

Clare Leavens Award • Joe Chase Award • Aviall High Achievement Award



AirMaintenance

UPDATE

The Magazine for Aircraft Maintenance Professionals

Transport Canada Approved for R/T



Lock Ring Not Located

Clean-Tech Lasers

VS-300: The First Practical Helicopter



Transport Canada 'Feedback'

Publication Mail Agreement No. 0041039024
and Return Undeliverable Canadian Addresses to
Alpha Publishing Group (2004) Inc.
Unit 100 - 8880 Graybar Rd, Richmond BC V6W 1H9
email: amumagazine@outlook.com

August - September 2023
Volume 22/Issue 2

\$7.95

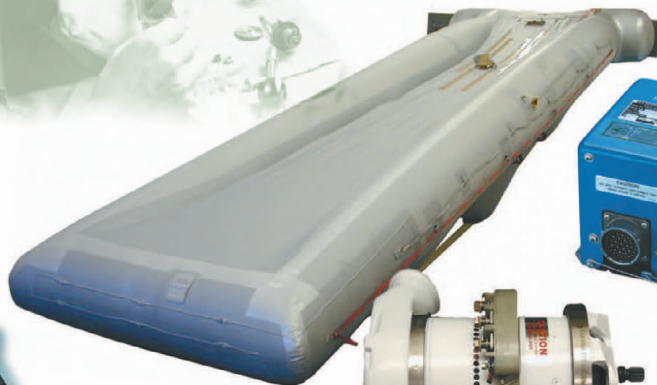
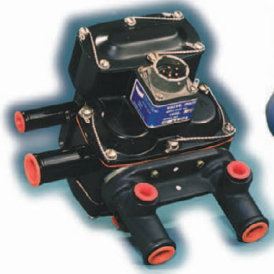
Canadian Aero Accessories Ltd.

Component Sales

Overhaul & Repair



Trusted
Experience
Since 1964



CALL US FOR THIS & MORE !

- Fire Bottles • Oxygen Bottles • Escape Slides • Life Rafts
- Starter Generators • AC Generators • Generator Control Units
- Boost Pumps • Fuel Pumps • Blowers • Valves • Brakes
- Hydraulics 5606 and Skydrol • Electronics/GCUs
- Actuators - Hydraulic and Electrical

Authorized repair Station For

GOODRICH

Ice protection systems

170 George Craig Blvd. N.E., Calgary, AB, Canada T2E 7H2

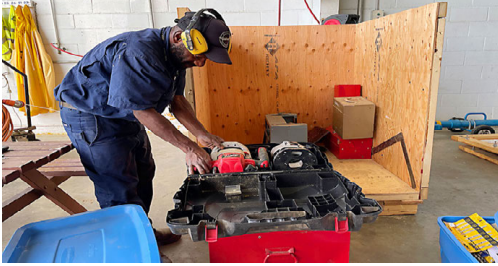
ph: 403.250.9077 • fax: 403.250.6841

sales@cdnaero.com

www.canadianaero.com



The Gift of Tools



It WAS A FEEL-GOOD moment in early May when the charitable organization Mission Aviation Fellowship received a donation of tools for their program in Papua New Guinea (PNG) through Abbotsford, BC-based KMS Tools and their “Tools for the World” program.

“Last summer when I was in Canada, I met a man who worked with KMS tools, and that’s how I learned about their Tools for the World program,” said Canadian MAF Pilot, Tim Neufeld. “I thought, ‘Hey, this could be really good for our team in PNG!’ Together with the team, they put together a wish list. Nine months later, that shipment has arrived!”

The crate of tools had been on an around the world journey to reach PNG. It was delayed in customs and misplaced on a wharf for a while. But the wait was worthwhile as it contained carpentry tools, wrenches and sockets, gear pullers, and other tools for the vehicle and property maintenance team, which will be used for maintaining the MAF PNG vehicle fleet and 70 staff houses and MAF properties across the country.

“Good tools are hard to find here,” said Neufeld. “Things can be busy, but the maintenance team helps take a load off of us all by maintaining MAF vehicles and houses — they get things done, and we know we are in good hands...The mechanics on staff are capable, and it has been incredible what they can achieve with what few tools they have. This gift will be a huge blessing to the entire team.” ■

— John Campbell, Editor

Departments

- 4 Upcoming Events
- 6 STCs & New Products
- 8 Industry Forum
- 24 AME Association and PAMA News
- 39 Classified Ads
- 42 AMU Chronicles

Features



VS-300: The First Practical Helicopter 10
By Igor Sikorsky

Transport Canada: Reports & Comments 18
Originally published as “Feedback”

Raising The Bar: Lock Ring Not Located 28
When a turbine Otter’s horizontal stabilizer actuator separates

Clean-Tech Lasers 34
There’s a new tool out there for surface coating pre-treatment

AirMaintenance Update

Unit 100 - 6660 Graybar Road
Richmond BC V6W 1H9 Canada
phone: (604) 214-9824
fax: (604) 214-9825

Published by Alpha Publishing Group (2004) Inc.
Publication Mail Agreement Number 0041039024 and Return Undeliverable Canadian Addresses to:
Alpha Publishing Group (2004) Inc.
Unit 100 - 6660 Graybar Road
Richmond BC V6W 1H9 Canada

email: chrissie@amumagazine.com

website: www.amumagazine.com

editor: John Campbell
art director: Cliff Vickstrom
publisher: Bill Carter
sales manager: Bill Carter
Advertising inquiries: (604) 214-9824

Subscription Rates: 1 Year: \$40 2 Years: \$60
AirMaintenance Update is published 6X annually. AirMaintenance Update may not be reproduced in whole or in part in any form without the express written permission of Alpha Publishing Group (2004) Inc. Copyright 2013 Printed in Canada

production manager: Chrissie Harvey
circulation: Anne Gervin
cover photo: Dreamstime.com

Corporate Member of:



This publication neither endorses nor confirms the information contained within. The appropriate authorities should be contacted prior to commencing work on any aircraft or aircraft part or procedure.

Publications Mail Registration No. 0007198278

ISSN 1703-2318

AMU is viewable online: subscribe and download at www.amumagazine.com

Upcoming Events

NEW FIREFIGHTING PLANES ARE ON THE WAY



PRODUCTION of a workhorse firefighting plane that is eagerly awaited in Europe to combat worsening mega-blazes is running “a little bit” behind schedule, and the first will not be delivered before the fire season of 2027, manufacturer De Havilland Canada told The Associated Press in late June. In launching production of the DHC-515 — a new generation of the famous “Canadair” water-bombing planes — the Canadian aircraft maker said last year that it expected to make its first deliveries “by the middle of the decade.”

France, among countries that battled devastating forest fires last year, is expected to be among the first recipients of the aircraft, and had hoped for a first plane in 2026 to reinforce its aging fleet. French President Emmanuel Macron had also made an ambitious pledge to replace all 12 of its Canadairs by the time he leaves office in 2027 and to add four more.

But the first plane won't be delivered to Europe before 2027, says the manufacturer, attributing the delay to contract negotiations with European governments over the “complicated engineering” of the sturdy, amphibious aircraft that can scoop up more than six tons of water from seas and lakes to be dumped at low altitude on blazing forests by their daredevil pilots.

Climate change is said to be driving the need for more planes that can dump water and other fire retardants on blazes. Major wildfires in Europe are now starting earlier, becoming more frequent, harder to stop and doing more damage. Scientists say wildfires will likely get worse as the climate warms. The fire season that usually took place in the summer is now extending to other months in drought-hit areas of southern France and other parts of Europe where climate warming poses the greatest risks. The Mediterranean region

is warming faster than the global average.

About 225 Canadair firefighting planes were produced since the 1960s. They've become essential for firefighters in France and elsewhere. But production of the water-bombers stopped in 2015, and manufacturer Bombardier then sold the program the following year to De Havilland. The company's relaunch of the upgraded DHC-515 responded to demand for replacements and larger fleets.

The European Union has placed 22 firm orders, and it will get those planes first. The initial production run of 22 planes for the EU will last into 2029 or 2030 — and two of the planes are earmarked for France. Any additional planes for France would only come after that first run. Also taking orders are provinces in Canada, where more than 400 wildfires spread choking smoke to the U.S. East Coast and Midwest earlier in June. 🌟

(With files from John Leicester, The Associated Press)

COMING EVENTS

Abbotsford International Airshow

August 11-13, 2023
Abbotsford, British Columbia
www.abbotsfordairshow.com

HAC Conference & Trade Show

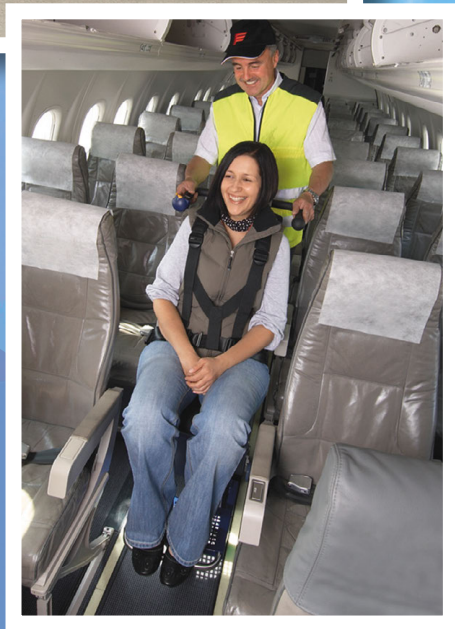
November 6-10, 2023
Vancouver, BC
www.h-a-c.ca

Advertisers Index

Amazon Stairclimber - BKD	5	Concorde Battery	16	NAASCO	27
Aeroneuf Instruments Ltd	17	Eagle Fuel Cells Inc	23	ProAero Aviation	13
BKD 3D Printing	36	Harbour Air	21	Propworks Propeller Systems	38
Canadian Aero Accessories Ltd	2, 44	Hartwig Aircraft Fuel Cell Repair	15	Rapco Inc	43
Canadian Propeller Ltd	37	JetBed - BKD	7	Schweiss Bi-fold Doors	16
CASP Aerospace Inc	37	MARSS	22	STOLairus	40

the **Amazon** stairclimber

the **AUTOMATED** lifting solution



- safe, dignified passenger transfer
- self-propelled: no lifting required
- versatile: used on commercial and corporate aircraft
- simple and easy to operate: training provided
- lifts 350 lbs. / 160 kg with the push of a button
- portable: use at base or take it with you

- compact and lightweight
- transports passengers quickly
- ensures fast and efficient turn times
- reduces risk of injury to staff and passengers
- unique, specialized design
- patented braking system

Tel: (604) 247-2128
Fax: (604) 214-9825

BKD AEROSPACE INDUSTRIES INC.

Call us for a quote or visit our website for more details.
Watch our online videos at www.bkdaerospace.com

info@bkdaerospace.com
Unit 100 — 6660 Graybar Road
Richmond BC V6W 1H9 Canada

STCs & new products

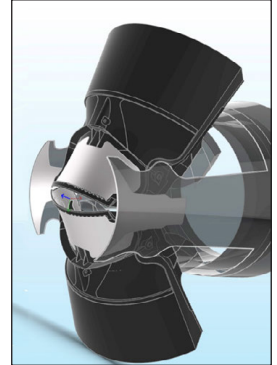
New gears have hardened teeth

KHK's new line of ratchets and pawls are designed to limit rotational motion to one direction. They are produced in six tooth sizes to resist torque loads from 3 Nm to 550 Nm and are made from 1045 carbon steel and feature induction hardened teeth for added durability. The ratchet gears are included in the KHK J series program where stock bores can be open along with the addition of keyways and sets screws, with production requiring only three business days. www.khkgears.us



STC solves reverser corrosion

Quiet Technology Aerospace has been awarded an FAA Supplemental Type Certificate for its solution to thrust reverser corrosion of the HTF7000 engine. QTA has engineered a one-piece forging in 7075, replacing the aluminum in the corroded area with a new Titanium aft section. QTA's terminating solution maintains the same inner mold line and exit area as a new original TR. The TR door and aft body permanent solution comes with a lifetime structural warranty that automatically transfers with the aircraft regardless of future sales of the airframe. www.qtaerospace.com



Storage space protects A380s

Losberger De Boer says it can now provide hangars for the storage and light maintenance of A380s that will protect the aircraft from environmental factors and help prevent wing cracks. Modular by design, the 95-metre clearspan space is capable of shading one or more A380 aircraft. Open at both ends, the structure can be installed to ensure existing hangars remain easily accessible, providing a flexible solution for storage and light maintenance requirements. The aluminium curved frame shade structure has a PVC roof and polyisocyanurate panels to protect the aircraft from environmental elements. www.losbergerdeboer.com



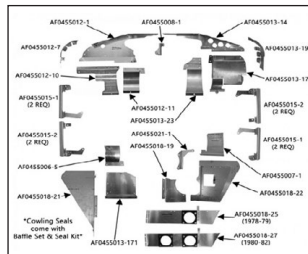
New flight deck upgrades Hawkers

Southeast Aerospace has been awarded an FAA STC for the installation of the Universal Insight Electronic Flight Instrument System as a modernization option for Hawker 800A, 800B, and 800XP aircraft with existing Collins EFIS 85/86, FCS-80, and APS-85 autopilots by upgrading to the new Universal InSight Integrated Flight Deck, the only viable EFIS upgrade to the Hawker 800 series in the market today. The InSight Display System is designed as an integrated flight deck solution featuring embedded synthetic vision with advanced mapping capability, electronic charts, and radio control. www.seaerospace.com



New baffles fight corrosion

Airforms now offers FAA-PMA baffles for all Cessna 152 OEM configurations as a replacement for existing assemblies. These new baffles have undergone individual PMA approval and can be purchased as standalone units or as a complete set. The reinforced design ensures extended durability and reduces metal fatigue failures. Each baffle assembly has the option of either a bare metal finish or a powder coated finish which enhances corrosion resistance. Standard silicone seals and low friction cowl saver seals are also available options. www.McFarlaneAviation.com



Spotlight features parabolic reflector

Streamlight's Waypoint 400 is an updated version of the rechargeable pistol-grip spotlight that offers up to 1,400 lumens of ultra-bright white light with 400,000 candela and a beam distance of 1,265 metres for enhanced down-range lighting capability. The portable light can be used as either a handheld mobile searchlight, or, with its integrated stand, as a hands-free scene light to illuminate an area. It uses LEDs and a deep-dish parabolic reflector for long-range targeting with optimum peripheral illumination, and features a lithium-ion battery that fully charges in four hours. www.streamlight.com



To announce your STC or new product, email a JPG photo and a product description to John at: amu.editor@gmail.com

JetBed™

Easy to Carry • Easy to Stow • Ready to Go



"Thank you for finally providing a solution to a comfortable, restful sleep on a corporate jet ... back support is superb ... the quality of your bed is evident ... a real winner."

