Magneto-optic/Eddy Current Imager — A Promising New Development in Nondestructive Testing

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Editorial Coordinator

Conventional eddy current inspection devices have been used for many years in various nondestructive testing (NDT) applications. While eddy current NDT has proven to be very effective and is widely used, it does have limitations. Some problems associated with the use of conventional eddy current devices include:

- Operator technique in setting up the equipment is very critical;
- Results can be affected by variations in paint thickness or surface irregularities, and paint removal is often required to assure an adequate inspection;
- Interpretation of defect indications is dependent on operator skill and experience;
- Defect indications are viewed only as a deflection of an indicator needle and are often ambiguous; and,
- Defect indications cannot be recorded or preserved for future analysis or comparison.

The catastrophic failure of a major portion of the pressurized fuselage skin of a Boeing 737 a few years ago focused industry attention on the need for improved NDT inspection methods that could detect small defects and/or corrosion in aircraft structures. The investigation following this incident disclosed that existing defects had gone undetected during previous inspections and that these defects had progressed to total failure of the skin along riveted skin lap joints.

As a result of U.S. Federal Aviation Administration (FAA) and industry task force recommendations, renewed emphasis was placed on improving existing technology and ensuring that inspection personnel were properly trained and provided with optimum working conditions and tools to improve reliable inspection results.

Industry and academic facilities were also trying to develop new NDT techniques and equipment, and the Boeing 737 incident provided the impetus to accelerate those efforts. One of the more promising developments of this research is now being implemented. It is called magneto-optic/eddy current imaging (MOI). MOI is a follow-on to eddy current technology, based on the same scientific principles of the eddy current phenomena.

Eddy current inspection devices were first developed and patented in the 1940s. However, practical and field applicable equipment did not come into use in the aircraft industry until 15 to 20 years later.

How Eddy Current Functions

In very simplified terms, eddy current NDT relies on electromagnetic principles first discovered by Michael Faraday in the mid-1800s. Faraday proved that an electrical current flowing in a circuit creates a surrounding magnetic field. When this magnetic field is placed in close proximity to a metallic surface, it will induce a minute electrical current in the article under test. As this induced current flows through the test piece, a defect (such as a crack) will interrupt or deflect the induced current flow. This disruption results in a corresponding deflection of the magnetic field associated with the induced current, and this deflection of the magnetic field can be detected and used to indicate a flaw.

Conventional eddy current NDT equipment uses a coil probe that creates a small, concentrated field at the end of the probe (Figure 1). The probe is normally held or passed across the test piece at a precise distance (termed "lift-off") by means of a fixture or guide block to ensure uniform indications. The induced currents are cir-

cular and cover a relatively small area surrounding the probe/fixture contact area. Defects within this area are detectable and show up as a deflection of a needle on the NDT device.

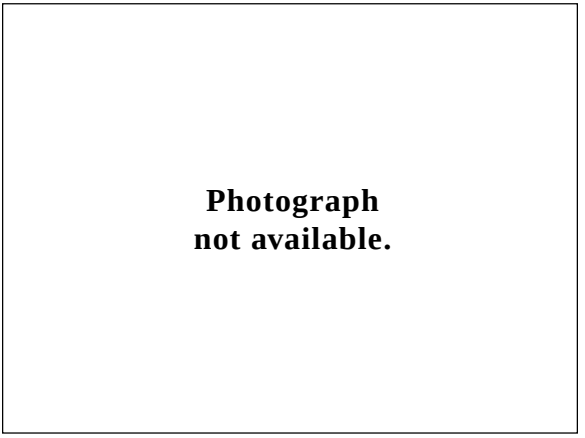

Figure 1

MOI uses these same principles of electromagnetic induction, but differs by using a thin planar foil placed near, and parallel to, the surface of the test piece to create a linear flow of current, thus inducing a similar "sheet" of electrical current in the test piece. When these relatively straight lines of current flow are interrupted or deflected by a defect or hole, the disruption creates a corresponding magnetic field that is perpendicular to the surface of the test piece (Figure 2).

