Correct Selection and Use of Respirators Is Vital in Contaminated-air Environments

—

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Editorial Coordinator

The U.S. Occupational Safety and Health Administration (OSHA) has established standards that limit worker exposure to harmful substances in the air. If an unacceptable level of harmful substances exists, an employer must first try to reduce the worker's exposure by changing the hazardous environment. Such steps include:

- Replacing the harmful substances with safer materials;
- Installing fume hoods or other ventilation systems to remove the harmful substances and purify the air; and,
- Reducing the time that workers contact harmful substances.

In some cases, however, these engineering and administrative controls cannot reduce the exposure to acceptable levels and alternatives must be provided. The most common alternative is use of a respiratory protection device. When respirators are required, the employer is obligated to establish a respiratory protection program; to make that program available, in writing, to all affected employees; and to train those employees in the use and care of respirators.

A standard published respirator program policy consists of three sections.

- *Purpose*. This is a brief explanation of the reason for the policy and its scope.

- *Responsibility*. This identifies, by name, the company officer charged with safety responsibility and explains that officer's duties and authority.

- *Program elements.* This defines, in capsule form, the most important aspects of the program. Among the subjects addressed are the certification standards governing respirators, selection of respirators for any given environment, training for respirator users, cleaning and storage of the devices, instruction on uses of respirators and inspections to enforce the regulations.

Simply providing a respirator for protection against a hazardous atmosphere is not enough. If the wrong respirator is used or the respirator is used incorrectly, serious injury or even death could result. The requirement for a respiratory protection program applies even if respirators are only needed on rare occasions or for a specific task.

The respirator protection program should include:

- Medical screening of affected workers;

- Selecting approved types of respirators;

- Assigning respirators and fit testing;

- Cleaning, disinfecting, inspecting, repairing and storing of the respirators;

- Understanding air quality standards;

- Setting standard operating procedures and work area surveillance; and,

- Evaluating the program.

Workers Should Receive Medical Screening for Respirator Use

Using a respirator is stressful to the human body. Some employees could suffer adverse affects from using a respirator, or even be unable to safely use one. Workers with health conditions — heart or lung disorders, a history of asthma or emphysema, any difficulty with breathing, documented lung problems, high blood pressure, arterial disease, missing or arthritic fingers, facial scars or even a tendency for claustrophobia — may not be able to use a respirator. Medical examinations and health tests should be administered to ensure that workers are physically fit and have no conditions that would preclude them from safely using respirators, if they are necessary to perform the task.

Identify Contaminants

Respirators are designed to protect against a specific hazard. Potential hazards fall into two general groups.

- *Oxygen-deficient air.* If the air does not contain enough oxygen, the respirator must supply breathable air (20.9 percent oxygen). Oxygen levels in confined spaces or poorly ventilated areas should always be measured. Certain areas may be purposely kept free of oxygen for specific purposes. In other instances, a process or chemical reaction may remove the oxygen from the air.

- *Air containing hazardous contaminants*. Air contaminants may be in gaseous or vapor form, or may be particulate matter consisting of dusts, mists and fumes. Contaminants are also classified by their effect on the body. Employees should be trained on chemical health hazards, asphyxiants, irritants and toxins. Contaminants often occur together and may be present in both particulate and gaseous forms.

Contaminants are classified according to the biological effects they cause and according to their chemical properties, which influence respirator selection.

Contaminants classified by biological effects include such groups as asphyxiants (which interfere with supply or use of oxygen in the body), irritants (which are corrosive and can cause inflammation of tissues), poisons (which damage organs and systems) and carcinogens (which can produce cancer after a latency period). Some classifications, such as pulmonary fibrous contaminants, which damage the lungs, apply specifically to particulate matter.

Chemical properties subdivide contaminants into groups such as inert (which do not react with other substances but may displace air and create oxygen deficiency), acidic (which react with water to produce acids that in concentrated form may corrode tissues), organic (compounds of carbon) and aerosols (produced mechanically by disintegration processes such as grinding, drilling and spraying).