Lusardi Construction Co.



The Comfortable Way to Fly

Easy to use, easy to stow!
Removable mattress, for easy cleaning. Meets or exceeds FAR-25-853a standards for flammability. JetBed™ weighs no more than 20lbs!

Available for:

Cessna CJ-1
Cessna CJ-2
Cessna CJ-3
Cessna XL & XLS
Cessna XLS-PL, XLS Plus
Cessna Encore & Ultra Encore
Citation X & Sovereign
Gulfstream G200
Gulfstream 550
Gulfstream G-IV
Gulfstream G-V
Challenger 300
Challenger 600 Series
Falcon 2000
Global Express
Learjet 45
Hawker 800
Falcon 50

"... a long flight was proof that JetBed was the right decision. Without hesitation, I would recommend JetBed to any operator seeking ease, reliability and quality ... Kudos to you and your Jet Bed staff for such a quality and innovative solution. You have surpassed all of my expectations ..."



JetBed™

"... a great addition to our cabin requirements ... deployment is extremely easy ... stores easily ... definitely a satisfied JetBed customer."

Qualcomm Flight Department



BKD

mobility products

Approved distributor

Tel: 604.247.2128 Fax: 604.214.9825

www.bkdaerospace.com

info@bkdaerospace.com

BKD Aerospace Industries Inc.



HondaJet offers a CPO program for interested buyers.

BRITTEN-NORMAN MOVES HOME

UK aircraft manufacturer Britten-Norman says it plans to increase production rates and to repatriate aircraft production to its historic home in Bembridge on the Isle of Wight. The move is a major change for the British firm which has been manufacturing its aircraft in eastern Europe since the late 1960s. Britten-Norman will invest in new jigs and tooling to create two additional production lines. The investment is in preparation for the planned launch of a zero-emissions Islander aircraft in 2026. The company will retain its 34,000-square-foot UK stronghold at Solent Airport Daedalus, home of the final assembly line for the Islander.

MERLIN PILOT TOURS ALASKA

Boston-based tech company Merlin Labs recently completed a series of 25 test flights in Alaska, showcasing its automated flight control system alongside a safety pilot. In collaboration with the FAA-designated University of Alaska Fairbanks UAS Test Site and Everts Air Cargo, Merlin successfully deployed its integrated hardware and software solution, the Merlin Pilot, on crewed aircraft for these test flights. Departing from Fairbanks, the flights ventured into rural areas, reaching destinations such as Fort Yukon, Galena, Huslia, Tanana, and Prudhoe Bay. Throughout the course



of these flights, the Merlin Pilot logged over 60 hours of autonomous flight time, collecting data in real-world conditions.

daJet global fleet exceeds 185,000 flight hours and has grown to over 230 aircraft worldwide.

HONDA HAS NEW SALES PITCH

During the month of June Honda Aircraft Company introduced its first Certified Pre-Owned program (CPO) targeted toward would-be HondaJet buyers. Honda says their program is the only one of its kind in the class, and that each HondaJet comes with inspection and maintenance processes before receiving the CPO designation. The program also offers end-to-end services, from ease of entry-into-service to post-sales support, backed by Honda Aircraft Company and its authorized sales network. The Hon-

THE TALENT HUNT IS ON

Airbus is calling on aerospace enthusiasts to join the sector as it looks to recruit more than 13,000 people across the globe in 2023. To date, more than 7,000 of those positions have been filled despite a challenging labour market. The company is offering thousands of job opportunities in manufacturing, engineering and activities supporting Airbus' long term objectives like cybersecurity, software engineering and new propulsion technologies (e.g. hydrogen, cryogenics, fuel cells). A third of the total

Talent Hunt



recruitment will be allocated to recent graduates and in 2023, Airbus expanded its academic partnerships with 42 business schools and universities worldwide.



CALLING ALL WANNABE AMES

The FAA is looking to develop the next generation of aviation professionals through two grants aimed at creating a more diverse pool of pilots and aviation maintenance technicians: the Aircraft Pilots Workforce Development Grants fund programs that educate students to become pilots, aerospace engineers or unmanned aircraft systems operators, and the Aviation Maintenance Technical Workers Workforce Development Grants fund programs that prepare people to be aviation maintenance technicians. Eligible organizations can apply for grants of up to \$500,000. Last year the FAA awarded \$10 million in grants to more than 20 schools and organizations.

GE RUNS SUPERCOMPUTER TESTS

To support the development of a new open fan engine architecture, GE Aerospace ran simulations in June using the world's fast-



est supercomputer capable of crunching data in excess of exascale speed, or more than a quintillion calculations per second. To model engine performance and noise levels, GE Aerospace created software capable of operating on Frontier, a recently commissioned supercomputer at the U.S. Department of Energy's Oak Ridge National Laboratory with processing power of about 37,000 GPUs. Frontier's processing speed is so powerful, it would take every person on Earth combined more than four years to do what the supercomputer can in one second.

AEROSHELL HAS A GREEN PLAN

Shell Aviation has introduced a new lifecycle sustainability approach for its AeroShell aviation lubricants to avoid, reduce and then compensate for lifecycle carbon emissions, improving aircraft performance while helping customers meet their net-zero greenhouse gas or carbon emissions ambitions. The new lifecycle sustainability approach will be included as standard across the full

AeroShell product range, including turbine engine oils, piston engine oils, greases and fluids, for both the commercial airline and general aviation markets. This upgrade to the AeroShell offering marks Shell's latest step to decarbonize in alignment with its net zero-emissions target which includes increasing low and no carbon offerings.



X-57 PROGRAM FAILS TO LAUNCH

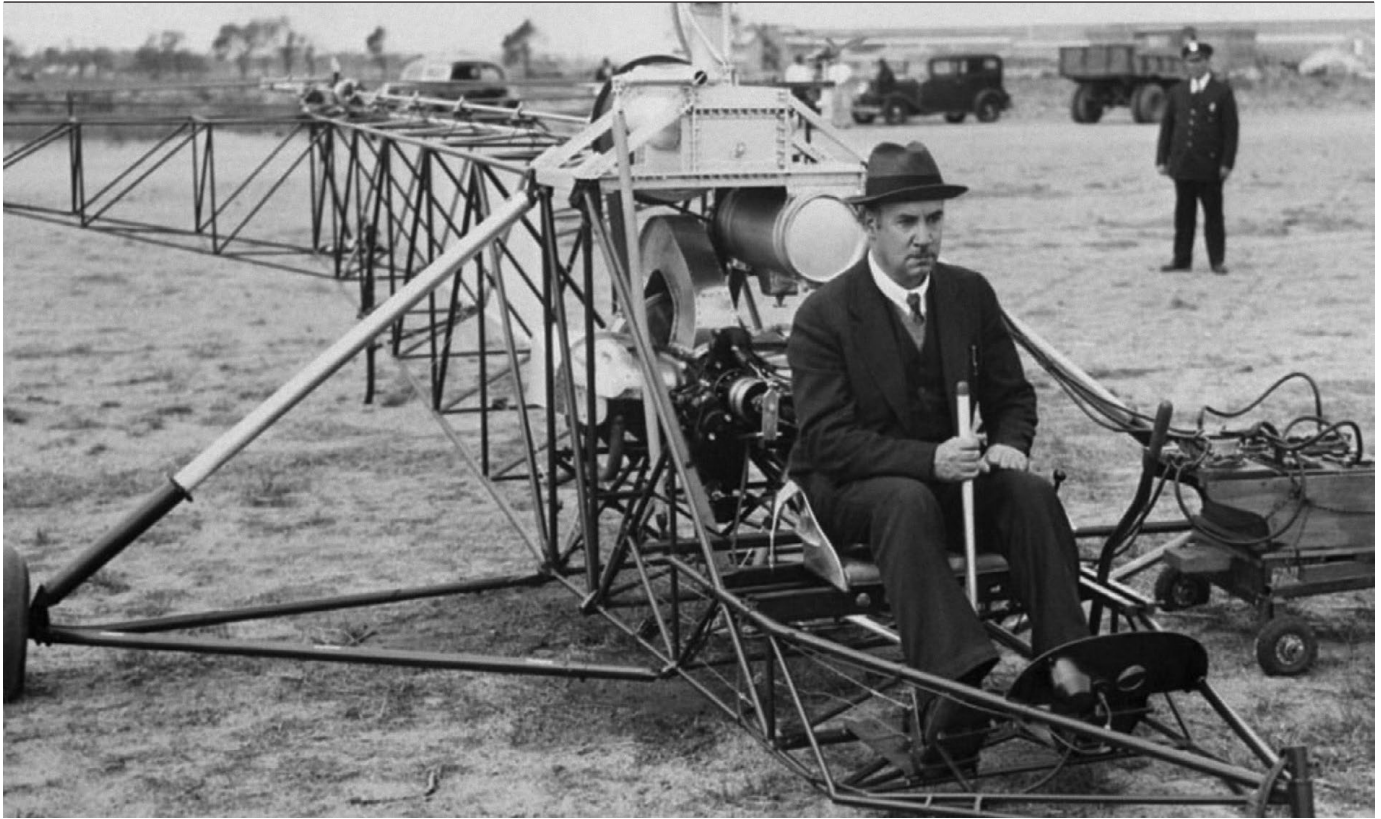
NASA has grounded an all-electric aircraft before its inaugural flight, ending a program that struggled to shoehorn existing technologies into a broader effort that would curtail greenhouse gas emissions. Engineers were racing toward one flight test of the X-57 Maxwell before the program is scheduled to officially end in September. However, the team recently discovered a mechanical issue with the motors — and it posed an “unacceptable risk” that could not be overcome in the coming months. The X-57 team has published more than 100 technical papers, and it helped create a foundation for electric aviation standards and regulations. ■

On September 14, 1939, Igor Sikorsky lifted off in his tethered VS-300 helicopter, beginning a flight test program that proved the efficiency and controllability of the single rotor design.



VS-300: The First Practical Helicopter

The year 2023 marks the centennial of a pioneering aviation firm. It is now 100 years ago that Igor Sikorsky founded Sikorsky Aero Engineering Company on Long Island, New York. To commemorate the man's legacy we look back at Sikorsky's VS-300, which was the first successful helicopter in the world to perfect the now familiar single main rotor and tail rotor design. The following essay was presented by Sikorsky at the Rotating Wing Aircraft Meeting of the Institute of the Aeronautical Sciences, January 29, 1941.



THE MODERN IDEA of air transportation is nearly always associated with the use of large fields for the departure and arrival of ships. As a general rule, an air traveler cannot start from his residence and reach his desired destination with an airplane while he can usually do so with an automobile. However the dreams of the past and the positive prediction for the near future foresee a different type of aircraft that could be safely operated from very small spaces between buildings or trees, or from small platforms on tops of buildings. Such aircraft would open a vast new field of usefulness and could become a very valuable vehicle of transportation for use by the average individual, as well as for a number of government uses.

The object of this paper is to describe the development of such aircraft. The present work was started in the year 1909 by the construction of two experimental helicopters and was completed by the recent development of a simple and very satisfactory Model VS-300 helicopter. From March to October 1940, this aircraft was extensively test flown and made several hundred flights. The ship demonstrated its ability to rise straight up, climb vertically or obliquely hover over one spot for several minutes under various conditions of weather, ranging from dead calm to fresh gusty wind of some 25 miles per hour.

The ship was also flown forward, backward, and sideways; it made a number of take-offs and landings from very small spaces between buildings, from a parking lot, the major part of which was occupied by automobiles, from a very small space situated between a fence and vegetable garden, etc. In fact, it



thoroughly demonstrated not only the possibility but the practicability of operating the aircraft from small spaces in a backyard in any weather, except unusually strong winds.

While the present VS-300 helicopter has been built as an experimental model, it may be considered that it definitely proved the immense practical possibilities of direct lift aircraft in general, as well the correctness and soundness of the particular proposed type. The VS-300 may be considered as the first successful single main rotor helicopter in the world.



AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals



We invite you to write an article covering your field of expertise. By contributing to AMU, you educate readers, and make them aware of your business, experience and talents.

