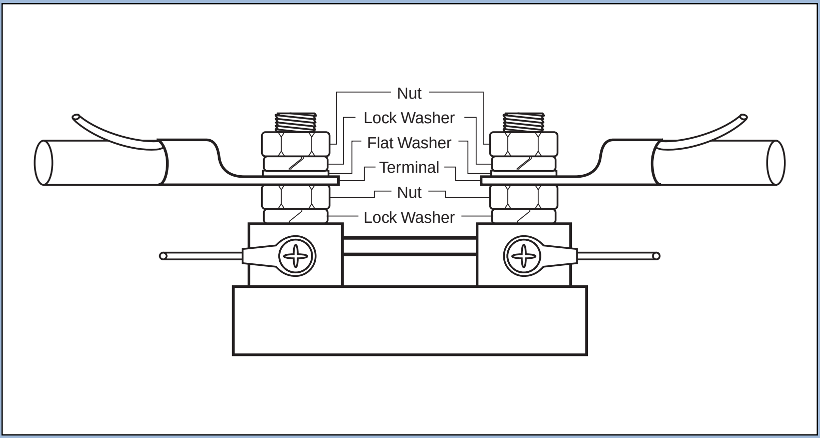
FLIGHT SAFETY FOUNDATION
Aviation Mechanics Bulletin

JANUARY–FEBRUARY 1999

Loose Connection On Battery Shunt Involved in Boeing 767 Emergency-landing Incident



FLIGHT SAFETY FOUNDATION
1947–1999

FLIGHT SAFETY FOUNDATION

Aviation Mechanics Bulletin

Dedicated to the aviation mechanic whose knowledge, craftsmanship and integrity form the core of air safety.

Robert A. Feeler, editorial coordinator

January–February 1999 **Vol. 47 No. 1**

Cover illustration: Martinair Holland Boeing 767 main-battery shunt buildup (i.e., arrangement on studs of washers, terminals and nuts) used during tests by incident investigators. The buildup shown may not be the buildup specified in the Boeing 767 maintenance manual. (Source: U.S. National Transportation Safety Board)

AVIATION MECHANICS BULLETIN

ISSN 0005-2140

Subscriptions: US$35 (U.S.-Canada-Mexico), US$40 Air Mail (all other countries), six issues yearly. • Include old and new addresses when requesting address change. • Flight Safety Foundation, 601 Madison Street, Suite 300, Alexandria, VA 22314 U.S. • Telephone: (703) 739-6700 • Fax: (703) 739-6708

What's Your Input?

In keeping with FSF's independent and nonpartisan mission to disseminate objective safety information, Foundation publications solicit credible contributions that foster thought-provoking discussion of aviation safety issues. If you have an article proposal, a completed manuscript or a technical paper that may be appropriate for *Aviation Mechanics Bulletin*, please contact the director of publications. Flight Safety Foundation assumes no responsibility for submitted material. The publications staff reserves the right to edit all published submissions. The Foundation buys all rights to published manuscripts. Payment is made to authors upon publication. Contact the Publications Department for more information.

Loose Connection on Battery Shunt Involved in Boeing 767 Emergency-landing Incident

—

FSF Editorial Staff

On May 28, 1996, a Martinair Holland Boeing 767-300ER (B-767) had numerous electrical anomalies as it flew over the North Atlantic Ocean during a scheduled flight from Amsterdam, Netherlands, to Orlando, Florida, U.S. The anomalies included several intermittent engine-indication-and-crew-alerting system (EICAS) messages, erroneous flight management system (FMS) displays, an uncommanded disconnection of the autothrottles and several uncommanded disconnections of the autopilot.

The aircraft was over the northeastern United States when the electronic flight information system (EFIS) displays failed. The flight crew declared an emergency and diverted the flight to Gen. Edward Lawrence Logan International Airport in Boston, Massachusetts, U.S. The crew intentionally landed the aircraft with the wing flaps retracted. After the aircraft touched down on the runway, the crew discovered that the engine thrust reversers and ground spoilers were inoperative, and that the antiskid braking system did not function fully.

Nevertheless, the crew brought the aircraft to a stop on the runway. All the tires on the main landing gear deflated, and a brake fire caused minor aircraft damage. None of the 191 passengers and 11 crewmembers was injured.

