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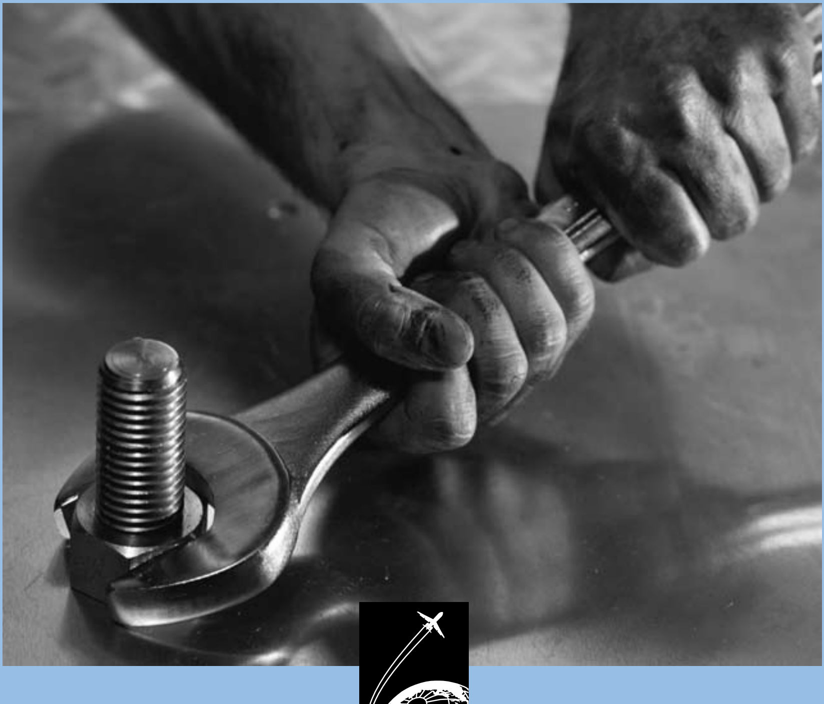

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Robert A. Feeler, editorial coordinator

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Loose Fasteners Cited in Dash 8 Pitch-control Anomaly

The incident report by the Transportation Safety Board of Canada said that tightening the nuts on a balance weight on the right elevator spring tab was overlooked as the aircraft was prepared for return to service after painting work.

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FSF Editorial Staff

Loose bolts that became jammed on the top surface of the right elevator of an Air Canada Jazz de Havilland DHC-8-100 (Dash 8), forcing the elevator spring tab into a trailing-edge-down position, were responsible for control problems that prompted the flight crew to declare an emergency soon after departure from Kingston, Ontario, Canada, for a flight to Toronto, Ontario.[1]

The aircraft was not damaged in the Sept. 2, 2004, incident, and no one in the aircraft was injured.

The Transportation Safety Board of Canada (TSB) said, in its final report, that the causes of the incident and contributing factors were the following:

- "The nuts securing the counterbalance weight to the weight arm were not tightened. They fell off, which in turn allowed the bolts to migrate out of the weights. When the outboard weight fell off, the bolts jammed on the top surface of the elevator; [and,]
- "The independent inspection was not adequate, in that it did not

> reveal that the securing nuts were not tight."

The incident occurred about 1430 local time, at the beginning of the aircraft's fifth flight of the day. It was the flight crew's first flight of the day; neither the captain's conversation with the captain of the previous flight nor the first officer's preflight inspection revealed any indication of a flight control anomaly during the previous flight. After a 15-minute turnaround, the flight crew taxied the aircraft to the runway for departure.

"During the takeoff run ... the controls were lighter than normal, and at rotation, almost no nose-up force was required," the report said.

The first officer, who was the pilot flying (PF), said that during initial climb, "abnormal forward pressure" was required to keep the aircraft's nose from pitching up. He applied nose-down trim, but the amount of forward pressure required on the controls increased.

"Thirty seconds after becoming airborne, the aircraft was 350 feet above ground level (approximately 700 feet above sea level), and the first officer had applied full nose-down trim," the report said. "The amount of forward pressure on the control column continued to increase as the aircraft accelerated, and the first officer notified the captain of the control difficulties and requested his assistance in holding the control column forward. As the aircraft climbed, the captain declared an emergency, indicating … that the aircraft [might have to be landed] at Trenton, Ontario."

