

**NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.**

ISSUED: August 14, 1974

Forwarded to:

Honorable Alexander P. Butterfield
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-74-61

Preliminary evidence from the National Transportation Safety Board's investigation of the International Business Machines, Inc., Grumman G-1159, N720Q, aircraft accident at Kline, South Carolina, on June 24, 1974, indicates that the ground spoilers deployed in flight, which resulted in an uncontrolled crash. The three occupants of the aircraft were killed.

The ground spoiler hydraulic system includes an electrically operated solenoid control valve. The system is designed so that the following conditions must be met to energize the solenoid and deploy the ground spoilers:

1. Power must be on the main DC electrical bus.
2. Main landing gears must be on the ground with weight on them.
3. The ground spoiler switch must be in the "ARMED" position.
4. Both power levers must be in ground "IDLE."

The system does not provide the pilot with a visual or audio signal to show ground spoiler deployment, but a "NO GROUND SPOILER" light on the panel will illuminate if the solenoid-energizing conditions are met and the spoilers fail to deploy on landing.

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Although the aircraft was probably certificated with the belief that the design of the ground spoiler actuation system provided sufficient redundancy to prevent in-flight deployment, the Board's review of the system design has disclosed what we believe to be a potentially dangerous condition. A hot electrical short, which bypasses the redundant switches in the line to the power terminal of the solenoid, could cause the unwanted actuation of the ground spoiler system. The original configuration of the aircraft provided a switch on each main landing gear strut which completes the circuit by connecting the power source to the ground spoiler's control valve solenoid.

On August 20, 1971, the manufacturer issued Service Change No. 98, which provided additional redundancy by breaking both the power source and the ground source to the solenoid, through the landing gear switches. This change, which was not mandatory, affected aircraft serial Nos. 1 through 90. The manufacturer advised that 39 aircraft had not been changed, including the aircraft involved in the accident. We believe that incorporation of this Service Change will eliminate the danger of a similar single failure, i.e., "hot electrical short," unwanted deployment of the ground spoilers in flight, and possible subsequent loss of control.

Although the incorporation of Service Change 98 may eliminate the possibility of in-flight ground spoiler deployment, we believe that a hot electrical short could possibly prevent the retraction of the spoilers on takeoff from a "touch and go" landing.

For this reason, the crew should have a means available to retract the spoilers at any time. In this regard, deployment of the spoilers cannot be detected visually, and some warning system may be required to alert the crew to unwanted spoiler deployment.

The Safety Board recognizes that the Federal Aviation Administration has issued an Emergency Telegraphic Airworthiness Directive to render the ground spoilers inoperative pending resolution of this problem. However, the actions we are recommending will result in modifications to the system which could permit use of the ground spoilers with a degree of reliability which will satisfy the airworthiness standards of 14 CFR 25.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration issue an Airworthiness Directive which will:

- (a) make Service Change 98 mandatory on Grumman G-1159 model aircraft,

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- (b) require a device that will warn the pilot of unwanted ground spoiler deployment,
- (c) require that adequate means be provided for the pilot to retract the ground spoilers in the event of an unwanted deployment.

McADAMS, THAYER, BURGESS, and HALLEY, Members, concurred in the above safety recommendation. REED, Chairman, was absent, not voting.

Isabel A. Burgess
By: John H. Reed *acting*
Chairman

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