The U.S. National Transportation Safety Board (NTSB) classified the occurrence as an incident, because the occurrence involved no fatalities or serious injuries, and because the aircraft was not substantially damaged. (U.S. Federal Aviation Regulations Part 830 defines an *incident* as "an occurrence, other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations." Part 830 defines an *accident* as "an occurrence associated with the operation of an aircraft … in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.")

NTSB said, in its Brief of Incident report, that the probable cause of the incident was "numerous electrical anomalies as a result of a loose main-battery-shunt connection and undetermined electrical-system causes."

The aircraft was delivered new to Martinair Holland in 1990 and had accumulated approximately 30,795 hours in service. The aircraft had been flown 98 hours after a maintenance inspection on May 21, 1996.

The NTSB report said that before the aircraft departed from Amsterdam, the flight crew and maintenance technicians saw that the cockpit-clock time displays intermittently reset to 00:00. The time displays are powered by electrical current from the hot battery bus, which is powered by both the main battery and the main-battery charger. The maintenance technicians reset the circuit breakers and then replaced the clocks. Nevertheless, the clock displays continued to reset.

The maintenance technicians then replaced the main battery and checked battery-charger voltage. The report said that the voltage was 28 volts, which is lower than the normal 33 volts. The maintenance technicians found the main-battery shunt terminals loose. They tightened the shunt terminals and rechecked battery-charger voltage; the voltage was 33 volts. The clocks then functioned normally, and the aircraft was released for service.

The B-767 took off from Amsterdam's Schiphol Airport at 1049 coordinated universal time (UTC; 1049 local time). The aircraft was in cruise flight at Flight Level 310 approximately 40 minutes later when both cockpit-clock displays went blank and then reset to 00:00. At the same time, the following EICAS messages appeared briefly and then disappeared: L IRS DC FAIL (left inertial reference system direct current failure); C (center) IRS DC FAIL; and R (right) IRS DC FAIL.

The flight crew checked and reset the relevant circuit breakers, as recommended by the quick-reference handbook (QRH). They also requested that passengers turn off any personal electronic devices (PEDs) in use, to eliminate the possibility of electromagnetic interference (EMI) with the aircraft's electrical systems. The report said that numerous PEDs were in use and were turned off.

"The flight crew, in radio contact with their dispatch center, discussed the situation and agreed that they could continue the flight," the report said.

Throughout the remainder of the flight, the EICAS messages that appeared 40 minutes after takeoff intermittently reappeared, and the clock displays intermittently went blank and reset to 00:00.

Other anomalies that occurred during the flight included:

- The zero-fuel weight (ZFW) value displayed on the FMS control/display unit changed to the maximum ZFW value for the aircraft;
- The airborne communications addressing and reporting system (ACARS) display changed from DATA to VOICE; and,
- The flight crew felt electric current when they touched the captain's utility light.

At approximately 1400, the autopilot caused the aircraft to begin slipping to the left, in an eight-degree left bank. The crew used rudder trim to level the wings. The aircraft then began slipping to the right. The crew again used rudder trim to level the wings. The crew believed that the slipping was caused by the autopilot's failure to track properly in the lateral navigation (LNAV) mode. They changed from the LNAV mode to the heading (HDG) mode, and the slipping ceased.

Approximately 40 minutes later, the autothrottles disconnected. The crew re-engaged the autothrottles. The autopilot then disconnected. The report said that, during the next 95 minutes (from 1440 to 1615), the autopilot disconnected 50 to 70 more times.

"The [autopilot disconnections] seemed to be related [to] crew actions," said the report. The first autopilot disconnection, for example, occurred when a flight crewmember used a switch to check main battery voltage. Each time the autopilot disconnected, the crew changed to another flight control computer (FCC; the aircraft has three FCCs).

The aircraft was approaching the northeast coast of the United States at 1611 when voltage on the 28-volt battery bus and voltage on the standby bus decreased to two volts, numerous EICAS messages appeared briefly, and the autopilot disconnected. The flight crew decided to divert the flight to Newark, New Jersey. The report said that the crew selected Newark because technical assistance was available there, Martinair staff was based there and another Martinair Holland aircraft would be landing there later that day.