The crew determined that the problem was a pitch-control anomaly, and, because they were able to control the aircraft, they continued normal climb procedures and leveled the aircraft at the assigned altitude of 4,000 feet. They allowed the aircraft to accelerate and reviewed the Air Canada Jazz *Quick Reference Handbook* (QRH) and the abnormal/emergency procedures section of the *Dash 8 Standard Operating Procedures (SOPs).*

"Although they had previously assessed that the elevator control was not jammed, they decided that the pitch-control-jam procedure was the most appropriate for their circumstance," the report said.

They slowed the aircraft from 185 knots to 150 knots, the maximum speed for a jammed pitch control. They pulled the elevator-pitch-disconnect handle and found that the left side (captain's) elevator controls functioned normally.

The captain took control of the aircraft, flew the aircraft to 12,000 feet and decided to continue the flight to Toronto/Lester B. Pearson International

Airport, where he conducted a normal landing without flaps.

Balance Weight Was Missing

A post-flight inspection revealed that half of one of the balance weights from the right elevator spring tab was missing, along with two nuts that secured the balance weight. The report said that the two bolts associated with the nuts had "migrated out of the remaining half weight and jammed on the top surface of the elevator"; as a result, the elevator spring tab was held in the trailing-edge-down position.

The report said that the Dash 8 pitch-control system comprises "two elevator-control-cable circuits, each operating an independently mounted, spring-tab-assisted elevator. Each elevator has a spring tab at the inboard end and a trim tab at the outboard end.

"The left elevator is actuated by the captain's control column through the left cable-control circuit and the left elevator spring-tab system. The right elevator is actuated by the first officer's control column through similar components."

The two control columns normally are interconnected to allow for simultaneous movements of both elevators. In the event that one of the control-cable circuits jams, the control columns can be disconnected by the elevator-pitch-disconnect system to allow the unjammed circuit to operate normally.

Spring Tabs Provide 'Aerodynamic Assistance'

The report said that the spring-tab system is "designed to provide aerodynamic assistance to elevator movement. There are two mass balances extending forward of each spring-tab leading edge. Each mass balance assembly consists of two weights bolted together and secured to the arm with two bolts.

"When the elevators are actuated, the control-column movements go directly to the spring tab and then to the elevator through the torque shaft. With the airplane on the ground and no aerodynamic load, the stiffness of the torque shaft overcomes the weight of the elevator, causing it to move with the control column. The geometry of the actuating hardware causes the elevator to move in the opposite direction to the spring tab. Maximum spring-tab deflection is limited by the crank stops, after which the elevators are moved directly by the control column. Maximum elevator deflection is limited by the lever stops."

Data from the aircraft's flight data recorder showed that the movement of the elevators was coordinated until the aircraft began accelerating for the takeoff run. The maximum differential in elevator deflection occurred when the airspeed reached about 120 knots; at that time, the right elevator was about 12 degrees trailing-edge-up, and the left elevator was about eight degrees trailing-edge-down, the report said.

Calculations indicated that, when the airspeed reached 185 knots, the stress on the aircraft's tail was near the structural limit.

The report said that the flight crew had no training that would have enabled them to determine that the cause of their problem was a jammed spring tab; in addition, the QRH contained no information that would have helped them diagnose the problem. As a result, they were unaware that the control problem was causing asymmetrical elevator loads that could have overstressed the tail of the aircraft.

"This lack of information contributed to [their] continuing the flight to destination rather than landing at the nearest suitable airport," the report said. "From their training, they would be predisposed to assume that a pitch-control jam would result in an inability to move the control column. Therefore, they did not associate the difficulty in holding the control column forward as an indication of a pitch-control jam. Instead of slowing the aircraft to minimize the abnormal forces on the aircraft, they continued with the normal climb procedures, including retracting the flaps and allowing the aircraft to accelerate.

"After declaring an emergency because of the pitch-control anomaly but without being able to determine the cause of the anomaly or whether there was any damage to the aircraft or its controls, the flight crew overflew a suitable [airport] where an emergency landing could have been accomplished. The QRH checklist for a pitch-control jam did not indicate that a landing should be conducted at the nearest suitable [airport]."

Spring Tab Required Rebalancing

A review of maintenance records showed that the aircraft had been at the Air Canada paint shop in Toronto from July 22 through Aug. 7, 2004.

