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Personal Protective Equipment Prevents Workplace Injury

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Personal Protective Equipment Prevents Workplace Injuries

For maximum effectiveness, protective equipment must be appropriate for the environment in which it will be used, must fit the wearer correctly, must function well and must cause minimum discomfort.

—

FSF Editorial Staff

Aviation maintenance personnel often are exposed to machinery, noxious chemicals and other hazards that can result in a variety of injuries. Many of those injuries could be prevented by using appropriate equipment and adhering to safety requirements.

A 1995 report by Israeli researchers on a five-year study of work-related accidents among aviation ground workers — including maintenance personnel — at an Israeli airline, said that 523 such accidents occurred from 1988 through 1992. Of the 523 accidents, 40 percent involved slips, trips and falls; 20 percent involved lifting and carrying; 19 percent involved machinery; 13 percent involved transportation accidents (including motor-vehicle accidents that occurred while traveling between home and work); and 8 percent involved physical injuries and impairments resulting from electrical burns, thermal burns, foreign substances in the eyes and exposures to chemicals and machinery.[1]

The report said that the work-related accidents occurred because of systems failures (mechanical systems, electrical systems and electronic systems) and human failures; most accidents were a result of human failures.

Flight Safety Foundation (FSF) says that losses from ramp damage — including damage incurred during maintenance — cost air carriers and corporate operators an estimated US$5 billion a year. FSF Executive Vice President Robert H. Vandel said that some U.S. operators have calculated that, for every dollar they spend because of ramp damage, they spend $2 for related injuries to maintenance personnel and ramp personnel.[2]

Nevertheless, Vandel said, "Current data sources do not contain sufficient information to develop a precise estimate of the extent of the problem."

An FSF initiative to help prevent ramp damage, hangar damage and related injuries is designed to collect more accurate and more detailed data on damage and injuries, including maintenance-related damage and injuries.

Specialists in preventing occupational injuries say that methods of reducing accidents include educating workers about workplace hazards and effectively enforcing company safety rules and government safety regulations.

Government occupational health authorities, which in many countries regulate working conditions, typically say that employers first should evaluate their operations to identify potential hazards and determine how best to control them. Whenever possible, employers should attempt to control hazards at the source. When that is not possible, however, a maintenance technician's exposure to hazards sometimes can be limited by using personal protective equipment (PPE), including protective clothing, face shields, safety glasses or goggles, earplugs or other hearing protection, and respirators. In addition, employees should comply with other rules on safe workplace clothing.

"Controlling a hazard at its source should be the first choice because this method will eliminate it from the workplace altogether or isolate it from the worker," said the Canadian Centre for Occupational Health and Safety (CCOHS), which has developed guidelines for establishing an effective PPE program.[3]

Among the strategies that should be considered first in an effort to eliminate hazards are those that include changes in engineering controls (physical changes to a machine or to a work environment), in work practices (methods that maintenance technicians are trained to use in performing their assigned tasks) and in

administrative controls (technicians' schedules or task assignments).[4,5]

If those efforts are not sufficient and PPE is required, the U.S. National Safety Council (NSC) said in its *Aviation Ground Operation Safety Handbook* that several general principles should be considered.

"The equipment should be appropriate for the environment in which it is being used," the NSC said. "For example, it would not be appropriate to provide acid handlers with the same kind of leather and asbestos apron worn by a welder. Nor would one furnish a welder with a rubber and plastic outfit suitable for acid handlers.

"Personal protective equipment and clothing should fit the user, do its job well and cause minimum discomfort. All three factors should be considered if the equipment is to provide maximum effectiveness."

The employer is responsible for determining whether workplace hazards exist that require employees to use PPE, for selecting the type of PPE that will be used and for ensuring that employees know how to use the PPE and how much protection it will provide.

The employees, however, are responsible for correctly using the equipment that is provided.

Nicholas Onufer, a registered nurse who teaches maintenance-safety classes for MedAire, a provider of medical services and related medical equipment to the aviation industry and other industries, said that most maintenance personnel in his classes recognize the value of PPE and related safety requirements.[6]

"Most people in the aviation industry understand that safety is a very important part of the job and are very attuned to safety requirements," Onufer said. "The maintenance-safety class is designed to keep maintenance personnel aware of what they're doing."

