



AEROSPACE INFORMATION REPORT

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VERIFICATION OF LANDING GEAR DESIGN STRENGTH

Verification of landing gear design strength is accomplished by dynamic and static test programs. This is essentially a verification of the analytical procedures used to design the gear. An industry survey was recently conducted to determine just what analysis and testing are currently being applied to landing gear. Timing in relation to first flight of new aircraft was also questioned. Opinions were solicited from designers of the following categories and/or types of aircraft:

- A. Military - Large Land Based (Bomber)
- B. Military - Small Land Based (Fighter)
- C. Military - Carrier Based (Navy)
- D. Military - Helicopter (Large)
- E. Military - Helicopter (Small-attack)
- F. Commercial - Large (Airliner)
- G. Commercial - Small (Business)
- H. USAF (WPAFB) - Recommendations

It is the objective of this AIR to present a summary of these responses. It is hoped that this summary will be useful to designers as a guide and/or check list in establishing criteria for landing gear analysis and test.

These recommendations are generally applicable to aircraft and landing gear arrangements of conventional design. Unusual designs may entail additional verification requirements.

Final strength verification requirements, including test procedures and documentation may be specified by the procuring activity or cognizant regulatory agency. Such specific requirements will take precedence over the general guidelines provided herein.

It should also be noted that the inputs making up this document have some bias toward military and larger commercial aircraft. Not all of the analysis and tests recommended are necessarily applicable to landing gear in the "light aircraft" category.

1. ANALYTICAL STUDIES RECOMMENDED AND/OR REQUIRED PRIOR FIRST FLIGHT

- A. A preliminary static analysis of all primary structural elements.
- B. A preliminary fatigue analysis of all primary structural elements.
Note: Both A and B should incorporate secondary loads resulting from gear deflections, as well as deflection of gear support points.
- C. A preliminary dynamic study of shock strut energy dissipation (Calculated metering pin).
- D. A preliminary study of brake energy dissipation.
- E. A preliminary study of nose and main gear shimmy stability.
- F. A preliminary in-flight dynamic analysis to avoid resonance (for helicopters)
- G. A preliminary ground stability analysis.
- H. Analysis of loads and response time for extension and retraction (both in flight and during ground check). Include analysis of manual operation.
- I. Analysis of loads and response time for steering system.
- J. USAF requires completion of a failure mode and effects analysis prior to first flight.

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