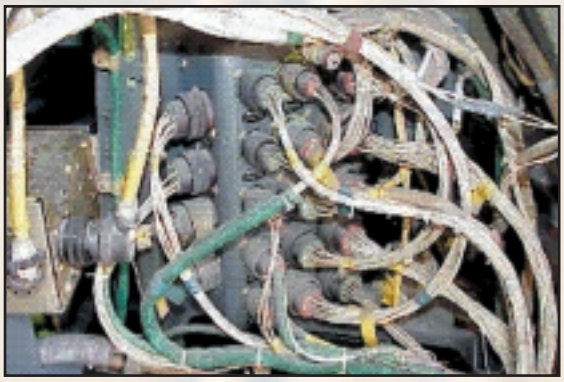
Aging Nonstructural Systems Research

In 1997, the White House Commission on Aviation Safety and Security requested that the FAA institute regulatory and research programs to address aging nonstructural systems issues not covered at that time by the FAA's Aging Aircraft Program and Aging Aircraft Research Program.



In response, the FAA released the Aging Transport Nonstructural Systems Plan (ATNSP). The initial intent of the ATNSP is to evaluate the effectiveness of current practices for design, maintenance, and repair in preventing or mitigating aircraft accidents precipitated by degradation or damage to aircraft nonstructural systems. Based on these evaluations, recommendations will be made for changes to the current processes under which systems are designed, maintained, and repaired.

The ATNSP calls for the FAA to add the following five specific tasks to the Aging Aircraft Research Program:

- To assess the degradation of airplane wire and determine the point at which wire degradation may hazard safe flight.
- To establish the condition of aging aircraft wiring components and validate the adequacy of visual inspection.
- To develop nondestructive testing tools for inspection and testing of wiring systems.
- To develop an arc-fault circuit interrupter for transport aircraft.
- To perform destructive testing of flight control linkages.

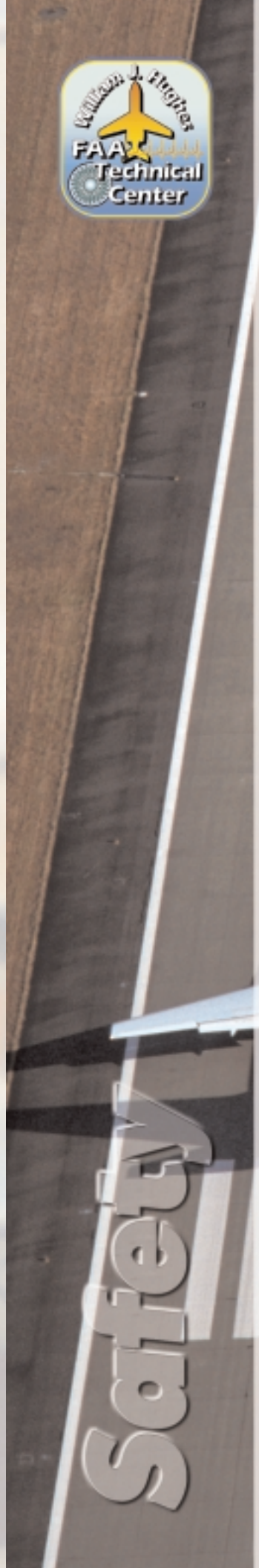
In establishing the Nonstructural Systems Research Program (NSRP), the FAA has committed to the principal that a fully effective research program must be based on service data analysis and teardown evaluations. The NSRP is fully coordinated with the FAA's Aging Transport Systems Rulemaking Advisory Committee (ATSRAC) and the Air Transport Association's Aging Systems Task Force (ASTF).

Current research initiatives include the development of an aging systems test and validation infrastructure; an assessment of wire service life; an assessment of the adequacy of visual inspection; the development of wire inspection and testing technologies and techniques; and the development, test, and validation of aircraft arc-fault circuit breakers.

Development of an Aging Nonstructural Systems Test and Validation Infrastructure

One of the first initiatives of the NSRP is the development of a systems test and validation capability at Sandia National Labs. This effort will draw upon the existing infrastructure of the FAA Aging Aircraft Nondestructive Inspection Validation Center (AANC), including its three retired aircraft: a Boeing 737, a McDonnell Douglas DC-9, and a 1971 Boeing 747 with over 100,000 hours of service. The recently retired B-747 will be subject to an intensive visual inspection of its electrical and mechanical systems. In addition, select electrical and mechanical systems on both the B-747 and DC-9 test bed aircraft will be baselined using state-of-the-art test and inspection techniques. In addition to yielding valuable insight regarding the state of aged aircraft systems, this initiative will provide two test bed aircraft for the test and validation of current and emerging maintenance technologies and procedures.

Safety



Development of Wire Testing Equipment

The FAA and the US Air Force Office of Productivity, Reliability, Availability, and Maintainability (PRAM) jointly sponsored a short-term effort to enhance an automated wire test system. The state-of-the-art equipment will be used to help baseline AANC's test aircraft and test articles and to establish a benchmark for future testing equipment developed and tested under the NSRP.

The NSRP will support the development of other systems that identify flaws that may impair the safe and effective transmission of electrical power and signals.

Assessment of Visual Inspection

A recent Air Transport Association survey of wiring in in-service transport category aircraft provided much data on physically observable faults in wire and wire installations. It did not, however, provide data on certain latent defects and invisible degenerative conditions, nor did it provide data on the degraded performance of wire and insulation. This data will become available through a complementary FAA-funded effort involving enhanced in situ testing and teardown.

Working in conjunction with the ATA, the FAA William J. Hughes Technical Center and the FAA AANC will perform supplemental nondestructive and destructive testing on interconnect system components identified by an FAA-industry working group. This data will provide a more complete assessment of aging electrical interconnect systems and will determine the limitations of visual inspection in assessing interconnect systems degradation.

Development, Testing, and Validation of an Aircraft Arc-Fault Circuit Breaker

The FAA is working with the US Navy's Office of Naval Research and the Naval Air System Command, Aircraft Division to develop aircraft arc-fault circuit breakers. An arc-fault is the undesired, momentary discharge of current from a conductor, i.e., a spark. This type of short circuit is particularly destructive because of the high temperature of the sparks it generates and the absence of any current excursions, which might trip standard thermal circuit breakers typically used on aircraft. Arc-fault circuit interrupter technology has the potential to mitigate the consequence of wire failure without requiring the redesign of aircraft circuitry. The execution plan for this initiative calls for a device sensitive to arc faulting while still meeting all performance and design specification of existing circuit breakers.

Mechanical Systems Research

Initiation of mechanical systems research is pending the deliberations and preliminary findings of the ATSRAC.

To find out more about the FAA Aging Nonstructural Systems Research, contact:

Airport and Aircraft Safety Research and Development Division
Airworthiness Assurance Research and Development Branch
Maintenance, Inspection, and Repair Section, AAR-433

Federal Aviation Administration
William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405
Phone: (609) 485-6181
Fax: (609) 485-4569
http://www.tc.faa.gov