To view our editorial guidelines please visit

www.amumagazine.com

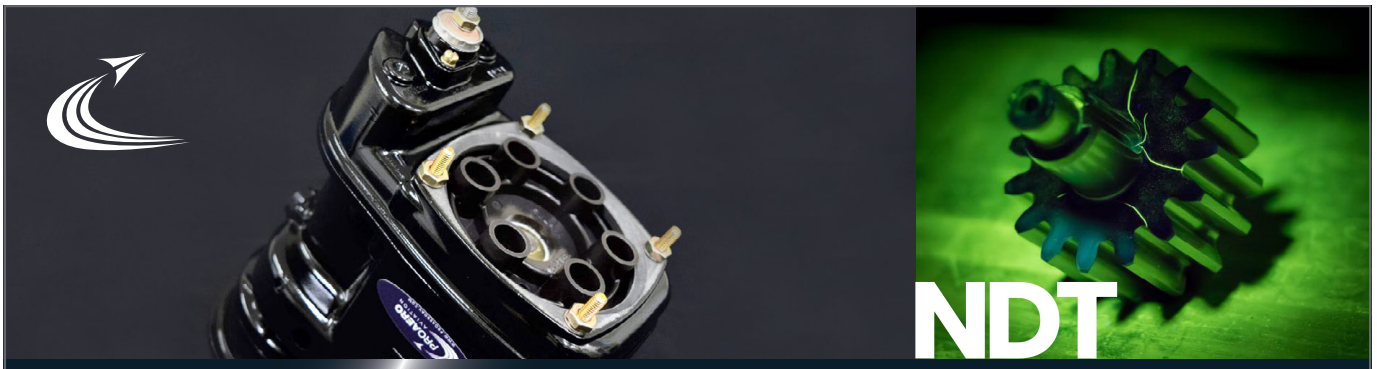
This characteristic permitted obtaining the necessary lift and control with the use of a very simple mechanism which offers possibilities of inexpensive production and easy maintenance.

The ship consists mainly of a tubular welded framework that includes near its center of gravity a 90-horsepower engine of the Aircooled Motors Corporation, and a simple transmission which sends most of the power into the vertical shaft of the main lifting rotor. A light horizontal shaft carries a small part of the power to the fuselage on which are situated the three auxiliary rotors which are used for the control of the aircraft and for the compensation of the torque of the main rotor.

It is by the use of these auxiliary rotors that normal airplane stick motions can be duplicated in order to control the helicopter whether it is hovering motionless over a given spot, traveling forward, sideways, backward, upward, or downward. Based on the action of rotating airscrews, the effectiveness of control remains substantially the same when the aircraft is hovering over one spot, or when it moves at different speeds.

The control of the VS-300 is obtained by changing the “pitch” of the three auxiliary rotors. Thus moving the control column or “stick” from side to side differentially changes the pitch in the horizontal auxiliary rotors causing a lateral, or aileron, reaction. By moving the stick forward and backward, the pitch on the two horizontal auxiliary rotors is changed simultaneously in the same direction, thereby achieving longitudinal, or elevator reaction.

Igor Sikorsky in a variant of the VS-300 helicopter. The VS-300 aircraft resides at the Henry Ford in Dearborn, Michigan.



AIRCRAFT SERVICE

Lycoming and Continental

- Piston Engines
- Component Repair
- Engine Overhaul
- Accessories
- Aircraft Service and Parts



1.800.667.0522
sales@proaeroav.com

2965 Airport Road, Kamloops BC Canada V2B 7W8

NDT

We are also able to carry out wing spar, landing gear, helicopter component, and engine component inspections in our NDT Department.

- CGSB certified Technicians.
Transport Canada approved.
- Liquid Penetrant Testing (PT)
 - Magnetic Particle Testing (MT)
 - Ultrasonic Testing (UT) on Continental Aero crankshafts.

We can thoroughly clean the unit to be inspected and then paint to your colour and paint specifications.

proaeroav.com



Rudder action is achieved by foot pedals connected to the pitch control of the vertical auxiliary rotor. This vertical rotor thus serves a dual purpose, namely, that of counteracting the torque produced by the single main lifting rotor, and as a means of changing the direction of flight. These three auxiliary rotors have a diameter of 7-1/2 feet, are lightly loaded, and rotate approximately four times as fast as the main rotor.

The main lifting rotor, as its name implies, furnishes the major part of the lifting force and has three blades of 14-foot radius. This lifting force can be so varied both in magnitude and direction as to produce hovering, vertical, forward, sideways and backward flight. The variance of the magnitude of the lift is accomplished by changing the pitch of the three main rotor blades so as to cause the helicopter to either ascend, descend, or hover. The direction of flight is governed by the three auxiliary rotors, it being only necessary to slightly tilt the whole ship in the desired direction of flight. Thus, tilting the helicopter slightly forward by pushing the stick forward, forward flight is achieved.

Power in the VS-300 is transmitted from the engine to the main lifting rotor by means of V-belts which drive the reduction gears attached to the main shaft. The two horizontal auxiliary rotors are driven by V-belts off a drive shaft which is coupled to the main gear drive and the rear vertical auxiliary rotor and driven through bevel gears from an extension of the aforementioned drive shaft. This whole drive system is connected to the engine drive by means of a "free wheeling" unit. If the number of rpm's of the main rotor were reduced below

a definite value, an automatic device would change the pitch of the main rotor. Therefore, should engine failure occur, all the rotating surfaces continue to operate in auto-rotation, thus making an autogiro out of the helicopter. The feature allows for safe landings without power.

A novel and interesting feature of the VS-300 is the method of synchronization between the engine throttle, the main lifting rotor and the two horizontal auxiliary rotors. This synchronization becomes very necessary when switching from hovering or vertical flight to say forward flight, since the pitch of the main lifting rotor is naturally greater when producing enough lift to hold the craft motionless, or while ascending vertically, than when forward motion is introduced.

However, since increasing the pitch of the main rotor blades means additional horsepower in order to maintain a constant rpm, the pitch control lever is connected to the engine throttle, thus an increase or decrease in pitch automatically means an increase or decrease in power transmitted to the main rotor. On the other hand, any variance of lift and power occasioned in the main rotor alone, unless the two rear horizontal auxiliary rotors were synchronized with it, would produce either a tail up or tail down condition. Therefore, the main pitch control is connected to the longitudinal control. In this manner, level flight is assured at all times. Of course the pilot can vary the actual amount of power of the engine at any time by a separate hand throttle.

The necessary flight controls thus number essentially three; namely, the control column, or stick, the rudder pedals, and



the main pitch control lever. It can be readily seen that flight is possible without taking the pilot to other than normal airplane flight reactions. A great advantage of the control system of the helicopter of this type over that of the conventional fixed wing airplane is that in the former the “feel” and effectiveness never vary regardless of the attitude of the craft since the control surfaces are always rotating at a speed far in excess of the stalling speed of their particular airfoil section.

The following are a few of the more important flights made on the VS-300 helicopter during the summer and fall of 1940:

On July 18th, a 15-minute flight was made during which time the ship was practically stationary all the time, hovering over one place.

On September 6 and on October 14, flights of 15 and 14 minutes respectively were made and the ship was flown over the field at a speed mostly between 30 and 45 miles per hour, making turns in both directions and making several times a figure eight in flight.

During the flights the ship reached an altitude of between 80 to 100 feet. On January 10, 1941 the VS-300 made a flight of 25-1/2 minutes duration. This is believed to be the longest flight ever made on a helicopter in America.

During several of the flights it was possible to approach, with the helicopter in plain flight, a man standing on top of a pile of rocks, or on another place, and enable him without moving from his place to load or unload a suitcase on the machine. On this flight it was necessary to approach the man and after the suitcase was loaded to move directly backward. Most



FUEL CELLS

QUOTES ON:
 Cherokee Tanks
 Fuel Cells & Metal Tanks
 Repair, overhauled & new
 Technical Information or
 Free Fuel Grade Decals





MONARCH PREMIUM CAPS
 Premium Stainless Steel
 Umbrella Caps
 for your
 Cessna 177 through 210

www.hartwig-fuelcell.com info@hartwigfuelcell.com

HARTWIG
 AIRCRAFT FUEL CELL REPAIR
 Keeping aircraft in the air since 1952

US: 1-800-843-8033
CDN: 1-800-665-0236

INTL: 1-204-668-3234
FAX: 1-204-339-3351



New One Piece 800-746-8273

DOORS

- AVIATION
- AG DOORS
- SHOP DOORS
- BARN DOORS

HYDRAULIC
 "One-Piece" DOOR
 OR
BIFOLD
 STRAP LIFT and auto latch

...Lift Straps

Say **YES...** to Strap-Lift Doors
 Say **NO** to Cable Lift

SCHWEISSDOORS.com

SIKORSKY S-92A FAA & EASA CERTIFIED DIRECT REPLACEMENT BATTERIES



FAA STC SR00917DE & EASA ESTC 10069610 offer Concorde's superior power and proven operation.

- Sealed lead acid batteries
- Lower cost per flight hour
- Reduced maintenance
- Hazmat Exempt shipping

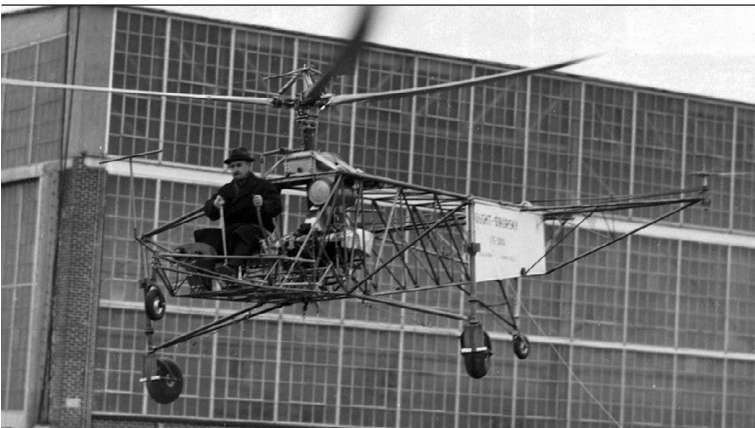


...the heart of your aircraft®

CONCORDE

CONCORDEBATTERY.COM
 626.813.1234 | ISO 9001 + AS9100

Crafted for Quality in the U.S.A.



of these flights were purposely made over such places where the helicopter could not be landed.

The completely satisfactory control of the machine which permitted it to approach a person and hover for substantial periods within less than two feet from the desired place was therefore positively demonstrated. It may therefore be considered as definitely proven that a helicopter with a control of such type will successfully solve all control problems connected with operating an aircraft in congested places between buildings or trees, and will permit landing on platforms situated on buildings or on board ships, etc. There can be no doubt that an aircraft of such characteristics will open a most important and large new field of air travel. ■

AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals

AMU

We invite you to write an article on your field of expertise. By contributing to AMU, you educate readers, and make them aware of your business and your talents.

To view our editorial guidelines please visit www.amumagazine.com

AERONEUF
INSTRUMENTS (L/EE/LT)

REPAIR - OVERHAUL - CERTIFICATION - SALES
RÉPARATION - RÉVISION - CERTIFICATION VENTE

AMO 27-91

EASA.145.7189

Since 1988
Depuis 1988

Now in Laval, located between Mirabel and Trudeau airports to better serve you !

Maintenant à Laval – Entre les aéroports Mirabel et Trudeau pour mieux vous servir !

Your solution for Avionics Maintenance

Votre solution en Maintenance d'Avioniques

Ground Equipment
Équipement au sol

600, 3^e Avenue, Laval, Québec, H7R 4J4
Tél: (514) 631-2173 Fax: (450) 627-2199
www.aeroneuf.com • info@aeroneuf.com

★ TRANSPORT CANADA ★

Reports and Comments

The following are selections of Canadian Aviation Service Difficulty Reports originally published as “Feedback” by Transport Canada.



REPORT: BEECH A100

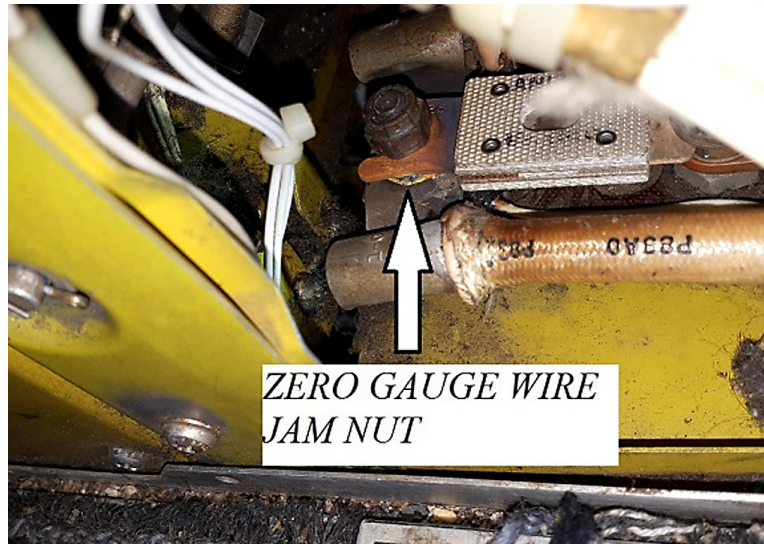
Aging Aircraft – Electrical Cables and Connections

Subject:

During a training flight, the crew selected the landing gear handle to the up position. The landing gear did not retract. Upon checking the circuit breakers, it was found that the right-hand no 1 and no 2 subpanel feeder 50-amp circuit breakers were out, which caused loss of power to the no 2 dual fed subpanel bus. During an inspection, it was found that the zero-gauge wires, connected to the terminal studs of the isolation limiters on the isolation limiter bus, were loose and had arced. The system was repaired and the aircraft returned to service with no subsequent issues.

Transport Canada Comments:

Aging aircraft, particularly their electrical cables and connections, are a significant concern in the aviation industry. The electrical system of an aircraft is complex, and it is critical to the safe operation of the aircraft. Over time, the cables and connections in the electrical system can deteriorate due to factors such as environmental exposure, vibration, and mechanical stress. As a result, it is essential to inspect the electrical cables and connections regularly to ensure that they are in good condition and functioning correctly.



