

AMT

Aircraft Maintenance Technology

*Written by aircraft maintenance professionals
for the professional maintenance team*

Official publication for AMTSociety

North Dakota
Air National
Guard technician
Scott Langston
inspecting a C-21.

September 2012

Military page 16

MAINTENANCE

C-21 maintenance program change by the North Dakota Air National Guard

Included in this month's
Tool and Equipment Supplement

Evaluating Your NDI Provider

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Work Procedures:

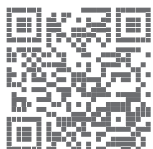
Workarounds

Can cause gradual
deterioration of standards **page 06**

40



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Cover Story



16

A New Experience

*Military Learjet Maintenance:
 Changing maintenance procedures from
 civilian to Air Force mechanics*

By Clint Lowe
Page 16

Industry Outlook

Industry Viewpoint

*Painting Aircraft:
 More than manipulating a spray gun*
By John Goglia
Page 34

Departments

Editor's Viewpoint 4
 Advertisers' Index..... 32
 Classified Advertising..... 33

Features

Work Procedures

*Workarounds: Can cause gradual
 deterioration of standards*

By Vern Berry
Page 06



06

Coatings

*Taking Plating Technology
 to the Aircraft: Tool for repair
 and OEM applications*

By Derek Vanek
Page 10



10

MRO Operations

*Creative Paint Schemes: From
 concept to attention grabbing*

By Ronald Donner
Page 22



22

Management Matters

*10 Commandments of
 Customer Service*

**By DeborahAnn
 Cavalcante**
Page 28



28

AMTSociety Mx Logs Update

Page 30

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Tools and Equipment:

Evaluating Your NDI Services

The NDI provider audit explained.
By Vern Berry

Product Spotlight

Nondestructive Testing Equipment

NBAA Maintenance Preview:

*Maintenance events and schedule for
 NBAA, Oct. 30-Nov. 1 in Orlando, FL*

Exclusive AMT Supplements

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New Faces at AMT



Ron Donner,
Editorial Director
Aviation

Ronald (Ron) Donner has spent his entire life devoted to aviation and he holds FAA certificates as an A&P/IA, and a Commercial Pilot with Single and Multi Engine Land, Instrument Airplane and Glider ratings.

begin this month by welcoming two new people to the staff of AMT. Phil Saran has joined Cygnus Business Media as publisher of *Aircraft Maintenance Technology*, as well as publisher of Cygnus' other two aviation publications, *Airport Business* and *Ground Support Worldwide*. Phil brings many years of publishing experience to Cygnus.

Russell Brody has joined Cygnus Business Media as a national account manager for AMT. Russell also brings years of experience to Cygnus, including media sales in the aviation industry.

Additionally, I will be playing a larger role in *Airport Business* and *Ground Support Worldwide* as editorial director aviation, as well as retaining my core responsibility as editor of AMT.

Look for Phil and Russell at upcoming aviation trade shows including next month's NBAA 65th Annual Meeting & Convention which will be held in Orlando, FL, October 30 through November 1. Stop by our exhibit, booth number 3389, and say hello to Phil, Russell, and other members of the Cygnus Aviation staff. See you in Orlando!

In this month's issue

As the leading aircraft maintenance publication, AMT provides our readership with applicable articles from all segments of aviation. One segment of aircraft maintenance often times overlooked by civilian aviation publications is the military segment. Tens of thousands of aircraft maintenance professionals, both direct members of the military as well as civilian contractors, maintain thousands of military-use aircraft worldwide.

This month's cover story of AMT is dedicated to all the men and women who serve our country in military aviation. Beginning

on Page 16 you can read how the North Dakota Air National Guard, the *Happy Hoologans* as they are proudly known, transitioned civilian maintained C-21 aircraft, the Lear 35 in civilian aviation, to a United States Air Force maintenance program.

Working in aviation and in particular aircraft maintenance we all know the importance of following standard procedures in any type of maintenance organization. Daily we are faced with endless numbers of maintenance policies, standard operating procedures, and maintenance instructions, all intended to ensure maintenance is performed to the exacting standards required for not only the safe operation of aircraft, but also the safety of everyone working in an aviation setting.

Unfortunately there are times when events occur and the investigation that follows reveals the presence of a deviation to the published procedures that have been established by the maintenance organization or by the aircraft or equipment manufacturer. Workarounds as they are commonly referred to, can begin as subtle deviations to standard practices by technicians, managers, engineers, or most anyone, generally with the best of intentions like getting the job done easier or in a timelier manner. Unfortunately these subtle deviations sometimes unknowingly evolve into regular practices and can become more of an organization's cultural norm. Read more about the dangers of workarounds beginning on Page 6 in this issue of AMT.

Ron Donner has worked in a variety of maintenance-related roles, both technical and management in general aviation as well as with a major airline. Ron was the recipient of the 2012 National Air Transportation Association (NATA) Aviation Journalism award.

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Workarounds

Can cause a gradual deterioration of standards and lead to complacency and accidents



By Vern Berry

Vern Berry began his aviation career as an A&P mechanic in 1979. His experience within the aviation industry includes key management roles in quality and safety for both MRO and air carrier operations. He currently resides in upper state New York where he writes and manages a consultant firm at www.blowntireaviation.com.

As a former air safety investigator, I was often presented with an accident or incident where one of the key elements of the event was the presence of a workaround or deviation to published procedures established by the organization or mandated by the manufacturer.

It's a common problem in all organizations and is rooted in our innate ability to problem solve coupled with resource driven pressures to get the job done better, cheaper, faster. By resource I mean time, money, and labor.

Learn from experience

It is said that our experience is the sum of our mistakes. However, we are fortunate that by reading about other mechanics' experiences — some of them bad — we have the opportunity to learn and improve our own performance daily.

The pressure to meet a schedule in busy maintenance organizations can unfortunately create an environment where workarounds become part of the cultural norms.

Here is a famous accident that hit the news many years ago: This was an accepted workaround supported by internal work instructions. The process failed to anticipate the failure of ground support equipment as a DC-10 engine was hung with the pylon attached to the engine rather than separately as called out by the manufacturer. The engine is left over night with the forklift supporting the forward portion of the engine. The forklift loses pressure and the forks settle creating a twist in the rear engine mount which then cracks. The next day the engine change is completed, but the crack goes unnoticed. As the aircraft departs the airport the left engine departs the airplane along with most of the left wing lift devices. The aircraft goes down.

Here's another (It didn't make the news): An aircraft elevator jack screw was removed and sent for overhaul. Upon completion of the overhaul, it was received and sent back to the aircraft for re-installation. After some time, it was installed and when the required inspection was accomplished it was found to have broken limit switch seals and a damaged switch housing. The unit was sent back to the

overhaul agency who estimated the damage at \$15,000. Further investigation revealed that the unit was the wrong part number for that aircraft. The project manager objected because the unit was originally removed from the aircraft; however, it was found that the unit had been modified by the previous owner, and installed



Photo provided by Vern Berry courtesy of Heritage Maintenance Services.

years before. The assumption and accepted practice was that, since it was the unit removed previously, it was acceptable for re-installation.

