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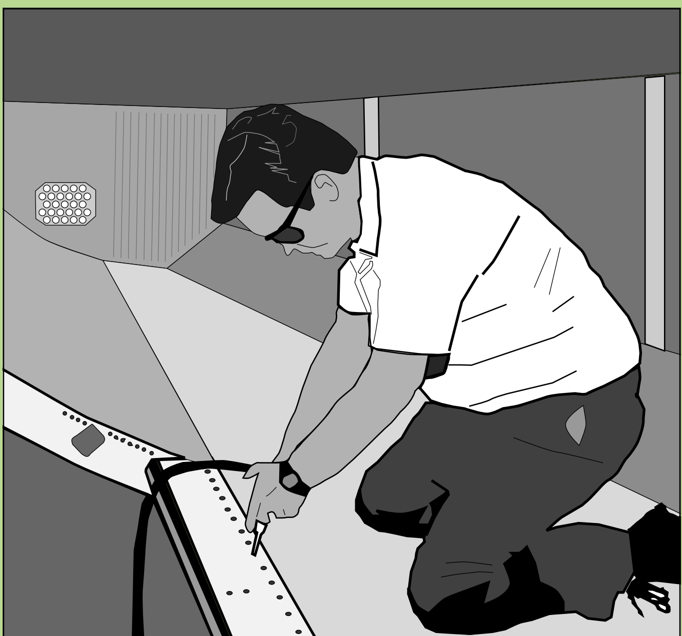
Test Scores for Mechanical Ability and Concentration Appear to Be Valid Predictors Of Inspection Performance



F L I G H T   S A F E T Y   F O U N D A T I O N

Aviation Mechanics Bulletin

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

Robert A. Feeler, editorial coordinator

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Test Scores for Mechanical Ability and Concentration Appear to Be Valid Predictors of Inspection Performance

—

Robert L. Koenig
Aviation Writer

A worker's mechanical aptitude and ability to concentrate can predict how well a nondestructive inspection (NDI) is performed.

That was one finding of a study conducted under contract to the U.S. Federal Aviation Administration (FAA) Civil Aeromedical Institute (CAMI). Specifically, the study concluded that the Bennett Mechanical Comprehension Test (BMCT) and some subtests of the Wechsler Adult Intelligence Scale (WAIS) could be useful in assessing candidates for NDI work.

The finding is contained in "Correlates of Individual Differences in Nondestructive Inspection Performance: A Follow-up Study," prepared by Richard I. Thackray, Ph.D., of Galaxy Scientific Corp. The study conclusions are especially significant because they agree with those of an earlier study on potential NDI inspectors by Shepherd.[1]

Thackray's study was designed to validate the earlier study's findings, using a different group of test subjects and a slightly modified software package. Although there were minor differences between the two studies' results, both found that higher scores on the BMCT and at least one of the relevant WAIS subtests were associated with more accurate performance on simulated inspection tasks.

Thackray's study found no relationship between accuracy and speed in simulated inspections. Nor was there evidence of any significant differences between men and women in their performance of inspection tasks.

Both studies also found "statistically significant increases" in the number of inspection mistakes and "false alarms" related to fatigue within each session and between the two sessions performed each day to simulate a day shift. (A "false alarm" was a good rivet that was incorrectly identified as flawed.) But Thackray's study said that the mistake-rate differences were "relatively small" and therefore "may not be of practical significance" in predicting inspector fatigue.

NDI is a means of testing aircraft parts — for cracks, metal fatigue and other weaknesses — without disassembling or destroying the parts. One instrument commonly used in such inspections is the eddy-current meter, an analog meter that measures eddy current–output deflections, which can indicate the presence of cracks.

Previous studies of NDI in the U.S. Air Force and in the nuclear-power industry had indicated that the proficiency of individual inspectors varied widely in detecting rivet cracks and other problems.[2]

In the commercial airline industry, a 1994 FAA report confirmed that inspector-to-inspector differences were a major source of variation in NDI.[3] Earlier studies did not determine the reasons for wide variations among individual inspectors, other than to suggest that a number of skills, aptitudes and traits seemed to be related to inspector performance on NDI tasks.

Testing those suggestions, Shepherd set out to determine the relationships between predictive measures — derived from several skills and aptitudes — and NDI performance and to examine the effects of changes in inspectors' fatigue levels during a simulated day-shift period.

Shepherd's study on one test group found the following:

- Test subjects' inspection accuracy (measured by the number of missed rivet faults and the number of false alarms on good rivets) correlated with their scores on tests of mechanical aptitude and concentration;
- The speed of inspections was related to traits such as impulsivity, extroversion (the tendency to focus on outside stimuli rather than on thoughts or feelings) and meticulousness;
- Test subjects' inspection accuracy was not related to how quickly or slowly they performed the tasks;
- Within and between the two inspection sessions conducted in one day, there were increases in the percentage of faults missed or false alarms on rivets. Although statistically significant, the increase in the rate of mistakes was considered to be "relatively small";

- Whether a test subject expressed a liking for inspection had no correlation with that inspector's performance on the NDI tasks; and,
- There were no differences between men and women in inspector performance.