Respirator Protection Based on Hazard Evaluation

After the hazards have been identified, each must be evaluated to determine the specific respirator required for protection. The evaluation should identify the employee(s) affected, the processes or environments that may require respirators, and the degree and type of hazard. The degree of hazard depends on the toxicity and the concentration of the substance. Toxicity is based on the way a substance enters and affects the body, and the quantity needed to cause harm. Maximum exposure limits are set to prevent injury.

Material safety data sheets (MSDSs) can identify exposure limits as well as the respiratory protection needed. MSDSs use some terminology and acronyms that are unfamiliar to the average technician. In evaluating the "Hazardous Ingredients/Identity Information" on a typical MSDS, it is important to understand the following terms:

- **OSHA PEL.** This is the OSHA permissible exposure limit (PEL), which may be expressed as a time-weighted average or as a maximum exposure limit.

- **ACGIH TLV.** This is the American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV), which is the maximum exposure limit or the concentration that should not be exceeded even momentarily. The ACGIH publishes annually a book that explains and lists the TLVs for various chemicals. (This publication is available from ACGIH, 6500 Glenway Avenue, Building D7, Cincinnati, OH 45211, U.S.)

Special equipment and trained specialists may be needed to measure the concentration of airborne contaminants. Depending on the toxicity and concentration, some substances present atmospheres that are immediately dangerous to life or health (IDLH) — severe injury or death may occur in a short time, or serious delayed effects may occur. Exposures to carbon monoxide or hydrogen sulfide, for example, can quickly result in death. Carcinogens, on the other hand, may have delayed but equally serious effects.

The hazard evaluation must also consider contaminants that may be absorbed through the eyes or skin, and that have no warning properties. Warning properties are factors such as odor, taste or irritation that allow the worker to recognize the presence of the substance before serious injury or death results. Carbon monoxide, for example, which is present in combustion fumes and from other sources, has no odor, color or irritating properties that suggest its presence.

Respirator Selection Should Address Specific Conditions

In the United States, approved respirators have been tested by the National Institute of Occupational Safety and Health (NIOSH), and the Mine Safety and Health Administration (MSHA). All NIOSH-approved respirators contain:

- An assigned identification number which begins with "TC," such as "TC-21C-101";

- A label identifying the type of hazard for which the respirator is approved;

- A description of the respirator's limitations; and,

- Parts that can be used with the basic unit.

It may be necessary to offer more than one style of respirator to ensure proper fit. Temperature extremes, communication requirements, or users with eyeglasses, beards or mustaches, or even facial scars, may require a specific style to ensure proper fit. The respirator must have the components required for special conditions. For example, if the wearer must communicate with other workers, a built-in microphone/headset should be provided. Pulling up the edge of a mask to talk negates the purpose of the respirator. In extremely cold conditions, it may be necessary to provide a special unit with a vortex tube to warm the air before it is inhaled.

There are two basic classifications of respirators.

- *Air-purifying.* These respirators may use canisters or cartridges that attach to the mask and remove hazardous chemicals from the air. Canisters and cartridges may contain filters, sorbents, catalysts or a combination of these items that remove specific contaminants from the air passed through the container. Air-purifying respirators may also use a blower, sometimes a battery-powered unit mounted on the wearer's belt, to provide a positive pressure in the respirator and thus prevent contaminants from leaking into the mask.

Air-purifying respirators cannot be used in oxygen-deficient atmospheres or in IDLH atmospheres.

Air-purifying respirators designed to protect the wearer against particulates — dust, mist or fume — use filters to protect the wearer against less toxic and less dangerous dusts and mists. OSHA exposure limits will help determine which respirator can be used.

When equipped with "high efficiency" filters, air-purifying respirators can be used in atmospheres containing dusts, mists, fumes or combinations of these contaminants, but only when concentration and toxicity levels are low. They cannot be used in atmospheres that have low oxygen, nor will they provide protection from hazardous gases or vapors. Air-purifying respirators should not be used in heavy abrasive blasting operations.