After the repainting and before the aircraft was returned to service, maintenance personnel performed numerous tasks, including balancing the control surfaces and tabs, checking that control movements were free and clear, conducting a line check and conducting a full-power engine run. Two signatures were required to signify that all required work had been completed: The first signature, which was dated Aug. 8, signified that an independent inspection of the aircraft's flight controls had been completed; the second signature, dated Aug. 9, signified that all work was completed properly.

During the control check, maintenance personnel had found that the right elevator spring tab was nose-heavy and required rebalancing. The work was not noted on the check sheets, the report said.

The rebalancing required that the tab drive bracket be disconnected from the pushrod and that a specified weight be attached to the trailing edge of the tab before the steel balance weights were removed and material was ground from the upper surface of the weights, the report said. An independent inspection of the work — required by Canadian Aviation Regulations because of the disturbance to the flight controls — was conducted the following morning.

Maintenance personnel were brought in from Halifax, Nova Scotia, Canada, to conduct the tasks required before the aircraft could be returned to service.

"On 07 August 2004, the aircraft maintenance engineer (AME) who balanced the spring tab started his normal work shift in Halifax at 0700 … [0600 in Toronto] and that morning was asked to go to Toronto to work on the aircraft coming out of the paint shop," the report said. "He arrived in Toronto in the afternoon and began working on [the incident aircraft]. Late at night on 07 August 2004, he completed the removal and reinstallation of the weights from the spring-tab balance arm.

"The AME who conducted the independent inspection of the controls arrived from Halifax on the evening of 07 August 2004, and the first task he completed the following morning was the independent inspection of all the aircraft flight controls."

Weight Had Been Removed

Many details were not available about the conduct of the maintenance tasks involving the spring tab because the work was performed about one month before the incident, the report said.

"However, the top of the jammed weight had been ground down, confirming that it had been removed at least once to grind material off in the attempt to balance the spring tab," the report said. "After the weights had been adjusted, they would [have been] reinstalled and the tab [would have been] rechecked for balance.

"Although it is possible that the nuts and washers were not reinstalled for the balance check, it is more likely that they were installed but left loose intentionally to facilitate re-removal of the weights should additional grinding be required. In any event, the final step of tightening them was overlooked. Without the nuts installed, the bolts migrated out of the weights, and when the outboard weight fell off, the bolts jammed on the top surface of the elevator.

"The task of balancing the spring tab was completed late at night by an AME who had traveled from Halifax and then worked a long day. The independent inspection that was completed the next morning did not discover the loose nuts; no explanation for this was found."

After the repainting, the aircraft accumulated about 162 flight hours (and 162 cycles) before the incident flight.

The operator conducted an internal investigation of the incident, using the Maintenance Error Decision Aid (MEDA) process, an investigative tool developed in the mid-1990s by The Boeing Co. to investigate maintenance incidents, the report said.[2]

The MEDA process identified several deficiencies, and, as a result, the operator modified some of its procedures "to improve the quality of the work and to reduce the chance of a maintenance error going undetected," the report said.

The report said that the modifications included the following:

- "The inspection form 'Preparation for Aircraft Paint Visit' was amended to record additional information that will indicate if it was necessary to adjust the balance weights when the control surfaces and tabs were checked for balance;
- "A communication was transmitted to all maintenance personnel to restate the requirements and expectations of an independent inspection;
- "Procedures are being drafted to monitor, approve and limit extended amounts of overtime; [and,]
- "Flight crew training syllabuses are being modified to include information and procedures for 'soft' jam situations."

In addition, Bombardier, which acquired de Havilland Aircraft of Canada in the 1990s, issued All Operator Message No. 789 to "raise the awareness of output/soft jam possibilities in the flight controls of DHC-8-100/200/300 aircraft so that flight crews will proceed immediately to the control jam checklist and not allow the aircraft to accelerate," the report said.♦

Notes

1. Transportation Safety Board of Canada. *Aviation Investigation Report, Flight Control Difficulties, Jazz Air Inc., de Havilland DHC-8-102, C-FGRP, Kingston, Ontario, 02 September 2004*. Report no. A04O0237.
2. McKenna, James T. "Maintenance Resource Management Programs Provide Tools for Reducing Human Error." *Flight Safety Digest* Volume 21 (October 2002): 1–15.