For the study to confirm or to find discrepancies with the previous study's results, Thackray made a minor software modification for the simulated inspection task. The software changes, which did not affect the basic nature of the NDI simulation, were made because of a software problem in Shepherd's study that had caused occasional malfunctions. Thackray's study used a new group of 37 subjects.

"Of particular concern was [determining] whether the relationships between NDI task performance and … measures of mechanical ability and attention-concentration [could be repeated with] a different group of subjects drawn from a somewhat different population," the report said. The test subjects in Thackray's study were 19 women and 18 men who ranged in age from 18 years to 29 years, had normal visual acuity and had no prior training in aircraft inspection. The report said that the subjects' lack of prior inspection experience "ensured a more heterogeneous sample, thereby maximizing differences among individuals." Most of the subjects were employed and were also enrolled as part-time students or trainees at a local junior college, university, vocational institute or military training program. Subjects were paid US$10 an hour to participate in the study.

Before performing the simulated rivet inspections, the test subjects were required to read a document describing eddy-current testing and were given initial training, including feedback sessions, on how to use a mouse and cursor to examine simulated rivets on a computer-monitor screen. In most situations, 10 minutes to 20 minutes of practice was required at the computer before test subjects reached a consistent level of performance.

The initial training was followed by three additional training sessions, each involving the inspection of 60 rivets, that prepared the test subjects for the inspection task. After a lunch break, each subject performed two task sessions, each involving the inspection of 300 rivets. The self-paced sessions lasted between 60 minutes and 90 minutes, with one rest break and the opportunity for subjects to take short breaks during the sessions.

Researchers administered subjective rating scales at the beginning and the end of each task session, and all subjects were interviewed at the end of the second (final) session. The subjects were asked how well they believed that they had performed and whether they believed that inspection was a kind of work that they might like to do.

The simulation task designers aimed "to develop a task that, by approximating the characteristics and requirements of eddy-current inspection tasks, could be used in the laboratory to investigate factors that may influence NDI performance."

The rivet inspections were simulated at a SUN SPARC Model 4/50GX-16-P43 computer work station with a 48-centimeter (19-inch) color monitor, a three-button optical mouse and a standard computer keyboard. The display on the monitor screen (Figure 1) consisted of four basic elements:

Simulated rivets. On the lower left part of the monitor screen, test subjects saw a single row of six simulated rivets to be inspected. Using the mouse, the subject moved the cursor around each "rivet" (while glancing at the "eddy-current meter" elsewhere on the screen) until he or she determined whether there were "cracks" in the rivet. All cracks were simulated as if they were under the surface and therefore were not visible.

If the rivet appeared to be flawed, the subject pressed the right mouse button, which caused a red cross to

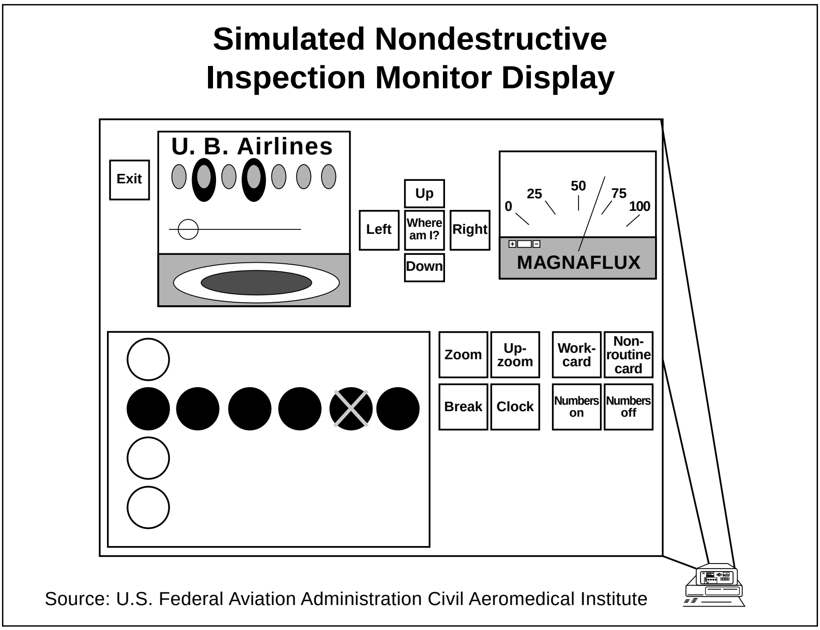

Figure 1

appear over that rivet. The words "rivet marked bad" then appeared on the monitor screen.