Gas and vapor respirators use cartridges or canisters to remove specific substances from the air. These special canisters contain sorbents, which are chemicals that treat the hazardous substance and remove it from the air. The difference between a cartridge and a canister is the size of the container. The larger canisters hold more of the sorbent material and can thus provide protection for a longer period.

Each cartridge or canister is color-coded to help identify the contaminants that it removes. Some cartridges and canisters provide protection from a single chemical, such as ammonia, while others may provide protection against an entire class of chemicals, like organic vapors. The label should always be read before use to identify the contaminant that it will protect against, the service life and the expiration date.

Gas and vapor respirators have many limitations. They cannot supply oxygen and cannot be worn in oxygen-deficient atmospheres. They should not be used if the chemical that they are protecting against does not have adequate warning properties. Without a warning from odor, taste or irritation the wearer could breathe contaminated air when the sorbent material is no longer useful.

Gas and vapor respirators should never be used in IDLH areas, except for an emergency escape from a contaminated environment. The wearer must remember that such respirators only protect against a specific gas or vapor and may be useless against other gases or vapors.

- *Atmosphere-supplying.* These respirators provide the user with uncontaminated air from outside the contaminated environment. This type of respirator does not remove the hazardous material from the air, but uses an independent source of clean air.

  Air-line respirators receive breathing air through a hose or air duct, which is usually supplied from a compressor or from compressed air cylinders, so they must incorporate a flow control valve or orifice to regulate the air flow to the wearer. These respirators protect against particulates, gases or vapors. They cannot be used in IDLH atmospheres, because the user is dependent on the air source and hose. If something should happen to the air source or hose, the user may not have time to safely exit the hazardous area. This type of respirator also has the disadvantage of the trailing hose, which may restrict movement and make certain jobs difficult to perform.

  Self-contained breathing apparatus (SCBA) provides uncontaminated air from a stationary source, usually a bottle carried on the wearer's back. A regulator must be used to control the air flow and some units also use a blower to maintain proper air flow. All SCBA systems provide positive air pressure in the facepiece of the respirator. Additional air is supplied whenever the pressure drops because of a leak or inhalation.

  In a closed-circuit SCBA (sometimes referred to as a rebreathing device), the breathing apparatus recycles all or part of the exhaled air. These systems are more complex and expensive than the open-circuit type, but they weigh less and can provide air for a longer period.

An open-circuit SCBA passes the exhaled air to the surrounding environment. These units are simple in design but heavier, which makes them unsuitable for strenuous work or work in confined spaces.

Pressure-demand SCBA full-face mask units are recommended by NIOSH in IDLH atmospheres. The pressure-demand design supplies uncontaminated air to the mask and the positive pressure helps to prevent hazardous chemicals from entering the facepiece.

Escape SCBAs are also open-circuit units that typically have a protection duration of only five or 10 minutes and are specifically designed for escape from a hazardous environment.

Combination SCBAs, which combine an air-line respirator with a backup closed-circuit SCBA supply in a full-face pressure demand system, can be approved for use in IDLH areas if the backup SCBA device contains enough breathable air for the user to escape to an uncontaminated area.

To be effective, any respirator must control all of the air that is breathed. This requires that the nose and mouth be covered and a tight seal to the wearer's face be maintained to keep contaminants away. A full-face mask usually provides a better seal than half-mask designs and has the additional advantage of protecting the eyes. For any extremely hazardous operation, such as abrasive blasting, a full-hood type unit is mandatory to ensure the positive-pressure, high-volume air flow necessary to preclude contaminants from entering the user's nose, mouth or eyes.

For operations generating dusts that may cause discomfort, but no injury, single-use dust masks may be used. These are disposable masks designed for individual one-time use. Such masks should be replaced when too much resistance is felt when breathing or whenever they are damaged or deformed. The acceptable use of these throw-away masks is extremely limited.

Employees Have Important Responsibilities

The individual who is required to wear a respirator also has responsibilities. These responsibilities include:

- Using the respirator as instructed;

- Maintaining the respirator;
- Evacuating to an area of "clean air" if the respirator malfunctions; and,
- Reporting any malfunction of the respirator or difficulty with its use, such as discomfort or resistance in breathing, fatigue because of respirator usage or interference with communication, vision or movement.

