UNITED STATES OF AMERICA
FEDERAL AVIATION AGENCY
WASHINGTON, D.C.

Civil Air Regulations Amendment 4b-14
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PART 4b—AIRPLANE AIRWORTHINESS; TRANSPORT CATEGORIES

Wing-Flap-Actuated Landing Gear Warning System

The Federal Aviation Agency published as a notice of proposed rule making (28 F.R. 4958), circulated as Notice No. 63-19 dated May 10, 1963, a proposal to amend Parts 4b, 40, 41, and 42 of the Civil Air Regulations to require the installation of a wing-flap-actuated landing gear warning system.

The currently effective § 4b.334(e) requires, for airplanes with retractable landing gear, that a means be provided for indicating to the pilot when the gear is secured in the extended and in the retracted positions; that, in addition, landplanes be provided with an aural warning device to function continuously when one or more throttles are closed if the gear is not fully extended and locked; and that, if a manual shutoff for the aural warning device is provided, it be installed so that reopening the throttles will reset the warning mechanism. A third safety provision, required by § 4b.740, is the Airplane Flight Manual containing the chronological outline of the procedures (checklist) to be followed by the flight crew during all phases of operations.

The Agency finds, from a review of the accident record over the past 8 years, that 17 inadvertent gear-up landing accidents involved airplanes operating under Parts 40, 41, and 42. Fifteen of these accidents involved a number of airplane models, irrespective of performance or type of powerplant used, whose maximum weight exceeded 12,500 pounds. Although these accidents did not result in either major injuries or fatalities, such accidents are potentially hazardous, particularly because of possible ignition of fuel which might be spilled.

From the analysis of the accident record and from a study of operational practices relating to landing gear aural warning systems, the Agency finds that the currently prescribed throttle-actuated aural warning device and the other safety provisions are not sufficiently effective in preventing inadvertent gear-up landing accidents. The Agency further finds that installation of a wing-flap-actuated aural warning system should reduce the number of such accidents, thereby eliminating the potential hazard to the airplane occupants and preventing damage to the airplane.

Among the comments received in response to the notice of proposed rule making were objections to the proposed requirement. It was contended that the installation of a fourth safety device was unjustified. The Agency disagrees because 10 of the 15 inadvertent gear-up landing accidents involving transport category airplanes probably would have been prevented if a wing-flap-actuated warning system had been installed. These accidents occurred after long approaches with throttles retarded and with the aural warning device manually shut off and not reset prior to landing, or after long power-on approaches and the aural warning device actuated too late to discontinue the approach and initiate a go-around. (The remaining five accidents involved two deactivated aural warning circuits because of a missing fuse and a pulled circuit breaker; a landing with the pilot aware that the gear was still extending; a complete electrical failure; and a no-flap landing during training.) The comment went on to say that the justification in the notice refers only to jet airplanes but the specific proposal applies to all type airplanes. It should be noted that the notice states that "the currently prescribed landing gear warning system is inadequate because of the faster pace of present day operations (which reduces the effectiveness of the

checklist on all airplanes) and because of the operational characteristics of jet transports (long straight-in approaches with throttles retarded, occasionally all the way to touchdown) * * *" The notice clearly speaks of all transport category airplanes and is not limited to any particular class. Although the notice refers only to jet transports in regard to long straight-in-approaches with throttles retarded, 4 of the 10 transport gear-up landing accidents that the Agency believes would have been prevented by wing-flap-actuated landing gear warning involved propeller-driven airplanes making approaches with throttles retarded. The proposal, therefore, is applicable to all transport airplanes irrespective of method of propulsion.

There were other comments which recommended amending the proposal to apply to all aircraft with retractable gears rather than limiting it to airplanes with a maximum weight of more than 12,500 pounds. This recommendation goes beyond the scope of the notice, and requires that an additional notice of proposed rule making be issued. The Agency is conducting a separate study of inadvertent gear-up landing accidents involving small airplanes. If the study indicates that amendments to the gear-up warning system requirements are needed, appropriate proposals will be made.

Several comments indicated that some interpretations of the proposal could result in the warning sounding for long periods of time during approach and takeoff. As proposed, an aural warning device would be required which would function continuously when the wing flaps are extended beyond the approach climb configuration setting or to a setting normally used following gear extension, whichever is the lesser. The intent of the proposal was that on airplanes for which an approach flap position is determined by the climb performance requirements under which the airplane is type certificated, the warning system would be activated when the wing flaps are extended beyond the maximum approach position. Since all airplanes type certificated under Part 4b must comply with climb performance requirements that determine approach flap positions, the final rule identifies the provision in Part 4b which establishes the approach climb configuration setting. Therefore, the final rule is amended to require activation of the warning system when the wing flaps are extended beyond the maximum approved approach position determined in accordance with § 4b.120(d).