If the rivet appeared to be good, the subject pressed the middle mouse button, causing the words "rivet marked good" to appear on the screen. The subject was allowed to change his or her response by re-pressing the appropriate button if he or she believed that the first response had been a mistake.

After inspecting all six rivets in the row, the subject clicked the left mouse button, which brought the next row of rivets to the screen.

Fuselage view. The upper left part of the screen showed a wider side view of the simulated aircraft fuselage, with the complete row of rivets to be inspected. By moving the cursor over the words, "Where am I?" in the directional windows, the subject could determine which part of the rivet row he or she was currently examining.

Eddy-current meter. On the screen's upper right section, a simulated analog meter (with a "needle" moving between 0 and 100) served as the eddy-current output indicator. When the meter's needle deflected beyond a certain point, the subject heard a signal. Meter deflections could be caused by:

- Touching a rivet edge with the cursor or moving the cursor over the rivet's head;
- Passing over a crack that could not be seen on the screen; or,
- Passing over or near an area of simulated corrosion, scratches or paint chips. Such areas were indicated visually by jagged, two-millimeter (0.08-inch) lines at random locations adjacent to a rivet. Not all rivets contained such "noise" spots.

Options. The lower right section of the screen displayed options that allowed the subject to look more closely at a rivet, take a break, display the elapsed time or cause a number to appear on each rivet. That last option was used by the experimenter during training feedback sessions.

To help provide more realism, experimenters designed the range (0.03 centimeter to 0.89 centimeter [0.014 inch to 0.35 inch]) and average fault size (about 0.25 centimeter [0.1 inch]) to correspond to the faults that a real inspector might find in the field.

"Meter deflection was proportional to crack size, with the simulated needle showing a similar rapid, abrupt deflection when the cursor passed over or was in close proximity to either cracks or noise elements," the report said.

In his study, Thackray analyzed three factors considered possible correlates to NDI inspection performance — mechanical aptitude, tirelessness/patience and extroversion/experience seeking — as well as the personality-test scores that were found to be the most important determinants of each factor.

All of the subjects in Thackray's study were given a battery of personality tests, and scores were closely analyzed for any correlation with the subjects' performance on the inspection simulation.

The tests taken by the subjects included:

- *Bennett Mechanical Comprehension Test.* This test measures the ability to perceive and understand the relationships of physical forces and mechanical elements in practical situations.

  A recent study suggested that persons with high scores on such tests of mechanical/electronics aptitude should be given greater consideration for jobs as NDI inspectors.[4] Shepherd's study found that BMCT scores showed "a significant relationship to performance; individuals scoring higher on the test were more accurate in their performance on the NDI task."

- *Arithmetic, Digit-span and Digit-symbol Subtests of the Wechsler Adult Intelligence Scale.* Numerous studies have found that these WAIS subtests measure a factor related to concentration that is variously described by different researchers as "attention-concentration," "freedom from distractibility" or "concentration-speed."[5]

  Shepherd's study indicated that the WAIS arithmetic and digit-span subtests "loaded highly on the same factor that included the [BMCT]," i.e., the WAIS subtests appeared to measure the same factor (mechanical aptitude) that the BMCT measured. Thackray's study used those two subtests, but it did not use the digit-symbol subtest, which did not show a strong correlation to inspection performance in Shepherd's study.

- *Matching Familiar Figures Test (MFFT).* This test measures the extent to which a person's cognitive style is impulsive or reflective.[6] The test consists of 12 "stimulus" pictures, each of which is associated with eight "response" pictures. Only one of the response pictures is identical to the stimulus picture; the other seven differ in minute details.

  Subjects who tend to make quick, inaccurate decisions on the test are said to have an impulsive cognitive style; those who tend to make slower, more accurate decisions are said to have a reflective cognitive style.

  Shepherd's study found that high scores on the WAIS arithmetic subtest tended to be associated with fewer errors on the MFFT test.

- *Subjective Rating Scale (SRS).* This simple self-rating scale, developed by Thackray, was used to assess the subjects' feelings about the project. It was given mainly to compare the subjects' feelings in Thackray's study with the subjects' feelings in Shepherd's study.

- *Typical Experiences Inventory*. This test measures subjects' susceptibility to distractions and stresses. Shepherd's study found that the subscale measuring distractibility showed a significant relationship to attitudes toward inspection. Persons who said they did not like inspection tasks tended to be more susceptible to distractions, as measured by this test.

- *Eysenck Personality Inventory (EPI).* This inventory measures extroversion, among other traits. Some researchers have suggested that extroverts tend to be less vigilant inspectors than introverts (those who focus on subjective states such as ideas, imagination or feelings).[7,8] Shepherd's study did not find a correlation between extroversion and inspection errors, but it did find that extroverts tended to finish the tasks more quickly. The EPI was included in the present study to re-examine the relationship between extroversion and inspection performance.