All of the air breathed must be through the filters, canisters or air supply system. If it is not, the user is not protected.

Respirators should fit snugly, but should not leave red marks or indentations on the user's face, and should not prevent turning the head. Physical characteristics or actions can affect the fit of a respirator. A beard or bushy sideburns may break the seal and prevent the facepiece from sealing properly. Chewing gum or tobacco should not be used when wearing a respirator because facial movement may break the seal. Special mountings for eyeglasses may be required, particularly if a full-face type mask is used.

Technicians should not assume that a respirator fits properly without testing it. A quantitative test may require the use of expensive testing equipment to measure the exact levels of contaminants in the air being breathed through the respirator; however, a simple but effective qualitative test can determine if the respirator fits properly. One such test introduces an irritating smoke, odor or taste into the breathing zone of the respirator being worn. If no odor or irritation is detected, the respirator is properly fitted.

A simple positive-and-negative test, conducted by blocking the inlet and then outlet ports of the respirator while inhaling and exhaling, can also be performed each time the wearer puts on the respirator. Most respirator manufacturers provide instructions for this test with the unit.

Respirators Require Proper Cleaning, Inspection, Repair and Storage

At the end of each shift or use of the respirator, it should be cleaned and disinfected. If the respirator is used by multiple individuals, it should be cleaned and disinfected between users. Cleaning materials and approved disinfectants are usually specified by the maker. The respirator should be inspected before and after each use. A damaged respirator may not provide the protection intended, and any parts showing deterioration or damage should be replaced immediately. Complex respirators should be repaired or serviced only by trained technicians. The NIOSH approval of the respirator is not valid if parts from a different manufacturer are used. Although parts may appear identical and mechanically fit the unit, only new parts from the same manufacturer should be used in repairing respirators.

OSHA regulations require that respirators be stored in a convenient and clean location, protected from dust, sunlight, heat, extreme cold, excessive moisture and damaging or contaminating chemicals. Just tossing the respirator into a toolbox is unacceptable. Anything that distorts or damages the sealing surfaces may render the respirator useless the next time it is needed. Well-maintained and properly used, a respirator can save a life. ♦

Editorial note: This article is based on information provided by INTEC's Hazard Awareness Training (HAT) series. For more information on HAT programs, contact INTEC, P.O. Box 163, Waverly, PA 18471, U.S. Fax (717) 963-5705.

EPA Permits 'Grandfathering' of U.S. Technicians Certified Under the National Refrigerant Recycling Program

On Oct. 28, 1994, the administrator of the U.S. Environmental Protection Agency (EPA) signed a regulation to permit "grandfathering" of voluntary technician certification programs under the National Refrigerant Recycling Program, Title 6, Section 608 of the Clean Air Act Amendments of 1990. Under this regulation, each program submitted for grandfathering is required to develop supplementary information that covers those topics that the EPA believes were not adequately covered by the test and training offered in the original voluntary program. Before a program can grandfathered, the EPA must review and approve this information.

U.S. technicians who perform maintenance that involves the use of freon refrigerants should investigate the requirements of this certification program and ensure that they are properly trained and certificated to perform such services. Technicians who successfully completed voluntary programs and applied for grandfathering within 30 days of publication of the grandfathering amendment can continue to use their voluntary certification card until May 15, 1995, to buy refrigerant and to work on equipment.

In addition to permitting grandfathering, this rule also clarifies what kinds of maintenance, service and repair of air-conditioning and refrigeration equipment require recovery of the refrigerant, and what kinds of maintenance, service, repair and disposal of air-conditioning and refrigeration equipment require certification of the technician.

The EPA defines "opening an appliance" as "any service maintenance, or repair on an appliance that would release class I or class II refrigerant from the appliance to the atmosphere unless the refrigerant were recovered previously from the appliance." The definition goes on to specifically exclude certain activities, such as connecting hoses and gauges to measure pressures within the appliance or adding refrigerant to or recovering refrigerant from the appliance. Persons opening appliances must comply with the refrigerant recovery requirements of 40 Code of Federal Regulations (CFR) Section 82.156(a), which implements Section 608.