The report said that the next hour of the flight was relatively uneventful. Voltage on the 28-volt battery bus and voltage on the standby bus had increased to 28 volts, no EICAS messages appeared, and the autopilot did not disconnect. The flight crew considered continuing the flight to Orlando.

At 1714, however, the flap/slat position indicators briefly moved to between position 0 and position 1, and the message LE SLAT DISAGREE briefly appeared, indicating that the wing leading-edge slat position did not agree with the flap/slat handle position. The flight crew decided to divert the flight to Boston, which had visual meteorological conditions and longer runways than Newark.

The relief captain, who was flying the aircraft from the right seat, disengaged the autopilot and autothrottles, and began the initial descent. The relief captain's EFIS (electronic attitude director indicator and electronic horizontal situation indicator) then failed, and the captain took manual control of the aircraft. Several messages indicating IRS faults then appeared on the EICAS, and navigation data disappeared from the captain's EFIS.

The crew declared an emergency and requested radar vectors to Boston's Logan International Airport. The captain used the standby (magnetic) compass to navigate. Air traffic control vectored the flight to a 20-mile (32-kilometer) final approach to Runway 4R, which is 10,005 feet (3,052 meters) long.

During the visual approach, the flight crew moved the flap/slat handle to position 1, which normally extends the wing leading-edge slats but not the trailing-edge flaps. The flap/slat indicator showed a disagreement (one needle moved between position 0 and position 1, the other needle moved to position 1), and the EICAS message LE SLAT DISAGREE appeared.

The report said, "The applicable QRH checklist (alternate electrical flap selection) was not followed [by the flight crew] due to the many previous temporary EICAS messages and electrical problems. In concert with other crewmembers [the relief captain and the first officer], the captain decided to make no more configuration changes."

A crewmember visually inspected the leading-edge slats and confirmed that they were extended fully. The flight crew used a slats-only approach speed of 162 knots. The report said, "During the last portion of the flight, the EICAS was filled with caution and advisory messages, which were read by [the first officer, who was sitting in] the observer's seat, on request of the captain. Among those, the EICAS caution message ANTISKID was read by [the first officer] but not acted upon by the captain and the [relief captain] because of the many messages and the high work load on approach."

The report said that the aircraft was landed smoothly in the runway touchdown zone at 1814 UTC (1414 Boston time). After the aircraft touched down, however, engine thrust did not decrease from flight idle to ground idle, and reverse thrust, autobrakes, automatic speed brakes and wing ground spoilers did not function.

The captain used manual braking to slow the aircraft. The antiskid system for the outboard main landing gear did not function, and all four outboard tires burst during the landing roll. The captain taxied the aircraft onto the last high-speed turn-off, approximately 1,800 feet (549 meters) from the end of the runway, shut down the engines and ordered the passengers and flight attendants to remain seated. The four tires on the inboard main landing gear deflated when their fusible plugs melted because of the excessive heat that built up during the landing. Airport firefighters extinguished a small brake fire. Approximately 25 minutes after landing, the passengers disembarked on mobile stairs.

The report said that investigators were not able to duplicate the electrical anomalies reported by the flight crew.

The incident aircraft was ferried to The Boeing Co.'s B-767 production facility in Everett, Washington, U.S. "At Everett, the airplane was subjected to testing equal to or greater than new-airplane delivery standards," said the report. "The wiring system was examined in detail for any anomaly that could have contributed to the problem. An [EMI] test was conducted throughout the cockpit and cabin with negative results. Additionally, several components were identified as possible contributors to the [incident] and were removed for separate testing. None of the testing was able to duplicate the events reported by the flight crew."

Nevertheless, the investigation revealed a loose connection on the main battery shunt and that the shunt was not assembled according to Boeing's specifications.

"The investigation revealed that the negative cable for the main battery was not positively secured to the main battery shunt [because] of stripped threads in the jam nut area on the stud," said the report. "Additionally, the main battery shunt was not built up [that is, the placement of the bottom and top nuts, flat washers and lock washers on the studs was not] in accordance with Boeing specifications. An examination of other [B-767s] in the Martinair fleet and on the production line at Boeing revealed similar [battery shunt] buildup problems."