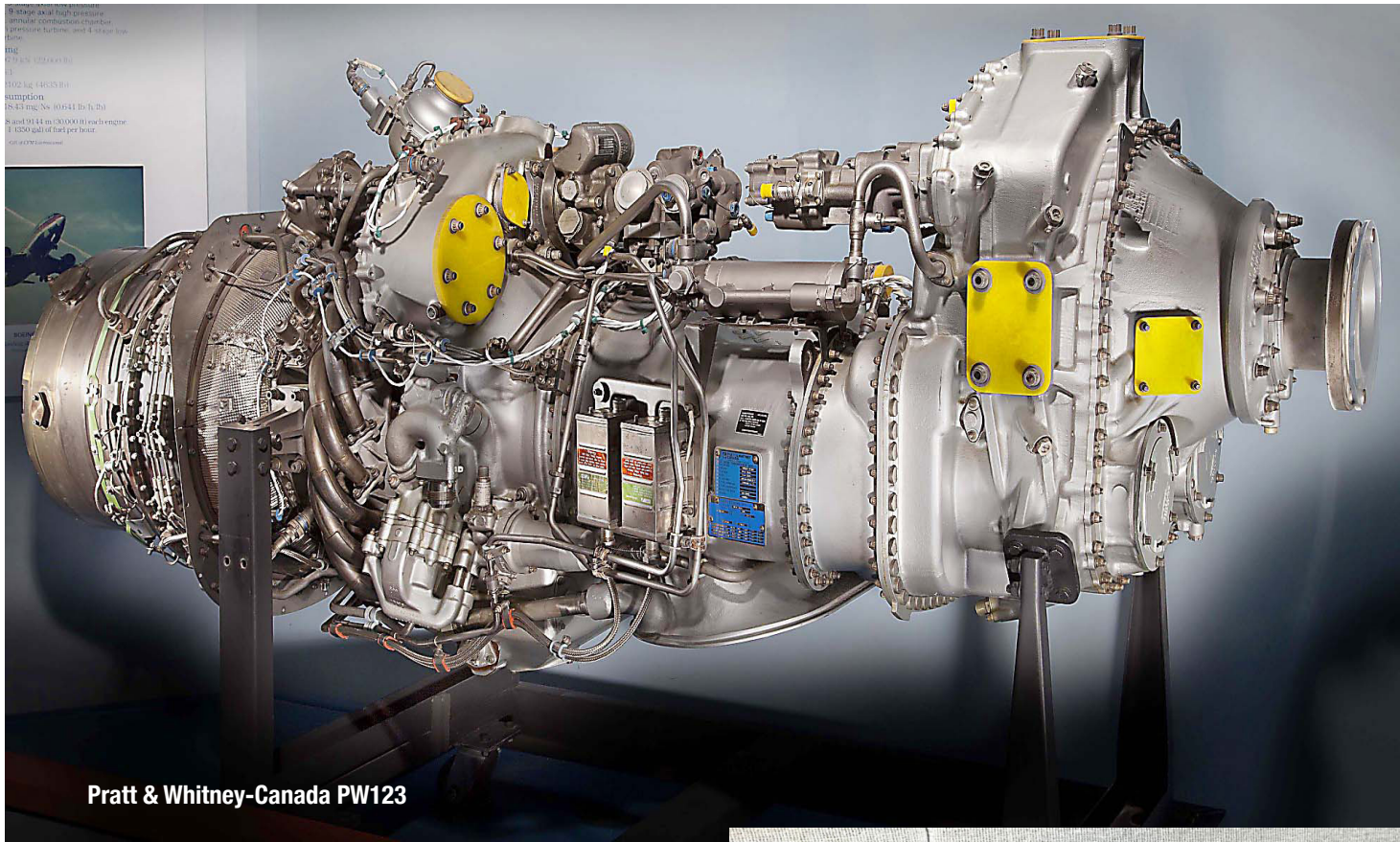
Above, left: Beech, Isolation limiter terminal stud location.
Above, right: Beech, Unserviceable hardware evident.

REPORT: PRATT & WHITNEY-CANADA PW123

Fuel Line Fitting Under-Torqued

Subject:

On take-off while climbing through 1500 feet, the crew identified a loss of torque on the #2 engine accompanied by a loss in propeller Revolutions Per Minute (RPM). The torque went to zero and the crew secured the engine. The aircraft landing was uneventful. An inspection by maintenance determined the loss of power was caused by a fuel leak at the fuel flow divider fuel inlet tube assembly. The affected fuel line and fittings were inspected, O-rings were replaced on the flow divider transfer tube and the line installed in accordance with the maintenance manual. Engine power runs were completed, and the aircraft was released back to service.



Transport Canada Comments:

The occurrence summary in the Transportation Safety Board (TSB) daily notification log of this event states that the maintenance personnel determined that an under-torqued fuel line fitting led to the drop in fuel pressure and subsequent engine power loss.

The fuel, oil and electrical systems of engines are normally housed in very cramped and restricted areas of most aircraft and access can be limited at best. Many “B” nuts for fluid lines may not have clearance to attach a torque wrench in a conventional way and a variety of extensions or adapters may have to be used for access.

These extensions or adapters may result in an over or under torque situation. The proper torquing of these lines is vital to ensure they remain secure so maintainers are reminded to be vigilant when installing or inspecting these lines and consult manufacturer’s instructions or standard practices such as AC43.13-1B for proper torque calculations if using extensions or adapters. This aircraft had an uneventful landing however had the fuel leak ignited, it may have been a very different outcome.

REPORT: BOMBARDIER BD 700 1A11

Global 5000 Unintended Life Raft Deployment

Subject:

During cabin inspection the pilot observed that the life raft that is stored under the aft cabin divan appeared to be swollen and he was unable to move or remove the raft. The



Lacking a usable life raft, the safety of these Bombardier passengers would be jeopardized during an emergency situation.

mooring line and ripcord are both on the inside of the compartment and were inaccessible. The ripcord/mooring line were not pulled. Something had failed and caused it to inflate. A procedure was supplied by Winslow where after trying to remove the raft by following the first steps in the procedure it was unsuccessful. The procedure for drilling the raft in the location was followed and it was found that the raft was inflated; the pressure was released and the raft was successfully removed from the aircraft. It was found to have self-inflated with both the inflation pull handle and mooring line still intact and not pulled.

Transport Canada Comments:

It is important to inspect all safety equipment before flight to ensure that they are in proper working order. In this case, the life raft would have been unusable in an emergency situation.

REPORT: EMBRAER EMB 545

Leaky Brake Control Valve

Subject:

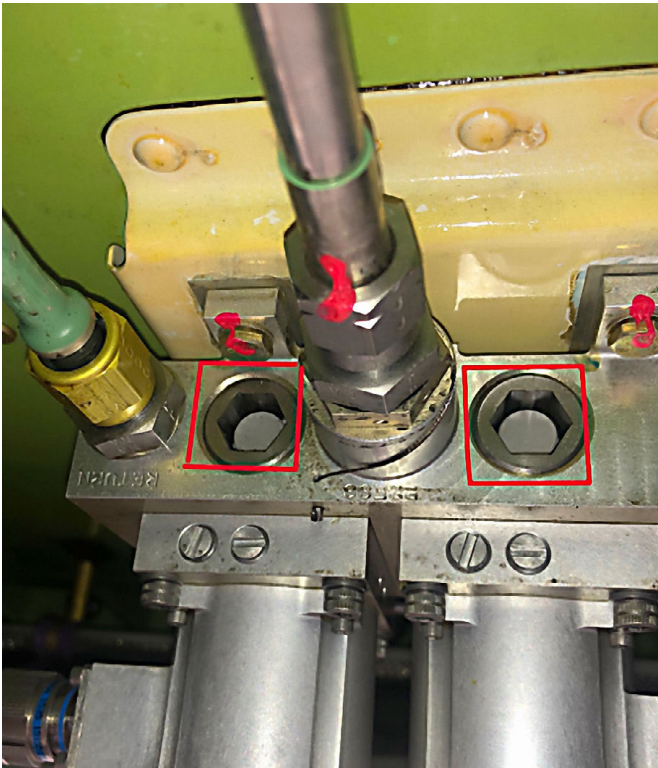
The crew contacted maintenance for a (blue advisory) hydraulic #1 low quantity crew alerting system (CAS) in flight. The decision was made to divert the aircraft and land. No caution CAS message appeared during the event. Hydraulic sys-



Embraer. Leaking Brake Control Valve.



Embraer in flight.



Embraer. New Brake Control Valve with flush set screws.



Cessna instrument panel.

Transport Canada Comments:

This interesting event shows how a component can fail for many reasons. Control valves will typically fail mechanically or electrically. The backing out of a set screw shows a possible assembly error at overhaul or manufacture.

Maintainers and operators are asked to watch for even the less apparent faults.

REPORT: CESSNA 172N

Smoke in the Cabin – Landing Light Switch Failure

Subject:

During the flight, the pilot reported smoke emanating from under the instrument panel. Upon inspection, it was discovered that the landing light switch had overheated, partially melting. These landing light switches have a mandatory replacement life of 48 months. The failed landing light switch was due for replacement on 16 August 2020.

Transport Canada Comments:

On 24 September 2007, a Cessna 152 took off from Oshawa Municipal Airport with the pilot and one passenger. During flight, they noticed an electrical odour, then a small fire and smoke emanating from the bottom of the lower left

tem #1 quantity started at about 51% and dropped to 16% after touchdown. The attached picture shows the brake control valve, part number 90007135-2, with an Allen key bolt backed out and leaking hydraulic fluid. A picture of the correctly installed Allen key bolts on a serviceable brake control valve is attached for reference.



BUILD YOUR FUTURE WITH



Now hiring in Vancouver, BC
 Openings for qualified and aspiring aircraft maintenance engineers and technicians!
 Find current positions at harbourair.com/careers



instrument panel. They were able to extinguish the fire, but the use of the extinguisher clouded the cockpit, reducing visibility considerably. Fortunately, after opening the side windows, they were able to regain enough visibility and landed uneventfully. (Reference TSB #A07O0264)

The Transportation Safety Board of Canada (TSB) report concluded with two safety advisories, one advocating for action to mitigate or eliminate the threat of fire caused by switches in the landing light circuit of Cessna 152 aircraft. The Federal Aviation Administration (FAA) responded with Special Airworthiness Information Bulletin (SAIB) CE-09-42-1 directed at Cessna 100, 200 and 300 series aeroplanes. This SAIB recommends that owners, operators, and maintenance technicians perform the actions contained in Cessna Service Bulletins SEB09-6, and MEB09-3. This topic was also published in detail in the Aviation Safety Letter Issue 4/2010.

Since the publication of these recommended maintenance actions by the FAA and Cessna in 2009, additional Service Difficulty Reports (SDRs) have been submitted, reporting further failures in Cessna 152 and 172 aircraft. These failures include but are not limited to Part Number C906-5, many of which failed prior to reaching their recommended service life. These failures have been described as: melted, heat damaged, overheated, smoke coming out of panel, stuck or weld-

ed in the on or off position, discoloured, and stiff to operate. Transport Canada Civil Aviation recommends that owners, operators, and maintainers become familiar with the contents of FAA SAIB CE-09-42-1, pay particular attention to all landing light, beacon light, and taxi light switches for signs of failure, and continue to submit SDRs when defects such as these are uncovered.

REPORT: FAIRCHILD SA227AC

Air Conditioning Cooling Turbine Failure

Subject:

On short final, a burning smell was noticed. After landing, on the short taxi to the ramp, smoke was noticed in the cockpit. On arrival at the ramp, the smoke had increased, the engines were shut down and the aircraft flight crew vacated more expeditiously than normal (this is a freight aircraft, no passengers were on board, two (2) crew only). The smoke cleared and no evidence of a fire was found anywhere in the aircraft.

Maintenance investigation found that the left-hand (L/H) conditioned air-cooling turbine had failed and that the turbine bearing had overheated and failed, which caused the oil

Maintenance and Ramp Safety Society

A Non-Profit Society Dedicated To Reducing Aviation Human Error

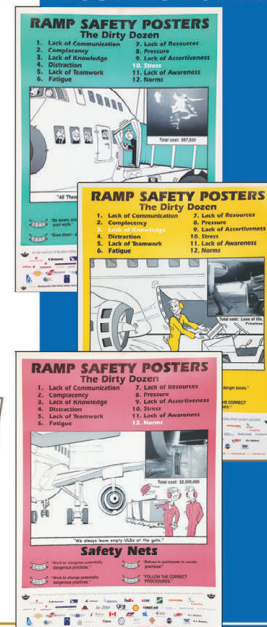
ORDER YOUR POSTERS TODAY!

The tools that we offer to help achieve a zero accident rate consist of:

- ▶ **Posters**—High impact, non stop reminders how to reduce human error
- ▶ **Videos**—High quality productions that show how to reduce human error.
- ▶ **Membership**—Access to human factor specialists help reduce human error
- ▶ **Training**—Courses designed by experts to help you reduce human error
- ▶ **'GroundEffects'**—Specialized articles to help you reduce human error

These Tools Save Lives and Money!

Are you going to deny yourself and your company the most important wish of all—SAFETY?



121 - 19140 28th Ave, Surrey, B.C. Canada V3S 6M3

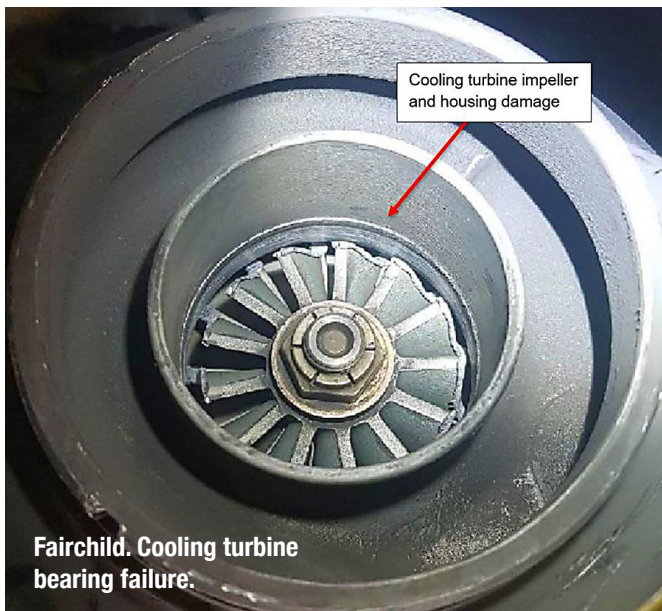
▶ tel: 604.531.9108 ▶ fax: 604.531.9109 ▶ email: marss@marss.org

Visit our website to view the full selection or to order your posters today! • web: www.marss.org

REMEMBER!
Safety and Profit
Work Together



Fairchild in flight.