Embry-Riddle Announces 1995 Aviation Safety Certificate Program Schedule

Embry-Riddle Aeronautical University (ERAU) has published a schedule of courses leading to certification in aviation safety management. The 1995 course schedule is:

- Human Factors in Aviation — March 13–17 (Daytona Beach, Florida, U.S.), and July 10–13, 1995 (Prescott, Arizona, U.S.);

- Aircraft Accident Investigation and Management — March 20–24 (Daytona Beach), and July 14–18, 1995 (Prescott);

- Aviation Safety Program Management — July 19–22, and Sept. 18–22, 1995 (both at Prescott); and,

- Advanced Accident Investigation and Crash-fire Rescue (CFR) Emergency Response — Sept. 11–15, 1995 (Prescott).

ERAU says that its Aviation Safety Certificate Program's goal is to prepare today's aviation safety manager for using restricted resources while still complying with increasingly regulated aviation operations. To be awarded the certificate, three courses must be completed successfully: Human Factors in Aviation, Aviation Safety Program Management, and either Aircraft Accident Investigation and Management or Advanced Accident Investigation and CFR Emergency Response.

Those interested in attending these courses should contact ERAU at (904) 226-6186 or fax (904) 226-6220.♦

This information is intended to provide an awareness of safety problems so that they may be prevented in the future. Maintenance alerts are based upon preliminary information from government agencies, aviation organizations, press information and other sources. The information may not be entirely accurate.

Change in Operational Environment Shortens Life of Tail-rotor Gearbox Input Gear on Bell-UH-1/TH-1 Helicopters

The U.S. National Transportation Safety Board (NTSB) recently investigated two accidents that occurred in late 1993 and early 1994 that involved the loss of tail-rotor authority on military surplus helicopters used in logging operations. In both accidents, the pilots reported a noise and vibration with the loss of tail-rotor control, just after beginning the lift of a load of logs on the external sling.

Investigation disclosed that the input gear in the 42-degree tail-rotor gearbox had failed because of a fracture from a gear-tooth root radius. Examiners noted no defects that may have contributed to fatigue cracking. The two failures occurred 249 hours and 125 hours after the last gearbox overhauls.

From 1986 through 1989, the NTSB investigated four additional accidents involving separation of the input spiral bevel gear on similar helicopters. In all four of these cases, fracture was the result of fatigue cracking that originated in a gear-tooth root radius. According to maintenance records for these helicopters, the time between gearbox overhaul and the accident ranged from 195 hours to 444 hours.

The NTSB researched the failure history of this part in military service and found that this part did not exhibit such a high failure rate at low times in service since overhaul. When the helicopter is converted to civilian use, its operator is obligated to maintain it in accordance with the appropriate military technical manuals, which in this instance call for the overhaul of the 42-degree gearbox after 1,500 hours in service. None of the gearbox parts have a stated lifespan under this military standard.

According to the manufacturer, the Bell UH-1/TH-1 helicopters were designed for utility missions including observation, troop transport and reconnaissance, in addition to external sling load applications. The design criteria assumed four maximum power (torque) applications per flight hour. In typical military operations, maximum engine torque is rarely used. Conversely, the civilian logging operation exposes the helicopter to maximum torque operation with nearly every pickup of a load of logs. It was found that a typical logging operation can subject the helicopter to 30 or more high-torque excursions per flight hour.

The NTSB concluded that the application of maximum or possibly even excessive torque during repeated log lifting operations contributed to the premature onset of fatigue and resultant failure of this component. The NTSB recommended that:

- The U.S. Federal Aviation Administration (FAA) issue an airworthiness directive calling for frequent inspections (at 200-hour intervals) of the tail-rotor drive-shaft intermediate gearbox input bevel gear on UH-1/TH-1 helicopters involved in repeated heavy-lift operations; and,

- Operators of such helicopters be notified to caution their pilots about the dangers of exceeding the torque limit on the engine.