- *Jackson Personality Research Form (PRF).* This widely used test measures various personality traits. Thackray used four scales from the test: endurance (willingness to work long hours with unrelenting work habits), cognitive structure (the need to make meticulous decisions based on definite knowledge), change (a liking for new experiences) and impulsivity (the tendency to act without deliberation).

  Shepherd's study indicated that the speed of inspections tended to correlate with the scores on measures of endurance, cognitive structure and impulsivity — but not change.

- *Figure Preference Test.* This test determines whether subjects prefer complex or simple perceptual stimuli. One study of industrial workers indicated that persons who tend to prefer simple stimuli also tend to prefer repetitive work that requires a constant focus of attention. But Shepherd's study found no correlation between figure preference and simulated-inspection performance, although it did show a significant relationship to distraction susceptibility.

Thackray's study included three measures of performance: the percentage of missed rivet faults, the percentage of false alarms and the average inspection time per rivet.

Missed rivet faults were the most common type of error. On average, test subjects missed about 7.8 percent of the faulty rivets, but they erroneously marked only 1.2 percent of the good rivets as faulty.

Although the percentage of false alarms was about the same as that found in Shepherd's study, the percentage of rivet faults missed was considerably lower than the 23 percent missed in Shepherd's study.

"The most reasonable explanation for this difference [in the number of rivet faults missed] between the two studies involves the software modifications to the NDI simulation [for the present study]," the report suggested. The software changes, which eliminated most of the lag in eddy current–meter response, seemed to make it easier for test subjects to detect rivet faults.

The rates for false alarms and missed rivet faults showed a correlation with each other but were not significantly related to the speed of inspection. "The lack of a relationship between speed of inspection and measures of performance error was consistent with findings of Shepherd's study," the report said. "However, the significant correlation between missed faults and false alarms was not anticipated, since the previous study found them to be unrelated."

Analyzing the data more closely, researchers suggested that the correlation between missed rivet faults and false alarms may have been exaggerated by the performance of three test subjects who "had exceptionally high false-alarm rates and who were also above average in missed faults. Inclusion of these individuals may have biased the relationship, resulting in a correlation that was spuriously high."

A secondary focus of the study was to analyze any evidence of fatigue in simulated inspections during the first and second task sessions. Shepherd's study "had shown some evidence of fatigue-related performance changes … ."

Thackray's analysis of variance showed a "significant increase" in the percent of missed faults and a "significant decrease" in the average inspection time per rivet between the first and second task sessions (Table 1, page 9). There was no significant change in the percentage of false alarms.

"The changes, although statistically significant for two of the three measures, were relatively small and generally in accord with the findings of the previous study," the report said.

Table 1
Mean Values for the Performance Variables

	Task Session		
Performance Variables	**1**	**2**	**Session Means**
Faults Missed (percent)	5.19	10.14	7.80
False Alarms (percent)	1.15	1.19	1.17
Time per Rivet (seconds)	12.36	10.86	11.61

Source: U.S. Federal Aviation Administration Civil Aeromedical Institute

"Also consistent with the earlier study was the finding of no gender differences in performance levels or change across sessions," the report said. Although a gender difference in attitude toward inspection work was found in Thackray's study (Table 2), as well as Shepherd's study, and men tended to score higher on the BMCT in both studies, these differences were not reflected in performance in either study.

Both before and after the two task sessions, researchers measured the subjects' attentiveness, tiredness, strain, interest and annoyance (Table 3, page 10).

At the end of each performance session, researchers asked the subjects to rate how much effort they had needed to keep alert when the task sessions began compared with when the sessions ended (Table 3). "Presession ratings indicated that subjects began each session feeling moderately attentive, somewhat above their normal energy level, moderately relaxed, moderately interested and not annoyed," the report concluded.

An analysis showed that test subjects tended to lose some interest, feel a bit more tired and annoyed and become somewhat less attentive to their rivet-inspection tasks as the simulated work day progressed.

Table 2
Number of Male and Female Study Subjects Expressing a Liking or Disliking for Inspection

Gender	Liked Inspection	Disliked Inspection
Males	11	7
Females	7	12

Source: U.S. Federal Aviation Administration Civil Aeromedical Institute

Even though each of those ratings tended to slip during the sessions, the researchers found that none of the postsession ratings were in the lower half of the ratings scale. For example, using a nine-point rating scale with 5 representing the midpoint or average value for each feeling, test subjects rated their attentiveness as 7.1 before the sessions and as 5.7 after the sessions.