Standard operating procedures

The air carrier SOP (standard operating procedure) was written requiring the mechanic to verify a part's acceptability for installation; which includes assuring the part was the right one for the aircraft. But their logic and the "rule of thumb" said that it was acceptable to install because of previously assumed installation history.

The root or contributing cause for many incidents or accidents lies in the failure of maintenance personnel to follow standard operating procedures. Often these systems contain some kind of double check system such as inspection buy back, ops check read backs, lock out and tag out, etc.

Key departures from maintenance SOP include:

- Failure to perform an adequate turn over during a work stoppage or shift change resulting in missing key information;
- Failure to follow a check list as directed by the aircraft maintenance manual;
- Use of improper tooling, improper tool substitutions — or misuse of tooling;
- Improper management of processes and their controls.

The point of maintenance processes and controls are to assure that high levels of safety and workmanship are maintained for the airplane to which they apply. Following them provides the means to avoid hazards as well as reduce the creation of hazards that are latent. It does something else that most people fail to realize, but on reflection becomes obvious — it promotes repeatability. If standards are high and followed, the quality will consistently reflect the standards. If a workaround is in place

then repeatability of a lesser standard may become the norm.

Tolerance creep

The thing is workarounds are insidious. They are subject to "tolerance creep."

Tolerance creep is the gradual deterioration of a standard or limit by the assumption that previous

experience shows that limits are flexible. As each evaluation of the limit is made for the same item or similar items on aircraft elsewhere, further "judgment calls" allow the limits to be exceeded based on logical sounding assumptions that promote general consensus.

A good sample of tolerance creep is fuel prices. Once gas got

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to \$4 a gallon, there was a public outcry. But as the price became the norm, people stopped protesting and have by and large accepted higher fuel prices.

In any organization once personnel have established that something works, even if it violates a standard, it becomes an accepted norm over time. Complacency has set in.

To that end latent hazards are not often detectable until an event reveals their presence. These latent "states" will wait for the right set of circumstances to reveal themselves.

Procedural deviations

Aircraft accidents are rare events and the least likely outcome of workarounds, but their severity greatly magnifies the outcome of such violations.

For example: In January 2003 a Beech 1900D crashed on takeoff

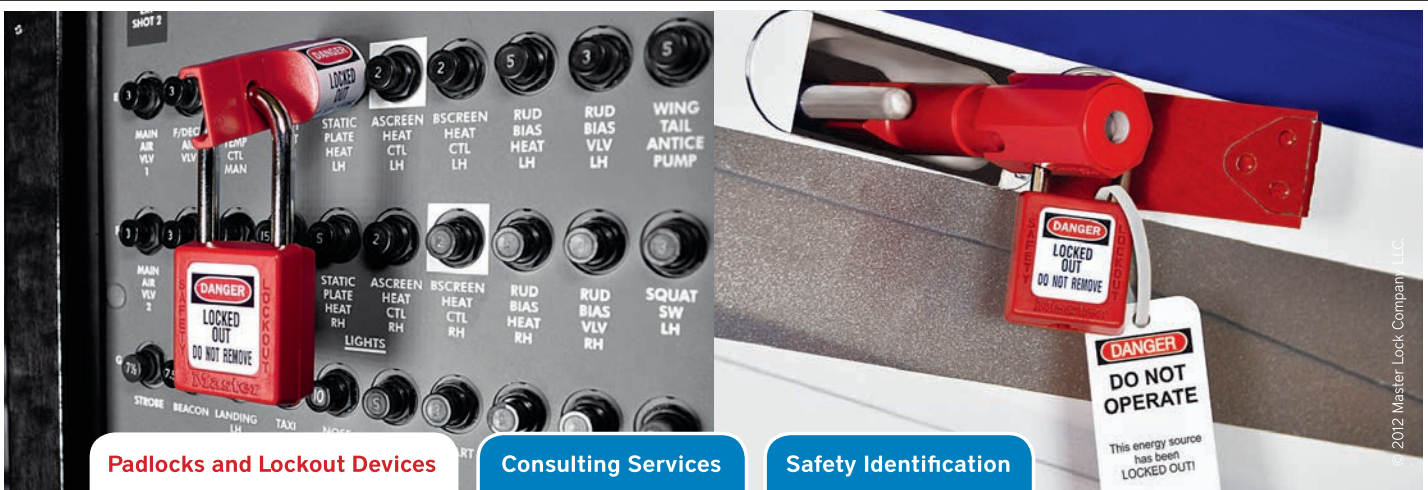
from Charlotte, NC. The findings from the report:

- The accident airplane's elevator control system was incorrectly rigged during the detail six maintenance check, and the incorrect rigging restricted the airplane's elevator travel to 7 degrees airplane nose down, or about one-half of the downward travel specified by the airplane manufacturer.
- The changes in the elevator control system resulting from the incorrect rigging were not conspicuous to the flight crew.
- The QA inspector did not provide adequate on-the-job training and supervision to the mechanic who examined and incorrectly adjusted the system.
- Because the repair station's inspector and the mechanic did not follow the procedure as writ-

ten, they missed a critical step that would have likely detected and thus prevented the accident.

In creating a progressive organization based on best practices, management must lead the way in ruthlessly examining internal processes for compliance, currency, and safety. Internal self-audit or evaluation methods are the most effective way of examining operations and challenging complacency. In using all the tools at our disposal we drive the risk posed by procedural deviations way down, to levels that assure every flight remains an uneventful journey.

It may be that some people's sole purpose in life is to be an example of what not to do in this world. Don't become the poster child for what not to do when fixing an airplane. Take the long way home . . . no workarounds. **AMT**



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Taking Plating Technology to the Aircraft

Selective plating is a widely used tool for both repair and OEM applications

By Derek Vanek

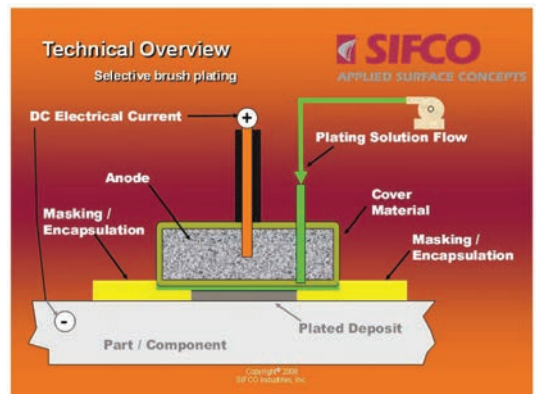
Derek Vanek is the manager of inside sales and technical support at SIFCO Applied Surface Concepts. He has been with the company since 1981, and holds a BS in Business Administration from Old Dominion University. For more information visit www.sifcoasc.com.