Faulty Fuel Line Downs Cessna 177B

In August 1993, a Cessna 177B sustained substantial damage following a loss of engine power during flight. The pilot declared an emergency when the total power loss occurred at 2,500 feet (762 meters) altitude about 12 miles (19 kilometers) from the destination. During an attempted forced landing on a highway, the right main gear hit a road sign, struck a construction barricade and came to rest on the shoulder of the highway. None of the three occupants was injured.

An examination of the wreckage revealed leakage in the fuel pressure line to the fuel flow indicator. After the leaking line was replaced, the engine operated normally. The airplane had last been inspected 28 hours prior to the accident.

The fuel line from the accident airplane was tested in the U.S. National Transportation Safety Board (NTSB) laboratory, which confirmed that fuel bled at many points along the hose when pressurized. The tag on the fuel line indicated that the line had been manufactured in 1989, and the part number was for a line made from Aeroquip type AE701 hose. Examination of the hose, however, disclosed that the line was actually fabricated from type AE601 hose.

An audit conducted by the airplane manufacturer found that its purchasing department had been unable to obtain the AE701 hose and had substituted the AE601 hose without the knowledge of the engineering and production departments. The AE601 hose was fabricated with a nitrile rubber polymer. The AE701 hose has a chlorinated polyethylene (CPE) polymer. Aeroquip stopped producing the nitrile-based AE601 hoses in 1992 and its hoses are now fabricated with the CPE material.

Similar hoses are used by Cessna on a number of aircraft models in fuel-pressure and fuel-primer line installations. Although Cessna had issued a service letter calling for replacement of AE601 hoses, a mix-up within their facility resulted in further installation of the potentially faulty hoses.

The NTSB said that because of the possibility of fuel leakage and in-flight fire from fuel lines made from Aeroquip nitrile-rubber AE601 hoses in aviation gasoline applications, the U.S. Federal Aviation Administration (FAA) should issue an airworthiness directive requiring replacement of fuel lines incorporating certain AE601 hoses, including Cessna part numbers S1236-3 and S2495-3, within two years of their installation date. Aeroquip AE 601 hoses can be identified by a metal tag containing the part number "601" and the assembly date (except those assembled by Cessna, which have the manufacture/cure and assembly dates on the Cessna data tag). These actions would affect AE601 hoses manufactured before 1993; the production of nitrile-based AE601 hoses ended in 1992. If no records are available to indicate the installation date or the assembly date, the hose should be replaced.

Because the degradation of the hoses appears to be independent of actual time in service, the NTSB also said that an inspection should be required within 30 days or at the next aircraft hose inspection, whichever occurs first. Any AE601 hose, exhibiting wetness or leakage, or AE601 hoses that have been installed for more than two years, should be replaced. These recommendations pertain to Part Numbers S1236-3 or S2495-3 hoses, which may be installed on Cessna models 172, 177, 182, 185, 206, 210, 303, 336 or 337.

Oxygen Mask Microphone Switches Confuse Communications Troubleshooting

An international airline operator was required recently to delay for three hours a widebody jet flight while attempting to pinpoint the cause of an inoperative boom mike. The cause was eventually traced to a switch on a crew oxygen mask. When a crew oxygen mask is pulled out of its container, the switch automatically disables the boom mike, transferring the communications capability to the oxygen mask.

The boom mike is switched back on when the oxygen mask is reinserted in the container and the switch is properly activated. In this instance, the switch did not properly activate, rendering the boom mike mute.

Although this malfunction occurred on a McDonnell Douglas MD-11 aircraft, communications systems on other aircraft may be wired similarly.

Catastrophe Averted After Failure of Electrically Powered Gear Actuator

In October 1993, a Beech King Air 200 experienced an in-flight electrical fire, causing the cabin and cockpit to fill with smoke. The pilot reported that the smoke became progressively more intense, made breathing difficult and severely restricted visibility in the cockpit. The pilot depressurized the aircraft and opened the dump valve and cockpit storm window to remove the smoke. He estimated that one additional minute of exposure to the smoke would have resulted in his incapacitation.