The report said that most of the electrical anomalies encountered in flight were caused by decreased power or interruption of power on the hot battery bus, the left DC bus and the right DC bus.

"The loss of the hot battery bus was most likely a combination of the main battery shunt termination being loose, preventing the proper grounding of the battery, and the main battery charger shutting down," said the report. The investigation did not determine the causes of the main battery charger shutdown or the DC bus power fluctuations.

The report said that the electrical current felt when the flight crew touched the captain's utility light was attributed to a crossed connection of the utility light's ground wire and the power wire to the aircraft-wiring terminal strip.

"The cross termination resulted in 28-volt AC [alternating current] power being conducted through the utility light chassis, and the ground was connected to the utility light switch," said the report.

The report said that the nonfunctioning of the thrust reversers and ground spoilers, and the failure of the engines to change from flight idle to ground idle after touchdown, resulted from an air/ground logic circuitry malfunction caused by intermittent disruptions of electrical power.

During the investigation, NTSB made three recommendations to the U.S. Federal Aviation Administration (FAA). NTSB said, "The flight crew was unaware that the systems that assist in stopping the airplane would be inoperative. The captain stated that [if he had known the systems were inoperative] a greater flap setting or a longer runway would have been considered to increase the margin of safety for landing."

Thus, NTSB recommended that FAA:

- "Require that the Boeing Commercial Airplane[s] Group modify the crew alerting system of the Boeing 757/767 to include a 'caution' alert to notify pilots when a malfunction in the air/ground logic circuitry has occurred that will render certain braking systems inoperative upon touchdown. The alert should also specify which systems (thrust reversers, ground spoilers, antiskid, etc.) will not function properly on landing, (A-96-121);
- "Require that the Boeing Commercial Airplane[s] Group modify its Boeing 757/767 Operations Manual to include a detailed emergency procedure and the necessary data for flight

crews to execute a landing when certain braking systems (such as antiskid, ground spoilers, thrust reversers and ground idle) will be inoperative. (A-96-122); and,

- "Review the design of transport-category airplanes other than the Boeing 757/767 to determine if there are features that notify pilots when a malfunction in the air/ground logic circuitry has occurred that will render certain braking systems inoperative upon touchdown. If not, incorporate the appropriate modifications. (A-96-123)"

NTSB in April 1997 determined that the modification of the crew-alerting system recommended in A-96-121 was not necessary. "Data [provided by Boeing] indicated that the combined effects of the loss of [ground spoilers, thrust reversers and ground idle] on landing performance [of the B-757 and B-767] was minimal," said NTSB. "The largest contributor to the extended landing rollout was the loss of the antiskid system, a failure which was annunciated to the flight crew [of the incident aircraft]."

As of February 1999, NTSB and FAA said that the FAA was working with Boeing to revise the B-757 and B-767 operating manuals per recommendation A-96-122, and that FAA was obtaining data from manufacturers of transport-category airplanes to "determine if corrective actions are necessary" per recommendation A-96-123.

Editorial note: This report was based on U.S. National Transportation Safety Board (NTSB) Factual Report NYC96IA116, NTSB Brief of Incident NYC96IA116 and NTSB Safety Recommendation A-96-121 through A-96-123. The 234-page factual report includes indexes, diagrams and photographs.♦

MAINTENANCE ALERTS

Contaminated Fuel-nozzle Screens In Allison 250-C20B Engines Cited in Four Helicopter Accidents

Four helicopter accidents and numerous malfunction-or-defect reports (MDRs) submitted by maintenance technicians prompted the U.S. National Transportation Safety Board (NTSB) to recommend actions to prevent contamination of fuel-nozzle screens in Allison 250-C20B turboshaft engines.