The two-day class teaches safety concerns in the hangar; management of medical emergencies in the workplace; and government occupational safety requirements, including the use of PPE. The class discussion of PPE emphasizes hearing protection, respiratory protection and eye protection, with some discussion of the circumstances in which protective steel-toed footwear or hard hats or other protective headgear might be warranted.

William O. McCabe, director, DuPont Aviation, said that the attitudes of company management are just as important as an understanding of the rules about use of PPE and other safety equipment.[7]

"You get the level of safety that you demonstrate that you want," he said.

"It's a lot more than just guidelines; it involves establishing a strong operating discipline."

The six maintenance personnel in his 30-member aviation department take "the normal precautions to protect their hearing and to wear gloves and safety glasses in hazardous areas," he said. "But we've gone beyond that."

For example, he said, "When working around aircraft, we mandate the use of bump hats [which protect against minor bumps and abrasion]. This also applies to the flight crews performing aircraft inspections, even when away from home base on trips."

McCabe said that when he became head of DuPont's aviation department in 1997, he arranged for a review of department safety practices by DuPont Safety Resources,[8] a DuPont business that provides consulting and training in workplace safety. He said that the review — and resulting safety recommendations — contributed to the department's record of nearly 2,000 days without an on-the-job recordable injury. (A recordable injury is an injury that must be treated by more than minimal, on-site first aid.)

"Airlines, particularly those in countries without stringent government occupational safety regulations, really need assistance," McCabe said. "They will achieve their own positive safety culture only by seeking [outside] assistance to tackle the basic details."

A number of government authorities and other organizations have guidelines for establishing workplace safety programs — including rules for the use of PPE and other safety requirements.

For example, CCOHS says that, in developing any program involving the use of PPE, three elements must be considered:[9]

- Protection of workers;
- Compliance with applicable laws, regulations and internal company standards; and,
- Technical feasibility.

PPE is known as a "point-of-contact" control that manages a hazard that has come in contact with a worker, rather than a "pre-contact" control that prevents such contact.

"PPE is used to reduce or minimize the exposure or contact [with] injurious physical, chemical or biological agents," CCOHS said. "A hazard cannot be eliminated by PPE, but the risk of injury can be eliminated or greatly reduced."

CCOHS said that PPE should be used only in the following circumstances:

- When pre-contact controls are inadequate or unavailable;

- As interim protection until pre-contact controls are implemented;
- When pre-contact controls would be ineffective or impractical, such as during maintenance, clean up and repair; and,
- During emergencies.

Where appropriate, workers' equipment should be fitted individually and, most importantly, all workers must be shown how to use and maintain PPE by conducting regular inspections to identify damage or malfunctions before the PPE is used.

CCOHS and other authorities say that a PPE program will succeed only if workers understand the need to use PPE and support the PPE program. The program should be reviewed at least once a year, along with reviews of production records and safety records, to determine that protection goals are being met.

Most PPE programs cite several categories of PPE, including protection for the eyes, which may be exposed to hazards such as chemicals, dust, projectiles, gas, vapor and radiation.

In the United States, the Occupational Safety and Health Administration (OSHA) estimates that 1,000 eye injuries occur in the workplace every day. About 60 percent of those injured have been found to be wearing no eye protection when the accident occurred; of the 40 percent who wore eye protection, many wore "the wrong kind of eye protection for the job," OSHA said.[10]

OSHA says that protective eyewear must be appropriate for the type of hazard being encountered and must be fitted properly so that hazardous substances cannot go around or under the protective equipment and into the eyes. Protective eyewear also must allow air to circulate between the eye and the lens of the protective equipment. Goggles typically provide better protection than face shields, but the best protection is provided when goggles and face shields are worn together. Prescription safety eyeglasses and prescription goggles are available for workers who require corrective lenses. Standard safety goggles may be worn over eyeglasses if the goggles have cups large enough to accommodate the eyeglasses.[11]

Safety specialists disagree about whether contact lenses should be worn by maintenance personnel who work with chemicals. Some say that contact lenses can trap dust or chemicals in the eyes, causing irritation, and that chemical splash may be more injurious if contact lenses are in the eyes. Others believe that contact lenses may prevent some dusts and chemicals from reaching the eyes.[12]

Nevertheless, CCOHS says that some conditions may require that contact lenses not be worn, including situations involving exposure to chemical fumes, vapors, dust and other particles in the air; potential for splashing chemicals; intense heat or dryness; exposure to infrared rays; and handling of caustic substances.