The aircraft was landed safely, and although the landing gear was jammed and partially extended, the emergency landing did not result in any passenger injuries.

The right main landing-gear actuator assembly was found jammed in an intermediate position, which precipitated a fire when it slowed or stalled the electric motor. Disassembly disclosed that two gear teeth had broken and separated from the actuator screw housing ring gear. One of the broken teeth was lodged between the ring gear and the electric-motor-driven pinion gear. The actuator had recently been overhauled and had been in service only 12 hours at the time of the failure. The manufacturer determined that the actuator had been reassembled with inadequate shimming, resulting in insufficient end play and excessive side loads on the gear teeth.

The airframe manufacturer issued a service bulletin in 1990 calling for the replacement of the 200-amp landing gear motor circuit breakers with 60-amp breakers. The intent of the modification was to provide a circuit breaker that would open before the landing-gear power system is damaged in a manner that might restrict the operation of the manual extension system. Of 2,276 model B-99, King Air 90, 100, 200 and 300 series aircraft affected, about 1,629 had reportedly been modified at the time of this accident. The accident airplane had not been modified.

As a result of these findings, the U.S. National Transportation Safety Board (NTSB) recommended that the U.S. Federal Aviation Administration (FAA) issue an airworthiness directive making compliance with the Beechcraft Service Bulletin #2035, Rev. II, mandatory within the next 100 hours in service or at the next scheduled inspection, whichever comes first.

Deteriorated Oil Lines Continue to Plague Piper PA-28/32

More than 25 years ago, Piper first recognized that the oil cooler hoses on PA-28 series aircraft could be damaged if routed too close to the engine exhaust stack. The radiant and residual heat in this area subjects these hoses to faster than normal deterioration, causing failure of the hose, resulting in oil loss and emergency landings. Piper first issued in 1968 a service letter dealing with the inspection and replacement of oil cooler hoses on PA-28 series aircraft. This was followed in 1972 by another service letter on the same subject.

In 1977, Piper issued another Service Bulletin #531, calling for an inspection to ensure adequate clearance from the exhaust stacks and recommending replacement of all flexible oil hoses after 1,000 hours in service.

Airworthiness Directive (AD)76-25-06 was issued against certain serial-numbered PA-28 airplanes to require compliance with SB #531. This AD did not, however, require the periodic replacement of the hoses as recommended by the manufacturer.

Since 1985, 26 additional accidents and incidents have involved ruptured or failed oil cooler hoses on PA-28 and PA-32 airplanes. Apparently, some technicians and owner-operators are allowing the hoses to remain in service until they fail. Records indicated that hoses have failed with 1,600 hours, 1,949 hours and as much as 3,141 hours since installation. Some hoses have been installed for up to 20 years without replacement.

In addition, 24 service difficulty reports have been filed since 1987 with the U.S. Federal Aviation

Administration (FAA) about these same hose installations.

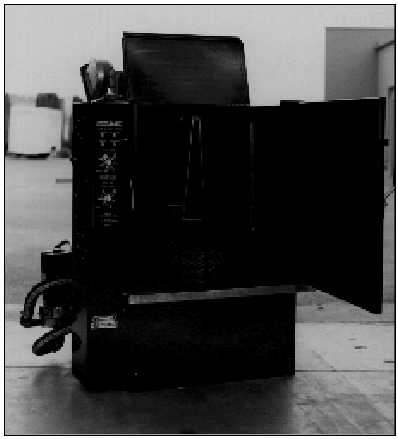
The U.S. National Transportation Safety Board (NTSB) has recommended that the FAA issue another AD applicable to PA-28 and PA-32 airplanes requiring a specific inspection of the hoses at each 100-hour or annual inspection. In addition, the recommendation calls for a maximum installed life of eight years or 1,000 hours, whichever occurs first.

