

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

ISSUED: March 8, 1979

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 Forwarded to:

Honorable Langhorne M. Bond  
 Administrator  
 Federal Aviation Administration  
 Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-79-4 and -5

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The National Transportation Safety Board is concerned about general aviation engine-starter system failures that sometimes result in complete failure of the airplane's electrical system.

A Beechcraft Queen Air, Model 65, N342N, operating under 14 CFR 135, had a complete electrical failure shortly after takeoff at Norfolk, Virginia, on March 4, 1978. The pilot proceeded to manually extend the landing gear and apparently decided it was down and locked. However, the gear collapsed during the landing roll, and the airplane was substantially damaged. Although the accident can be attributed to failure to follow the checklist for emergency extension of the landing gear, the total electrical failure must be considered the underlying cause. Postaccident examination of the right engine-starter system revealed that the starter case was badly blistered, the starter relay terminal boots were severely damaged by heat, the relay plunger was in the on position, and the relay fixed contact point was fused to the movable contact point. The Safety Board concludes that continued operation of the starter motor had overheated and overloaded the electrical system, causing the complete failure.

A survey of similar experience in the FAA's Service Difficulty Records, covering General Aviation Starter Systems for a 1-year period through August 9, 1978, indicated that there had been at least 26 instances of contactor, often called "relay" or "solenoid," failures. Most, if not all, of these involved uninitiated or continued starter operation. In most cases the fault was noted when the engine rotated with only the master switch activated. However, in six cases, one including another Beechcraft Queen Air, continued starter motor operation apparently was not detected and the electrical system failed completely. At least two of the six cases, both involving Beechcraft B24R's, occurred during IFR flight when loss of the electrical system can be most serious. Other models involved were a Beechcraft A36, a Beechcraft C23, and a Piper PA-31-350.

Among the 20 cases in which the fault apparently was detected and did not result in complete electrical failure, 14 involved Cessnas; most of the 14 were model 210's. The other six involved a Mooney 20F and five Beechcraft models--a Queen Air 65-B80, two B19's, a C24R, and an A36.

Although the records do indicate that some airplanes are more prone than others to develop this kind of fault, the Safety Board believes that the hazard potential is sufficiently universal as to call for industrywide attention.

The Safety Board believes that aircraft owners and pilots should be warned of the possibility of encountering electrical system failure as a result of the unintentional or continued operation of starter motors, and should be provided guidance regarding means of reducing the risk of such failures. Such means could include modification of existing aircraft electrical systems to require contactor redundancy or periodic inspection or replacement of certain electrical components. For future production aircraft, the Safety Board believes that some positive means should be provided to indicate to the pilot that an engine starter is operating.

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

Issue an Advisory Circular or take other appropriate action to alert pilots to the fact that unwanted and unknown continued engine starter operation may result in complete electrical failure in general aviation airplanes in service. Also, describe actions pilots can take to avoid such engine-starter operation. (Class II--Priority Action) (A-79-4)

Amend 14 CFR 23 and 14 CFR 27 to require indication by which a pilot can be advised whenever an electric engine starter is operating. (Class III--Longer Term Action) (A-79-5)

KING, Chairman, DRIVER, Vice Chairman, McADAMS, and HOGUE, Members, concurred in the above recommendations.

By:  James B. King  
Chairman