Cooling turbine impeller and housing damage

Fairchild. Cooling turbine bearing failure.

reserve in the turbine to smoke and enter the cabin air vent system. The turbine is an on-condition item that is subject to a 200-hour oil level check during which a visual inspection is also carried out. This inspection was carried out 172 hours prior to the failure, with no abnormalities found.

Transport Canada Comments:

Cooling turbine bearing failure often results in seizure, and multiple service difficulty reports (SDRs) suggest that this is accompanied by smoke/oil mist in the cabin. Other indications of failure have been described as: smoky haze, white smoke, or acrid smell in the cabin/cockpit. In addition, cabin temperature rising, while not responding to temperature controller or manual temperature control, has also been reported.

It is important to reiterate that inspection and servicing outlined by the manufacturer should be completed correctly and during the suggested interval. In addition, SDR data suggests that high oil level, or a blockage in the air delivery system may contribute to cooling turbine failure.

Australian Transport Safety Bureau (ATSB) covered a similar occurrence: AB-2018-033. The following picture from this report illustrates the result of a typical cooling turbine bearing failure. ■

FUEL CELLS

All Makes & Models - Piston - Turbine - Rotor - Jet

Quality and Safety.

New

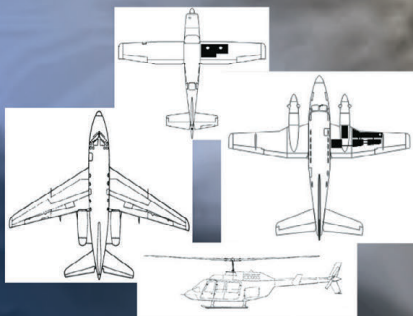
- OEM & PMA Replacements
- 5 year warranty
- Quality Installation Kits
- FAA Certified TSO & PMA Mfg

Factory Overhauls

- Exchanges & Major Overhauls
- 5 year warranty
- Over 40 years of experience
- FAA Certified Repair Station

Valves

- Stainless steel drain valve kits



Technical Support / Sales
800-437-8732

Tel: 715-479-6149
Fax: 715-479-6344

Online Catalog
www.eaglefuelcells.com

© 2014 Eagle Fuel Cells-ETC, Inc.

Pacific AME Association



Corporate Members

Our corporate members are important to us! From supporting and sponsoring the association's workshops to donating boardrooms for our meetings and training, we appreciate their hard work and dedication to furthering the industry.

Corporate benefits

1. Access to work shops and meetings during the year on topics of interest to AMEs
2. Opportunities and discounts to participate in our functions
3. A representative of a corporate member has the right to attend and speak at every monthly meeting
4. Corporate Members are entitled to advertise that they are members of the Pacific AME Association
5. Opportunity for employment networking at our workshops
6. Free advertising of your company on our website and social media platforms

7. Free job postings on our website

8. Two corporate members are provided with reserved seats at our workshops

Formal Transfer

PAMEA has decided to formally transfer Membership Administration to AMEC/TEAC which is currently handled by the Ontario Association. What this means for the Membership is that our web site page will send you to the Ontario Association Membership pages for you to Sign Up if you are a new Member or to complete your renewal as a PAMEA Member.

What this means for the future is more time to concentrate on Conferences; more time to communicate to members through a Monthly Newsletter; more time to deal with your issues.

www.amec-teac.ca/pacific

Western AME Association



Who We Are

The Western Aircraft Maintenance Engineers Association (WAMEA) is an organization equipping its members with the knowledge and professionalism which distinguishes the occupation of Aircraft Maintenance Engineers (AMEs) in the aviation industry.

For any inquiries email, info@wamea.com

or email, president@wamea.com

Phone: 587-713-WAME (9263)

<http://www.amec-teac.ca>



Central AME Association



Women AME in Training 2023

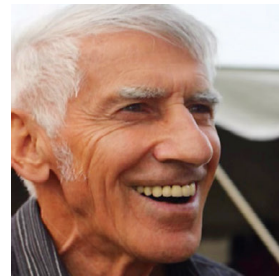
Winner: H el ene Trudeau

H el ene has been studying Aircraft Maintenance Engineering at Red River College Polytech in Winnipeg and is now an AME apprentice at Fast Air. She hopes to contribute to aviation safety and to bring people along the journey with her to encourage young girls through her volunteer efforts with various local organizations.

As a member of the Friends of the 99s, she has recently helped install a winter kit on their Cessna 152 and looks forward to assisting in projects involving the organization and the aircraft.

CAMEA Outstanding AME 2023 Winner: Henri Boulanger

Henri Boulanger obtained his commercial pilot and AME licenses in the early 60s. He spent many years flying bush planes for Bearskin Lake Air Service and maintaining aircraft in Big Trout Lake, Ontario.



Henri then moved to Lac du Bonnet, Manitoba, in the late '70s, where he worked as a pilot and maintenance worker for several local air services, including Silver Pine, Tall Timber, and Bluewater Aviation. He has completed contract work for Buffalo Airways and Adventure Air throughout his career.

In recent years, Henri's work has primarily involved completing annual inspections for private customers, many of whom have become his close friends. Salvage jobs are among the most challenging tasks for an AME, requiring repairing and flying the aircraft safely. Despite working in bitterly cold winters, Henri has always enjoyed his work and its challenges. He considers working in a warm hanger a treat compared to outdoor maintenance.

About CAMEA

CAMEA is a not-for-profit organization run by a volunteer group of AMEs. www.camea.ca



AME Association of Ontario

#613 - 7360 Bramalea Road, Mississauga, Ontario L5S 1W9
tel: 1-905-673-5681 email: association@ame-ont.com website: www.ame-ont.com



Skills Development Fund Project

The Ministry of Labour, Immigration, Training, and Skills Development of Ontario awarded a Skills Development Fund (SDF) contract to the AME Association of Ontario on March 31st, 2023. The contract for this project has two distinct purposes.

First is an "Outreach" program which will help individuals interested in becoming an Aircraft Maintenance Engineer to learn more about the AME vocation. Over the next 10 months, we will be traveling to various Approved Training Organization (ATO) colleges and aviation themed events such as airshows and career fairs in Ontario. We will be offering awareness information to interested young people who are looking for a challenging and successful career as an Aircraft Maintenance Engineer.

The second, and equally important purpose, is to offer a "knowledge and wellness improvement" program. This will offer both on-line and in-person technical, safety, and personal wellness courses to recent ATO grads and existing AMEs. The aim of this program is to ensure that the province has access to a continuously growing base of highly skilled and well trained AMEs. This type of professional development program exists within many other industry sectors ... so it is time for our sector "to catch up". As an added benefit those people completing these courses may then wish to become mentors to yet other AMEs.

The project's half-million dollar budget is a substantial amount of monies in comparison to our typical annual budget. Needless to say, the association executive and directors are closely monitoring the budget

and activities. Also, although this project is not one of the larger SDF funding applications approved by the Ministry, it is the very first one approved for the AME Association of Ontario.

To our President Louis Anderson's and various members of the executive team's credit, it is also one of the few bid application submission circumstances in which the Ministry's approval was given upon the very first bid submission provided by an organization. It typically takes a couple of bid submission attempts over consecutive years to get the Ministry's approval, especially from an organization that has never been awarded funding from any federal or provincial ministry before. The current contract is for a single year, but the association is positioning itself to make another SDF bid package for multiple upcoming years.

Annual Conference and Workshop

The conference committee has rescheduled the annual conference to November 29 & 30 with setup by vendors on November 28. This will allow us to use more of the facilities that were to be occupied by another group. Again this year, we will be using the Delta Hotel and Conference Centre near the Toronto Airport. The theme of this year's conference is "The Future of Aircraft Maintenance-Performance, Professionalism and Pride." Details and updates will be posted on our Conference website:

www.ame-ont.com/cpages/conference-2023

Submitted by *Stephen Farnworth,*

For the Board of Directors

www.ame-ont.com



Quebec AME Association

Association des Techniciens/Techniciennes d'Entretien d'Aéronefs du Québec

C.P. 34510, 3131 Côte-Vertu; CSP Place Vertu, Saint-Laurent, Qc, H4R 2P4
email: info@ame-tea.com website: www.ame-tea.com



Nous sommes l'Association des Techniciens et Techniciennes d'Entretien d'Aéronefs du Québec et nous sommes fiers de pouvoir servir et promouvoir la communauté des TEA du Québec. Membre de l'AMEC/TEAC, nous travaillons avec les différentes associations de TEA à travers le Canada sur différents dossiers, dont certains directement avec Transports Canada.

L'Association des TEA du Québec promeut la sécurité des personnes affectées par les métiers de la maintenance aéronautique, favorise des pratiques sûres sur le lieu de travail et reconnaît que la sécurité est la pierre angulaire de l'industrie aéronautique.

Nous avons récemment été actifs à différents niveaux et avons eu le plaisir de participer à la journée Carrière de l'École nationale d'aérotechnique de St-Hubert le 29 mars et avons eu la chance d'y rencontrer nombre de futurs TEA. Plus de 43 compagnies qui emploient des TEA au Québec y étaient présentes. Notre présence permet aux étudiants d'en apprendre plus sur les aléas du métier et de ce qui les attend lors de leur premier emploi. Aussi, plusieurs nouveaux étudiants profitent de cette journée pour faire le plein d'informations. L'Association des TEA du Québec continue la progression de différents dossiers tels que diverses questions de nos membres relatives à la réglementation

et la recherche de nouveaux avantages pour eux avec différents partenaires. Vous pouvez en apprendre plus à notre sujet à l'adresse suivante : www.ame-tea.com email: info@ame-tea.com

About Us

The association's mission is to represent all AMEs in Quebec regardless of the company or the contracts on which they work. Regardless of the type of aircraft on which the AME works, he/she will be welcome. We will simply recognize ourselves as a holder of an AME Transport Canada M1/2, E or S license with an attachment in Quebec.

The Association will ultimately become the AME's voice to Transport Canada's ears and will work with existing AME associations from coast to coast to make our profession stronger and more cohesive. One of the great goals of our association is to elevate ourselves to the status of a professional and to be recognized as such by the various federal government bodies. The other major mission of our association will be to make our profession better known to the public and to get involved with young people so that they know what AME's work is and consider it as a career choice.

Visit : www.ame-tea.com email: info@ame-tea.com

Atlantic AME Association



Sign the petition

Aircraft Maintenance Engineers of Canada / Techniciens d'Entretien d'Aéronefs du Canada (AMEC/TEAC) have petitioned the Canadian House of Commons to have April 20th officially recognized as 'AME Day' in Canada. This date is a significant date for AMEs in Canada, as it was this day in 1920 when Canada's very first Air Engineer licence (predecessor to the Aircraft Maintenance Engineers licence) was issued to Robert McCombie of Regina, Saskatchewan.

All of the Canadian Regional AME Associations have signed the original request for this petition to be put forward and we are now asking for your support in getting this petition presented to the House of Commons, so that the Government of Canada will recognize the work the AME does to keep the Canadian Aviation Industry moving for the people of Canada.

To sign, follow this link:

<https://petitions.ourcommons.ca/en/Petition/Details?Petition=e-4405>

By e-signing this petition, we will be closer to having AME recognized as a profession worthy of national recognition. Thank you for your help with this petition.

Thanks from Single Parent Association of Newfoundland and Labrador

A big thank you to the AME Association - Atlantic Inc for their generous donation of 50/50 ticket proceeds from their annual Conference in St. John's. We appreciate being recognized as your charity of choice, and for supplying our food bank with the necessary additions to future hampers!

www.atlanticame.com

SoCal PAMA Chapter



Who We Are

The purpose of SoCal PAMA is to promote a high degree of professionalism among aviation maintenance personnel; to foster and improve methods, skills, learning, and achievement in the field of Aviation Maintenance; to conduct local meetings and seminars; to publish, distribute, and disseminate news, technical bulletins, journals, and other appropriate publications dealing with the trade of Aviation

Maintenance; to collaborate with other organizations in aviation in the queries of governmental agencies pertaining to maintenance rules and guidelines.

www.socalpama.org





Flight Safety Detectives: Episode 173 Cargo Door Headaches

John shares his long history dealings with cargo door issues. He shares how door engineering has evolved over time. He also explains the rush to convert passenger aircraft to cargo aircraft that came about in the 1980s due to many airlines getting into the air cargo business.

Flight Safety Detectives:

Episode 172 Flight Plan creates aviation safety risks

Some flight plans have aviation safety risks baked in. Todd Curtis and John Goglia discuss a runway excursion accident involving a student pilot who in the same flight was attempting to satisfy both a night currency requirement and a 250 nautical mile training flight requirement for an instrument certification.

The plan literally went off track during the attempted takeoff at the fourth stage of the flight plan.

“They bent some metal, no one was injured, but there is a lot to learn from this incident,” John says.

The original plan involved a flight of well over 400 nautical miles of night flying, well exceeding the training requirement. The plan also involved landing and takeoff at two busy airports. Due to traffic, weather, and fueling station issues, two unplanned fuel stops were added.