Numerous coatings are available today to protect or to enhance the performance of aircraft components. Surface enhancements include corrosion protection, increasing wear resistance, improving electrical conductivity, enhancing lubricity, increasing hardness, or improving the adhesive bond between cemented parts.

Once the components are put into service and are subject to normal wear and tear, refinishing may be required. For tank plating applications, this consists of removing the damaged or worn component from the aircraft and sending it to the plating shop to be stripped and plated or anodized. In many cases disassembly is time consuming and impractical.

For example, an operator removed corrosion products from cadmium plated steel fasteners. During the process, the anodized coating was removed up to 3/8 of an inch from 1,200 fasteners that ran the length of the wings of the aircraft. The timely and expensive option was to disassemble, strip, reanodize, and reassemble the parts. The more attractive option was to selectively brush plate the individual areas directly on the wing.

Selective plating encompasses a fam-



ily of portable electrochemical processes that are used on aircraft in both OEM and repair applications. This includes systems that are used for on-site electroplating, as well as portable anodizing and electropolishing. These systems are set apart from traditional tank finishing processes because they can be performed anywhere — in the shop or out in the hangar, and the parts can be plated or anodized without removing them from the aircraft.

Specifications and approvals

Brush plating is widely accepted for use on both military and commercial aircraft. Key specifications include AMS 2451 and MIL-STD 865, as well as numerous commercial specifications from Bell Helicopter, Boeing, Messier-Bugatti-Dowty Aerospace, Goodrich, and Pratt & Whitney; and prime approvals from Sikorsky, Honeywell, GE AE, and Rolls-Royce (See chart on page 15.)

How does it work?

Brush plating and anodizing operations somewhat resemble painting. The operator dips an absorbent tool in a solution and then



Fuel fitting component; small bores are brush nickel plated prior to brazing.

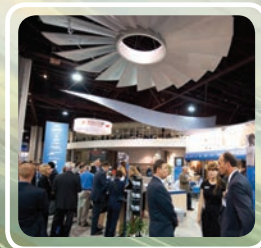
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brushes it against the surface of the area to be plated.

A portable power pack provides a source of direct current for all the processes. The power pack has a minimum of two leads. One lead is connected to the tool and the other is connected to the part being finished.

The direct current, supplied by the power pack, is used in a circuit that is completed when the tool is touching the work surface. The tool is always kept in motion whenever it is in contact with the work surface.

Work surface preparation is usually accomplished through a series of electrochemical operations. These preparatory steps are performed with the same equipment and tool types that are used for the final finishing operation. Good preparation of the work surface is

as important as movement of the tools to produce a quality finish.

Adhesion:

The adhesion of brush electroplates is excellent on a wide variety of materials including steel, cast iron, stainless steel, copper, and high temperature nickel-base materials. Adhesion from brush plating is comparable to that of tank plating.

Metallographic structure:

Most brush plated deposits are metallurgically dense and free of defects. Some of the harder deposits, such as chromium, cobalt-tungsten, and hard nickel, are microcracked, much like hard tank chromium. A few deposits, such as cadmium and zinc are deliberately microporous. Brush plated deposits tend to be more fine grained than tank deposits.

Hardness:

The hardness of brush plated deposits lies within the broad range of the hardness levels obtained with tank deposits. Brush plated chromium is somewhat softer; however, a new green alternative to chromium, Nickel-Tungsten (80 percent Ni, 20 percent W) provides comparable hardness to chromium when heat treated and 10 times better wear.

Corrosion protection:

Brush plated cadmium, zinc-nickel, tin-zinc, nickel, tin, and zinc deposits on steel have been salt spray tested per ASTM-B-117. The brush plated deposits meet or exceed the requirements for tank electroplates when compared to AMS and military specification requirements.

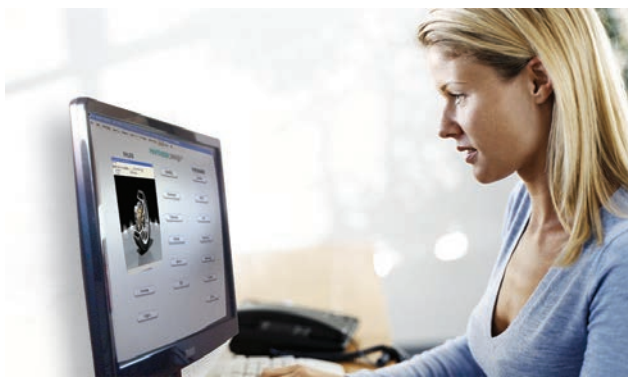
Brush anodized coatings have



Brush plated sulfamate nickel deposit.



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been tested and meet the performance requirements of MIL-A-8625E, AMS 2470, AMS 2468, AMS 2469, and BAC 5623.

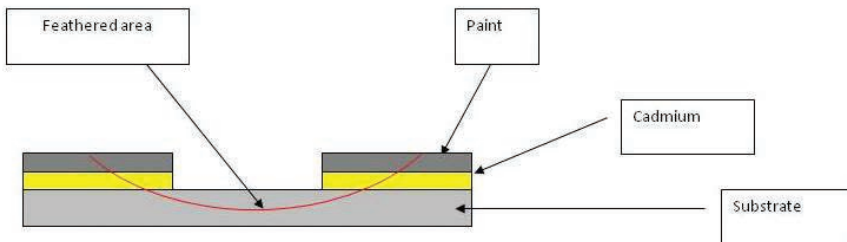
Hydrogen embrittlement:

Cadmium, zinc-nickel, and tin-zinc plating solutions have been specifically developed for plating or touching up high-strength steel parts without needing a post-plate bake.

The most common deposits used when brush plating aircraft components are cadmium, zinc-nickel, and tin-zinc. These deposits are brush plated onto localized areas of landing gear to repair damage caused by runway debris or other mechanical damage. Additionally, a common application is plating sulfamate nickel to localized areas of engine components to improve the brazing process.

The brush plated cadmium, zinc-nickel, and tin-zinc are low hydrogen embrittling deposits, and can be applied to localized areas for touchup of defective tank plated cadmium deposits without a post-

Sketch of defect repair area.



plating bake. They can be applied to the component in-situ, on the plane with minimal to no masking. It is a fast and simple repair — solvent clean, mechanically abrade, and plate.

Brush plating: Repairing damaged cadmium plating on a landing gear

During a routine maintenance inspection, the operator discovered several damaged areas on

the landing gear, including two bushing diameters. There were several small areas of damage that penetrated both the paint and the underlying cadmium plating. This localized damage was a good candidate for repair by brush cadmium plating because it could be done without any disassembly of the landing gear.

Carrying out the repair

The individual defect areas to be plated were solvent cleaned first. They were then mechanically abraded with 120 grit aluminum oxide sandpaper to slightly feather the defect area and to clean the area to be plated.