James W. Allen, M.D., M.P.H., an occupational health physician, said that if a maintenance technician undergoes laser surgery for vision correction, he or she should wear safety glasses for two months to three months after surgery to prevent eye injury. Allen said that extra eye protection is required while the technician adjusts to changes in viewing patterns that may affect depth perception.[13]

PPE programs also include protection against hearing loss that may result from exposure to loud noise. Government authorities in many countries have formulas for calculating worker exposure to noise and require hearing protection in the workplace for workers exposed to noise of more than about 85 decibels (dB) for long periods of time. (A decibel is equal approximately to the smallest degree of difference of loudness ordinarily detectable by the human ear. The scale begins with zero dB for the faintest audible sound. Other sounds on the scale include normal conversation at about 60 dB, a ringing telephone at 80 dB and a jet engine during takeoff at 140 dB. Without hearing protection, people exposed to noise of more than about 85 decibels for long periods of time may experience permanent hearing loss.)[14]

Hearing protection may include earplugs, earmuffs or helmets. Earplugs, which typically are manufactured from foam plastic, waxed cotton, silicone or fiberglass fiber, are inserted into the ear canal to block sound. They can be disposable or reusable. Earmuffs are two hard-shelled cup-like devices containing sound-attenuating material and cushioned by soft material; a headband connects the two cups. Helmets can be manufactured to support earmuffs and to cover the head to reduce bone-conducted sound.[15]

Another element of PPE is protection for the head, which may be at risk because of falling objects, bumping and entanglement of the hair in machinery. If maintenance personnel work in areas that present risks for injury, they should be required to wear hard hats or — for those working near exposed electrical conductors — protective helmets that are designed to reduce the risk of electrical shock. The NSC said that bump hats, which originally were intended for wear by maintenance personnel working inside a fuselage, should not be considered adequate substitutes for conditions requiring hard hats.

Breathing protection may be required because of risks from dust, vapor, gas and oxygen-deficient atmospheres. There are three types of respiratory protective devices — air-purifying respirators, air-supplied respirators and self-contained breathing apparatuses.[16]

Air-purifying respirators remove hazardous chemicals and other contaminants from the air. They are used only in atmospheres that contain sufficient oxygen to sustain life and that do not contain a higher concentration of contaminants than specified.

Air-supplied respirators deliver uncontaminated air from an independent source through a supply hose connected to the wearer's facepiece. Many of these devices should not be used in atmospheres that are immediately dangerous to life or health because the wearer might not have time to leave the hazardous area if the equipment malfunctions.

Self-contained breathing apparatuses (SCBAs) provide uncontaminated air from a stationary source (typically a tank carried on the wearer's back). Some units, known as rebreathing devices or closed-circuit SCBAs, recycle some or all of the wearer's exhaled air. These units weigh less than open-circuit SCBAs (which expel exhaled air to the surrounding environment) and can be worn in confined spaces. Pressure-demand SCBAs provide positive pressure to prevent hazardous chemicals from entering the facepiece.

The NSC says that selection of proper respiratory equipment should be determined after identifying the hazardous substances in the air; understanding the hazardous properties of each substance; determining exposure conditions, air-contaminant levels and oxygen levels; determining whether there are limitations to safe use of the device; and fitting the respirator to the wearer. Some countries require medical surveillance of workers wearing respiratory equipment.

PPE may be required to protect the body — including hands and feet — against chemicals; temperature extremes and inclement weather; electrical shock; impact; cuts, scrapes and punctures; contaminated materials; or entanglement of regular clothing in machinery. Depending on the hazard, protective clothing may be required for the entire body or a portion of the body.[17]

Impervious clothing often is required for protection against chemicals and other hazardous substances, cuts and impacts. If protective clothing is required because the worker will be exposed to a hazardous chemical, information about the best type of material (often some type of rubber or synthetic fiber) to provide protection should be available on the

material safety data sheet (MSDS) or from the supplier or manufacturer of the chemical. Before use, wearers should receive training for use of the clothing, including instructions on the hazards of skin contact with the chemical, the protective limitations of the clothing, the consequences of a failure of the protective clothing and how long the clothing should last before disposal or decontamination.[18]

In addition to PPE, personal cleanliness is important for workers exposed to chemicals and other substances that may irritate the skin. Workers should comply with the recommendations of medical specialists about what type of soap to use (because an incorrect type may contribute to irritation) and when to use it. Skin creams also may be recommended in some circumstances to help replace natural oils removed from the skin by contact with some substances.[19]

Cold-weather clothing should be selected both for warmth and for its suitability in working conditions.