Todd and John talk about the decisions made before this flight began that created unnecessary safety risks. Among the takeaways was the need to make better flight plans and to change those plans as circumstances unfold.

Be a content contributor

Our members work at many airports in the Central Ohio area and may be interested in some event happening at your airport. This information might include visiting vintage aircraft or dignitaries, fly-ins, airshows, etc. If you know of some upcoming event or special interest item at your airport, pass us an email including some base information and we'll post it here for other members to view.

www.copama.org



Increase your starter generator reliability with NAASCO's Mercury Mod™ upgrades

Advanced cooling for greater reliability!

Mercury Mod
Phase II

Approved for:

Agusta • Bell • Bombardier • Eurocopter
MD • Schweizer • Sikorsky

HAC



NAASCO NORTHEAST CORP.

FAA repair station # FD1R135K • EASA.145.4687

www.naasco.com

Scan QR



for more information

To learn more about our cost-saving repair and overhaul programs, contact NAASCO today!



Lock Ring Not Located



Incident aircraft at hangar.

There are still unanswered questions as to why this turbine Otter's horizontal stabilizer actuator separated into two pieces, causing the crash of DHC-3 N725TH.

ON SEPTEMBER 4, 2022, about 1509 Pacific daylight time, a De Havilland Canada DHC-3, N725TH, was destroyed when it impacted Mutiny Bay, near Freeland, Washington, and sank. The pilot and nine passengers were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 135 scheduled flight. The US Coast Guard and Good Samaritans responded to the accident site.

The NTSB traveled to the scene of the accident, and the following investigative groups were formed: Operational Factors, Systems, Structures, Maintenance Records, Meteorology, and Aircraft Performance. Parties to the investigation are the Federal Aviation Administration (FAA) and the operator, Northwest Seaplanes, dba Friday Harbor Seaplanes. The airplane was designed and manufactured in Canada, and pursuant to International Civil Aviation Organization Annex 13, the Transportation Safety Board of Canada has assigned an

Accredited Representative to the investigation and designated staff from Viking Air Limited (the current type certificate holder) as their technical advisors.

The wreckage recovery operation was completed by the US Navy's Supervisor of Salvage and Diving on September 30, with about 85% of the airplane recovered from the sea floor (see figure 1). The Systems group performed a field examination of the wreckage during the week of October 3, with follow-up activities in the NTSB Materials Laboratory October 18-19. The horizontal stabilizer actuator (also referred to as the trim jack) and both elevators were shipped to the NTSB's Materials Laboratory for further examination.

The airplane wreckage was heavily damaged due to water impact. Figure 2 depicts what was positively identified during the wreckage examination. The right horizontal stabilizer and the left wing were not recovered. Both were visually identified



Above: Incident aircraft.

Figure 1. Main wreckage lift.



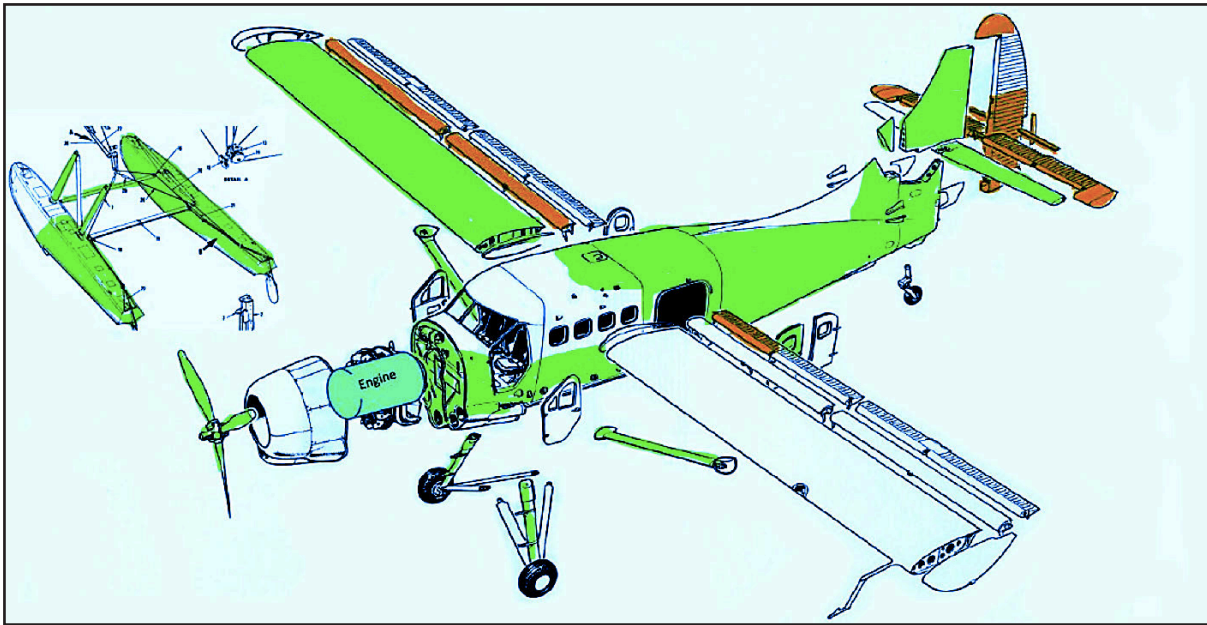


Figure 2. Recovered wreckage highlighted in green. Recovered flight controls highlighted in orange.

by a camera located on the remotely operated vehicle during the recovery operation, but both pieces shifted during one of the lifts and were unable to be located afterwards.

The Systems group found the horizontal stabilizer actuator (see figure 3, page 31) had separated into two pieces at a threaded assembly fitting. The actuator is part of the airplane's pitch trim control system. The pitch trim wheel, located in the cockpit, is used to manipulate the actuator through control cables that rotate the actuator, extending (lengthening) or retracting (shortening) the overall length of the actuator. This extension or retraction changes the incidence of the horizontal stabilizer, thereby providing a mechanism for the pilot to relieve elevator control force pressure. The actuator was found separated where the clamp nut threads into the barrel section (see figure 4, page 31).

Examination of the threads inside the barrel and the threads on the clamp nut revealed that the two components separated by unthreading (that is, rotation of the barrel and/or clamp nut) as opposed to being pulled apart in tension. The upper portion of the actuator remained attached to the horizontal stabilizer, and the lower portion remained attached to its mount in the fuselage.

A circular wire lock ring is used to prevent the barrel and clamp nut from unthreading. The lock ring (see figure 6, page 31) is normally installed in the lock ring groove (see figure 5, bottom of page 31) and has a tang or "pin" at one end (noted in figure 6) that is inserted into a hole in the lock ring groove. The tang continues into another hole in the clamp nut threads. The lock ring was not located in the wreckage.

The manufacturer's assembly drawings for the horizontal stabilizer actuator call for a hole to be drilled into the clamp nut to accept the lock ring tang, after it has been threaded into the barrel during assembly. Post accident examination of

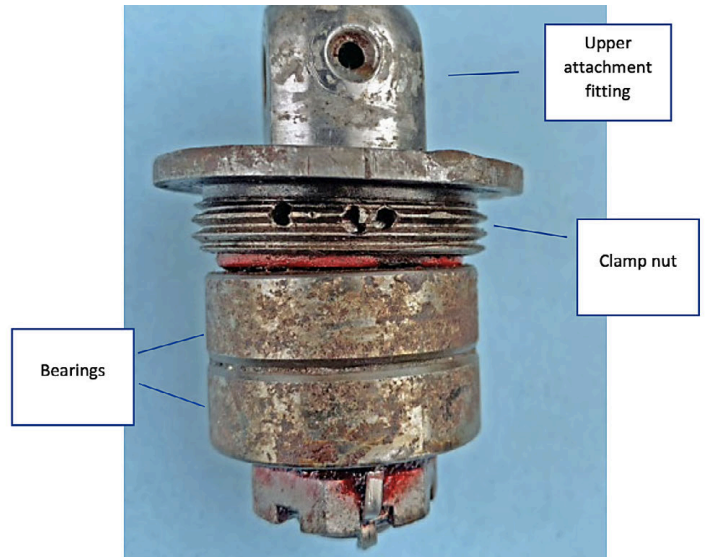
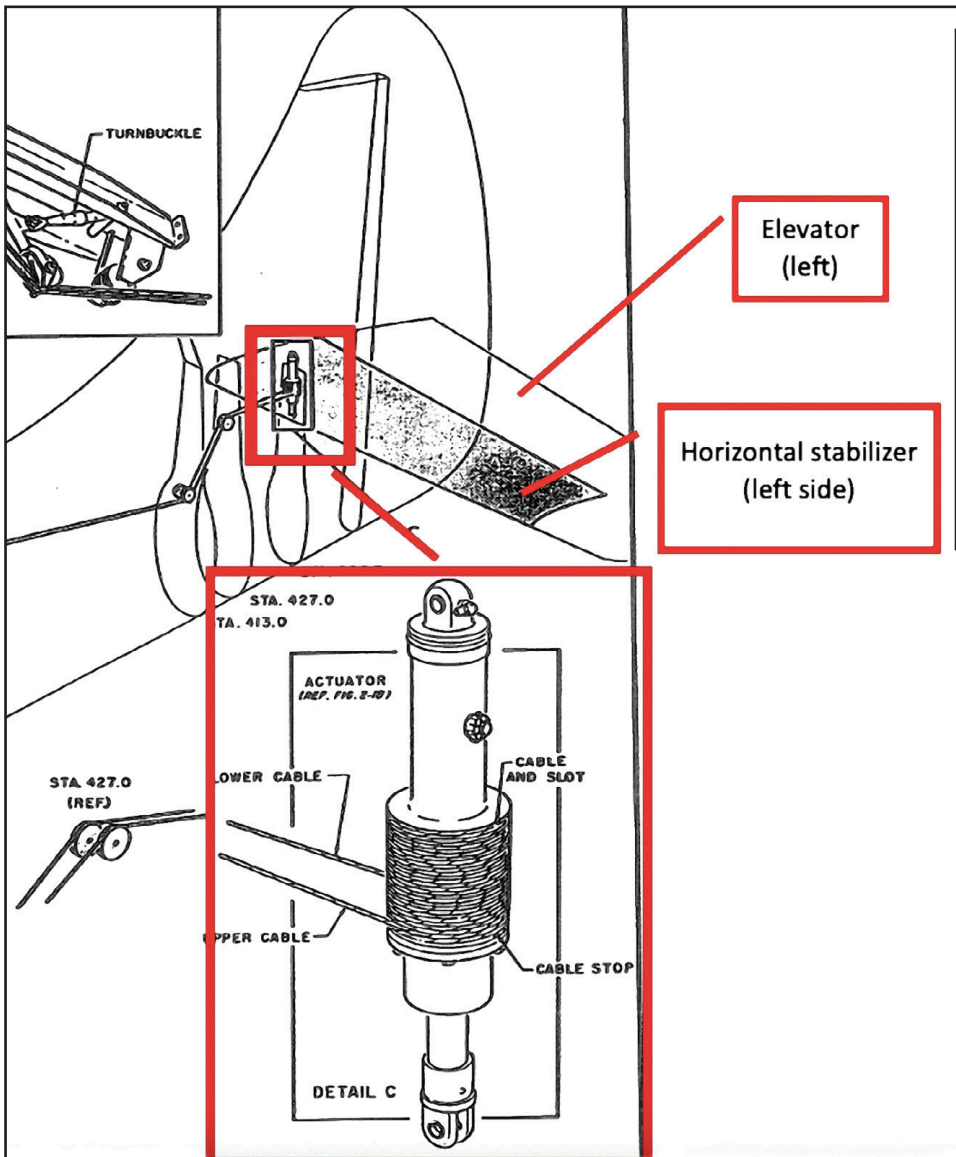


Figure 7. Clamp nut from accident airplane.

the airplane revealed that five holes had been drilled into the clamp nut threads; three holes were damaged such that they would not allow for the full insertion of the lock ring tang (see figure 7, this page). This suggests that it may be possible for a lock ring to be partially installed, with the tang not fully seated in a hole in the clamp nut.

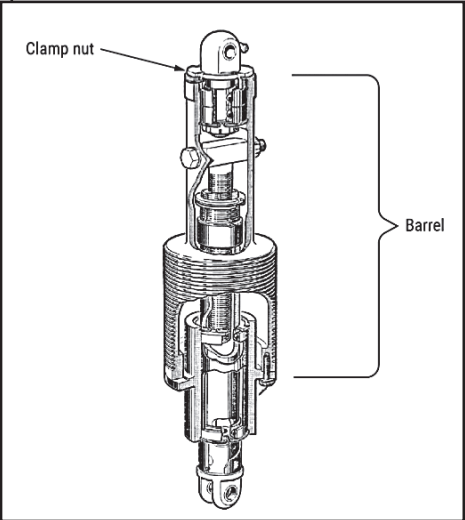
Further, it might be difficult to visually determine if the lock ring is fully engaged in the clamp nut hole (depending on conditions such as lighting, viewing angle, and the presence of dirt or grease). Figure 8 (seen on page 32) shows two exemplar horizontal stabilizer actuators with a lock ring tang fully and partially installed, respectively.

According to preliminary information from the operator,



Elevator
(left)

Horizontal stabilizer
(left side)



Small drawing, above:
Figure 4. Horizontal stabilizer
actuator clamp nut and barrel.