Because the surface was painted, the only masking that was required

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COATINGS

was used to catch the small amount of runoff of the plating solution.

The absorbent plating tool was placed into a small container of the cadmium plating solution to soak for a few minutes prior to plating. The positive lead was plugged into the anode, and electrical contact from the power pack was made by attaching the negative lead to a con-

ductive area near the damage.

With the power pack voltage properly set, the deposit was applied by rubbing the saturated anode on the defect area in a circular motion until the calculated ampere-hours (to achieve the desired thickness) were passed. The area was water rinsed and dried.



Bushing repair

The bushing repair was carried out in a similar fashion, with minimal masking to control the solution. The surfaces were solvent cleaned, mechanically abraded, and the cadmium was applied to the bores and faces of the bushings.

Once the plating was completed, the chromate conversion coating was applied to the plated areas for 30 seconds. The areas were rinsed and air dried.

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- Messier Dowty PCS-2144
- Parker BPS 4511
- Parker LP 15
- Pratt & Whitney SPOP 321
- Pratt & Whitney PWA 36953
- Pratt & Whitney PWA 36960
- Rolls-Royce – Allison EPS 10245
- Sikorsky SS 8494
- Sikorsky SS 8443
- TRW Aeronautical Systems
- Lucas Aerospace SPD 1000

At this point, the repaired areas on the landing gear were ready for the touchup paint to be applied. The plated bushings were ready for service.

Summary

Selective plating is a widely used tool in the aerospace industry for both repair and OEM applications, offering portability, flexibility, and high quality coatings. It can help minimize aircraft downtime and return aircraft to full functionality. **AMT**



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A New Experience: Military Learjet **MAINTENANCE**

Changing maintenance procedures
from civilian to Air Force mechanics



By Clint Lowe

Clint Lowe holds an FAA A&P certificate with Inspection Authorization and a Commercial Pilot certificate with instrument and multi engine ratings.

The 2005 Base Realignment And Closure (BRAC) announcement to shut down flying operations at the Fargo-based North Dakota Air National Guard (NDANG) fell with a thud. With an unsurpassed safety record (more than 30 years and 145,000 flight hours in fighters without an accident) and two Hughes Trophies in the F-4 Phantom and F-16 Falcon under their belts, a melan-

choly mood permeated the base as the maintainers absorbed the news.

Also known as the *Happy Hooligans*, the 119th Wing has received major Air Force awards for maintenance, including the USAF Daedalian Maintenance Trophy. Sure, there was the C-27J Spartan on a distant horizon, but without a means of retaining personnel and their skills, a Herculean effort to rebuild maintenance skills would await them when



the time came. Old talent would move to other jobs, perhaps outside their unit, and new talent would have no one to mentor them.

Bridge mission: C-21

It was a bleak picture until the announcement they'd be getting the C-21 to work on during the five-or-so-year interim period — they called it a “bridge” mission. “A C-21? What is a C-21?”

They shortly learned the C-21, an off-the-shelf Learjet 35A, had always been maintained by civilian mechanics. There were no Air Force tech schools for it, no Air Force training standards for it, and tech data amounted to Learjet maintenance manuals. They felt like the Pekingese that caught the car.

The news of the airplane's arrival surprised everyone from the Support Program Office (SPO)

Current USAF Maintenance Processes

Safety of aircraft and personnel is paramount to the USAF. To mitigate accidents, there are several major programs the Hooligans work with to prevent everything from tools being left in airplanes to people getting bad chemicals on themselves. Here are some brief highlights:

Specialists vs. A&Ps — The Air Force uses specialists trained on particular systems/processes to accomplish maintenance on the aircraft. In FAA-speak, the hydraulic specialist might best be compared to a technician holding a Repairman FAA license. Maintenance tasks are assigned according to the system (avionics, for instance) being worked on and a specialist is selected to work the issue, whether it is a phase inspection, flight line maintenance, or a tire change in the hangar. The most A&P-like is the crew chief, who is assigned to a single aircraft and assumes responsibility for its maintenance.

Consolidated Tool Kits (CTK's) — Leaving tools in airplanes is a no-no. To prevent this, the NDANG uses a combination of processes to ensure tools don't get left behind. One portion is to “have a place for everything and everything has to be in its place,” which is done by cutting the shape of every tool in the box into a foam layer at the bottom of the drawer, which ensures the mechanic can notice a missing tool immediately during inventory. Once the inventory is complete, the technician returns the box to the tool room where another individual checks the box and then the box is scanned for turn-in and verified on TC-Max.

Electronic Technical Data — In the Air Force, working without current technical data right beside you is a serious offense. To ensure tech data is available for every possible task on the aircraft and save printing costs, the Air Force requires everyone to use laptops for tech data. The laptops are updated daily by ethernet connection to the main

computer when stored for recharging overnight.

“Safe for Maintenance” — Prior to doing anything on an Air Force airplane, there is a requirement to make the airplane “Safe for Maintenance.” The process is intended to shut down and isolate all systems so people won't get hurt and equipment won't get damaged when mechanics start working on it. Radios get shut off, thrust reverser pins are double-checked, and aircraft grounding is verified. For the Learjet 35A, the “Safe for Maintenance” checklist involves roughly 50 steps, ranging from ensuring chocks by the wheels to checking the inverters are “off” prior to applying external power; throughout the document are at least as many warnings and cautions that apply to the step involved. Only after running this process can maintenance proceed on the plane.

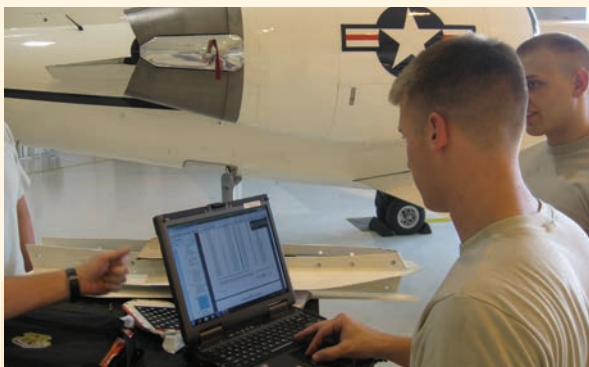
Hazardous Materials — Everything from aircraft polish to fuel sealants are tracked on computer by location and expiration date. Industry material safety data sheets (MSDS) are maintained in the issue area to consult immediately if someone comes in contact with the material as well as to ensure proper protective gear is worn when using any item.

Phase Inspections — Manufacturers' phase inspection requirements were transferred to airline-style phase cards broken down by specialty so specialists can work all required items of a phase.

Technical Order — A Technical Order (aka Tech Order and TO) is literally a military order directing the maintainer to accomplish a task in a certain way. On military platforms, these are detailed, step-by-step instructions (remove screws, then remove panel) to perform maintenance. FAA tech data, by contrast, relies on A&P general practices and knowledge to a great extent to accomplish a job. When finishing a task on a Learjet, you often find, “Restore aircraft to normal.” In a TO, there would be a detailed process (replace panel and tighten screws to 10 inch-pounds) to accomplish this, which caused some teething pains when the C-21 first arrived.

