clarification of such procedures, including safety margins and the need for prompt and proper sequencing of each action.

3. Reemphasize in training that pilots use the aircraft instrumentation, rather than their physiological responses, to determine the extent and cause of emergencies.

The Board further recommends that the Air Transport Association bring this report to the attention of its training committee.



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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

December 29, 1971