In addition to using planar rather than circular electromagnetic flow, MOI capitalizes on another principle also discovered by Faraday, called the magneto-optic effect. Faraday observed that when a plane of polarized light was passed through glass in a direction parallel to an applied magnetic field, the plane of polarization rotated (Figure 3, page 4). MOI employs special magnetic garnet materials instead of glass in exploiting and enhancing this principle to make the magnetic fields ***visible.*** A schematic of the sensor device is shown in Figure 4, page 4. This capability provides a means to

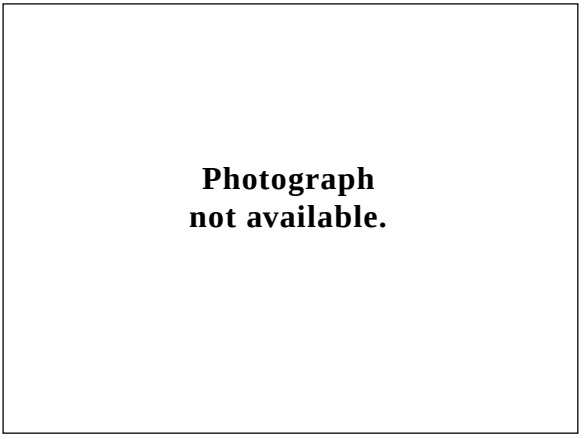

Figure 2

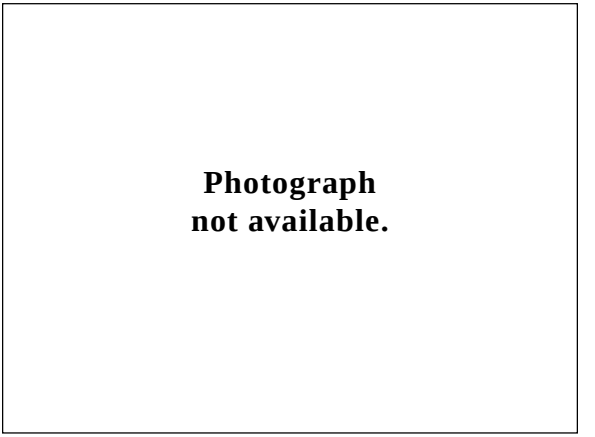

Figure 3

image disruptions directly in otherwise uniform magnetic fields associated with distortions in eddy currents, such as those caused by cracks or corrosion.

With MOI, this visible indication of defects is instantaneous, real-time, and essentially a picture of any deflections of the current flow in the test piece. Since this is an electronic "picture," it can be recorded or even enhanced for future analysis or comparison. The complete MOI system consists of a hand-held sensor, a power/control unit and a cathode-ray tube (CRT) for the visual indication. The system is easily portable and adaptable to field applications.

Field Tests Prove MOI Effectiveness

A number of manufacturers and airline operators have conducted extensive testing of MOI equipment. Current technology uses a 3-inch-diameter sensor that provides an image of a relatively large area compared with that covered by conventional eddy current probes. This larger contact area restricts the use of MOI to large (flat or convex), relatively

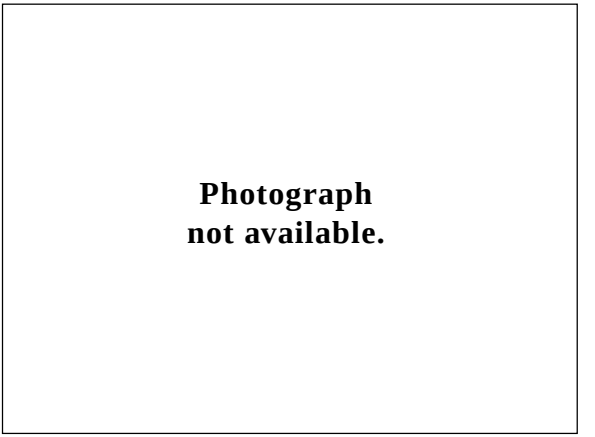

Figure 4

unobstructed areas. Fortunately, this is ideal for fuselage exterior skins, wing surfaces and control surfaces.

The technique is relatively insensitive to the effects of liftoff, so paint removal is not usually necessary. It is advantageous, however, to maintain contact with the test surface to achieve the highest quality images. Test inspections have indicated that crack images can be seen in some cases through nonconductive material that is far thicker than any conventional paint layer.