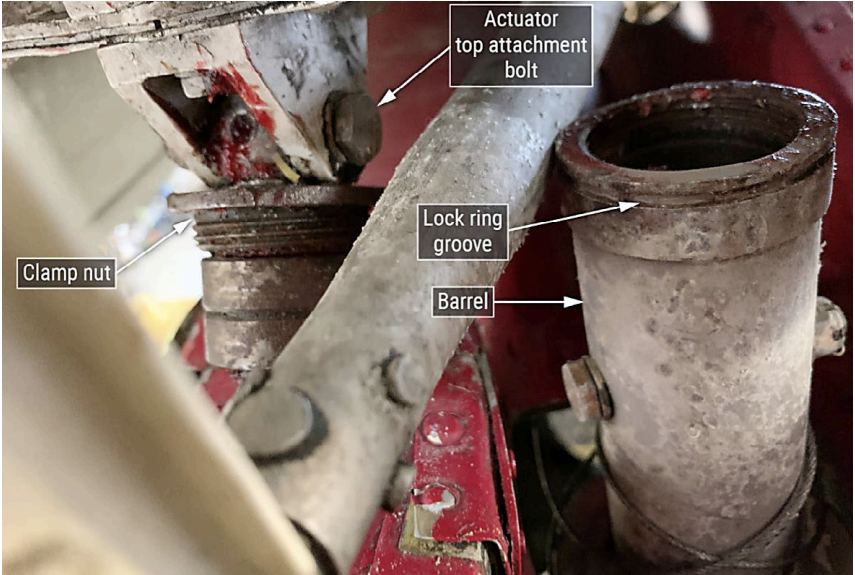
Drawing at left: Figure 3.
Horizontal stabilizer actuator
location.

Bottom, right: Figure 5. Horizontal
stabilizer actuator clamp nut and
upper end of barrel section as
found in the wreckage.



Figure 6. Exemplar lock ring:

Tang





Above: Investigators examine remains of incident aircraft.

Right: Figure 8. Exemplar horizontal stabilizer actuators and lock rings.

the most recent overhaul of the horizontal stabilizer actuator was completed on April 21, 2022. The actuator is the only means to hold the horizontal stabilizer in its position, and the lock ring keeps the assembly from unthreading.

Unthreading of the clamp nut and the barrel during flight would result in a free-floating horizontal stabilizer, allowing it to rotate uncontrollably (trailing edge up or down) about its hinge, resulting in a possible loss of airplane control.

As of the most recent Aircraft Accident Investigative Update on this incident, the NTSB does not know whether the lock ring was installed before the airplane impacted the water or why the lock ring was not present during the airplane examination. The NTSB, in coordination with the Transportation Safety Board of Canada, has asked that the manufacturer draft instructions for an inspection of the actuator to ensure that the lock ring is in place and properly engaged to prevent unthreading of the clamp nut. Those instructions will be released and provided to all operators of the DHC-3 airplane worldwide in a Service Letter.



The investigation into this accident will continue with examinations of both elevators in the NTSB Materials Laboratory; interviews of the FAA principal operations and principal maintenance inspectors assigned to the operator; a review of maintenance records, including historical records for accidents, incidents, and service difficulty reports; and interviews with maintenance personnel. An evaluation of lock ring failure modes and lock ring installation instructions will be accomplished in addition to an aircraft performance study. ■

Additional information will be released as warranted.

Share your field of expertise with readers
by writing an article for AMU magazine.
Contact our editor, John Campbell via email :



amu.editor@gmail.com

AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals



As a vendor or sponsoring company, you can provide information that is vital to maintaining the level of professionalism expected of those working in today's aviation industry.

To view AME association and PAMA newsletters online, visit:

www.amumagazine.com

Clean-Tech Lasers

There's a new tool out there for surface coating pre-treatment



MOST AIRCRAFT MROs understand the value of pretreating the metal surfaces of parts to remove corrosion, grease, residue, old coatings, or to roughen the surface of metals prior to coating. By ensuring the items are cleaned down to bare metal, you can avoid costly warranty issues that result when coatings peel, flake, bubble, or otherwise fail prematurely. The surface conditioning, cleaning, and profiling of jet engine parts may also be required to perform specific maintenance in accord with their operation specifications as FAA Certified Repair Stations.

Unfortunately, the traditional techniques used for this purpose are messy and require expensive consumables, as well as substantial time for preparation and cleanup. These methods are also drawing scrutiny from regulators like the EPA and OSHA since they can pose risks to the environment and applicators.

With clean laser technology, there is now an environmentally friendly alternative to abrasive blasting and chemical stripping.

Today, a more effective alternative is utilizing industrial-grade, precision laser-based systems that can remove paint, contaminants, rust, and residues with a high-energy laser beam that leaves the substrate unaffected. Preparation and cleanup time are minimal, and the low-maintenance equipment can last decades.

According to Vincent Galiardi, owner of Galiardi Laser Clean, a surface cleaning operator based in St. Charles County, Missouri, many people are surprised to learn that clean technology lasers are the most cost-effective, efficient, and safest method of industrial surface preparation.



Silica sand used in abrasive blasting typically fractures into fine particles and becomes airborne.

“Many people are unfamiliar with the use of lasers to pre-treat metal surfaces,” says Galiardi. “When I do a demonstration, at first the people in attendance are skeptical. But after I use the laser to treat a small area, everyone starts talking and getting excited. By the end, when I let them try the equipment, everyone is having a good time and saying how great the laser works.”

Given its effectiveness pretreating metal surfaces, industrial laser systems are increasingly being used by aircraft MROs. Technicians can use mobile handheld units or the systems can be integrated into automated inline processing lines. With significant advantages in safety and efficiency, laser cleaning is poised to disrupt the surface pre-treatment market across more sectors.

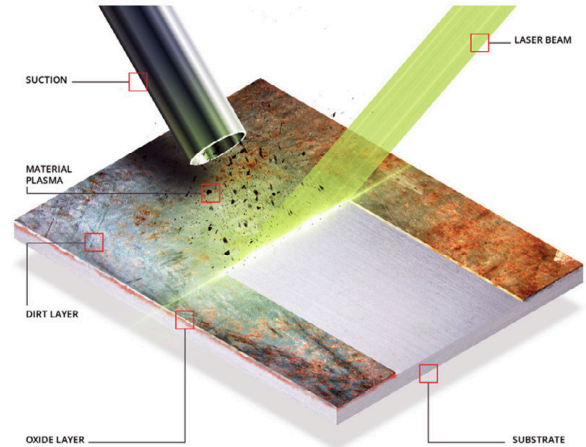
Resolving conventional cleaning limitations

There are many applications in aircraft maintenance operations that require pre-treatment of metal surfaces prior to coating. In most cases, the tech on the job will rely on metal pre-treatment procedures such as sandblasting, dry ice blasting, or chemical stripping—which as previously mentioned have their limitations and drawbacks.

Sand Blasting

Abrasive sandblasting involves forcefully projecting a stream of abrasive particles onto a surface, usually with compressed air or steam. The silica sand used in abrasive blasting typically fractures into fine particles and becomes airborne, which can cause serious or fatal respiratory disease.

When workers inhale crystalline silica, the lung tissue reacts by developing fibrotic nodules and scarring around the trapped silica particles, causing a fibrotic lung condition called silicosis. Estimates indicate that more than one million



Industrial laser cleaning - or ablation - is the process of clearing away undesired material from a solid surface by irradiating it with a laser beam.



Laser blasting technology can be utilized by MRO professionals to clean aircraft fixtures, perform selective paint removal on rivets, and more.

U.S. workers are at risk of developing silicosis and that more than 100,000 of these workers are employed as sandblasters.

In addition, particles are generated during abrasive blasting that further contribute to respiratory problems and other harmful health effects.

“When sand or any other media is used to knock off particles from a substrate, there is always a byproduct that has the potential to become airborne and inhaled,” says Galiardi. “Besides the sand, this could be the particles you’re removing – the coatings, plating, anodizing, corrosion, and even lead paint. Industry has needed a cleaner, safer surface pre-treatment solution for a very long time. Sandblasting is inherently unsafe for operators. The silica glass used in sandblasting is toxic. An operator must wear a full HEPA suit when sandblasting to avoid breathing in particulates.”

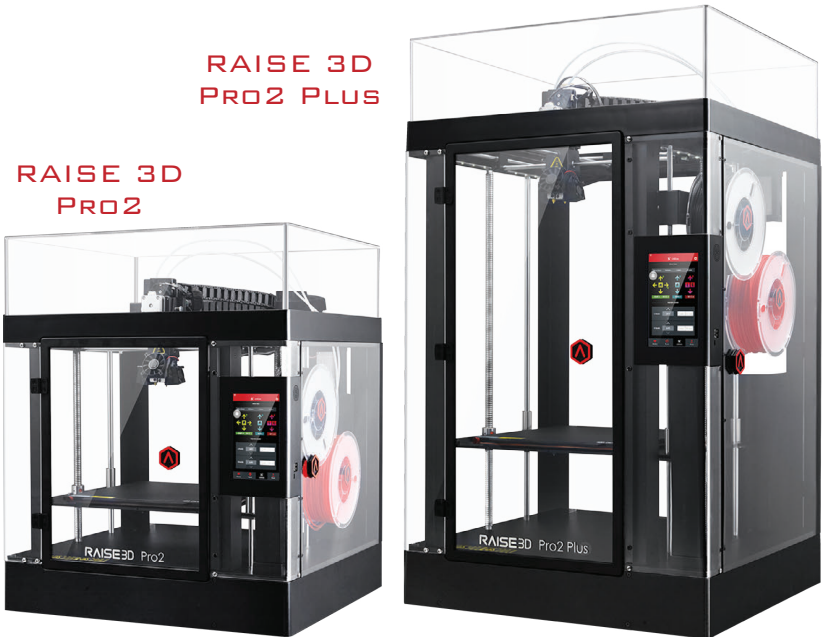
Sandblasting also is time-consuming to clean up since the sand essentially scatters everywhere, even though it is usually considered a “fast” cleaning method.

B · K · D ·
A E R O S P A C E

INDUSTRIES INC.
3D SPECIALTIES



Custom 3D design and high quality printing available for specialty parts and tooling. Wide range of materials available from 316L Stainless Steel to plastic. Contact us at : **604.247.2128**



**RAISE 3D
 Pro2 PLUS**

**RAISE 3D
 Pro2**

COMING SOON

**CREATE & ORDER YOUR 3D PARTS ONLINE
 USING BKD'S 3D PRINTING WEB PORTAL**

Our system will allow you to remotely access and print your own high quality 3D parts. Simply login, create a new project, or access an existing one, specify your project details and get a quote for 3D production. Once approved, print your project and have it shipped to you. Call us for more information about your 3D project.

Pro2 (WxDxH)		Pro2 Plus (WxDxH)	
Single Extruder Print	Dual Extruder Print	Single Extruder Print	Dual Extruder Print
305x305x300 mm	280x305x300 mm	305x305x605 mm	280x305x605 mm

Slicing Software: ideaMaker. File Types: STL, OBJ, 3MF, OTLP. Machine code: GCODE.
 Supported OS: Windows, macOS, Linux. Network: Wi-Fi, Ethernet. Power-loss Recovery.
 Print Tech: FFF. Head System: Dual-head w/ elec. lifting system. Filament Diameter: 1.75mm.
 Filament Run-out Sensor. Print Head Travel Speed: 30-150 mm/s. Layer Height: 0.01 - 0.25mm.
 Nozzle Diameter: 0.4mm (Default) and 0.2/ 0.6/ 0.8/ 1.0 mm. Max Nozzle Temperature: 300 °C.
 Max Build Plate Temperature: 110 °C. Connectivity: Wi-Fi, LAN, USB port, Live camera.
 Filter: HEPA with activated charcoal. Certifications: CB, CE, FCC, RoHS. ISO 9001 & ISO 14001.



Utilizing industrial-grade, precision laser-based systems are a better option to remove paint, contaminants, rust, and residues with a high-energy laser beam while leaving the substrate unaffected.

Dry Ice Blasting

With dry ice blasting, dry ice pellets are used as the abrasive. The challenge is that dry ice blasting is often not abrasive enough to sufficiently remove paint or corrosion from the surface of metals. Since dry ice is an expensive consumable, the costs can escalate when cleaning metal surfaces in higher volumes.

The substrate is not affected by the laser, and the systems do not create any mess or byproducts.



Chemical Stripping

With chemical stripping, harsh, even toxic chemicals are used to strip metal-based objects of paint, rust, and other contaminants to bare metal. However, for operators, exposure to corrosive acids and noxious chemical fumes is inherently dangerous. The process can also be time-consuming to prepare the proper chemical bath, achieve the required level of cleaning, and dispose of the waste. In addition, disposing of toxic chemicals is costly and closely regulated.

Laser Cleaning

Laser-based systems have significant advantages over these traditional methods, including ease of use in which an operator simply points and clicks a high-energy laser beam at the surface. The substrate is not affected by the laser, and the systems do not create any mess or byproducts. The approach is eco-friendly, energy-efficient, and completes the job in half the time of traditional methods when preparation and cleanup are considered.

“In our experience, laser cleaning is as fast at removing rust or old coatings as other methods, but without the same amount of cleanup,” said Galiardi. “When we treat a surface with lasers, any fumes or dislodged particulate is extracted into a HEPA filter and the job is done. There is no media [sand, dry ice, chemicals] to replenish or clean up.”

Galiardi Laser Clean uses laser systems made by Orlando, Florida-based



CASP aerospace inc.