For that reason, researchers found that "subjects could not be characterized as inattentive, tired, strained, bored or annoyed following the performance sessions." In general, the subjects' initial and changed attitudes were remarkably similar to those of subjects in Shepherd's study.

The ratings of the amount of effort required for test subjects to remain on task indicated that "slight effort was required to maintain involvement in the task initially, with moderate effort required towards the end of a task session."

Like Shepherd, Thackray found a clear relationship between subjects' performance in simulated rivet inspections and their scores on the BMCT. "The [BMCT] would seem to define the [mechanical aptitude] factor, while the [WAIS arithmetic subtest and the MFFT error score] suggest important attentional components [that are] associated with it," the report said.

Of the three factors considered possible correlates to NDI performance, Thackray concluded that mechanical aptitude "seems to stand alone as an ability factor, in contrast to the other factors, which represent personality dimensions."

Statistical analysis showed that only the mechanical aptitude factor was "significantly related to performance." Among the test measures determining the mechanical aptitude factor, WAIS subtests measuring concentration were correlated with NDI performance.

Table 3
Mean Pre- and Post-session Ratings*

Variable	Mean Presession Ratings	Mean Postsession Ratings
Attentiveness	7.1	5.7
Tiredness	3.9	5.3
Strain	3.4	3.9
Interest	6.9	5.0
Annoyance	1.2	1.8
Effort Required for Alertness	3.1	4.6

*Using a nine-point rating scale, with 5 as the midpoint.

Source: U.S. Federal Aviation Administration Civil Aeromedical Institute

Results from another test — the MFFT error score — suggested that "individuals who were slow and accurate in their performance on the MFFT also tended to be more accurate in their performance on the simulated NDI task."

Nevertheless, the author concluded that "the validity of this apparent relationship to NDI task performance is questionable," because the MFFT scores did not show significant correlation with the mechanical comprehension factor in Shepherd's study.

Concerning the second factor, tirelessness/patience, Thackray found that "a meticulous, unfaltering personality style" and "deliberation and patience" were the best predictors for that factor, but tirelessness/patience did not correlate with NDI performance.

The third factor, extroversion/experience seeking, seemed to be best predicted by "an outgoing personality dimension with a dislike and avoidance of routine activities." But, like the second factor, the extroversion/experience-seeking factor was not significantly related to NDI performance.

With some exceptions, Thackray's study confirmed the conclusions reached by Shepherd's study. The principal findings of the two studies were that:

- There is a significant relationship between scores on the BMCT and accuracy in simulated rivet inspections. "This finding was the single most important of the two studies and supports the beliefs and opinions of NDI experts that mechanical aptitude may be a good predictor of NDI proficiency."
- Scores on WAIS subtests that measure concentration also showed "a significant relationship" with rivet-inspection performance. But Thackray's study indicated that the WAIS arithmetic subtest showed a stronger correlation, and Shepherd's study indicated that the WAIS digit-span subtest showed a stronger correlation.
- The relationship between MFFT error scores and rivet-inspection performance is uncertain and needs further study. Although Thackray's study found an apparent relationship between MFFT scores and inspection accuracy, Shepherd's study did not. "Because of this lack of consistency between studies, the validity of this relationship is uncertain," the report said.
- Although there were "statistically significant increases" in the percentage of faults missed in the later sessions of the inspection simulations, that increase "was relatively small in both studies and may not be of practical significance."

- In both studies, the test subjects' liking for inspections was not related to how well they performed the simulated tasks. Similarly, no relationship was found between the speed and the accuracy of inspections.♦

Editorial note: This article was adapted from "Correlatives of Individual Differences in Nondestructive Inspection Performance: A Follow-up Study," by Richard I. Thackray, Ph.D., of Galaxy Scientific Corporation, with the support of the FAA Human Factors Research Laboratory, Civil Aeromedical Institute, in Oklahoma City, Oklahoma. The 12-page study, which includes charts, tables and an extensive bibliography, was included as Chapter 10 of *Human Factors in Aviation Maintenance — Phase Five Progress Report*, FAA Report no. DOT/FAA/AM-96/2. January 1996.

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Master Technician Training Program Introduced

FlightSafety International (FSI) has introduced a new concept in training and certification for aircraft maintenance technicians. Called the master technician training program, it is designed to enable technicians to earn credentials that will represent their skills, technical proficiency and achievements.

The structured program leads through five progressive levels of training and testing to the status of master technician certification, awarded only for examination grades of 90 percent to 100 percent at every level and a demonstrated depth of knowledge.

In addition, FSI offers topical enrichment courses for the technician to expand his or her overall base of aircraft knowledge.

The first Master Technician Training Program has been introduced at the FSI Gulfstream Center in Savannah, Georgia, U.S., for the Gulfstream-IV business jet.