NTSB said that the following U.S. helicopter accidents involved contamination of Allison 250-C20B fuel-nozzle screens:

- On April 18, 1994, a Hughes 369D was destroyed when it landed hard on rocky terrain after the engine lost power during a sightseeing flight near Hanapepe, Hawaii. One passenger was killed; the pilot and three passengers were seriously injured. NTSB said that the helicopter was operated in a marine environment and that the fuel-nozzle screen contaminants included salt;

- On April 14, 1996, a Hughes 369D was substantially damaged in a forced landing after the engine lost power during cruise flight at 200 feet to 300 feet above ground level near Yerington, Nevada. The three occupants sustained minor injuries. NTSB said that the fuel-nozzle screen was partially blocked by debris;

- On Nov. 16, 1996, a Hughes 369D was substantially damaged when it struck trees after the engine lost power during an external-load operation near Forks, Washington. The pilot was seriously injured. NTSB said that the source of fuel-nozzle screen contamination was the operator's in-ground fuel-storage tanks; [and,]

- On Jan. 12, 1997, a McDonnell Douglas Helicopter Systems (MDHS) 369D was substantially damaged when it landed hard in an open field after the engine lost power on takeoff from a helipad near Kamuela, Hawaii. The pilot was not injured. NTSB said that the helicopter was operated in a marine environment and that the fuel-nozzle screen contaminants included salt.

NTSB said, "Numerous [MDRs] of partially clogged Allison 250 engine fuel nozzles have been submitted by mechanics."

The fuel-nozzle screen is one of three fuel-straining devices on the Allison 250-C20B engine. The fuel pump's fuel-straining device, when obstructed, bypasses fuel around the filter and provides a warning to the pilot. The fuel control unit, which meters fuel to the fuel nozzle, has an inlet screen with a bypass feature but no warning feature.

The fuel-nozzle screen has no bypass feature or warning feature. NTSB said, "The engine manufacturer's inspection guidelines recommend that the fuel-nozzle screen be inspected only when the engine [fuel pump] filter bypass light illuminates and/or the engine fuel pump filter is found to be contaminated."

NTSB said that none of the helicopters involved in the accidents or

MDRs had an airframe-mounted fuel filter, which is an option on MDHS 369 series helicopters.

Based on these findings, NTSB made the following recommendations to the U.S. Federal Aviation Administration:

- "Direct all operators of helicopters powered by Allison 250 series engines to conduct a one-time inspection of all the engine fuel-nozzle screens to ensure that they are intact, unobstructed and functional. (A-98-84);

- "Determine appropriate inspection intervals for helicopters powered by Allison 250 series engines and then require that periodic inspections be accomplished on those engine fuel-nozzle screens to prevent the accumulation of contaminants that could alter the fuel delivery, engine performance and ultimately clog the fuel-nozzle screen and cause engine power loss. (A-98-85); [and,]

- "Determine if the optional airframe-mounted fuel filter on helicopters powered by Allison 250 series engines provides substantial improvement in the removal of fuel system contaminants, and, if so, require airframe-mounted fuel filters on those helicopters that do not already have them installed. (A-98-86)"

DC-10-30 Gear-retraction Problems Traced to Overlooked Gear Pins

A maintenance technician and a pilot, in reports to the U.S. National Aeronautics and Space Administration Aviation Safety Reporting System (ASRS), said that overlooked landing-gear pins in two Douglas DC-10-30 aircraft prevented the flight crews from retracting the landing gear during takeoff.

The maintenance technician's report said, "[The] center gear pin [was not] removed before flight. There was no log[book] entry of [the] center pin being installed, and no flag or streamer was visible from the ground."

The report said that most DC-10 aircraft have three gear pins, but the DC-10-30 has four gear pins. "The mechanic who removed the gear pins failed to count in the pouch the fourth pin," said the report.

Regarding another incident, the pilot's report said, "After takeoff, we attempted to retract the gear, but the mains stayed down and locked. We checked all the related systems and found no apparent problems, so we returned to the airport. We found the main gear pins installed.

"We learned later that the aircraft had been ferried here with the gear down, the pins installed and the flags removed. When I did my preflight of the cockpit, I noted that all the flags were behind the first officer's seat, per the company manual. It never came to mind that the mechanics had removed the flags from the pins."

Overlooked Rigging Pin Causes Flight Control Problems During Helicopter Takeoff

The Canadian Transportation Safety Board (TSB) said that a flight-control rigging pin that was not removed after maintenance caused a Sikorsky S-61N helicopter to depart from controlled flight during a subsequent takeoff from a barge on the Brem River in British Columbia, Canada, on Sept. 8, 1997.

"As soon as the helicopter left the deck, it began to turn rapidly to the right," said the TSB. "After the third turn, the helicopter nosed over and, as the airspeed increased, stopped turning."