   The Maintenance Error Decision Aid (MEDA) process originally was developed by The Boeing Co. to collect more data on maintenance errors but evolved into a project to provide maintenance organizations with a standard process for analyzing factors that contribute to errors and for developing corrective actions. The MEDA process assumes that errors by maintenance personnel are unintentional, that errors result from multiple factors (such as misleading information or incorrect information, design issues, inadequate communication or time pressure) and that most of these factors are manageable.

MAINTENANCE ALERTS

Overstress Leads to Rotor-blade Failure

The Bell/Garlick UH-1B helicopter was en route to Gore, New Zealand, on a ferry flight. Near Mokoreta, Southland, New Zealand, a main-rotor blade separated from the aircraft. The helicopter spiraled to the ground from an estimated altitude of 500 feet and struck terrain. The pilot, the only occupant, was killed in the accident on April 22, 2004.

"The separation of the white main-rotor blade evidently resulted directly from the failure of the white TT [tension-torsion] strap [a critical rotor-hub component] — fatigue cracking had progressively spread across more and more laminates," the report by the New Zealand Transport Accident Investigation Commission said. ["Red" and "white" are designations commonly used in maintenance to identify individual blades and their associated components.] "The TT straps were enclosed within the yoke and blade grip, preventing any opportunity for visual inspection beforehand. Probably no symptoms of an impending failure would have occurred to warn of the event."

Metallurgical study of the TT straps showed "clear evidence" that the TT straps (especially the red TT strap) had been subjected to tensile forces greater than those developed at normal speeds, indicating that the main rotor had been operated at a speed exceeding the maximum permitted

339 rpm (revolutions per minute) at an unknown time before the accident, said the report.

"The overstress on the TT straps which resulted from this overspeed was clearly beyond the fatigue limit for the material, because of the visible buckling [of the TT straps] it produced, and probably resulted in the fatigue-initiation sites at the anchor-pin holes of each laminate," the report said. "Once the fatigue process had been started by such abnormal loads, cracks would continue to propagate under normal load conditions, probably at each flight cycle when the rotor was brought up to speed before takeoff."

Although it was "probably not a factor in the accident," one of the "items of concern" found in the investigation was an absence of identification markings on the TT straps and on record cards, the report said.

"The absence of serial number identification on the records meant that these TT straps could never be uniquely identified, and hence no times-in-service could properly refer to them," the report said. "These records plainly showing this lack of identification had subsequently been in the hands of numerous [operational and regulatory] parties, who each had a duty of care, and who should have been expected to note the discrepancy and respond to it."

Composite Panel Separates From Engine

During the takeoff of a Boeing 777-200 from Copenhagen (Denmark) International Airport, ground crewmembers observed "a smoke of powder and blast of debris" from the left engine. Air traffic control informed the flight crew of the observation, and the pilot-in-command elected to land the airplane at the departure airport.

During the return, the only discrepancy among the left engine parameters was an intermittent absence of an engine gas temperature indication. The airplane was landed with the left engine set to idle and without the use of the thrust reverser on that engine. There were no injuries to crewmembers or passengers in the incident on June 15, 2002.

"Accident investigators from AAIB-DK [Danish Aircraft Accident Investigation Board] initiated the investigation of the aircraft immediately after [the] landing and found a significant loss (approximately 25 percent) of the left-hand composite thrust reverser inner wall (C-duct)" on the left engine, said the report by AAIB-DK.

The engine-overpressure blowout panels were found in the CLOSED position, indicating that no air leak from the engine-air-bleed system or cooling system had caused the thrust reverser inner-wall failure, said the report.

"A closer inspection of the damaged thrust reverser composite inner wall and parts found on the runway area revealed [that] a large area of solid skin of the left-hand thrust reverser inner wall had disbonded from the honeycomb substrate, creating an instability that precipitated the separation," the report said. "Furthermore, there was an indication of a lack of adhesion between the honeycomb core and the composite plies on the inside surface of the composite panel."

Testing of the failed composite inner panel revealed that the left inner-wall tension coupons located immediately in front of the separation area were not as strong as the corresponding coupons on the right-engine inner wall, said the report.

"The most probable cause of separation of this individual panel was a manufacturing event in which some combination of solvent and water came in contact with uncured epoxy matrix and adhesive," the report said. "This event could have altered the wetting and flow of materials, thus producing a very weak bond at a specific location on the panel. The type of spill event would affect only a single panel."