Levels in the G-IV Master Technician path are courses in:

- Maintenance Initial;
- Maintenance Update Refresher;
- Engine Run and Taxi:
- Maintenance Update;
- Advanced Troubleshooting or Electrical and Avionics Initial; and,
- Operational Maintenance Procedures.

For more information, contact FSI at (800) 462-2032 (United States and Canada) or (201) 939-0346.

Workshops Offered on Management, Human Factors in Helicopter Maintenance

Helicopter Association International (HAI) will offer courses in helicopter maintenance management and human performance in helicopter maintenance in late January 1997.

The helicopter maintenance management course, to be held Jan. 27–Feb. 1, will include the following elements:

- Principles of management and management information systems;
- Maintenance malfunction information reporting (MMIR) basics;
- Inventory management;
- Productivity improvement and error reduction;

- Financial management;
- Accounting overview; and,
- Regulatory overview.

The human performance in helicopter maintenance course, to be held Jan. 31–Feb. 1, will examine:

- Case studies;
- Factors that determine a person's characteristics and behavior;
- Human-factor errors; and,
- How to deal with stress and fatigue.

Both courses will be given in conjunction with HAI's 1997 Heli-Expo in Anaheim, California, U.S. For more information, contact HAI, 1635 Princess Street, Alexandria, VA 22314-2818 U.S. Telephone: (800) 435-4976 (United States and Canada) or (703) 683-4646.♦

MAINTENANCE ALERTS

Fatal Helicopter Accident Results in NTSB Recommendation

In April 1996, a Bell Helicopter Textron 206L-1 helicopter operated by a U.S. state police agency was destroyed following an in-flight breakup. Witnesses on the ground reported seeing the helicopter in level flight about 300 feet (91.5 meters) above a hill and observed something fall from the tail of the helicopter. The helicopter immediately entered a spin, the main rotor separated in flight and the helicopter struck the ground in an inverted position.

Examination of the wreckage revealed that the tail assembly, including the vertical stabilizer and the tail rotor gearbox and blades, had separated from the tail boom. This aft portion of the tail boom was found along the flight path about 137 meters (450 feet) preceding the main wreckage site.

The U.S. National Transportation Safety Board (NTSB) materials laboratory examined the tail boom and confirmed the pre-existence of cracking at the failure point of the tail boom. It appeared that the cracking began in the tail-boom skin at a nutplate rivet attachment for the most forward bolt that secures the gearbox fairing to the tail boom. [A nutplate is a small, threaded attachment, riveted to sheet metal, that acts as a nut for a bolt attachment.] In the area of the separation, the tail boom is made of two semicircular pieces of skin that overlap and are riveted on a longitudinal joint.

There was evidence of extensive rubbing of the tail-boom skin from the gearbox fairing and the tail rotor driveshaft cover on the left side of the tail boom. The tail-boom fractures in this area were flat and transverse, typical of fatigue fractures. But extensive rubbing and oxidation in the fairing contact area obliterated the original fracture indications. Away from the rubbed area, the fracture indications were more visible. It appeared that the fatigue cracking, which began at the nutplate rivet hole, had progressed to a length of 10.2 centimeters to 12.7 centimeters (four inches to five inches) in opposite circumferential directions before the final failure.

The manufacturer was aware of reported fatigue cracking in the tail boom and had issued an Alert Service Bulletin (ASB) in 1987, which was later revised. The ASB was in three parts, with Part I describing the required tail-boom modification, Part II describing the interim inspection procedures for unmodified tail booms and Part III detailing the inspection procedures for field-modified tail-boom assemblies.

A review of the maintenance records of the accident helicopter revealed that it had been modified in accordance with the ASB in 1989 and that it had been regularly inspected in accordance with the manufacturer's recommended program. At the time of the accident, the helicopter had operated about 108 hours since its last 100-hour inspection.

More than 8,000 Bell 206-series helicopters are operating throughout the world, many of which are the 206L-1, an extended version operating at higher gross weights. Many of these 206Ls are equipped with stabilized cameras for television stations or large spotlights for police use, and they frequently hover for extended periods while at or near maximum gross weight. Such flight regimes require maximum power and maximum antitorque application, thus significantly increasing the stress on the tail boom. The force creates maximum tension in the area of the left-upper portion of the tail boom, making this area more susceptible to fatigue cracking.

Recognizing these concerns, the manufacturer has recommended modification of existing helicopters and has instituted production changes to later 206L-series helicopters by adding doublers to the skin in areas where cracking has been noted. The helicopter involved in the accident had been modified by installation of a doubler, but the doubler did not include the failure area on that helicopter.