Following a radio discussion with maintenance personnel, the copilot removed the rigging pin from the tail rotor quadrant, which is within the flight-control "broom closet" in the cockpit. "As a result, the pilot regained control of the tail rotor system and carried out an uneventful landing at the barge," said the TSB.

"The rigging pin had been left in since the previous maintenance and had been missed by both [maintenance technicians] during their postmaintenance inspection and by the pilots during their preflight inspections."

TSB said that a warning flag had not been attached to the rigging pin and that the flight-control maintenance had not been recorded in the aircraft logbooks.

Actuator Malfunctions Cause Dash 8 Roll Spoilers to Jam in the Extended Position In Flight

The U.S. National Transportation Safety Board (NTSB) has recommended that the U.S. Federal Aviation Administration (FAA) require replacement of the roll-spoiler piston assemblies in de Havilland DHC-8 (Dash 8) airplanes.

NTSB cited the following incidents of Dash 8 roll spoilers jamming in the extended position in flight:

- On April 3, 1995, a Dash 8 entered an uncommanded left roll during approach to Moline, Illinois, U.S., because the left, inboard roll spoiler was extended approximately 50 percent;
- On Jan. 22, 1997, a Dash 8 entered an uncommanded left roll

while being rotated for takeoff at Charleston, West Virginia, U.S., because the left, inboard roll spoiler was extended approximately 50 percent; and,

- On Feb. 20, 1997, a Dash 8 entered an uncommanded left roll on departure from Detroit (Michigan, U.S.) Wayne County Metropolitan Airport because the left, outboard roll spoiler was extended approximately 50 percent.

In each event, the flight crew maintained aircraft control, declared an emergency and landed without further incident. NTSB said that, in each aircraft, the welded plug at the base of the roll-spoiler actuator piston had separated and lodged between the piston and the housing. "This restricted the piston's travel and prevented its full retraction," said NTSB.

NTSB said that these malfunctions, and seven other malfunctions reported by Dowty Aerospace, which manufactures the actuator, were caused by improper welding of the plugs. NTSB said that Dowty has discontinued manufacture of the welded-plug assemblies (part no. A50991-2) and introduced a new piston assembly (part no. A44714-2) with a swaged piston blank.

NTSB recommended that FAA require Dash 8 operators to replace the welded-piston-plug assemblies with swaged-piston-blank assemblies.♦

NEWS & TIPS

ICAO Documents And Standards Added to Database

IHS TransPort Data Solutions will republish the International Civil Aviation Organization (ICAO) advisory documents and standards in its aviation database, AV-DATA.

AV-DATA also includes the U.S. Federal Aviation Regulations; U.S. Federal Aviation Administration airworthiness directives, notices of proposed rule making, advisory circulars and type certificate data sheets; the Joint Aviation Requirements (JARs); the International Air Transport Association recommendations for air transport of dangerous goods; and Flight Safety Foundation publications from 1993.

The company said that AV-DATA now contains the equivalent of approximately 200,000 pages of international aviation regulations, advisory guidelines and compliance documents related to airworthiness, safety and maintenance.

For more information: IHS Transport Data Solutions, 15 Inverness Way East, Englewood, CO 80112 U.S. Telephone: (800) 320-5660 (United States and Canada) or +(303) 858-6325.

Deicers Provide Quick Installation On Saab 340, 2000

New *FAST*boot™ pneumatic deicers, available for the Saab 340 and 2000, can be installed in two hours, according to the manufacturer, BFGoodrich.

Installation labor involves only priming the aircraft's leading-edge surfaces and rolling down the deicers. The product minimizes the use of solvents. Deicers for additional regional aircraft models are planned.

For more information: Gary Plummer, BFGoodrich Aerospace, Ice Protection Systems Division, 1555 Corporate Woods Parkway, Uniontown OH 44685 U.S. Telephone: +(330) 374-3045.

Walk-off Mats Control Dust, Dirt

A new line of walk-off mats is said to provide easy control of dirt, dust and other contaminants from shoes, casters and cart wheels. The mat holds a pad of sheets with adhesive surfaces. When the top sheet has been covered with dust and debris, the dirty sheet can be peeled off to expose the next, clean sheet.