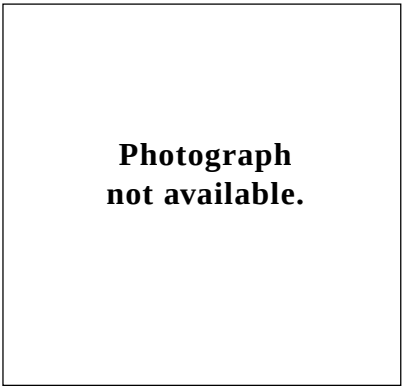

Figure 5a

Test articles were fabricated with minute cuts simulating fatigue cracks emanating from the rivet hole. The actual test article is shown in Figure 5a, and the MOI image of the test article is shown in Figure 5b. A simulated .020-inch crack is barely visible, but the .040-inch notch is plainly visible on the MOI sensor.

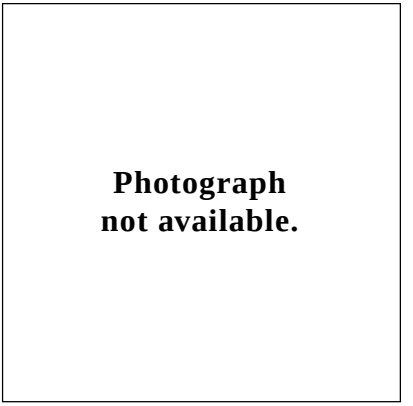

Figure 5b

Since the MOI sensor images the magnetic field surrounding such a crack, a nonuniform current flow around such a crack leads to a nonuniform image. Typically, the center portion of the image of a very long crack will be weaker than the ends because of a more uniform current flow near the center. The ends of these types of cracks are generally quite obvious and easily detected as

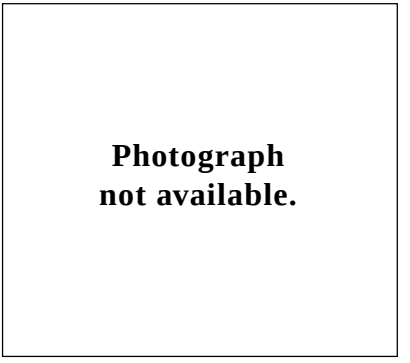

Figure 6a

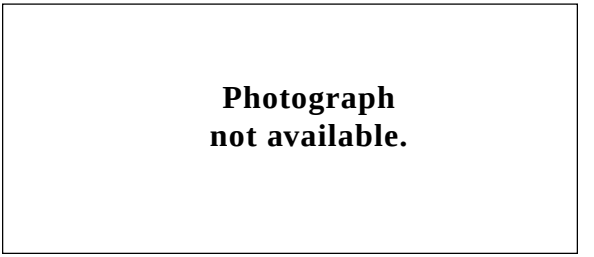

Figure 6b

illustrated in the examples shown in Figures 6a and 6b.

The reliability and repeatability of MOI has been found to be at least as good or better than conventional eddy current NDT. Tests have shown that 95 percent of the inspectors will find 90 percent of cracks as small as 0.126 inch as measured from the rivet shank. By comparison, conventional NDT techniques tested indicated that this same confidence factor would result in a 90 percent-95 percent confidence level *only with slightly larger cracks*.

MOI Detects Corrosion and Subsurface Defects

The performance of MOI as a corrosion detection device is more difficult to quantify because there are no common corrosion sample standards against which various techniques can be tested. One manufacturer has designed a set of eddy current corrosion standards consisting of flat-bottomed holes in aluminum of various depths and covers, to be used in conjunction with corrosion inspection procedures with a low-frequency eddy current method contained in its manuals. While MOI was found to readily detect these defect samples with sharp edges on the holes, it may not be a fair test because corrosion pitting is seldom this well defined.

Varying the frequency of MOI affects the depth of the sensor's penetration, with lower frequencies increasing the depth. So far, a definitive procedure to use MOI to detect subsurface corrosion has not been adopted. The FAA and specialized laboratories are continuing evaluations of MOI for corrosion and subsurface defect detection. Testing of corrosion samples by a major manufacturer is also continuing, and results appear promising.

MOI Detects Second Layer Defects

Testing of MOI to detect cracking in second layer skins at lap joints is also progressing. By varying the frequency, the MOI sensor was shown

to be able to detect sample notches in the second layer of a lap joint. In adjusting the frequency, however, the first layer indications became much more diffused.

Work on perfecting MOI techniques to detect second layer defects is continuing. But it appears most likely that it will be necessary to make two passes to inspect a lap joint fully: first at a higher frequency to inspect the top layer, and a second at a lower frequency to detect defects in the second layer.

