



AEROSPACE INFORMATION REPORT

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Superseding AIR4243

Landing Area/Landing Gear Compatibility -
A Brief History of SAE/Corps of Engineers Cooperation

RATIONALE

The A-5 Committee recommended stabilization at the last meeting.

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1. SCOPE:

This document discusses the work done by the U.S. Army Corps of Engineers and the Waterways Experiment Station (WES) in support of SAE A-5 Committee activity on Aerospace Landing Gear Systems. It is an example of how seemingly unrelated disciplines can be combined effectively for the eventual benefit of the overall aircraft system, where that system includes the total airfield environment in which the aircraft must operate.

In summary, this AIR documents the history of aircraft flotation analysis as it involves WES and the SAE.

2. BACKGROUND:

The U.S. Army Engineer Waterways Experiment Station is located at Vicksburg, Mississippi. It was established in 1929 as a hydraulics laboratory to help control floods in the lower Mississippi valley. Today, WES is a research, development and testing complex of six internationally recognized laboratories supporting the civil and military missions of the Corps of Engineers and the United States of America. WES currently has a work program funded by 120 sponsors who pay all project costs on a reimbursable basis. The sponsors include the Corps of Engineers, other Federal agencies, and, under special conditions, private industry and foreign agencies/governments.

3. DISCUSSION:

The U.S. Army Corps of Engineers (CE) and the Waterways Experiment Station have been associated with SAE Committees (A-12 and A-5) on Aerospace Landing Gear Systems since 1950. The SAE committees have been concerned with "aircraft ground flotation" since that time.

3. (Continued):

In January, 1951, a conference on flotation provided information on flexible pavement design and on runway construction time, which contributed to development of a Unit Construction Index or UCI. This led to publication in March 1953 of the Technical Memorandum Report WCLS 53-13, "The Unit Construction Index Chart for Aircraft Ground Flotation Evaluation," by the U.S. Air Force Wright Air Development Center. It was intended that the UCI chart would be placed in the "Handbook of Instructions for Aircraft Designers (HIAD)" and the UCI used to constrain aircraft landing gear design so as to limit the need for airfield upgrading to accommodate each new aircraft.

The SAE landing gear committee had an immediate interest in flotation. The committee included members from many airframe manufacturers, tire and gear component manufacturers, and Air Force procurement and mechanical development elements. However, the committee had little awareness of pavement behavior. CE and WES were invited to attend as committee visitors, and the association has continued to the present. Through the years, this association has provided a valuable forum for exchange of knowledge between the two interacting technologies of landing gear design concerns and landing area load support considerations. The association has contributed to sponsorship of research in aircraft ground flotation and other aircraft pavement interaction matters and has helped to shape research programming toward more useful and valuable results.

The UCI was incorporated into the HIAD but the simplistic basis of its development soon resulted in shortcomings pointed out by SAE committee members. With Air Force support and guidance and CE backing, as the agency responsible for civil engineering support of the Air Force, WES first devised the Construction Index as an improvement of the UCI, but this too was not sufficient. By this time there was Air Force concern for assault field operation of some transport aircraft and the need for HIAD (or equivalent) guidance, which could be used to limit aircraft support requirements for both conventional pavements and for providing capability to operate from bare soil landing strips.

Accordingly, the WES, under guidance and acting for the Air Force R & D Directorate, undertook to produce guidance for limiting flotation requirements of aircraft for both conventional pavements (in the Zone of Interior or ZI) and for expedient military airstrips (in the Theater of Operations or TO). This work was published in December 1961 and revised in July 16, 1965 as WES MP 4-459, "Ground Flotation Requirements for Aircraft Landing Gear" and covered both ZI and TO airfields. With some adjustments by committee negotiation, this flotation guidance was adopted and placed into the HIAD in 1964, replacing the UCI.

The committee indicated concern for landing mat-surfaced airfields in 1962 and WES, through committee meeting participation, provided desired information on landing mat and membrane-surfaced airstrips.