The NTSB believes that 206L, L-1 and L-3 models that do not include a doubler in the gearbox fairing-attachment area are susceptible to premature fatigue cracking. The NTSB is also concerned that the currently recommended 100-hour inspection interval is inadequate and has therefore recommended that the U.S. Federal Aviation Administration

(FAA)"issue an emergency Airworthiness Directive [AD] for [Bell] 206L, L-1 and L-3 model helicopters that do not have doublers in the gearbox fairing-attachment areas to require immediate and recurring inspections for cracks in the tail boom in the areas specified in Bell Alert Service Bulletin 206L-87-47, with inspection intervals to be no more than 50 hours (Class I, Urgent Action)."

Technicians maintaining and inspecting Bell 206-series helicopters should ensure that they are familiar with the relevant inspection requirements and be particularly vigilant in performing the inspections.

FAA Warns of Unapproved Fasteners

The U.S. Federal Aviation Administration (FAA) Suspected Unapproved Parts Program Office has issued a notification about reported nonconforming fasteners. The U.S. Department of Defense inspector general informed the FAA that KSS Socket Screw, Phoenix, Arizona, U.S., had sold fasteners purporting to meet applicable military specifications, but testing revealed that the fasteners did not conform to the specifications.

Part numbers referenced in the notification were: NAS 1351 and 1352; MS16995 and 16996; MS16997 and 16998; MS24667 and 24668; MS24671 and 24672; and MS24674.

The FAA recommended that "aircraft owners, operators maintenance entities, parts distributors, suppliers and manufacturers should determine if they have received or installed any NAS and MS parts from KSS Socket Screw. Installation of the hardware should not be made unless the items have been reinspected and/or tested to show conformance with the applicable [military specification]. Type-certificated products are required to conform to their type design. In instances where hardware has been installed, appropriate action should be taken."✦

NEW PRODUCTS

New Products Offered For Remote Imaging

Olympus America Inc. has introduced products in its Videoimagescope™ line intended to enhance inspectors' ability to inspect hidden or internal areas, including:

- Model IV6C5, a very small, flexible video imagescope that uses a charge-coupled device (CCD) image sensor at the tip of a flexible probe. The probe needs an access hole to the inspection area of only 0.6 centimeter (0.236 inch). The device is said to provide high-resolution, true-color images in real time, with no motion blur or “rainbow” effect. The instrument is available in probe lengths ranging from two meters (6.6 feet) to 16 meters (52.5 feet). The probe tips have two-way articulation, and optical tip adapters provide wide flexibility of viewing;

- Model IW-2, an industrial video analyzer that features high-resolution display on an optional built-in 14.2-centimeter (5.6-inch) liquid crystal display (LCD) monitor. This unit accepts video output from the company’s video imagescopes or from video cameras attached to any manufacturer’s fiberscopes or borescopes. The manufacturer says that user-friendly software provides high-capacity image storage for building data bases, image processing and enhancement, split-screen comparison and sophisticated measurement.

- The ILK-C Video/Light Source Combination Unit, a highly portable remote visual-inspection unit combining a built-in 150-watt light source and appropriate video-imaging equipment for video imagescopes, flexible fiberscopes or rigid borescopes, in one compact package. The company says that the inspector can carry a scope, a light source, a video camera-control unit (CCU) and a detachable LCD monitor in one unit on a shoulder strap; and,

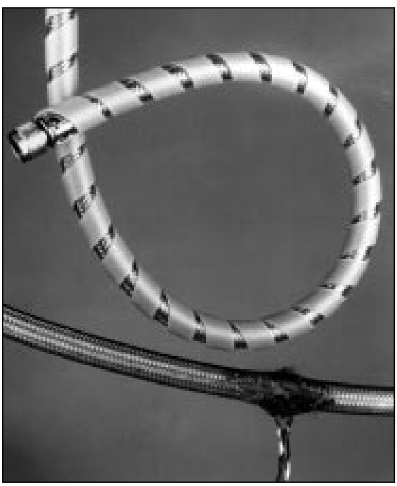
- Model IV7D5X1-26, a video imagescope retrieval tool consisting of a small-diameter viewing device with an internal working channel that accepts a choice of retrieval tools: a magnet, a snare loop, a four-wire basket or a three-prong forceps. Using this device, an operator was recently able to retrieve a piece of a small tool that had fallen deep into the compressor section of a turbine engine. The video imagescope located and identified the object, and the four-wire basket was inserted through the working channel to capture and retrieve the piece of tool.

The ILK-C Video/Light Source Combination Unit from Olympus America Inc.

For more information, contact: Olympus America Inc., Two Corporate Center Drive, Melville, NY 11747-3157 U.S. Telephone: (516) 844-5888.