Operators Gain Experience with MOI

Several operators and manufacturers have used MOI to inspect various critical structures. The advantage of not having to remove paint to conduct inspections has proven to be a major consideration for operators. A few manufacturers have also evaluated MOI, and some have included it as an alternate NDT procedure for specific applications. In several instances, MOI has been approved as an "alternate means of compliance" with FAA airworthiness directives requiring inspections of specific areas.

Operators using MOI for specific applications have reported good results in the reliability of inspection findings and substantial time savings by eliminating paint removal and repainting required previously. In one instance, a Boeing 747 operator reduced the total work hours to strip, inspect and repaint fuselage lap joints from 2,520 hours to only 80 hours using MOI.

In another instance, a major airline reported that using MOI to perform a section 41 area inspection on Boeing 727s gave good results without paint removal and without cumbersome templates to guide the eddy current probe. This same operator has also inspected skin lap joints on the fuselage of Boeing 727s through paint and decals with good results. As a result of the larger area inspected with 360-degree visibility, inspection was conducted in a single pass rather than in multiple setups.

It appears that MOI will prove to be a real step forward and will provide an improved method of NDT inspection for applicable aircraft structures. Future developments may include the ability to set automatic alarms to alert the operator to a defect indication and even automated inspection systems using MOI.

Image enhancement techniques are also being explored by the Photonics Group at the U.S. National Aeronautics and Space (NASA)-Ames Research Center. It may be particularly beneficial in interpreting and delineating the areas and depths of corrosion indications. ♦

References

Aircraft Inspection with the Magneto-Optic/Eddy Current Imager (MOI). Paper presented at the International Conference on Surface Treatments in the Aeronautical and Aerospace Industries, Cannes, France, June 3-5, 1992.

Photos and reference data courtesy of PRI Instrumentation, 25500 Hawthorne Blvd., Suite 2300, Torrance, CA 90505 U.S.

NEWS & TIPS

U.S. Federal Aviation Administration Releases 1991 Aviation Drug Test Results

The U.S. Federal Aviation Administration (FAA) recently announced results of the second full year of drug testing. The testing includes employees in (and job applicants for) safety-sensitive positions in the U. S. aviation industry. During 1991, the FAA reported that aviation employers such as airlines, repair stations and contractors conducted 279,881 drug tests. Of these tests, less than one percent (a total of 2,673) resulted in positive indications.

The percentage of positive results was higher than that reported in 1990. Officials believe this higher positive rate occurred because aviation contractor personnel were added to the testing requirement in 1991. The frequency of the random testing was also increased from 25 percent to 50 percent, as required by FAA regulations.

FAA Administrator Thomas C. Richards said: "Pre-employment positives account for almost half of the positive results, demonstrating that pre-employment testing prevents applicants who test positive from being hired for aviation safety-sensitive positions."

The results are based on reports from almost 4,200 aviation employers representing more than 342,000 employees in safety-sensitive positions. A detailed breakdown of the 1991 drug test results for the aviation industry

indicates that 1,586 of the positive tests were in the maintenance personnel category. More than half of this number (838) were in the U.S. Federal Aviation Regulation (FAR) 145 Repair Station personnel category.

The ratio of positive test results compared with the number of tests conducted was higher among maintenance personnel than in any other category of personnel employed in the industry. This is a serious threat to professional maintenance.

Boeing Incorporates Industrial Design Concepts in 777 Cockpit

Boeing Commercial Airplane Group has concentrated additional efforts to create the ideal work space for the airline pilot in the flight deck of its newest aircraft design, the Boeing 777. The role of the industrial designers has been emphasized and Boeing solicited input from airlines and pilot unions in the company's efforts to make the new twin-engine aircraft functionally exceptional.

The long-range, twin-engine widebody jetliner is sized between the company's 767-300 and 747-400, with seating proposed for 360 to 390 passengers.

Industrial designer Grace Wong explained, "Industrial design functions as an interface between the user and the design engineers to improve the overall design concept." More than 600 suggestions from other Boeing aircraft users were evaluated. Of that number, about 120 new ideas already have been incorporated into the current flight deck plans.

Boeing's efforts to develop smoother shapes and surfaces, instead of hard corners and geometric shapes, are designed not only to reduce the potential for injury, but also to reduce wear and tear damage to cockpit furnishings and maintenance costs. By providing more convenient storage spaces and properly sized cup holders, etc., the in-service damage to cockpits is also expected to be drastically reduced. The technician should benefit from fewer maintenance requirements and fewer repairs necessitated by breakage and damage to poorly designed fixtures.