Incorrect Installation Produces Delayed Hydraulic Leak

The Robinson R44 helicopter was being flown from Cork, Ireland, to Weston, Ireland. About 700 feet above ground level, severe vibrations of the cyclic control began, and the controls became "stiff and heavy." The pilot conducted an emergency landing in a field two miles (three kilometers) from Cork Airport. After exiting the helicopter, the pilot examined the area underneath the auxiliary fuel tank and noticed oil on the firewall.

The pilot, the only occupant, was not injured, and the helicopter received minor damage in the Nov. 2, 2004, incident.

An engineer was called to the scene of the landing to investigate the problem.

"The engineer confirmed by using a hydraulic ground rig that the forced landing was caused by loss of hydraulic fluid in the flight control system, which in turn resulted in the flying controls functioning without hydraulic servo assistance," said the report by the Irish Air Accident Investigation Unit. "The engineer detected that the leak was coming from a T-piece union on the output side of the hydraulic pump. He removed the union … and noted that the O-ring retainer (part no. MS 28773-04) had a ring mark around it, indicating that the associated union nut (part no. D452-6) was tightened too far up the union and distorted the retainer."

The helicopter manufacturer said that the retainer, which seats the O-ring seal, had not been installed properly during manufacture, the report said. Because the retainer is not visible after installation, the manufacturer used a leak check with normal system pressure to verify that the installation was correct. The manufacturer has since revised procedures to provide for visually inspecting the retainers and O-ring seals earlier, to verify correct assembly before the fittings are installed in the final assembly.

At the time of the incident, the helicopter had a total of 24 flight hours since new.

"The incident shows that an improperly installed retainer may not cause a leak for several flying hours," said the report.

Omitted Filler Material Cited in Deicer Boot Separation

The Fairey Britten-Norman BN2A Mk III-2 Trislander had just taken off from Guernsey (Channel Islands, U.K.) Airport when the sound of a "crack" was heard in the airplane's cabin. The pilot was informed by a positioning pilot from the same company who was aboard that a cabin window was broken and that several passengers had been injured. The pilot landed the airplane at the departure airport, taxied it clear of the runway and shut down the engines. One passenger was seriously injured, and 10 passengers and the pilot received minor or no injuries in the July 23, 2004, accident.

"After the passengers had disembarked, the pilot noticed that a deicer boot had separated from the left-hand propeller and was now on the seat inside the cabin, adjacent to the broken window," said the report by the U.K. Air Accidents Investigation Branch.

According to a laboratory report, the separation of the deicer boot was attributed to peel stresses generated outboard of the restrainer strap in an area where the adhesive bond was damaged, said the report.

"The propeller [Hartzell HC-C3YR-2CUF] manufacturer considered that the initial, very small unbonded area was insufficient to generate damaging peel stresses but that the area had grown due to ingress of contaminants because the required filler material had not been applied," the report said. "Whatever the initial reason for the disbond, once the disbonded area became large enough to generate a peel force equal to the peel strength of the adhesive, the disbonded area would have started to grow very rapidly."

There was no evidence to confirm or refute the suggestion that moisture or other contaminants had caused the bond to deteriorate, said the report.

"While it is entirely plausible that this was the case, work was carried out on this propeller by the operator which involved fitting a new harness guard and restrainer strap to one of the blades," the report said. "When the restrainer strap was removed, and [while] it was absent from the blade, it would have been very easy to damage the adhesive bond if any movement of the deicer boot lead strap had taken place. The risk of such damage would have been reduced if the deicer boot had been installed with the required fillet of filler material because this would have relieved any peel stress on the adhesive."

The maintenance company that had reworked the propeller involved in the accident had overhauled about 100 propellers without using the required filler, said the report.

"This investigation has not determined the reason why filler was not applied, other than that it was probably related to a real or perceived supply difficulty," said the report.

Subsequent involvement by the U.K. Civil Aviation Authority has ensured that the noncompliant practice has been corrected and the affected propellers identified, said the report.

The following causal factors were cited in the report:

- "The accident was caused by the separation of a deicer boot from the left propeller during the takeoff"; and,
- "The deicer boot separated due to peel stresses generated by forces on the propeller. The peel stresses arose because of physical [damage] or contamination damage to the adhesive bond, which occurred because the required filler material was not used at the root of the deicer boot."