Since 1970

Aircraft Safety and Life Support Equipment

Repair • Overhaul • Exchange • Sales

Fire Protection



Cartridges



Floor Covering



Securaplane Batteries, Camera and Security Systems



Oxygen Cylinder Assemblies



Crew Masks



Inflation & Pneumatic



www.caspaerospace.com

98 Columbus Street, Pointe Claire, Quebec H9R 4K4
Tel: 514.630.7777 • Fax: 514.630.9999 • info@caspaerospace.com

PROPELLER, BLADE, & GOVERNOR MRO Aluminum & Composite

Toll Free - 1 800 773 6853
info@canadianpropeller.com
www.canadianpropeller.com



Your Authorized
Service Facility

CANADIAN  **PROPELLER**

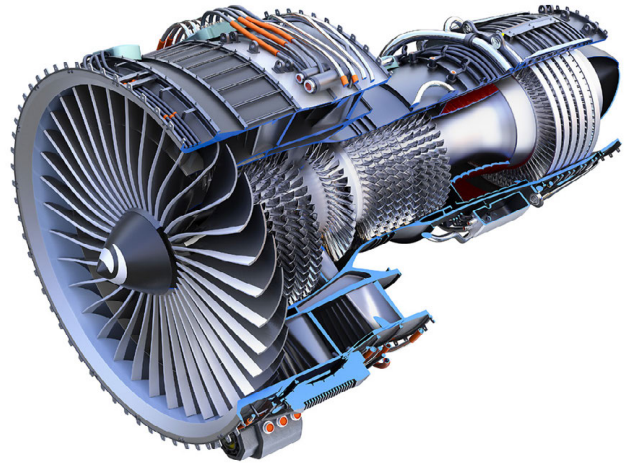
Laser Photonics, a provider of industrial grade CleanTech laser systems for cleaning and surface conditioning. The American-made systems function either as mobile standalone units or can be integrated into production lines.

The laser systems are available in portable and stationary models ranging from 50 to 3,000-watts (a 4,000-watt version is in development) with chamber sizes from 3' x 3' in size to 6' x 12'. The systems can also be installed in manufacturing lines in cabinets or operated by a robotic arm.

On top of corrosion and coating removal, the cutting-edge laser blasting technology can be utilized by MRO professionals to clean aircraft fixtures, perform selective paint removal on rivets, and more. The technology was developed to match and exceed strict industry standards.

With clean laser technology, there is now an environmentally friendly alternative to abrasive blasting and chemical stripping for surface pretreatment, conditioning, and profiling. The approach is safer for operators and highly adaptable to a wide range of MRO applications.

“As people become more aware of laser-based systems and compare them to traditional methods, they need to factor in prep and cleanup time, which can significantly impact project cost. When the improved operator safety, equipment longevity, and lower maintenance of laser systems are also considered, the clean laser technology has a much higher ROI,” says Galiardi.



Pretreating metal surfaces of engine parts to remove corrosion, grease, residue.

The longevity of low-maintenance laser systems further adds to their value, increasing ROI, and making replacement unnecessary for decades.

“CleanTech laser systems can last for 50,000 to 100,000 hours. That’s many decades working eight-hour days. After purchase, there’s virtually no maintenance necessary,” concludes Galiardi. ■

PROPWORKS
PROPELLER SYSTEMS

Overhaul • Repair • Sales

Winnipeg 1-888-679-2965
Edmonton 1-888-457-1910

Avia • Dowty • Hartzell • Hamilton Standard
Hamilton Sundstrand • McCauley • MT Propeller
Sensenich • Governors • Non-Destructive Testing

FACTORY TRAINED TECHNICIANS - EASA APPROVED
AMO #105-99

www.propworks.ca

AirMaintenance
UPDATE

The Magazine for Aircraft Maintenance Professionals

AMU

We invite you to write an article on your field of expertise.

To view our editorial guidelines please visit www.amumagazine.com

Aviation Services



SINGLE PISTON • TWIN PISTON • SINGLE TURBINE • TWIN TURBINE
JETS • HELICOPTERS • APPRAISALS

Certified Aircraft Appraisals
Member of National Aircraft Appraisers Association

LORNE GRAY AGENCIES LTD.

TEL: 403-547-1024 FAX: 403-547-0037 EMAIL: INFO@AIRCRAFTCANADA.COM

www.aircraftcanada.com

Canadian Aero
Accessories Ltd.



Component Sales
Overhaul & Repair



Authorized repair Station For



Ice protection systems
PowerSystems

170 George Craig Blvd. N.E.,
Calgary, AB, Canada T2E 7H2

ph: 403.250.9077

sales@cdnaero.com
www.canadianaero.com



Pitot-Static
Test Adaptors

For all Types of Aircraft

Nav-Aids Ltd

1-877-332-3055 www.navaidsltd.net

AirMaintenance Update
Celebrating 20+ Years



Leading Edge Technology



Beaver & Otter Safety & Performance Modifications

- Beaver – STOL Kits
- Wing Angle Kits
- 5370 Upgross Kits
- Otter – STOL Kits
- 400-lb. Upgross Kits
- Float Stretch Kits
- “Yukon” Cargo Door



Walter Turbine Otter Conversions
*“the most cost effective
Turbine Otter Conversion
on the market”*



TC approved (AMO# 80-07)
for Maintenance,
Repairs, Structures,
Welding & Manufacturing

www.stolairus.com / stolairus@telus.net
6095 Airport Way, Kelowna, BC V1V 1S1
(North end of Kelowna Int'l Airport)
Phone: (250) 491-7511
Fax: (250) 491-7522

Aviation Services



Heli Technology Inc

SPECIALIZING IN BELL HELICOPTERS

204, 205, 206, 212 & 407

- Dynamic Component Overhaul
- Genuine Bell Parts Sales
- Exchange & Rental Program
- Field Maintenance
- In-House Reworks & Machining

OVER 30 YEARS EXPERIENCE

Phone: (250) 566-4401
Fax: (250) 566-4333

PO Box 18, 3010 Selwyn Road
Valemount BC V0E 2Z0

Now Hiring at Stolairus Aviation Inc.



We are currently looking for an experienced
AME for full time employment.

Prospects will have a minimum of 10 years Canadian
General Aviation M1 Maintenance experience.
A strong structures and DHC-3 Otter experience a bonus!

Please visit our website (www.stolairus.com) for more
information on our AMO.



No phone calls –
Please send resume to:
stolairus@telus.net

AirMaintenance Update www.amumagazine.com



Alpha Publishing Group Inc.

Unit 100 - 6660 Graybar Road
Richmond BC V6W 1H9 Canada

Aviation Services

When flying is what you do, we're here.

Sealand Aviation, located at Campbell River on Canada's West Coast, provides experienced and efficient aircraft maintenance and service.

- Transport Canada approved for repairs, maintenance, structures, welding and manufacturing.
- A&P and IA on staff for US inspections and US annuals.
- EASA Part 145 Approved



2300 Airside Drive, Campbell River Airport
2880 Spit Road, Campbell River Floatplane Base

www.sealandaviation.com • 1.800.331.4244

SAVEONJETFUEL

- Enviro Tanks
- Bulk Jet Fuel
- Avgas

Toll Free: 1-866-353-3030
www.saveonjetfuel.com

SERVING THE HELICOPTER INDUSTRY

ENGINE APPROVED KITS
NEW DPU 7-7070 VIDEO RECORDING

MACHIDA

- HD VIDEOSCOPIES
- BORESCOPIES
- BLENDING SCOPIES
- CUSTOM SCOPIES

WWW.MACHIDASCOPE.COM

Find us on [Facebook](#) [Linked in](#) [twitter](#) [YouTube](#)

FLYRITE

AMO 90-97 EDMONTON, AB
ACCESSORY OVERHAULS

STARTER-GENERATOR

OVERHAULS BY THE BOOK!

- Overhauls
- Modifications
- Exchanges
- Service
- Rentals

SAFRAN • SKURKA • THALES
1-888-439-6020

info@flyrite.ca
Ph. 780 439-6020
flyrite.ca

www.flyriteaccessoryoverhauls.com

Ground Effect

Propellers are louder over ground, researchers find.



The effects of the ground on propeller noise have been measured experimentally for the very first time by researchers.

THE EFFECTS of the ground on propeller noise have been measured experimentally for the very first time by researchers in the Aeroacoustics research team at the University of Bristol. The team found clear differences in the noise characteristics of propellers when over ground, known as ‘Ground Effect,’ compared to when operated normally. They noted an overall noise increase when measuring at angles above the ground, with hydrodynamic and acoustic interaction effects being a key factor to the overall noise trends.

It is hoped this research, tested in the National Aeroacoustic Wind Tunnel facility, can inform strategies to reduce the noise of aircraft while taking off or landing, by either changing the design of the landing pads or by changing the design of proposed aircraft architectures.

“In light of the need for greener aviation, there has been a push in the aviation industry to develop electrified aircraft,” said lead researcher Liam Hanson. “There is a lot of potential benefits from electric aircraft which have been identified by a variety of companies worldwide, including all of the major aircraft manufacturers.”

However, if urban air services such as on-demand air taxis are to become a reality within city limits, engineers must tackle the issue of sound pollution, generated by propellers. An important subset of electric aircraft being developed recently are for the purposes of Advanced Air Mobility (AAM). The propellers used by these aircraft are smaller than

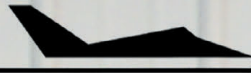
helicopters which have been in use for years, usually being far smaller in diameter and rotating at higher speeds. As a result the noise characteristics are very different to the existing knowledge, and so further research is required.

While eVTOL and sUAS aircraft are taking off or landing from a rooftop or landing pad, the propellers are likely to experience Ground Effect, an aerodynamic phenomenon which changes the performance of propellers. This change in the propeller aerodynamics within Ground Effect changes the acoustic performance of the propellers and causes complex interactions.

“Until now, no literature existed for the problem of isolated propeller noise in ground effect,” said Hanson. “Our research sought to answer for the first time what happens to propeller noise while it operates in Ground Effect and what are the key acoustic and aerodynamic interactions which are most important to understand. For the first time we have comprehensively measured the noise of small-scale propellers during take-off and landing while interacting with the ground. It is clear we can expect louder eVTOL aircraft during take-off and landing if the complex interactions with the ground are not considered.”

Based off their new understanding of propeller noise in Ground Effect, they are now conducting additional tests on different methods to potentially reduce the noise of the entire system. ■

RAPCO,inc.



REPLACEMENT AIRCRAFT PARTS CO.

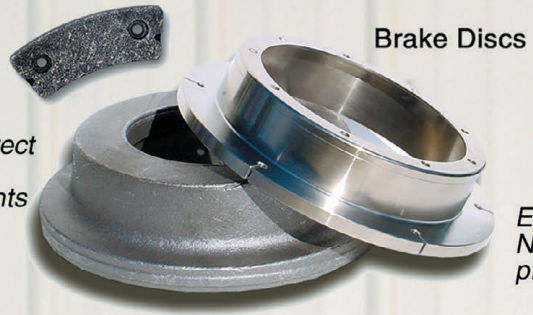
Rapco, Inc. can help you reduce maintenance costs...this is good for you and your customer. With the impact fuel prices have had on general aviation flying, and the resulting impact on maintenance facilities, everyone needs to find a way to decrease their operating costs, without sacrificing quality or safety. Rapco can help.

All Rapco parts are FAA-Approved, warranted better than the OEM, to save you and your customers money. Call now to see how we can help you - 1-800-527-2726



Vacuum Pumps

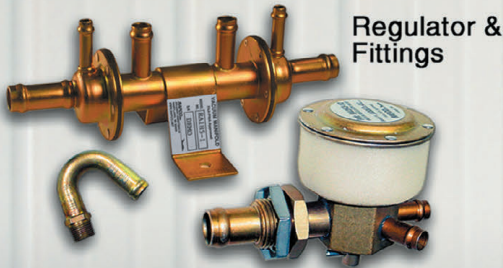
Easily check vane wear



Brake Discs

Over 80 direct brake disc replacements

Electroless Nickel plating



Regulator & Fittings



De-Ice Components

Leads, boots, modules, brushes & more

Visit: <http://www.rapcoinc.com/acappguides.html> for individual specific application guides for most popular aircraft

Request an e-card at www.rapcoinc.com

PARTS DEPARTMENT

RAPCO,inc.
REPLACEMENT AIRCRAFT PARTS CO.



1-800-527-2726

RAPCO,inc.
REPLACEMENT AIRCRAFT PARTS CO.

www.rapcoinc.com

NO PLANE NO GAIN

visit www.noplanenogain.org

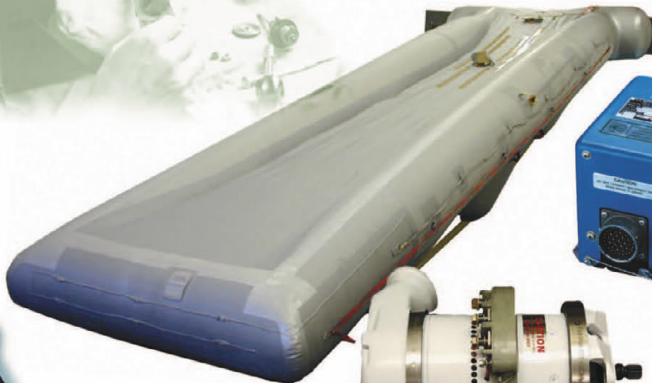
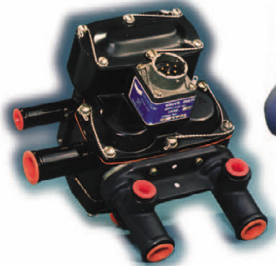
Canadian Aero Accessories Ltd.

Component Sales

Overhaul & Repair



Trusted
Experience
Since 1964



CALL US FOR THIS & MORE !

- Fire Bottles • Oxygen Bottles • Escape Slides • Life Rafts
- Starter Generators • AC Generators • Generator Control Units
- Boost Pumps • Fuel Pumps • Blowers • Valves • Brakes
- Hydraulics 5606 and Skydrol • Electronics/GCUs
- Actuators - Hydraulic and Electrical

Authorized repair Station For

GOODRICH

Ice protection systems

170 George Craig Blvd. N.E., Calgary, AB, Canada T2E 7H2

ph: 403.250.9077 • fax: 403.250.6841

sales@cdnaero.com

www.canadianaero.com