Laptops are updated daily by ethernet connection to the main computer when stored for recharging overnight.

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Staff Sergeant Eric Hoff installs thrust reverser flange bolts. The fire sleeve is for a wiring harness to be installed later.

at Tinker AFB, OK, down to the flight line crew chiefs. The NDANG shortly learned the airplanes, victims of budget cutbacks, were being diverted from a trip to the boneyard at Davis-Monthan AFB in Tucson, AZ, for storage; the aircraft were being saved to fly another day.

Military maintenance program

At Fargo, and later at Hartford, CT, and Battle Creek, MI, training and management personnel determined how to create a military maintenance program from scratch. There were no examples to draw from; while the Air Force had moved military maintenance programs over to civilian contracting on many occasions, no one could remember such a program moving the other direction. About the only guidance was in the form of general Air Force regulations saying if it was FAA-certified, then the unit would have to maintain it to FAA standards. From this tidbit the NDANG went about the business of developing the C-21's military maintenance program.

Essentially, program development required maintenance of the aircraft according to Federal Aviation Administration (FAA) requirements using Air Force processes. As an example, if the FAA requires a 24-month check of the aircraft pitot-static system, the job would be accomplished by Air Force technicians qualified to Air Force pitot-static system check standards. A sheet metal repair would be accomplished

by a technician trained to Air Force standards, but using methods and technical data approved by the FAA. And so it went.

Learjet training

To gain an understanding of the C-21 systems, the NDANG contracted with a civilian Learjet training school to give general maintenance training to full-time technicians. A training aircraft was flown in from Wright-Patterson AFB for hands-on familiarization. From this training, technicians gained a basic understanding of the aircraft and its systems.

Avionics people learned civilian radios and equipment. Crew chiefs learned about pre-flights. Engine, hydraulic, fuel, and other specialists homed in on their specialty areas. Jobs started to become defined and organization began to take shape



Senior Master Sergeant Kevin Odegaard and Master Sergeant Jeff Lien buck rivets on a flap sector bracket replacement.

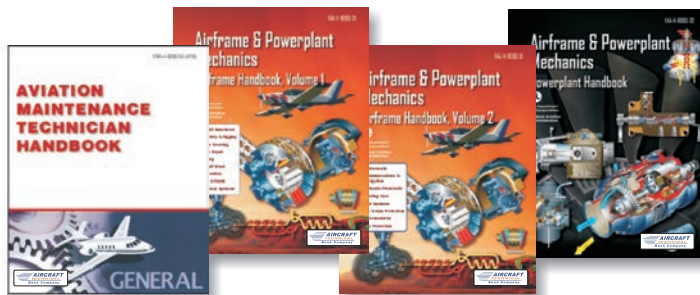
across the maintenance group.

As the aircraft began to show up in early 2007, the technicians

observed temporary CLS

personnel as they performed jobs; later CLS personnel observed as

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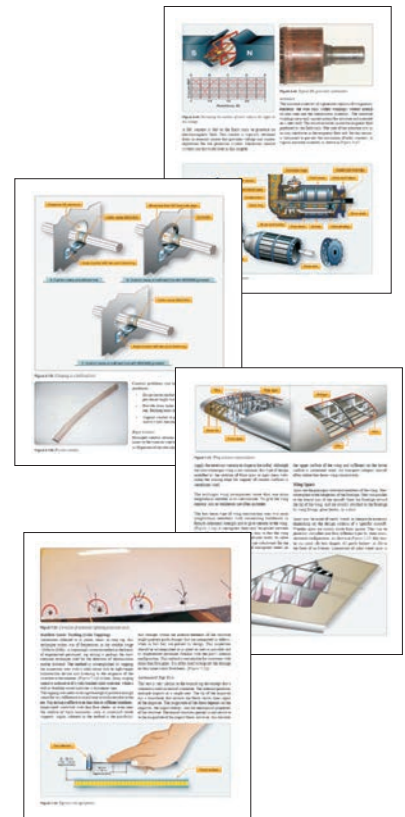
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One of the first C-21s to arrive at the NDANG base is met by an F-16.

Photo courtesy of the NDANG.



we reversed roles with them. By July 2007 Fargo was confident enough to declare a take-over of maintenance on Sept. 1, a full month before the scheduled handover date of Oct. 1.

The Air Force process

As it dug into the process, the Air Guard learned to work with FAA technical data far less detailed than Air Force Technical Orders (TOs). It learned to blend

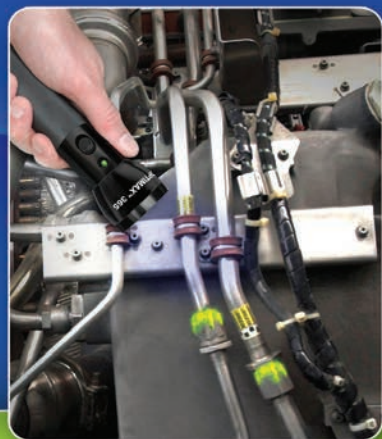
original equipment manufacturer (OEM) service bulletins and FAA Airworthiness Directives into a system of Air Force publications. It found sources for technical data not available through the SPO or OEM

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(like brake component manuals and emergency avionics battery data) and created methods to ensure the data was current. It gained electronic versions of tech data to accommodate Air Force electronic tech data initiatives (*see sidebar*). This dynamic process continues to be monitored and refined.

The Happy Hooligans created, from scratch and through conversations with engineers and Lear mechanics across the nation, the means of accomplishing Air Force-mandated processes never seen on a Learjet.

Making an aircraft "Safe for Maintenance," for instance, grew from nothing to a training class and new tech data. Phase inspections were broken down into work cards, assigning shop areas of responsibility in comprehensive, detailed steps and constructed directly from OEM maintenance manuals. Thousands of pages were written, organized, reviewed, and published to meet Air Force requirements, training goals, and to clarify processes for maintainers.

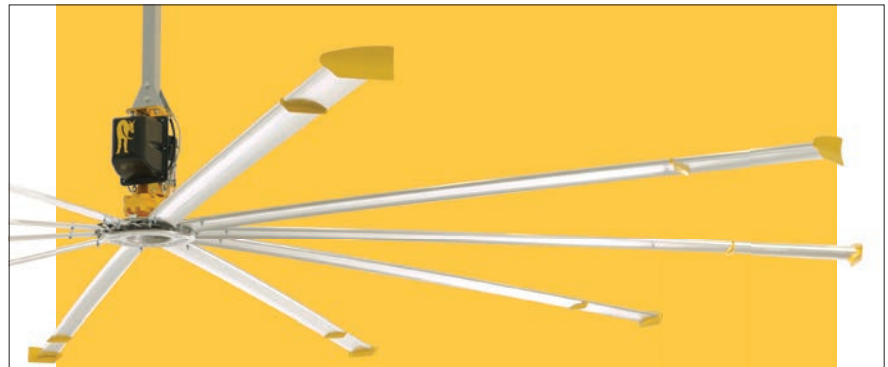
On the way, they found and corrected literally hundreds of technical data errors discovered in the FAA approved maintenance publications, reporting both to tech data monitors at the SPO and at the OEM. The technicians determined many improved methods of conducting inspections and repairs, always with an eye toward safety first and cost savings when possible. And you know what? The process works ... well.