High-visibility clothing should be worn during the day, at night and during adverse weather by maintenance personnel working near moving aircraft or other moving vehicles. In some tasks, a high-visibility vest will be sufficient; other tasks require full-body high-visibility clothing. The U.K. Health and Safety Executive says in its guidelines on selection of high-visibility clothing, "As a rule, the darker the conditions or work site, the greater the amount of [high-visibility] clothing required."[20]

Gloves are among the most frequently used types of PPE. Protective gloves are available in many materials, but no single material or combination of materials provides unlimited protection against hazardous substances. Selection of gloves should be determined by a number of factors, including the amount of flexibility and touch sensitivity that will be required to perform the task and the potential effects of exposing the skin to the substance, including both the immediate effect on the skin and the potential long-term effect to the entire body of absorbing the chemical through the skin. Before the gloves are worn, they should be checked for proper fit and examined to ensure that there are no leaks or tears. In some tasks, gloves themselves may present risks; they should not be worn while working with many types of machinery because they may become entangled in moving parts. Gloves with metal components should not be worn near electrical equipment.[21]

Protective footwear should be worn by any employee at risk of foot injury. CCOHS said that the most common on-the-job foot injuries result from impact, compression and puncture.

Protective footwear is designed to protect against those hazards and others, including cuts, burns and electric shocks. The thickness and material of the sole of the shoe should be selected according to the hazards of the job and the type of flooring in the workplace. For example, technicians who work on concrete floors, which are unyielding and uncomfortable, should wear shoes with thick insulating soles and shock-absorbing insoles. Soles also should be slip-resistant. Some types of protective footwear include steel toe caps to protect the feet against impacts of falling objects.[22]

Employers and maintenance personnel must consider several other factors before determining the suitability of PPE for a particular task. Among those factors are the length of time that PPE will be worn, the physical effort required to perform a task, requirements for the worker to communicate with others, the general health of the worker and whether one item of PPE is compatible with other items being worn simultaneously.[23]

"For example," HSE guidelines said, "does the use of a particular type of respirator make it difficult to get eye protection to fit properly?"

Some types of clothing and accessories present particular risks and should not be worn in the workplace. A military aviation publication, for example, has cited the injury risks presented by jewelry, accompanied by photographs of the left hand of a maintenance technician whose finger was severed because the ring he was wearing was caught on a door hinge when the technician slipped while exiting an aircraft cockpit.[24]

"All jewelry, including personal adornments such as rings, bracelets, bangles, earrings, necklaces/medallions are considered likely to present a potential hazard to personnel working on aircraft, aircraft equipment or operating powered machinery, tools or equipment," the magazine said. "They are to be removed before commencing work."[25]

Jewelry items could become trapped in moving equipment, pulling the wearer toward the moving parts, or become attached to the edges of equipment or aircraft, presenting the wearer with a risk of strangulation, injury or loss of limb.

Jewelry also presents the risk of foreign object damage (FOD). If items of jewelry drop within an aircraft or other equipment, they could become lodged in a position that could restrict movement of aircraft controls or could interfere with proper operation of the equipment.

Loose-fitting garments, neckties and gloves — including protective gloves

— also can become entangled in equipment and should be worn only when appropriate.

Metal jewelry, including metal wristwatch straps and metal eyeglass frames, presents an additional hazard: These items conduct electricity and could cause short circuits, which might injure the wearer, damage electrical equipment or cause fires.

The airport maintenance environment presents maintenance personnel with many risks involving exposure to chemicals, machinery and other hazards. Nevertheless, PPE — when used properly — and compliance with effective safety rules can help maintenance personnel avoid the injuries and impairment that can result from hazards in the workplace.♦

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6. Onufer, Nicholas. Telephone interview by Werfelman, Linda. Alexandria, Virginia, U.S. Nov. 21, 2002. Flight Safety Foundation, Alexandria, Virginia, U.S.

