

DATE 8/8/80

# ADVISORY CIRCULAR



DEPARTMENT OF TRANSPORTATION  
Federal Aviation Administration  
Washington, D.C.

**Subject:** PREVENTION OF RETRACTABLE LANDING GEAR FAILURES

1. **PURPOSE.** This advisory circular updates statistical information related to landing accidents involving aircraft with retractable landing gear and suggests procedures to minimize those accidents.
2. **CANCELLATION.** Advisory Circular 20-34C, ~~Prevention of Retractable Landing Gear Failures~~, dated May 17, 1979, is canceled.
3. **DISCUSSION.** A review of the Federal Aviation Administration's General Aviation Accident Factual Reports for the year 1979 disclosed that 1,002 airplanes equipped with retractable landing gear were involved in accidents. Of those 1,002 airplanes, 106 or 10.5 percent were involved in "landing gear" accidents. Further study showed that 63 percent of the 106 accidents were the result of a human factor and 37 percent involved mechanical/technical reasons. Accidents involving retractable landing gear can be reduced with deliberate, careful, and continued use of the checklist by pilots, and the performance of maintenance, as recommended by the aircraft manufacturer, by qualified personnel.

#### 4. OPERATIONAL FACTORS AND PERCENTAGES INVOLVED IN RETRACTABLE GEAR AIRCRAFT ACCIDENTS.

- a. Neglected to extend landing gear -- 35.8 percent.
- b. Inadvertent retraction of landing gear -- 10.3 percent.
- c. Activated gear, but failed to check gear position -- 11.3 percent
- d. Misused emergency gear system -- 0.9 percent.
- e. Retracted gear prematurely on takeoff -- 2.8 percent.
- f. Extend gear too late -- 1.8 percent.

Initiated by: AWS-340

5. PREVENTION OF GEAR UP OR COLLAPSED GEAR LANDINGS.

a. We ~~recommend~~ the following tried and ~~proven~~ landing ~~procedures to~~ deter inadvertent ~~wheels~~ up or inadvertent gear retraction during touchdown and ~~rollout~~:

(1) On the downwind leg, ~~or~~ at the final approach fix inbound, make it a habit ~~to complete~~ the ~~recommended~~ landing gear ~~checklist~~ for your aircraft. This accomplishes two purposes. It ensures that action has been taken to lower the gear, and it increases your awareness so ~~you~~ can recheck the ~~gear-~~down indicators prior ~~to~~ landing.

(2) **Complete** the landing **roll** and clear the runway before operating any levers or switches unless good operating practices dictate otherwise. This will **accomplish** the following: The landing gear strut safety switches will be actuated, deactivating the landing gear retract system. After **rollout** and clearing the runway, you will be able to focus attention on the after landing checklist and to identify the ~~proper~~ **controls**.

b. We suggest the following for **consideration by** the owner/operator:

(1) Provide a **condensed** checklist, mounted in view of the pilot, as a reminder for its use and easy reference.

(2) Periodically review the landing gear emergency extension procedures for your aircraft.

(3) Be familiar with the landing gear warning horn and warning light systems of your aircraft. Use the horn system to cross-check the warning light system ~~when~~ an unsafe **condition** is **noted**.

(4) Review the procedure for replacing light bulbs in the landing gear warning light displays for your aircraft, so that you can properly replace a bulb to determine if the bulb(s) in the display is good. Check to see if spare bulbs are available in the aircraft spare bulb supply before flight.

(5) Have known landing gear deficiencies ~~corrected~~ before flight.

REMEMBER, AS A **PILOT YOU ARE RESPONSIBLE FOR THE SAFE OPERATION OF YOUR AIRCRAFT.**

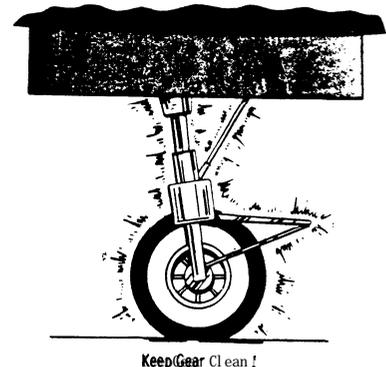
6. MECHANICAL FAILURE. Mechanically-induced failures of retractable landing gear have involved:

- a. Metal fatigue/failure.
- b. **Improper** installation of parts.
- c. **Improperly secured** parts.

- d. Use of non-standard . . . . .
- e. Rupture of hydraulic lines.
- f. Failure of electrical wire connections, relays, **contactors**, and/or actuators.
- g. Malfunctions of warning systems.
- h. Inoperative limit and safety switches.
- i. **Uplocks** failed to release.
- j. **Downlocks** failed to engage.
- k. Wheels **jammed** or hung up in **wheelwells**.
- l. Chains have disengaged **from** sprockets.
- m. Cables fouled in pulleys.
- n. Slide tubes became bound due to **contamination** and corrosion.
- o. Torque tubes and drag struts **were** bent due to excessive loads being applied.

Many of those difficulties **were** found to be the result of improper rigging and **adjustment**, lack of lubrication and/or an insufficient program for **the prevention** and control of Corrosion.

7. **PREVENTIVE MAINTENANCE**. It is a good practice to use the information furnished by aircraft manufacturers in servicing your aircraft. Particular attention should be directed toward keeping the landing gear, **wheelwell**, and adjacent areas clean and free of **mud** and debris. Dirty switches and valves may cause false safe light indications or interrupt the **extension** cycle before the landing gear is **completely down** and locked. Repair or replace protective boots that are damaged or missing. Oversize or recapped tires may cause landing gear to stick in the **wheelwell** and **prevent extension**. Assure that shock struts are properly inflated and the pistons are kept clean. **Lubricate** landing gear in accordance with the manufacturer's instructions. Wipe off excess grease **when** lubricating landing gear system. Establish a program **for** corrosion prevention and **control** for your aircraft to preclude its effect upon proper operation/failure of landing gear structure and parts.



8. REQUIRED MAINTENANCE. During the annual, **100-hour** or progressive landing gear inspection cycle, the aircraft is placed on jacks and the gear **completely** inspected for **condition**, rigging, and **proper** operation, including the warning system. Intermediate inspection and servicing will further ensure against landing gear system malfunction.

9. INSPECTION FREQUENCY.

a. **How** often shall a landing gear system be inspected and serviced? As often as it is necessary **to** assure proper function of the landing gear system. At least as often as Federal Aviation **Regulations**, including applicable **Airworthiness Directives**, require. It **is recommended** that the aircraft ~~\*manufacturer's~~ instructions for inspection frequency and procedure be **followed**.

b. An ideal time for an interim inspection of the landing gear system ~~would be~~ during the pilot's preflight inspection.

c. When aircraft are operated **from** rough surfaces or are used for student instruction, more frequent inspections may **be** in order. when a hard landing is experienced or the gear strikes an object **while** taxiing, it is wise to inspect for damage. Damage may occur and rigging may be affected by sharp turns at high taxi speeds, by faulty technique during a crosswind landing, or by taxiing off a hard surface into deep mud or snow.

d. Awareness of our human limitations, those of the aircraft we operate, and the proper application of good maintenance practices can effect a substantial reduction in accidents involving retractable landing gear, and a substantial improvement in aviation safety.



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~~Director~~ of Airworthiness