To be sure, "Blue Suit" maintenance has been a success. Supported by a military maintenance team, the Happy Hooligans have excelled while operating in 20 countries on missions for Air Mobility Command, USCENTCOM (Middle East Operations), JOSAC (Domestic Airlift, including VIPs, humanitarian, and air ambulance) and the National Guard Bureau (NGB) in Washington, D.C.

Evidence includes the 2009 JOSAC Unit of the Year Award, a record of 100 percent mission accomplishment while deployed in the Middle East, NGB Pilot Qualification Training for other C-21 units. **AMT**

Clint Lowe has spent most of his aviation career with the United States Air Force and Air National

Guard in a variety of roles including maintenance, safety, training, oversight, and accident investigation. In 2007 he received the Maintenance Group Senior NCO of the Year Award. He currently is a Quality Assurance Inspector/Quality Assurance Representative with the North Dakota Air National Guard in Fargo, ND.



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By Ronald Donner

Creative Paint Schemes

From concept to attention grabbing

Ron Donner has held both technical and management roles in general aviation and during his 27 years with Northwest Airlines. He holds FAA certificates as an A&P/IA and a commercial pilot.

How often have you gazed across the airport ramp or walked down a flight-line at one of the many popular airshows and said now that's a cool looking paint scheme? We know the work that goes into one of those striking multi-color paint schemes, and it generally begins by the aircraft owner or operator conceptualizing a preferred appearance, or in some cases a desire to represent a company brand. These conceptual ideas are often times placed into reality through a paint scheme designer.

One such company

Craig Barnett, CEO of Scheme Designers Inc., having designed more than 10,000 paint schemes for aircraft worldwide, says, "Most clients for whom we create custom paint schemes do not like to strongly brand their aircraft. However, a degree of branding does add a personal touch, a reminder of one's successes and achievements, and when used for business, a strong message to passengers that they are working with a successful company, with significant resources."

Barnett goes on to explain the most common way of showing a corporate

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Photo courtesy of Capital Aviation.



Operating an aircraft in the rough and tough racing environment requires exacting attention to detail during paint preparation.

brand is by the application of a small logo where it counts — next to the entrance door of a jet for example. Here, the brand impacts the passengers, but is less identifiable from a distance to common observers. Other owners like the subtle approach, incorporating the design into the

tail-section aft of the registration number which may have meaning to the owner yet retains a degree of anonymity. At times a design is adapted across a varied fleet of aircraft, requiring a lot of thought and consideration as it's applied to each aircraft.

The result of a design company's creativity is a comprehensive set of schematic design drawings for the paint facility to accomplish the desired appearance. Capital Aviation

Inc., an FAA certificated repair station located on Willey Post Airport near Oklahoma City, is one of many paint shops with experience in the application of attractive paint schemes. I spoke with Scot Webber, executive vice president of Capital, about the business of painting aircraft these days. Webber began by saying, "Aircraft painting has

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remained pretty consistent throughout the years. Aircraft need to be protected against the elements and paint is a major part in maintaining an aircraft for the protection against corrosion."

Capital's paint organization consists of six paint supervisors and approximately 40 painters and aircraft maintenance technicians. It uses the traditional in-house on-the-job training program for paint staff, and staff may attend any necessary specialized training offerings by paint manufacturing companies.

Going green

Webber also feels the process of paint application in many ways has not changed over the years and says, "Really the only trend that we see is with the paint materials going "Green,"



Photo courtesy of Sherwin-Williams Aerospace Coatings.

getting away from the chromates. Also we are seeing more paints go "High Solids" with a lower volatile organic compounds (VOC) content. We don't consider the move to newer paint systems as trends as much as a shift driven by the Environmental Protection Agency (EPA) and the overall desire by industry to

Many aircraft owners use the same basic design for all their aircraft, as is the case with this Bell 206, Cessna 210, and Falcon 50.

use safer and environmentally friendly paint systems."

Capital has used an eco-friendly paint stripper called SunSetStrip manufactured

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locally by WEBBERTEK for more than three years and says its paint shop has become completely hazmat free. He goes on to say this paint stripper has also allowed it to remove the existing paint from an aircraft more completely and in less time.

Application of the design

When asked what some of the more interesting paint projects have been Webber shares several. He says, “We painted a Challenger Jet with a solid red base and silver stripes. The challenge on this aircraft was to keep the red consistent throughout the entire aircraft. We also painted a P-51 race aircraft which required a lot of attention to ensure the paint was exactly prepared in order to make sure it stays on an aircraft operating in such a rough and



Photo courtesy of Capital Aviation.

tough environment that racing provides.” Other projects were a Sky Raider for the Oklahoma Museum of Flying which required duplication of a 1950s paint scheme, and a Falcon 50 owned by NASCAR favorite Greg Biffle.

Capital was provided a full set of schematic design drawings for the Biffle Falcon from Scheme Designers and Webber says, “Painting a multi-colored

Maintaining a consistent red color throughout an entire aircraft can be challenging.

design to exacting measurements requires attention to detail. It’s very important to have everyone communicating with one another, so everybody is on the same schedule. As an example you need to have a plan of action for each color and where to apply them on the aircraft. Individual



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For all of you NASCAR fans

Greg Biffle holds a Private Pilot certificate for fixed wing single engine land and rotor wing. His three aircraft are based at the Statesville, NC, airport and include the Dassault Falcon 50, a Cessna 210, and a Bell 206 helicopter all painted in the same livery. One aircraft maintenance technician and up to four pilots make up the flight department, and combined the three aircraft fly approximately 350 hours annually.

Greg Biffle is part of the Roush Fenway Racing team where his No. 16 3M-sponsored Ford Fusion is one of several cars utilized for practice and NASCAR Sprint Cup championship racing.

Roush Fenway and Sherwin-Williams have had a longtime working arrangement, as have 3M and Sherwin-Williams. Biffle says, "I've found that a new paint job on my aircraft not only enhances its aesthetics, but protects its surface from wear and corrosion. Sherwin-Williams Aerospace coatings not only provide all my aircraft with a long-lasting quality appearance, but its durable finish keeps them looking great for a long time. These are the same reasons we not only use Sherwin-Williams Aerospace coatings in the sky, as well as using its Automotive finishes on the racetrack."



Photo courtesy of Sherwin-Williams Aerospace Coatings.