A comment was received suggesting that flexibility be permitted in selecting the flap position at which the gear-up warning system is activated. It appears, however, that, if the selected position is less than the approach position, a large number of nuisance warnings might occur during approaches and takeoffs. On the other hand, if the selected position is greater than the approach position, the gear-up warning system would lose effectiveness because it would sound late in the approach. Therefore, the suggestion has not been accepted.

A comment was received contending that on certain airplanes the presently required throttle-actuated warning system is ineffective because it activates too many nuisance warnings, and suggests that the proposed wing-flap-actuated system alone should be considered adequate. The proposed warning system is activated when wing flaps are extended beyond a prescribed position; however, if a landing is made in which the wing flaps are not extended beyond the prescribed position, the throttle-actuated warning system is needed. Therefore, the suggestion has not been accepted.

Another comment was received suggesting that the presently required throttle-actuated gear-up warning system is adequate on airplanes which do not have the optional manual shutoff on the aural device and, therefore, on such airplanes the proposed flap-actuated warning system should not be required. The throttle-actuated warning system is not activated during a power-on approach, even if the aural warning device is functioning. Of the 15 transport airplane gear-up landing accidents previously mentioned, one definitely and probably two others occurred after a power-on approach. Therefore, the suggestion has not been accepted.

One comment was received recommending that in new airplanes the circuit for the flap-actuated warning system should be separate from the circuit for the throttle-actuated warning system. This recommendation apparently was prompted by an inadvertent gear-up landing accident in which the aural warning device was silenced by pulling out the circuit breaker when the manual shutoff failed to silence the device during a long approach. The Agency considers that a requirement for two separate circuits

would pose an unwarranted burden because it would require protection against a combination of equipment malfunction and improper cockpit procedure. Therefore, the recommendation has not been accepted. Furthermore, the proposed rule has been amended to make it clear that separate circuit is not required. However, the voluntary installation of separate circuits is not prohibited.

A comment was received questioning the validity of the premise in the notice that the faster pace of present day operations reduces the effectiveness of the landing checklist. It was contended that the landing checklist may be too long and cumbersome, and suggested shortening it so that flight crews would be more aware of important items such as extending the gear prior to landing. The Agency does not consider that landing checklists are unnecessarily long or cumbersome. In none of the gear-up accident investigation was this suggested by flight crewmembers. There is no evidence that shorter checklists would change the cockpit procedures to make the existing warning and indication systems more effective or reduce the frequency of inadvertent gear-up accidents.

A comment suggested changing the proposal to apply only to those airplanes in which the main landing gear is used as a speed control device. None of the inadvertent gear-up landing accidents involved the main gear down and nose gear up, which would occur if the landing gear were not lowered after using the main gear to control airspeed. Therefore, this suggestion has not been accepted.

A number of comments requested that the proposal be revised to specify clearly that the flap position sensing unit can be installed at either the flap or the flap control handle. The intent of the proposal was that the sensing unit can be installed at any suitable location in the airplane and the final rule is so amended.

Interested persons have been afforded an opportunity to participate in the making of this regulation and due consideration has been given to all relevant matter presented.

This amendment is made under the authority of sections 313(a), 601, and 603 of the Federal Aviation Act of 1958 (49 U.S.C. 1354, 1421, 1423).

In consideration of the foregoing, § 4b.334(e) of Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) is hereby amended by adding a new subparagraph (4) to read as follows, effective May 22, 1964:

§ 4b.334 Retracting mechanism.

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(e) *Position indicator and warning device.* * * *

(4) In addition to the requirements of subparagraphs (1), (2), and (3) of this paragraph, landplanes shall be provided with an aural warning device to function continuously when the wing flaps are extended beyond the maximum approved approach position determined in accordance with § 4b.120(d) if the gear is not fully extended and locked. There must be no manual shutoff provided for the warning device. The flap position sensing unit may be installed at any suitable location in the airplane. The system required by this subparagraph may utilize any portion of the system, including the aural warning device, required by subparagraph (2) of this paragraph.

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By the Civil Aeronautics Board:

/s/ N. E. Halaby

N. E. Halaby

Administrator

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(SEAL)

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