The mats are available in two sizes, 600 millimeters (mm) by 900 mm (two feet by three feet) and 600 mm by 1,200 mm (two feet by four feet), in standard or antistatic forms.

For more information: Bonnie Kitchen, ASG Division of Jergens, 19520 Nottingham Road, Cleveland, OH 44110 U.S. Telephone: +(216) 486-6163.

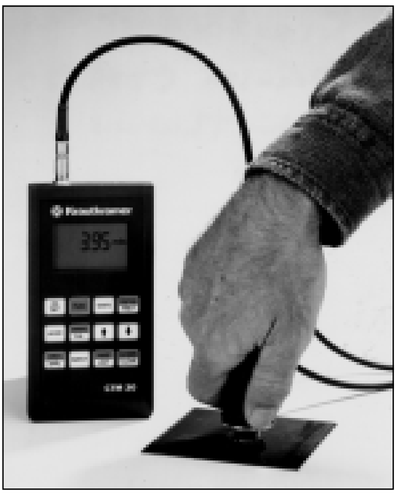
ASG Walk-off Mat

Gauge Measures Coating Thickness

Ultrasonic technology enables the CTM 20 coating-thickness gauge to measure coatings and multiple layers covering nonmetallic materials. Such measurements are not possible with magnetic methods or inductive methods, according to the manufacturer.

The device measures the thickness of paint coatings, plastic and other insulation layers on wood, plastic, glass, ceramics and metallic materials. It also performs non-destructive measurements of multiple layers. The CTM 20 can measure total thickness as well as the thicknesses of individual layers.

For more information: Krautkramer Branson, 50 Industrial Park Road, Lewiston, PA 17044 U.S. Telephone: +(717) 242-0327.



Krautkramer Branson CTM 20 Coating-thickness Gauge

New Hush Kit Certified for DC-8 Series 50/61

Quiet Technology Venture and Fine Air Services have received the first U.S. Federal Aviation Administration supplemental type certificate to install stage-3 hush kits on McDonnell Douglas DC-8 series 50/61 aircraft. The hush kit brings the standard Pratt & Whitney JT3D engines into compliance with U.S. noise regulations while maintaining a level of performance that makes continued operation of the DC-8 economically viable, according to the manufacturing partnership.

The firm plans to develop hush kits for other aircraft, including the Boeing 707 and the British Aerospace BAC 1-11 200/400/500 series.

For more information: Susan Gilbert, Quiet Technology Ventures, 8000 NW 56th Street, Miami, FL 33166 U.S. Telephone: +(305) 371-6054.

Respirator Protects Welders from Particles, Gases

The Speedglas® Fresh-air® II G 900 System powered air-purifying respirator blows cool, filtered air on the welder's face and creates a positive atmospheric pressure in the mask to help prevent the entry of particles and

Speedglas® Fresh-air® II G 900 System Respirator

gases, according to the manufacturer, Hornell Speedglas.

The respirator uses three cartridge filters to remove particles and gases, or particles only. The unit's self-contained battery powers the blower for six hours to eight hours before recharging, and the face plate is supplied with the purchaser's choice of four self-darkening lenses.

For more information: Hornell Speedglas, 2374 Edison Boulevard, Twinsburg, OH 44087 U.S. Telephone: (800) 628-9218 (United States and Canada) or +(330) 425-8880.

Bumper-post Sleeves Improve Safety, Appearance

Ideal Shield® protective bumper-post sleeves are said to eliminate the need for costly scraping and painting. The thermoplastic sleeves are made to slide over posts up to eight inches (20 centimeters) in diameter and from six inches to 84 inches (15 centimeters to 213 centimeters) in height. Custom sizes also are available.

The bumper-post covers are available in Occupational Safety and Health Administration standard yellow and custom colors, and can be molded with safety warnings and symbols to alert workers to hazards present and safety precautions required.

For more information: Brandi Parenti or Virginia Giurastante, Ideal Shield, 2555 Clark Street, P.O. Box 09210,

Ideal Shield® Bumper-post Sleeve

Detroit, MI 48209-1355 U.S. Telephone: (800) 731-1722 (United States and Canada) or +(313) 842-7290.