Expandable Abrasion Protector Wraps Around Metal Hoses

M.M. Newman Corp. has introduced a line of spiral-cut, expandable plastic chafe guards designed to protect braided metal hose in installations where the hose is subject to movement and wear. Heli-Tube™ Abrasion Protector wraps around braided metal to prevent chafing without restricting flexibility. The product is available in various materials that meet American Society for Testing and Materials (ASTM) specifications for abrasion resistance, and it comes in seven sizes, for protecting hoses that are up to 15.2 centimeters (six inches) in outside diameter.



Heli-Tube from M.M. Newman Corp.

Heli-Tube is available in Teflon, which is chemically inert and nonflammable, for use in temperatures from -268 degrees C to +260 degrees C (-450 degrees F to +500 degrees F); nylon, which is self-extinguishing; and ultraviolet (UV)-resistant black polyethylene for outdoor applications. The product can be supplied on spools, cut to length or supplied in a spool-out box.

For more information, contact: M.M. Newman Corp., 24 Tioga Way, Marblehead, MA 01945 U.S. Telephone: (617) 631-7100; Fax: (508) 631-8887.

"Plastic-safe" Ink and Marker Remover Is Suitable for Aircraft Interiors

Aircraft technicians and refurbishing workers have long been plagued with the problem of removing pen, pencil and crayon marks from aircraft interior panels. Chemtronics® has introduced a product designed to solve this problem.

The BrushClean™ Ink and Marker Remover is said to safely and effectively eliminate marks left by pens, markers, lead pencils, nail polish, wax-based materials, crayons, stamp pads and other inks without harming plastic surfaces.

The manufacturer claims that this product provides maintenance and refurbishing facilities with the ability to thoroughly clean and revitalize plastic surfaces without repainting, in most cases.

The applicator brush gently scrubs surfaces to quickly and completely remove ink residue. The solvent is brushed into the defaced area and then wiped clean. The package also features a valve that sprays effectively in all directions, even upside down.

According to the manufacturer, the product contains no chlorofluorocarbons (CFCs), hydrochlorofluorcarbons (HCFCs), hydrofluorocarbons (HFCs), chlorinated solvents or ozone-depleting compounds. It is said to be safe for metals, glass and most plastics. As with all cleaners, a compatibility test should be conducted on a small, noncritical area of the surface before general use.

BrushClean™ Ink and Marker Remover from Chemtronics®

For more information, contact: Chemtronics, 8125 Cobb Center Drive, Kennesaw, GA 30152-4386 U.S. Telephone: (770) 424-4888; Fax: (770) 423-0748.

Aircraft Vibration-Monitoring System Introduced

Endevco Corp. has released the MICROTRAC IIB™, an aircraft-mounted vibration-monitoring system that is said to reduce or eliminate the need for ground balancing equipment. MICROTRAC IIB analyzes vibration signals from accelerometers on each engine and produces and stores in-flight data on vibration phase and amplitude. The system provides single- and dual-plane balance solutions for rebalancing engines.

By recording in-flight data, MICROTRAC IIB eliminates the need for engine ground runs that are typically part of engine-balancing procedures, and the early warning offered by the system allows operators to perform necessary engine service without interrupting flight schedules. MICROTRAC IIB is said to be designed for ease of use, with a front panel that calculates and displays solutions automatically.

MICROTRAC IIB features a generic hardware chassis that allows the chassis to be used in a variety of different aircraft models, with an appropriate plug-in "personality" module for each specific aircraft model. MICROTRAC II, which is standard equipment on most Boeing and McDonnell Douglas aircraft, can be upgraded to MICROTRAC IIB by simply replacing the "personality" module.

For more information, contact: Endevco Corp., 30700 Rancho Viejo Road, San Juan Capistrano, CA 92675-1789 U.S. Telephone: (714) 493-8181; Fax: (714) 661-7231.

Automated Aircraft-Wheel Inspection Machine Introduced

The Hocking WheelScan Mk IV has been introduced as a high-performance eddy-current inspection device for detecting cracks, corrosion and microscopic flaws in aircraft wheels that could be missed by manual inspection.

The device is said to be able to inspect aluminum or magnesium wheels, either painted or bare, in less than two minutes per hub. Push-button controls mounted on an industrial-quality keypad allow for lowering and rotating the hub, setting inspection parameters and recalling or adjusting stored inspection programs.

The probe is automatically calibrated and brought to the hub, where it precisely tracks the profile of the wheel. Five high-density displays indicate the inspection settings. The unit, which is 91.4 centimeters (36 inches) high by 86.4 centimeters (34 inches) wide and 86.4 centimeters deep and weighs 200 kilograms (440 pounds), can be used as a permanent installation or easily moved for field use.

For more information, contact: Krautkramer Branson Inc. [the North American distributor for Hocking products], 50 Industrial Park Road, Lewistown, PA 17044 U.S. Telephone: (717) 242-0327; Fax: (717) 242-2606.♦

WheelScan Mk IV from Hocking

BLANK
INSIDE
BACK
COVER