Nose-gear Actuator Failure Disrupts Cabin Pressurization

On May 13, 2005, a McDonnell Douglas MD-88 was being operated on a scheduled passenger flight from Denver, Colorado, U.S., to Atlanta, Georgia, U.S. Soon after takeoff, the pilots heard a loud noise and observed an unsafe nose landing gear indication and a loss of cabin pressurization. The pilots placed the landing gear handle in the DOWN position and observed three green indicator lights. The control tower confirmed that the landing gear was down. The airplane was landed uneventfully at Denver, and there were no injuries to the two pilots, three flight attendants and 93 passengers.

"Post-accident examination by maintenance personnel revealed a hole in the forward pressure bulkhead and broken [nose landing gear] actuator," the report by the U.S. National Transportation Safety Board said. "The nose landing gear actuator piston rod had worn threads, and a key locking washer in the [landing] gear assembly was sheared."

At the time of the accident, the airplane had accumulated 41,790 flight hours and 32,669 cycles. The operator said that there was no maintenance history for the actuator and that it was likely original equipment when the aircraft was delivered in 1990.

The report said that the probable cause of the incident was that "the failure of the nose [landing] gear actuator resulted in penetration of the forward pressure bulkhead and a loss of pressurization."

Improperly Torqued Plug Downs Helicopter

An Enstrom FA-28A helicopter was substantially damaged when it struck terrain and rolled over after the engine failed during takeoff for an observation flight. The pilot was seriously injured, and the passenger was not injured in the Aug. 23, 2004, accident.

A U.S. Federal Aviation Administration airworthiness inspector examined the failed engine. Representatives from the helicopter manufacturer, the engine manufacturer and the operator attended the inspection.

"The engine inspection revealed that the 1/8-27 NPT Allen plug [a National Pipe Thread specification] to the no. 4 cylinder was missing," the report by the U.S. National Transportation Safety Board (NTSB) said. "Once the hole was plugged, the engine ran smoothly."

The probable cause of the accident was the power failure "as a result of other maintenance personnel under-torquing the plug," NTSB said.

Attachment Bracket Fails Before Inspection Due

The Britten-Norman BN-2A Islander, operated as a scheduled passenger flight, was being landed when the pilot detected a significant airframe vibration and a pronounced rumbling noise during the rollout. When the wheel brakes were applied, the airplane veered left, and the pilot was unable to correct the deviation. The airplane exited the runway and struck a drainage ditch, sustaining substantial damage to the fuselage. The pilot and two passengers were not injured in the April 6, 2005, accident.

During a post-accident inspection, maintenance personnel discovered a broken aluminum-alloy landing gear oleo attachment bracket (part no. NB-40-0075) on the left main-landing gear strut assembly.

"[The broken part] is the subject of a repetitive inspection procedure outlined in [U.S.] Federal Aviation Administration (FAA) Airworthiness Directive (AD) 2002-02-11, which allows two methods of compliance," the report by the U.S. National Transportation Safety Board said. "The part may be replaced or the bracket must be inspected more frequently."

The manufacturer had designed a new version of the oleo attachment bracket (part no. NB-40-0079) made of steel.

"Installation of the newly designed, steel oleo attachment bracket significantly reduces the number of repetitive inspections required," the report said. "Operators that elect to utilize the old-style aluminum-alloy oleo attachment brackets are required to conduct recurring inspections every 500 hours, or every 1,200 landings, whichever occurs first."

The accident airplane's maintenance records showed that the aluminum-alloy brackets had last been inspected about 101 hours, and 218 landings, before the accident. An FAA airworthiness inspector who examined the maintenance records commented that there was a substantial accumulation of dirt, grease and oil on and around the broken bracket, said the report.

"The FAA inspector said that during the last main landing gear overhaul, the operator elected to install the old-style aluminum-alloy oleo attachment brackets, primarily due to the cost of the new-style steel oleo attachment brackets," said the report.

The report said that NTSB determined that the probable cause of the accident was "the fracture of the aluminum-alloy landing gear bracket assembly, which resulted in a loss of control during the landing roll."♦

NEWS & TIPS

Keeping Restrained Under Pressure

Lightweight, portable fall protection is offered by the Wingrip Vacuum Pad Fall Restraint System. The product consists of a vacuum pad, vacuum module, hose, harness, safety lanyard and work-positioning rope. The rope and safety lanyard are connected to a vacuum pad held in place against the aircraft skin by negative compressed-gas pressure.