Required Recurrent Training Proposed

The U.S. Federal Aviation Regulation (FAR) Part 65 Working Group, which is drafting proposals for changes in the mechanic/technician licensing rules, recently developed a proposal that would significantly change the regulations if adopted.

The Working Group, which is chaired by the Professional Aviation Maintenance Association (PAMA), is composed of representatives from general aviation, airlines, repair stations, various associations and training agencies.

A recent proposal from the group would mandate recurrent training for existing and future licensed airframe and powerplant (A&P) mechanics/technicians under FAR 65.83 and would also add a new part to be called "Training Requirements." The proposals call for:

- Section 65.83, which had been called "recent experience requirements," to be renamed "currency requirements." Paragraph (a) would remain the same. This whole section would apply only to those who work "for compensation or hire."

- In paragraph (b), the currency requirement is changed from six months to 1,000 hours. It would apply to technicians who have served under his/her rating, those who have technically supervised other technicians, those who have served as instructors or supervisors of instructors, and those who have served in an executive capacity in the maintenance or alteration of aircraft.

- In addition to the 1,000 hours, section 65.83 would also require "training specified in section 65.84." This new section would require "a course of training acceptable to the administrator of not less than 16 hours." This would be required within each 24-month period.

- There would also be provisions in 65.83/84 for re-qualification training for technicians who have not maintained their currency. This re-qualification training would usually be 30 hours.

- The 16 hours of recurrent training every 24 months represents the same amount of training currently required for Inspection Authorization (IA) renewal under 65.93 (a) (4). The proposed recurrent training of 16 hours would be intended to satisfy both A&P currency and IA renewal requirements.

Mandated recurrent training has been discussed in the aviation maintenance profession for many years. Results of a survey conducted last year by PAMA indicated that two-thirds of the respondents were in favor of more specific requirements for recurrent training. The Working Group proposal now goes to the Maintenance Subcommittee of the full Aviation Rulemaking Advisory Committee (ARAC) for consideration and pos-

sible inclusion in the eventual Notice Of Proposed Rule Making (NPRM) for FAR Part 65. It appears likely that mandatory recurrent training of technicians will be included in the revised Part 65.

O-rings Are Simple — But Delicate

Basic technician manuals define an O-ring as a means to block a passage between two construction parts and thus prevent loss of gas or fluid. That may sound simple, but these parts are also delicate and easy to damage. Although every technician may have heard the following admonitions before, a few reminders about taking the proper care when working with O-rings may save the next technician from having to replace the seal.

Removing. The reason for the prohibition against using a sharp or pointed tool to remove an O-ring is not to protect the old part, which is discarded anyway. The precaution is to protect the seating groove because any damage or nicks in it will damage the new O-ring or cause it to leak.

Preparing. Prior to installing new O-rings, remember to confirm the part number because visual appearance is not an adequate assurance. After the correct part is confirmed, the ring should be lubricated with the proper material: Skydrol grease for Skydrol O-rings; DC-7 Compound for fuel and petroleum-based oils; and Celvacene or the equivalent for silicone rings. Never use Vaseline because this can harden so much under low temperature conditions that moving parts may jam. Inspect the groove and ensure that it is free from nicks. It should also be clean and free of any debris or scraps from the old ring.

Installing. When an O-ring must be rolled over a threaded area to seat it in the groove, a piece of paper rolled around the threads provides proper protection. Adhesive tapes are not recommended because the adhesive may stick to the part and affect the seal.

Any O-ring subject to pressures above 1,500 psi (pounds per square inch) should be supported by a backup ring. Some lower-pressure installations also use backup rings to extend the useful life of the ring. The backup ring must be on the proper side of the O-ring (if only one is used), and any backups that are used must be checked prior to final assembly to ensure that they are in the groove and do not protrude at any point.

Such attention to detail may require a few extra minutes, but it can save hours. ♦

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.

Oil and Fuel Do Not Go Well Together

A Canadian operator recently suffered a catastrophic engine failure in a test-cell run as a result of cross-connecting two lines in the main engine fuel control system.

The fuel control had been replaced in the test cell because of a problem with slow acceleration. When the fuel system was pressurized, fuel immediately started to pour out of the drain mast. Motoring the engine in an attempt to seat a seal did not work. In subsequent troubleshooting, it was found that the pressure case regulator (PCR) line and the overboard drain line of the main engine control (MEC) had been cross-connected. This was corrected and the leakage stopped.