NASCAR favorite Greg Biffle and his Dassault Falcon 50.

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colors are done one at a time, even when a paint scheme may have colors overlapping one another. You apply the first color and when dry, re-mask the plane for the next color, apply the next color, and repeat the process until you are finished." Webber says, "If you have just one painter out of sync it can mess up your day real fast."

Many times the aircraft owner/operator will choose the type of paint system they want applied. Other times a customer just wants a quality paint used and the paint facility will work with the customer to choose a system based on the type of aircraft, type of operation, and cost.

In the case of the Falcon 50, the Sherwin-Williams' paint system was used. The entire paint system consisted of several products each

White, Acry Glo Conventional Metallic Seminole Red, Black Velvet and Windfield Bronze, Acry Glo Conventional Aviation Gray, and SKYscapes Clearcoat. Webber says start to finish, the Falcon paint process took approximately four and a half weeks to complete using a 12-person crew.

Webber shares his thoughts on paint system selection. "Ideally customers will choose a paint system we are accustomed to working with." He says, "Being familiar with the paint system can be a big advantage for any paint facility. The Sherwin-Williams system used on the Falcon 50 is very user friendly, we've been using it for a long time, and our painters are very comfortable using it." **AMT**



"You need to have a plan of action for each color and where to apply them on the aircraft. Individual colors are done one at a time, even when a paint scheme may have colors overlapping one another. You apply the first color and when dry, re-mask the plane for the next color, apply the next color, and repeat the process until you are finished."

— Scot Webber, Executive Vice President, Capital Aviation

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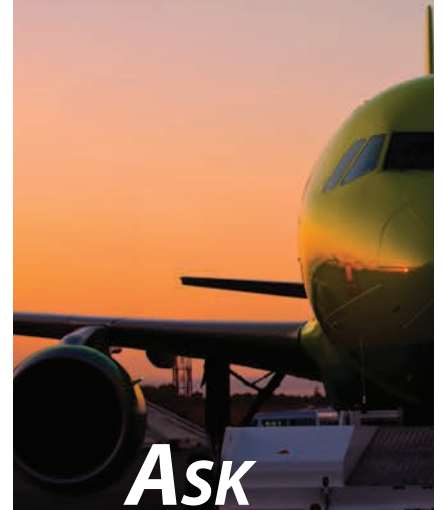
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10 Commandments of Customer Service

Effective ways to be of service to internal and external customers



By DeborahAnn Cavalcante

DeborahAnn Cavalcante earned her Master of Aeronautical Science, with a specialization in Safety Management from Embry-Riddle Aeronautical University in Daytona, FL, and her Bachelor of Science from VA Tech in Business and Risk Management.

OK, why would the boss leave this article on my desk? I am not customer service, I am operations; I am not customer service, I am maintenance; I am not customer service, I am accounting. Perhaps he or she is trying to tell you the entire organization is customer service.

Whenever we provide anyone associated with the organization, whether internally or externally, some form of communication, we are engaging in customer service.

No one is asking you to be a servant to anyone else; they are simply asking you to be of service to others. Dr. Martin Luther King once said, "Everyone has the power of greatness, not for fame but greatness, because greatness is determined by service."

Any time an interaction occurs between two individuals, whether inside our organization or outside, whether it is a vendor, a supplier, or a direct paying customer, we should all think about how we can be of service. In reality, we would desire them to be of service to us. Let's take a look at what I consider the 10 Commandments of Customer Service.

1. Never stop smiling on the phone, in an email, or in person. Whatever your primary method of customer contact is, there should be a smile contained in it. I ask you, is it possible to smile in an email, or on the phone, as you would when you greet your customer face to face? Of course it is! Think about it; everyone wants to do business with pleasant people; most customers will respond positively, thereby opening the door to turn the task into a relationship.

2. Acknowledge every person who walks through the door, calls, emails, or communicates with you in any

way. Not only is this both a display of professionalism and good manners but it communicates to the customer that they are "in and on your radar". This proves especially beneficial in situations of peak traffic where the customer may need to wait for service. This technique diffuses the impatience of waiting because you have let them know you are aware and that you care.

3. If at all possible erase the words "no," "I don't know," and "We can't do that" from your vocabulary. Replace them with "Let me find that out for you," "Please allow me to check into that for you, I may have a better suggestion," or, "I am happy to find someone who can answer that for you." When you cannot offer what the customer needs, present alternatives. At all costs, do not leave them hanging with the question unanswered or the issue unresolved. By sticking with them and following through, you gain their respect and their trust.

4. State your name when answering customer service calls. Identifying yourself sends a clear message that you possess a service attitude, and adds immediate friendliness as well as professionalism to the conversation. It also prevents the other party from thinking you may not have any desire to assist them and that may well be why you have not offered your name.

5. None of us are fortunate enough to have customers that never have a problem! Most issues can be moved forward to a resolution by beginning with a sincere "Please accept my apology." No one will appreciate you making excuses, and at this point they are irrelevant; what is relevant is diffusing the customer's dissatisfaction, positioning them

to be receptive to your potential solutions. Some people are reluctant to apologize, especially if they were not the one to cause the problem. It is important to remember this is not a personal issue; it is your job to develop skills to turn negative situations into positive ones. In addition to apologizing for the service failure, it is important to acknowledge that the company has let them down by saying "We have obviously not met your expectations."

6. The most important word in the English language to most people is the sound of their own name. Get to know your customers, call them by name whenever possible. Most of us have experienced the heartwarming feeling of someone we do not know well calling us by name. It leaves us feeling comfortable and with a desire to return at a future time. This is a key element in establishing long-term customer relationships and loyalty and changes a cold task to a warm sincere transaction.

7. Attitude, attitude, attitude; you have the choice to make it positive or negative. A positive attitude is a driving force toward happiness and success. Customers like to do business with happy successful people. If someone is having a bad day your positive upbeat attitude will be contagious and could end up being just the medicine they need.

8. The customer is always right, even when they are not! What I mean here is that we can all see the same thing, or view the same event and draw different conclusions based on our perceptions. It therefore becomes important to remember that your customer may perceive something differently than you do, and who is "right" holds far less significance than understanding the difference in perception, which has the potential to ultimately lead to agreement.

9. Give the customer more than they expect. The concept of underpromising and overdelivering is not new, yet how many of us actually take the time or effort to deliver more than the customer expected. Master this skill and you are sure to build loyalty with your customers.

10. If a customer expectation cannot be met offer a choice of alternatives. There certainly are times when as much as we would like to deliver what the customer is asking for it may not be possible. If we can shift the customer's focus to a couple of alternatives, we have interrupted the negative focus of the need not being met. The key to this is offering the customer the alternative choices, and letting them choose.

In the end, how a customer feels, more than what they think when they leave your facility or complete the transaction, will determine if you will ever see them again. Be cognizant of the fact that it is seven times more difficult to get a new customer than retain the one you have.