Fall-restraint System

Pads can also be connected in series to enable a greater range of motion by the maintenance technician.

Because the system is non-electrical, it can be used in any environment and eliminates the requirement for long runs of electrical cable, generators and a battery-charging system. If failure of the air or nitrogen supply occurs, an audible warning alarm sounds and the pads maintain a safe-working vacuum for at least 20 minutes.

For more information: Flexible Lifeline Systems, 14325 West Hardy Road, Houston, TX 77060 U.S. Telephone: 1 (800) 778-9048 (U.S.); +1 (817) 788-5780.

Block Chemical Spills

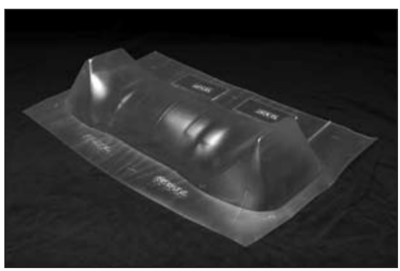
Used as part of an emergency response plan, Ultra-DrainSeals allow fast response to spilled chemicals and liquids. The product, manufactured by UltraTech International, is molded with a reinforcing mesh between layers of polyurethane.

The construction allows the seals to block most drains on contact. The seals are long-lasting and tear-resistant, and units are available in many sizes and shapes to fit numerous drain configurations, the manufacturer says.

For more information: UltraTech International, 11542 Davis Creek Court, Jacksonville, FL 32256 U.S. Telephone: 1 (800) 353-1611 (U.S.); +1 (904) 292-1611.

Landing Gear Boots Speed Maintenance

Preformed polyurethane protective boots from 3M Aerospace help reduce down time during the mandated inspection of main landing gear cylinders on Boeing MD-80 and MD-90 aircraft, the manufacturer says. Polyurethane Protective Boots SJ8667HS FP502 are designed to eliminate the labor-intensive removal and reapplication of the primer-and-paint topcoat during maintenance.



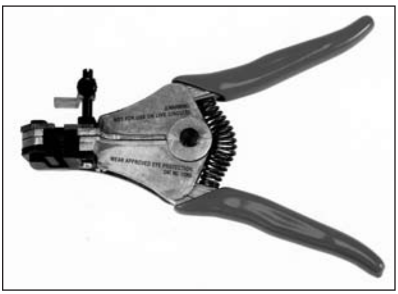
Landing Gear Protective Boots

The boots, which are conformable to the curvature of the landing gear struts, are said to improve impact resistance and provide corrosion protection. The self-adhesive boots can be installed quickly and easily, the manufacturer says.

For more information: 3M Aerospace, 3M Center, Building 223-1N-14, St. Paul, MN 55144 U.S. Telephone: 1 (800) 364-3577 (U.S.); +1 (650) 737-7501.

Wire Stripping Is Automated

An automatic wire stripper from Klein Tools is designed to remove insulation from Tefzel and Teflon solid and stranded wire. Fine insulation can be stripped without damage to the conductor, the manufacturer says.



Wire Strippers

Gripper pads firmly hold the wire and prevent damage to the insulation, while the adjustable wire stop ensures uniform stripping lengths. The plastic hand grips are said to provide operator comfort.

For more information: Klein Tools, 7200 McCormick Blvd., Chicago, IL 60659 U.S. Telephone: 1 (800) 553-4676 (U.S.); +1 (847) 677-9500.

Kit Indicates Water in Fuel

The CDFP (Clean Dry Fuel Pads) kit reveals the presence of undissolved water in aircraft fuel tanks, mobile fuel-storage tanks or stationary fuel-storage tanks. Testing requires a small fuel sample to be taken in a static-free test jar or bucket from the fuel nozzle or lowest point of a tank sump. A chemically treated test pad dropped into the sample yields a visible positive or negative result in about one minute.

A major advantage of the CDFP system is said to be the ease of use, with no vials or tubes required to perform the testing. The kit is intended for testing both jet fuel and aviation-grade gasoline.

For more information: AVFMATS, P.O. Box 8803, Columbus, GA 31908 U.S. Telephone: +1 (706) 327-0909.

Need to Vent?

Hi-Tech Hose offers a polyvinyl chloride (PVC)–coated polyester duct that includes a built-in storage pouch and belted cuffs at both ends for moving large volumes of air, smoke or fumes.