During the following shift, the starter was removed and two or three liters of oil drained from the gearbox starter drive, an unusual occurrence. The oil tank was checked and appeared to be normal. Three subsequent starts with the engine running at idle power were normal. After these runs, the engine oil level remained normal, so the next test involving take-off power checks was initiated.

Four minutes and 17 seconds later, the engine exploded. Subsequent investigation disclosed that the engine oil system contained 35 percent fuel as a result of the previous crossed lines. The failed turbine punched a 14-inch hole in the casing, the fan midshaft separated and a number of the low-pressure turbine blades were liberated. The repair cost exceeded $3 million.

It was found that the PCR and MEC drain lines could be crossed with no restriction, a design flaw that had not previously been discovered (or at least had not been reported). However, there were several indications that something was wrong:

- Oil was flowing out of the starter drive pad;
- The oil level was still on the mark without any oil having been added; and,

- A massive leak from the drain mast indicated that a line was crossed somewhere.

In hindsight, it is easy to see that the oil tank had something other than just oil in it. If only the technician had taken the time to get the proper manual and ensure that the lines were properly connected … . The engine manufacturer has now changed the connector on one of the lines to make this particular cross-connection impossible.

All-purpose Lubricants Not Necessarily Good For Everything

A major U.S. air carrier recently reported finding problems with the knobs on the passenger entertainment system panels. Volume and channel selector knobs were sticking and hard to move. Technicians were spraying the assembly with all-purpose lubricants such as WD-40, LPS-1, Liquid Wrench, etc. Although the knobs were "freed" the units subsequently failed, requiring a more thorough investigation by the repair vendor.

It was found that after spraying the knob(s), the plastic knob parts began to soften within 24 to 48 hours. The electronic parts attached to the knobs began to loosen a short time later, leading to total failure of the unit. The airline has cautioned line personnel not to use such products on the control panels of passengers' entertainment systems in the future.

The same carrier also found that line maintenance personnel frequently troubleshoot a problem related to stiff or binding cables, pulleys, pivoting quadrants, etc., by simply spraying the suspected bearing with an aerosol lubricant. If the binding is relieved, the troubleshooting has been effective; however, *the corrective action is not yet complete because nothing has been done to provide ongoing lubrication.*

An easy-to-apply, all-purpose aerosol lubricant can flush the normal grease away from any component it is applied to. Although the application may provide immediate relief of the binding bearing, the lubricant quickly dries out, creating an environment that can contribute to corrosion, excessive friction, worse binding and subsequent failure of bearing surfaces. If multiple areas or suspect bearings are sprayed in an effort to locate the culprit of the binding complaint, more harm than good can result.

The operator has suggested that an aerosol grease meeting U.S. MIL-C-23827A standards be used in lieu of the more common products (WD-40, LPS-1, etc.) for such applications. This product, (D5907 MP), is Aeroshell #7

grease in an aerosol can. With an operating temperature range from minus 100 degrees F to plus 300 degrees F, this product is ideally suited to the operating environment of most airframe applications.

Inspect Fire Extinguisher Data Labels

The U.S. Federal Aviation Adminstration (FAA) recently issued an alert cautioning technicians to check data plate/instruction labels on portable fire extinguishers. Most aircraft portable fire extinguishers are required to be maintained and tested in accordance with the National Fire Protection Association (NFPA) standard No. 10. This NFPA standard has been revised with two substantive changes.

The first change is that "no advertisement can be placed on the front side of the extinguisher itself." Many repair and servicing agencies apply their own advertising or inspection stickers on the original data plate. The NFPA standard is intended to ensure that critical instructions are not obscured by the addition of advertising or inspection stickers. It requires that all such stickers be affixed on the opposite side of the container so that the individual's ability to use the extinguisher in an emergency will not be hampered.

The second NFPA standard change calls for a six-year inspection period, at which time the bottle assembly is to be emptied and opened to permit interior inspection prior to being serviced and recertified.

Technicians involved in maintenance and inspection programs covering portable fire extinguishers should review these changes and ensure that appropriate changes are incorporated where applicable.

Know What's in The Barrel!

A Canadian operator recently experienced a severe engine fire on an HS-748 aircraft following servicing of the water-methanol system. Although the barrel from which the system was serviced was properly labeled "water-methanol," it was subsequently found to contain a substantial amount of avgas.