Inspection of flexible hoses for hardening, stiffness and deterioration should be a basic tenet of every technician's inspection procedures. ♦

NEW PRODUCTS

Environmentally Friendly Parts Washer Operates Automatically

Hydro-Blast Inc., a manufacturer of industrial cleaning equipment, has developed an enclosed automatic cabinet parts washing system that it claims eliminates all environmental concerns about waste disposal. According to the manufacturer, these units use no solvents, but have powerful jets of hot water and biodegradable detergents that clean all grease, dirt and contaminants from the parts.



Hydro-Blast Inc. offers this new automatic cabinet parts washing system that evaporates waste water.

The manufacturer has addressed the issue of waste water disposal by developing a system to evaporate the waste water overnight without any discharge of contaminated material to sewer drain systems. According to the manufacturer, this "nothing down the drain" disposal feature reduces the waste material by as much as 98 percent. Further advantages are claimed from automatic operation without time-consuming labor.

For more information, contact: Hydro-Blast Inc., 6917 NE 39th Court, Vancouver, WA 98661, U.S.

New Technology Uses Light Impulses to Detect Lightning Risk

An article published in the May–June 1991 *Aviation Mechanics Bulletin* outlined lightning hazards for technicians working outside during thunderstorms. A number of detection and alerting devices were listed at the end of that article.

The AllSky Lightning Detection system senses lightning in clouds, providing advance warning of ground strikes.

Technology developed for use in the U.S. Space Shuttle program has been adapted to the AllSky Lightning Detection system, which the manufacturer claims offers several advantages over other systems. Airborne Research Associates says that the system provides advance warning by optically sensing intracloud lightning, which typically occurs 10 to 30 minutes before ground strikes. The unit has an optical mode that will function in electrically noisy environments, or from within or close to structures. Using an electrical field signal, the unit is said to be able to track the approach and departure of storms, or to sound an alarm when the lightning potential is detected within a preselected area.

For more information, contact: Airborne Research Associates, 260 Bear Hill Road, Waltham, MA 02154, U.S. Telephone: (617) 890-8381.

Caps Available in Small Quantities

Every technician is aware of the need to keep lines, fittings and attachment ports covered and protected from foreign matter during storage and

DENCO Industrial Products supplies caps, plugs and protectors in "job size" packaging.

shipment. But too often, the cover consists of a piece of masking tape. Caps, plugs and protectors have been available, but the right one never seems to be on hand.

DENCO Industrial Products has issued a catalog showing its full range of metal and plastic caps, plugs and protectors in threaded or plain styles. The company offers "job size" packaging in quantities ranging from 25 pieces to 250 pieces.

To obtain a copy of DENCO's source book, contact: DENCO Industrial Products, 9701 Darrow Road, Vermilion, OH 44809, U.S.

Booklet Offers 'Clean Air Facts' to Protect Work Environment

United Air Specialists has published the "Clean Air Fact Guide," which is intended to educate maintenance managers about air-cleaning products. Many aircraft maintenance facilities have painting, welding or composite repair shops that can result in air contamination and worker discomforts such as itchy eyes, scratchy throats or more serious ailments.

The 23-page booklet features simple and practical guidelines to ensure that the work environment is safe and free of irritating air contaminants. The guide includes U.S. Occupational Safety and Health Administration (OSHA) regulatory information and an explanation of compliance requirements in layman's terms.

For a free copy of the "Clean Air Fact Guide," contact: United Air Specialists, 4440 Creek Road, Cincinnati, OH 45242, U.S. Telephone (513) 891-0400.

Radome Mask Reduces Erosion Effects

PM Research Inc. offers a line of polyurethane erosion-protection masks custom-molded to fit more than 100 models of U.S.-manufactured aircraft in operation today. The manufacturer claims that this .012-inch-thick mask will remain clear and protect the radome from rain erosion for an extended period without adversely affecting radome transmission efficiency.

Installation is said to be quick and requires no special tooling or cure time. For more information, contact: PM Research, 4110 Niles Hill Road, Wellsville, NY 14895, U.S. Telephone: (716) 593-3169, fax (716) 593-5637. ♦