Ventilation Hose

The hose, which is reinforced by a wire helix, is suitable as an outlet for portable or temporary ventilation blowers. The product is manufactured from flame-retardant materials and has a wear strip for external abrasion resistance. It is available in sizes from four inches to 24 inches (10 centimeters to 61 centimeters) interior diameter and in standard 15.0-foot and 25.0-foot (4.6-meter and 7.6-meter) lengths.

For more information: Hi-Tech Hose, 400 East Main St., Georgetown, MA 01833 U.S. Telephone: 1 (800) 451-5985 (U.S.); +1 (941) 966-0394.

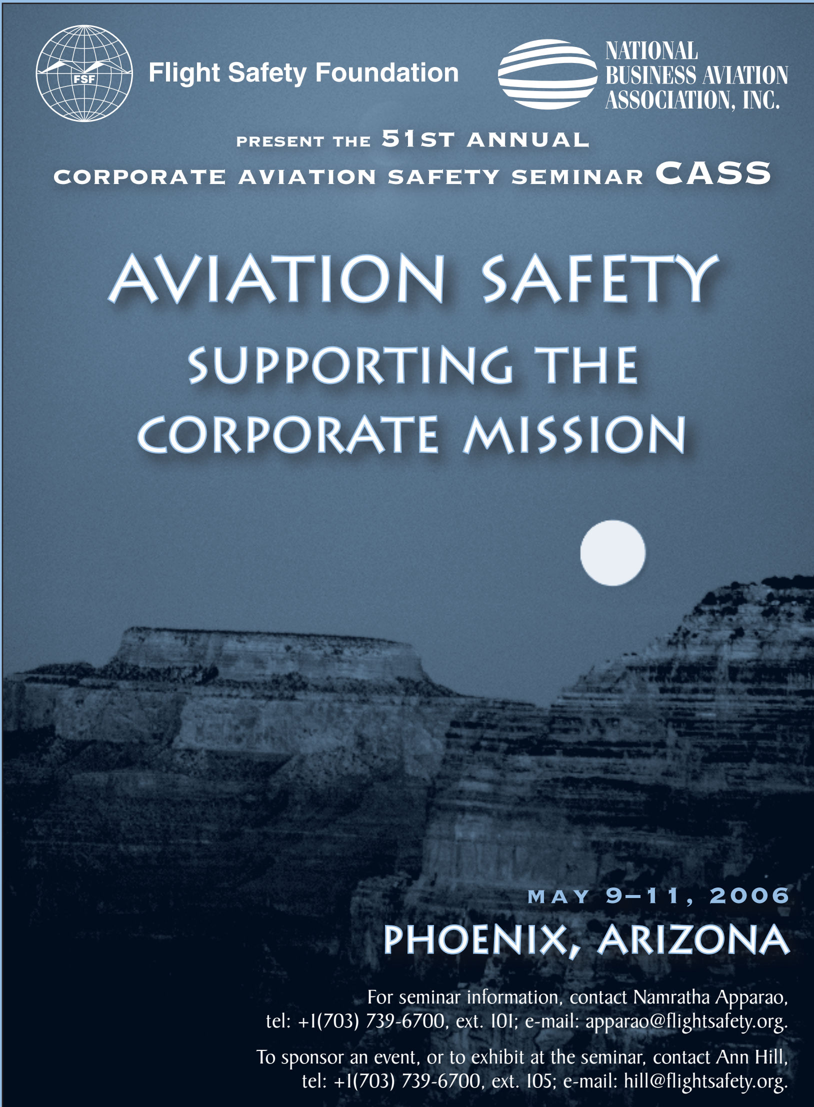
Tool Belt Fights Back Pain

Designed to prevent a tool belt from adding significantly to the weight of the tools it holds, the Toolster Pro Utility Belt is constructed of six ounces (170 grams) of nylon and neoprene. The belt's wrap-around configuration enables a close fit, and it supports the lower back, reducing strain and the possibility of injury, the manufacturer says.

The ergonomic design and Velcro closings are said to keep tools closer to the body. Supplementary Dock-It Pockets can be added for carrying additional tools when needed and removed when not required.

Tool Belt

For more information: Toolster Belts, 7850 Ruffner Ave., Van Nuys, CA 91406 U.S. Telephone: 1 (800) 211-5416 (U.S.); +1 (858) 583-0681.♦



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