Challenge yourself; each week, add one new commandment to what you are already doing. If each employee in your organization did the same, the level of customer service would increase dramatically. Internally, you could expect to see more effective communications between co-workers, more cooperation and cohesiveness among teams, increased customer retention and loyalty, and an overall up-tick in morale and productivity. **AMT**

DeborahAnn Cavalcante leads Diversified Aviation Consulting (DAC) and has firsthand experience in air carrier operations, private charter aircraft, general aviation operations, military/civilian interface, FBO management, maintenance repair station training, safety training, human factors training, and customer service training. For more information on DAC visit www.dac.aero.



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AMTSociety State of the Industry Address

Welcome back to all of you that were able to take vacation and enjoy time to be with your family, relaxing, and getting some rest. And to everyone, I sincerely hope that you have enjoyed a safe summer.

Maintenance safety

Finish all the steps before calling the task complete. Does this sound basic? Yes it is ... but there continues to be maintenance-induced aircraft accidents where the mechanic has not followed the order of the steps, did not finish a step, or did not complete all the steps of the task as instructed. Instructions for Continued Airworthiness (ICA) contains the sequential steps for completing a task. It goes without saying (but I will write it anyway!) that the sequence of steps developed by the manufacturer is very important. The job will be performed correctly and safely when each individual step is started and completed, one step at a time in sequential order.

It is not a bingo game out there. It really is a matter of safety and safety cannot be compromised.

— Stay safe, Tom Hendershot

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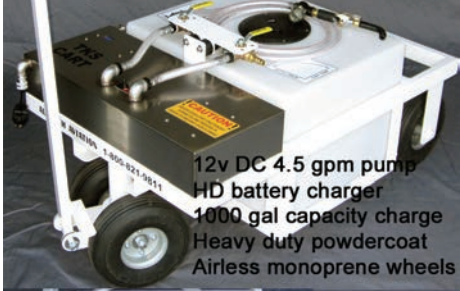
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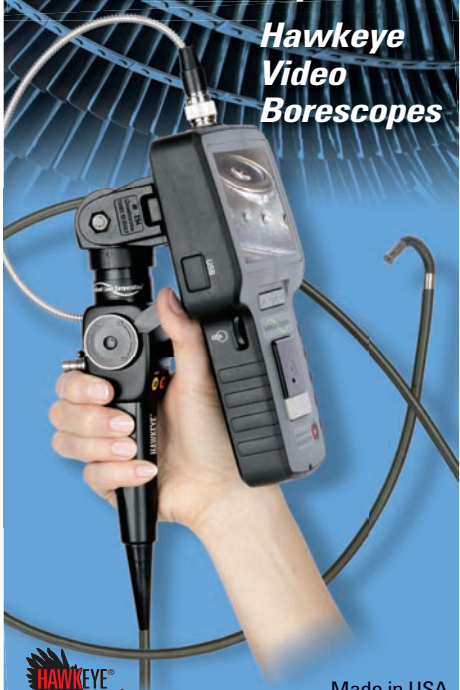


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Coming in the October issue of AMT.

AMT visits Embraer Executive Jets' in Melbourne, FL, where it recently received a production certificate from the FAA to assemble Phenom 100s in the United States.

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Advertisers' Index

ACES Systems	22
Aerotek	15
Alberth Aviation.....	31
All Metal Maintenance Stands.....	31
AMT Bookstore	19
ATEQ	25
AVGROUP	36
Aviall	2
Big Ass Fans	21
Brown Aviation Tool Supply Co.	26
ECT.....	32
Elliott Aviation	25, 35
Gage Bilt.....	24
Global Parts.....	14
Gradient Lens Corporation	31
Hammonds.....	18
JLG.....	5
Kett Tool Company	23
Klassic Tool Crib.....	32
MasterLock.....	8
Maynards.....	9
Miraj.....	24
Moduline Cabinets	29
NBAA	11
Parker Hannifin	22
Pentagon 2000.....	12, 13, 31
Prime Turbines	23
Sherwin-Williams Aerospace Coatings	27
Spectronics Corporation	20
Survival Products.....	31
Taughanock Aviation	26
USATCO	7
Western Aircraft	31

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Painting Aircraft

More than manipulating a spray gun



By John Goglia

John Goglia has 40+ years experience in the aviation industry. He was the first NTSB board member to hold an FAA aircraft mechanic's certificate. He can be reached at gogliaj@yahoo.com.

Aircraft painting is one of those jobs that frequently gets short shrift when it comes to saving money on hiring skilled labor. In my experience, this is true whether the aircraft owner or operator is a major airline or repair station or a private owner of a general aviation aircraft.

Many people seeking a paint job for their aircraft seem to think that anyone who can wield a paintbrush or spray gun can paint an aircraft. Many maintenance organizations apparently think the same thing when they assign untrained and unskilled workers to the task of aircraft painting, but that is a dangerous assumption to make.

Many jobs that may have limited safety impacts in other situations can have very significant impacts in aviation if not performed properly. Aircraft painting is one of them. It is a skilled job that requires knowledge and proper training. Most importantly, workers who paint aircraft need to have sufficient knowledge of aircraft control surfaces, including hinge points, and the location of static ports and pitot tubes, both of which control vital instruments. They need to not only know where these areas are but also the critical functions they perform in safe flight.

And it's a job that requires proper preparation to prevent paint from getting into sensitive areas. In fact, the preparation can frequently take more time than the paint job itself. Knowing what to tape and cover is, of course, critical. Knowing not to use razor knives to trim masking tape is also important. I have seen unskilled painters score aircraft surfaces; these scores can lead to corrosion and cracking of the aluminum skin.

One case that came to my attention when I served as an NTSB member involved dozens of aircraft (mostly 737s and a few 747s) that had to be prematurely retired

because bad paint jobs were suspected to have deeply scored the aircraft's skin to the point that it was more economical to scrap the aircraft than to try to repair or replace the skin. One of the score lines ran from the main entrance door clear to the tail. Investigators believed that the various paint jobs resulted from changes in aircraft operators, which caused changes in names and color schemes.

Improper painting can and has caused aircraft incidents and may have also been a factor in aircraft accidents. One egregious GA paint job I saw was at a small,

Aircraft painting is a skilled job that requires knowledge and proper training. . . Improper painting can and has caused aircraft incidents and may have also been a factor in aircraft accidents.

uncontrolled field where a pilot on landing reported difficulty in controlling the aircraft. A subsequent inspection indicated that the likely cause of the problem was the improper touch up of a Piper Tri-Pacer. Someone, through negligence, lack of knowledge or skill, or all three, had allowed paint to run into an aileron hinge resulting in stiff movement of the aileron. Hence the difficulty that the pilot experienced on landing.

Since cost-saving measures usually mean that A&P mechanics will not actually be painting aircraft, they are frequently assigned to supervise. This means that the burden of ensuring that workers are properly trained in the importance of proper prep and painting falls on them. **AMT**



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