It is suspected that someone inadvertently discarded drained fuel samples into this partially empty barrel. When the water-methanol injection system sprayed this highly flammable mixture into the compressor intake, the ensuing explosion and fire nearly destroyed the aircraft.

Container labels cannot be taken for granted. Unless one can be certain that the contents are as listed and uncontaminated, bulk containers that have been partially used should be tested prior to use in critical applications.

Aft Cargo Compartment Overheats

A Boeing 747 operator reported an incident in which a lower-level aft cargo compartment fire warning light illuminated approximately 10 minutes after takeoff. A return to the departure airport was initiated and the crew discharged a fire extinguisher bottle into the area. Shortly thereafter, the bulk cargo fire warning light came on. A second extinguisher bottle was discharged and the fire warnings ceased. The subsequent landing was uneventful.

Inspection revealed smoke stains on the fuselage near the pressurization outflow valves and the aft fuselage water drains. Damage inside the fuselage was limited to a small area. Two water drain lines and heater tapes around them were severely charred. The adjacent insulation blankets were also affected. Three circuit breakers were tripped that protected the heater circuits of the water drain line.

Although the exact cause was not determined, maintenance personnel suspected that a defect in the water drain heating system welded the contacts in the ground safety relay. With this defect, the drain masts were then supplied with the higher voltage (air mode) instead of lower voltage (ground mode) while the airplane was on the ground, resulting in overheating of the drain masts. The heat then could have ignited debris beneath the cargo floor that was fed by oil-contaminated insulation. A preventive measure includes installation of titanium heat shields inside the fuselage over the mid- and aft-drain masts.

Avoid Potentially Catastrophic Misconnects

Two years ago a Boeing 737-400 crashed just before reaching the runway because the wrong engine was shut down after a fire warning. Immediately after the accident, news media articles implied that the fire warning wiring had been cross-connected, which resulted in a fire warning for the wrong engine being displayed in the cockpit. It was later found that no miswiring was involved in this incident. But the possibility for this to occur existed on this aircraft and many others.

As a result, one major air carrier has

initiated engineering studies to pinpoint any wiring or plumbing connections that can potentially be cross-connected. Any systems having left and right installations in close proximity to each other were investigated. This included items such as warning circuits, extinguisher wiring and plumbing, smoke detectors, fire shutoffs, etc.

The operator found several such possibilities existed in its fleet. Wiring and connectors were found to be identical and of sufficient length to be connected to either unit, thus opening the door for potential cross-connections in the future.

The operator has developed modifications for each potential misconnection situation. When possible, one connector was replaced with another type, or the contacts were "clocked" differently so that the connector was physically impossible to connect to the wrong unit. In other cases, the wiring was rerouted so that the connector would not physically reach the wrong unit. Where plumbing was involved, connectors were replaced or plumbing rerouted to make it physically impossible to misconnect the unit to the system.

Technicians involved in maintenance and inspection activities on multi-engine or complex aircraft should always be alert for such traps. If a potential for misconnection is found, the design defect should always be reported to the manufacturer as well as to one's own company. At the very least, the potentially troublesome lines or wiring should be color-coded to their respective units as a temporary measure until the system is modified. ♦

Stainless Steel Coating Protects Exposed Steel Equipment

A product called "Steel It Vinyl Coating System" has been introduced by the Stainless Steel Coating Co. According to the manufacturer, this coating system provides longlasting protection for steel ladders, stands and other equipment that is constantly exposed to severe weather or immersion in saltwater. The system uses a unique 316L stainless steel leafing pigment that protects surfaces from fresh and saltwater and provides resistance to strong chemical environments.

Photograph not available.

The properties of this coating system appear to make it ideal for use in protecting aircraft servicing equipment constantly exposed to weather and the blasting effects of aircraft movements on open ramps. The manufacturer claims the coatings are easily applied over well-sandblasted surfaces by normal spraying equipment. The cured coating is stated to be so tough that the four-coat system is capable of providing many years of protection to submerged steel equipment. For more information, contact: Stainless Steel Coating Co., P.O. Box 1145, South Lancaster, MA 01561 U.S. Telephone (508) 365-9828.