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24. "Bits 'n' Pieces: Jewellery, Rings and Things." *Cockpit* Issue 174 (Summer 2002): 24. *Cockpit* is the flight safety magazine published by the Royal Navy Flight Safety and Accident Investigation Centre in the United Kingdom.

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MAINTENANCE ALERTS

Missing Bolts Lead to In-flight Loss of Exhaust Fairing

A Bombardier CL600-2B19 Regional Jet en route from Minneapolis-St. Paul (U.S.) International Airport (MSP) to Cincinnati/Northern Kentucky International Airport (CVG) was damaged when an engine exhaust fairing separated from the aircraft. No one among the 43 passengers and three crewmembers was injured in the Jan. 3, 2001, incident.

Startup, taxi and takeoff from MSP were normal. During the climb, however, "an airframe vibration developed," said the incident report by the U.S. National Transportation Safety Board (NTSB). The aircraft's gauges,

readouts and controls were unaffected. The flight crew radioed to the airline's maintenance staff, but in-flight efforts to correct the problem failed.

"The flight continued, and the vibration remained unchanged until the airplane leveled off at 7,000 feet [2,135 meters] during the approach to [CVG]," the report said. "At that time, the crew felt a bump, and then the vibration completely ceased."

The airplane was landed and was taxied to the gate.

Inspection revealed that the no. 1 exhaust fairing was missing and that the left, aft fuselage had a dent nine inches (23 centimeters) below the vertical stabilizer.

"According to a [U.S.] Federal Aviation Administration (FAA) inspector, the engine was removed after the incident and taken to the company's maintenance facilities, where an inspection was performed," the report said. "The exhaust nozzle assembly would have normally been attached to the exhaust frame case with 30 bolts. All 30 bolts were missing, 'with no trace.'" The exhaust frame case had what appeared to be aluminum deposits at about the three o'clock position and the nine o'clock position, about six inches (14 centimeters) forward of the mating flange. The exhaust nozzle assembly was not recovered.

FAA requested that NTSB examine sample bolts (which were not from the incident aircraft) with more than 6,600 hours in service. The NTSB metallurgist who tested the used bolts and compared them to new bolts found no evidence of cracking or overuse in the used bolts. "The new bolts were within the tensile strength and hardness specifications required, and the hardness and the tensile strength results increased from the new bolts to the used bolts," the report said.

On Oct. 18, 1999, the tailpipe had been removed during repairs. The maintenance records included no mention of the bolts being changed. On May 3, 2000, the tailpipe was loose, and 10 bolts were replaced, with the remaining bolts being retorqued. The last inspection on the airplane was performed about two weeks, or 105 hours, before the incident.

NTSB determined that the probable cause of the incident was "missing exhaust nozzle bolts for undetermined reasons. A factor was inadequate maintenance inspection of the affected area."

Engine-fan Blade Defect Undetected for 10 Years

About eight minutes after takeoff from Melbourne, Australia, on a flight to

Sydney, the crew and passengers of a Boeing 767-200 aircraft heard a loud noise, accompanied by vibration of the airframe. The anomalies were caused by the failure of the no. 1 engine as the B-767 climbed through Flight Level 160 (approximately 16,000 feet) during the flight on Nov. 27, 2001. The engine was shut down, and the aircraft was returned to Melbourne.

"Engineering inspections of the [Pratt & Whitney] JT9D-7R4 engine found that one of the fan blades had failed part-way along its length and impacted the fan case at the 11 o'clock position, causing the failure of several nose-cowl bolts and substantial damage to components adjacent to the impact point," said the technical analysis report on the incident by the Australian Transport Safety Bureau (ATSB).

The failed blade punctured the nose cowling, and a section of the blade separated from the cowling. A fan-speed sensor and a nose-cowling bolt also penetrated and exited from the cowling. The airframe and control surfaces were not damaged.

"ATSB laboratory examination of the blade section remaining within the fan rotor disk found that the blade had fractured as a result of fatigue crack growth from a pre-existing defect at the blade trailing edge," said the report. "The defect was identified as a shallow crack that had formed during or before the last blade-refurbishment operation, carried out in 1991."