Inflatable Jacks Combine Power, Ease of Use

SPX Power Team's Generation IV Inflatable Jacks have lifting power of 12 tons (107 kilonewtons) to 74.6 tons (664 kilonewtons) and lifting heights of 8.8 inches (22.4 centimeters) to 20.5 inches (52 centimeters). The jacks can be inflated with compressed air or water at maximum pressure of 116 pounds per square inch (8 kilograms per square centimeter).

The jacks are reinforced with Aramid/Kevlar® and are flexible, lightweight and nonconductive. The manufacturer said that the jacks resist oil, ozone and most chemical agents.

For more information: Pete Dixon, SPX Corp., 2121 West Bridge Street, P.O. Box 993, Owatonna, MN 55060-0993 U.S. Telephone: (800) 541-1418 (United States and Canada) or +(507) 455-7150.

Agencies Announce Conference on Aging Aircraft

The U.S. Federal Aviation Administration (FAA), U.S. Department of Defense and U.S. National Aeronautics and Space Administration will sponsor the third joint *Conference on Aging Aircraft*, Sept. 20–23, 1999, in Albuquerque, New Mexico, U.S., for specialists in aviation-safety research, aircraft design and manufacturing, fleet operation and aviation maintenance. The purpose of the conference is to disseminate information on current practices and advanced technologies designed to ensure the continued airworthiness of aging commercial and military aircraft.

The conference will provide an opportunity for interaction among key personnel in research and development, commercial airline operations, military fleet operations, aviation maintenance, and aircraft-certification and regulatory authorities.

Activities will feature tours of the FAA Airworthiness Assurance Nondestructive Inspection Validation Center. Sample test articles and a defect library will include full-scale, representative sections of airframe structures and engine structures with realistic defects in known locations. Exhibitors will have the opportunity to display and demonstrate their products alongside and, in some cases, on the test articles.

For more information: Dennis Flath, Galaxy Scientific, Attn: Conference on Aging Aircraft, 2500 English

Creek Avenue, Building C, Egg Harbor Township, NJ 08234-5562 U.S. Telephone: +(609) 645-3772, ext. 129.

Distance Education Program Features Interactive Video

The College of Aeronautics in Flushing, New York, U.S., has expanded its distance education program. In partnership with United Technologies, Pratt & Whitney and Sikorsky Aircraft, the college offers bachelor-degree programs and associate-degree programs in avionics, aviation maintenance, computerized design, flight and pre-engineering.

Through interactive video conferencing, students at the college's New York campus and at United Technologies facilities in Connecticut, U.S., and Tennessee, U.S., can participate in real-time classroom dialogue.

For more information: Krisztina Vida, College of Aeronautics, LaGuardia Airport, Flushing, New York 11371 U.S. Telephone: +(718) 429-6600.

Pressure-sensitive Tapes Meet U.S., U.K. Requirements

Scapa Tapes of North America offers two double-adhesive-sided, flame-retardant cloth tapes (8 mils and 13 mils [0.2 millimeters (mm) and 0.33 mm] thick) for use in installation or repair of aircraft-cabin floor coverings and furnishings. The tapes meet the material requirements of U.S. Federal Aviation Regulations (FARs), Part 25 and Boeing Material Specification, BMS.5 133B-Type IV Class, according to the manufacturer.

The tape also is available with a single adhesive side (8.5 mils [0.22 mm] thick) and meets FARs Part 25 flame-retardant requirements, for repair of cargo-hold and baggage-hold linings, aircraft wiring and general applications.

Another tape is made of polyurethane (14 mils [0.36 mm] thick) and is used for abrasion and erosion protection of propeller-blade leading edges and de-icer areas, and leading edges of wings and empennage structures. Dowty Aerospace Propellers, U.K., the type certificate holder and manufacturer of several types of propellers, approves use of the tape via its process specification no. PS 732. This includes U.K. Civil Aviation Authority approval of use, and under bilateral airworthiness agreements between the United States and the United Kingdom, FAA approval of use.

For more information: Scapa, North America Headquarters, 111 Great Pond Drive, Windsor, CT 06095 U.S. Telephone: (800) 801-0323 (United States and Canada); +(860) 688-8000; Fax: +(860) 688-7000.♦

BLANK
INSIDE
BACK
COVER

Visit our World Wide Web site at http://www.flightsafety.org