Cable Tensiometer Requires No Additional Fittings

The ACM-200 cable tensiometer recently introduced by Tensitron Inc. is said to be usable on cables of 1/16 through 1/4 inch thicknesses and up to 200 pounds of tension without the need to change any fittings or use additional risers. By simply rotating the four-position center riser, the unit adapts to use on 1/16-, 1/8-, 3/16-, and 1/4-inch cables. Small enough to fit through a four-inch opening, the manufacturer states that a unique latching mechanism in the handle allows easy one-hand operation and the

ability to lock on the cable in the closed position. A memory pointer lock is provided for use in areas where the pointer cannot be observed. Calibration and support are readily available from the manufacturer at reasonable cost with quick turnaround service. For more information, contact: Tensitron Inc., 1668 Valtec Lane, Boulder, CO 80301 U.S. Telephone (303) 444-5383.

Fume Extraction System Cleans Air

The IMPELL Corp. recently introduced a small self-contained fume extraction system designed for use in small production and rework areas where soldering and desoldering are done. The manufacturer claims that SolderMate will remove the harmful fumes produced in soldering operations, trap the contaminant in the unit's filtration system, then recirculate the cleaned air to the employee work environment. The activated charcoal filter system is said to help soldering operations comply with U.S. recommendations for air quality in such work areas.

The unit is equipped with a filter monitor light that illuminates automatically when the filter needs to be replaced. The filter unit is said to be compact, with the fan at the bottom of the unit to create a low center of gravity and maintain a quiet work environment while filtering up to 140 cubic feet of air per minute. The pick-up hood can be swiveled or turned to be close to the work area, yet outside the field of vision of the operator. For more information, contact: IMPELL Corp., 5139 South Royal Atlanta Drive, Tucker, GA 30084 U.S. Telephone (404) 939-6923.

Photograph not available.

Clamp-type Drill Stops Offer Safety Without Tool Damage

Clamp-type drill collar/stops are offered in a wide range of sizes from 1/8 inch to as large as four inches by the Stafford Manufacturing Corp. The "Set-Stop" collars can also be machined to fit intermediate sizes for special applications.

According to the manufacturer, these clamp collars have several advantages over the older setscrew col-

lars: the collar/stops sit squarely on the shank or flutes of the cutting tool to provide even holding pressure; they will not gouge or chip tool surfaces and they can be more precisely set because the clamping pressure has no tendency to move the stop, as does a setscrew.

Photograph not available.

Collars are available in convenient sets or individually. For more information, contact: Stafford Manufacturing Corp., P.O. Box 2370, Woburn, MA 01888 U.S. Telephone (508) 657-8000.

Ultrasonic Flaw Detector Completely Portable

The DuPont Quantum hand-held ultrasonic flaw detector/thickness gage recently received an award for product innovation at a prestigious engineering fair in Europe. The instrument was among a select group of 26 devices chosen by a panel of engineering, science and industry specialists to receive the prize. It was the only nondestructive testing device so recognized.

Photograph not available.

The manufacturer claims that the three-pound, battery-powered unit, which can be programmed for specific testing parameters, is ideal for ramp or hangar work in detecting flaws or checking material thickness in aircraft structures. The unit operates in the basic ultrasonic inspection modes: pulse-echo, pitch-catch and through-transmission. It is claimed to be highly flexible, accommodating all standard flaw detector and thickness gage transducers, single- or dual-element, contact, delay line, angle-beam or immersion types. For more information,

contact: DuPont External Affairs, Wilmington, DE 19898 U.S. Telephone (302) 992-5326.

New Silicone Sealants Described in Brochure

GE Silicones recently issued a brochure describing the properties and recommended applications of its familiar RTV series of silicone sealants and encapsulants. The brochure covers both the one-part RTV adhesive sealants that are supplied ready-to-use, as well as the two-part RTV compounds that require the mixing of two components before application.

According to GE, quick reference charts are provided that show standard product specifications as well as suggested uses and applications for each product. The publication claims to answer many common questions about silicone sealants and encapsulants. It also provides data on by-products, cure rates, and primer requirements. A chart is provided to aid in estimating the amount of product required for specific tasks.

The family of GE RTV sealants is said to include general-purpose products as well as those with special properties such as flame retardance, noncorrosiveness, enhanced fuel resistance, etc. Request publication number CDS 4415, or for more information, contact: GE Silicones, Inquiry Handling Service — PR#IND-01-92, P.O. Box 330, Poestenkill, NY 12140 U.S. Telephone (518) 233-3505. ♦