After being refurbished, the failed fan blade had been held in stock until being installed in the accident engine — which had been installed previously in several aircraft of different airlines — in August 1998. "The manufacturer's records indicated a subsequent blade service life of 7,187 hours and 2,083 cycles," said the report.

The trailing-edge fan-blade defect could have been discovered by non-destructive testing following the refurbishment, the report said.

"The engine manufacturer stated that the eddy-current method specified for this inspection had the capability to detect defects well below the size of the actual defect present," said the report. "In this regard, therefore, error by the inspecting technician was the most likely factor contributing to the failure to detect the defect."

The report said that the defect was too small to be seen by the in-service visual operations required by the manufacturer and completed by the various operators that had used the engine containing the faulty fan blade.

"An optional eddy-current inspection of the blade by the last operator was capable of detecting the defect, but

was not performed (nor [was such an inspection] required to be performed) along the blade trailing edge," the report said.

ATSB Recommends Review of Continuing Airworthiness System

The Australian Transport Safety Bureau (ATSB), after a two-year investigation of the withdrawal from service of a number of Ansett Australia Boeing 767s, has issued a series of safety recommendations intended to ensure the continuing airworthiness of air transport category aircraft.

ATSB said in a Nov. 15, 2002, report on the investigation that Ansett Australia did not conduct "certain required fatigue-damage inspections of the aircraft structure" and that "as a result, there was uncertainty as to the continuing airworthiness status of the aircraft."

The investigation continued after Ansett Australia ceased operations in March 2002 "because of the importance of the issues involved for the safety of 'class A' aircraft around the world," the report said. (Class A aircraft are those with a certificate of airworthiness issued in the transport category or those used for regular public transport operations in Australia.)

"The international continuing airworthiness system, like all complex and safety-critical activities, is dependent on robust systems to maintain high reliability," the report said. "The circumstances surrounding the withdrawal from service of the Ansett B-767 aircraft revealed, among other things, that the reliability of the continuing airworthiness system was threatened by a number of weak defenses."

The report said that, in addition to finding errors made by Ansett Australia, the investigation found "deeper system and resource weaknesses in the airline group and shortcomings by the U.S. regulator of the aircraft type [the U.S. Federal Aviation Administration], both of which CASA [the Australian Civil Aviation Safety Authority] was unaware."

The investigation's findings included the following:

- Although The Boeing Co. introduced in 1997 a B-767 airworthiness-limitations structural-inspection program to detect fatigue cracking in susceptible areas of the airplane, Ansett personnel "did not initially recognize that some airworthiness-limitations structural inspections were required by 25,000 cycles, and a period of almost 2 1/2 years elapsed before that error was identified. At the time that the

inspection program was introduced, some Ansett B-767 aircraft had already flown more than 25,000 cycles. In June 2000, further 25,000-cycle inspections were introduced. … Ansett did not initially act on this";

- CASA's "documented requirements for maintaining an effective continuing airworthiness system for Australian class A aircraft were not clear and unambiguous, and that increased the potential for a reasonable misinterpretation and, therefore, an inconsistent application of the requirements." The report also said that CASA's response to Ansett Australia's problems was "not adequate."

  ATSB recommended that CASA review the transmittal of information on aircraft faults, malfunctions and defects, and its surveillance of Australian operators of class A aircraft in their continuing airworthiness assurance activities. CASA also should consider introducing a periodic certification maintenance review for Australian class A aircraft, ATSB said;

- The FAA airworthiness directive (AD) that resulted in development of the B-767 airworthiness-limitations structural-inspection program was issued about two years after the close of the public-comment period on the issue. ATSB said that the delay "had the potential to result in poor safety outcomes."

  "Timely action by the FAA in issuing the airworthiness directive would have had the potential to alert Ansett, CASA and other operators to the process [under way] to mandate the June 1997 program, and of the time frame specified for compliance with the program," ATSB said.

  ATSB also said that FAA delayed issuing other related ADs and that there was "potential conflict between the different [methods] used to develop structural inspection thresholds and any related grace periods."

  ATSB recommended that FAA promptly process and release ADs that require revisions of the airworthiness-limitations structural inspections for damage-tolerance aircraft types. (Damage-tolerance refers to the design criteria for modern jet aircraft.) ATBS said that FAA also should ensure that adequate systems exist to alert nations where U.S.-designed or U.S.-manufactured aircraft types are operated in the event that "delays in FAA rulemaking have the potential to compromise the continuing airworthiness assurance of those aircraft types."

ATSB also recommended that the International Civil Aviation Organization (ICAO) develop standards for states of registry to ensure that performance measures for continuing airworthiness standards take into consideration the process defined in the standard and the outcome that the standard is intended to achieve. ICAO also should develop standards for the classification and format of service information issued by manufacturers of aircraft, engines and components.♦

NEWS & TIPS

Software Tracks Battery Laboratory Work From Start to Finish

Battery Manager software organizes and consolidates operations for battery laboratories, according to the manufacturer, Digitron Firing Circuits. The Microsoft Windows 2000–based software is designed to be integrated with Digitron Firing Circuits test equipment and other standard laboratory equipment.

Each battery tracked by the system is assigned a unique bar code and unique job number. Following each job step, the results are automatically entered into the system, which indicates the test sequence to be performed next. Failures during a test are flagged on the display. Any authorized technician can access a log that includes every item of information about the job parameters, the battery, the tests performed and other pertinent data. The user can view information about all phases of every battery job, the manufacturer said.

For more information: Digitron Firing Circuits, 30 Shelton Technology Center, Shelton, CT 06484 U.S. Telephone: +1 (203) 446-8000.

Intermediate-size Torque Wrench Offered

Enerpac has added to its line of specialized torque tools an intermediate-size hydraulic square-drive torque wrench to speed and simplify bolting and unbolting. The model, SQD-75-1, weighs 11.9 pounds (5.4 kilograms) and produces a maximum torque of 5,570 foot-pounds (7,553 joules).

The SQD-75-1, like the other hydraulic square-drive torque wrenches in the Enerpac series, features a slim nose radius and a 360-degree-swivel hose connection, which is said to facilitate positioning in confined areas.

Intermediate-size Hydraulic Square-drive Torque Wrench

A push-button drive release makes possible reversal of the square drive without tools.

The wrench's housing is corrosion-resistant and is supplied with a storage case to guard against damage.

For more information: Enerpac, 6100 North Baker Road, Milwaukee, WI 53209 U.S. Telephone: +1 (262) 781-6600.

Face Shield Combines With Air-purifying Respirator

The ClearVisor Face Shield by Hörnell provides complete eye and face protection and combined with the Adflo respirator also provides purified air, in a slim, lightweight unit, said the manufacturer.

The polycarbonate ClearVisor Face Shield is said to have exceptional clarity and a wide field of vision and to provide protection from impact hazards.

The air-purifying respirator, incorporating a high-efficiency particle filter, can be combined with an optional cartridge for further protection against organic vapors, sulfur dioxide, chlorine and hydrogen chloride fumes. A nickel metal hydride (NiMH) battery can charge the respirator for up to 13 hours of operation in high-efficiency configuration and six hours of operation in high-efficiency mode with protection against organic vapors and other chemical contaminants.

The ClearVisor Face Shield meets American National Standards Institute (ANSI) standards for industrial eye and face protection and U.S. National Institute for Occupational Safety and Health (NIOSH) standards for respirators.

For more information: Hörnell, 2374 Edison Blvd., Twinsburg, OH 44087

ClearVisor Face Shield With Respirator

U.S. Telephone: (800) 628-9218 (U.S.) or +1 (330) 425-8880.

Cable-management System Eliminates Sharp Bends

A product designed to protect and organize fiber optic cables in a way that ensures maximum data transmission output has been released by Device Technologies. The FastDrop cable-management system is based on radius-control modules that are strong enough to accommodate large bundles of cables, the manufacturer said.

FastDrop is said to have been designed with a precise 90-degree curve, whose radius provides the correct minimum bend for fiber optic cables. The product is intended to avoid too-sharp bends, which can interfere with signal transmission or cause fibers to break. Individual units consist of polycarbonate quarter-circle forms available in three sizes: one inch (2.5 centimeters), 1.75 inches (4.4 centimeters) and three inches (7.6 centimeters).

FastDrop can be configured for horizontal cable runs or vertical cable runs, and mounted using metal tabs, screws or zinc-plated steel strips. Two FastDrop modules can be mounted facing one another for 180-degree return loops. According to the manufacturer, FastDrop is suitable for a variety of cables and hoses in addition to fiber optics.

For more information: Device Technologies, 3 Brigham St., Marlborough, MA 01752 U.S. Telephone: (800) 669-9682 (U.S.) or +1 (508) 229-2000.

Transfer System Uses Hollow Balls

Hollow balls that are 60 percent lighter than solid balls and provide 6,000 pounds (2,722 kilograms) minimum crush strength per unit are featured in new ball-transfer systems by Thomson Industries. The systems are ideal for palletizers, air cargo and conveyor systems, said the manufacturer.

Ball-transfer System

The transfer systems feature one-inch (2.5-centimeter) stainless hollow balls riding on smaller stainless balls. Units have a nylon-flanged base that is said to offer easy mounting and reduced noise. No lubrication is

required. Load capacity is 25 pounds (11.3 kilograms).

Custom options for the transfer units are available, including nylon balls for low-noise or nonscuffing applications; a variety of ball sizes; a variety of housing materials, such as carbon steel; alternate mounting configurations; and spring loading.

For more information: Thomson Industries, 2 Channel Drive, Port Washington, NY 11050 U.S. Telephone: +1 (516) 883-8000 or (44) 1271 334 500 (Europe).

Spiral Heaters Protect Pipes From Freezing

Spiral heaters that are said to prevent pipes from freezing at high altitudes and cold environments are offered by Elmwood Sensors. Applications include aircraft waste disposal systems, the manufacturer said.

The spiral heaters are available in single-layer etched circuits and multi-layer etched circuits, as well as single-layer wire-wound circuits and multi-layer wire-wound circuits. Control devices such as thermostats, thermocouples and thermal fuses can be directly integrated into any heater assembly. The spiral heaters are an economical way to provide uniform heat distribution where complete coverage of materials is not required, the manufacturer said.

For more information: Elmwood Sensors, 500 Narragansett Park Drive, Pawtucket, RI 02861 U.S. Telephone: +1 (401) 727-1300.

Lightweight, Collapsible Cameras View Hidden Locations

Newly introduced pole cameras, the XtendaCam Series from iShot Imaging, illuminate and view otherwise inaccessible locations and transmit a video signal to a monitor or recorder, said the manufacturer. They are said to be highly maneuverable because of their light weight, collapsible carbon-fiber composite poles and a lockable swivel mechanism that lets the user aim the camera. Cabling is within the unit to ensure fast deployment and avoid snags, the manufacturer said. Applications include viewing around corners and into cavities.

XtendaCams' poles extend to as long as 11.5 feet (3.5 meters) and collapse to less than three feet (0.92 meter). They can be stowed in a case suitable for transit. Various models include cameras and lenses for color, monochrome, infrared or zoom viewing.

For more information: InterTest (the parent company of iShot Imaging), 303 Route 94, Columbia, NJ 07832 U.S. Telephone: +1 (908) 496-8008.♦

Call for Nominations

Flight Safety Foundation Business Aviation Meritorious Service Award

This award has been presented by the Foundation since 1975 for outstanding service and contributions to corporate aviation safety. The award, which was established during an era in which the role of business and corporate aviation was expanding, recognizes individuals whose work enhances safety in this segment of the industry. Recipients have included industry leaders, government officials, members of the news media and researchers whose findings were especially relevant to corporate aviation. The award includes a handsome, wood-framed, hand-lettered citation.

The nominating deadline is February 7, 2003. The award will be presented in Hollywood, Florida, USA at the FSF Corporate Aviation Safety Seminar, April 22–24, 2003.

Flight Safety Foundation

Submit your nomination(s) via our Internet site.
Go to http://www.flightsafety.org/merit_award.html

For more information, contact Kim Granados, membership manager, by e-mail: granados@flightsafety.org or by telephone: +1 (703) 739-6700, ext. 126.

Want more information about Flight Safety Foundation?

Contact Ann Hill, director, membership and development, by e-mail: hill@flightsafety.org or by telephone: +1 (703) 739-6700, ext. 105.

Visit our Internet site at <www.flightsafety.org>.