FLY UTAH

UTAH AERONAUTICS CONFERENCE
2023

Moving to Mastery: Pilot and Mechanic Training

Ted Chester, Randy Chesley,
and Stephen Snyder

Platinum Partnership

Gold Partnership

SLC INTERNATIONAL

SUU AVIATION

ELECTRIC POWER SYSTEMS

Silver Partnership

Redtail JET CENTER

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NORTHERN UTAH ECONOMIC ALLIANCE

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your freedom to *fly*

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Governor's Office of Economic Opportunity

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A LOCHNER COMPANY
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AXIOM AVIATION

Speakers

Ted Chester

Randy Chesley

Stephen Snyder

Propeller Tech Support

TOP 8 MOST COMMON ISSUES

- GREASE LEAKING
- OIL LEAKING (RED OR BLACK)
- PROP IN FEATHER ON SHUT DOWN
- VIBRATION (NEW-OLD)
- CRACKS IN COMPOSITE BLADE PAINT
- DAMAGE IN ALUMINUM BLADE
- THREADED MCCAULEY/HARTZELL DOUBLE SHOULDER
- CAN'T ACHIEVE REQUIRED RPM (FIXED PITCH-CONSTANT SPEED)

GREASE LEAKAGE

- Serious propeller defects may give indications prior to failure, such as sudden or abnormal grease leakage or vibration during operation. Several catastrophic failures have been prevented by thorough and timely inspection techniques at the onset of such indications. Operators need to be aware of the possibility that prudent action to investigate abnormal grease leaks or vibration may prevent blade retention failures.
- HC -SL-61-165

ABNORMAL GREASE LEAKAGE OR VIBRATION CAN BE AN INDICATION OF A FAILING PROPELLER BLADE OR BLADE RETENTION COMPONENT. AN IN-FLIGHT BLADE SEPARATION CAN RESULT IN A CATASTROPHIC AIRCRAFT ACCIDENT.

HC-SL-61-165

If any oil or grease is evident on the propeller, the source of the leak should be determined before cleaning since the oil or grease may be leaking from a crack, seal, or lubrication fitting.

AC 20-37E

Perform visual inspection without cleaning of parts. A tight crack is often evident due to traces of grease emanating from the crack. Cleaning can remove such evidences and make a crack more difficult to see visually.

HC-SL-61-165

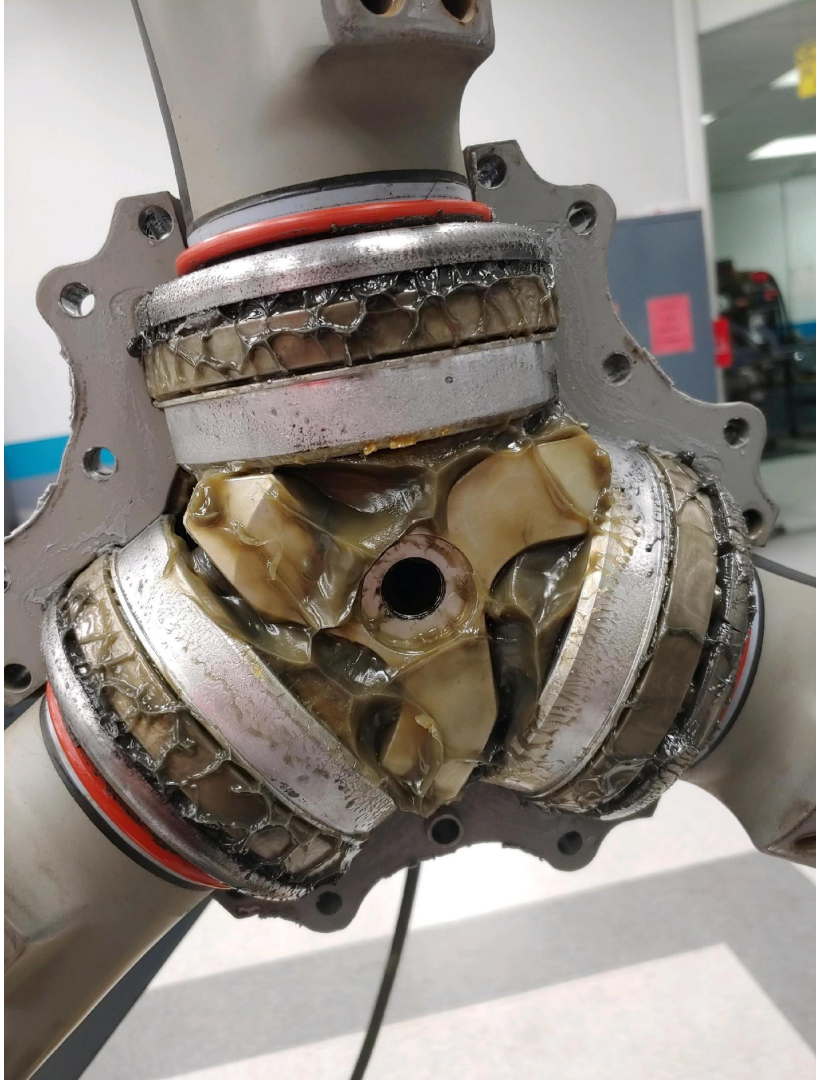
Perform visual inspection of the hub and blade retention areas to locate the origin of leakage. IF the origin of grease leakage is determined to be a noncritical parts such as an O-ring or sealant, repairs can be accomplished during scheduled maintenance.

If suspected cracks are found, **BEFORE FURTHER FLIGHT, REMOVE PROPELLER AND SEND TO**

HC-SL-61-165

PRECISION PROPELLER

4777 W. AERONCA ST.



Grease Leakage

- The most probable cause of this problem is the momentary sticking of the blade o-ring in the hub socket.
- Minor leaking from blade seal area is common on new propellers and propellers recently overhauled or modified to oil filled configuration. Any initial leakage is usually seen as a minor streaking on the blades.
- SL-1998-24

NYCO GREASE GN3058

AEROSHELL 5


THIS PROPELLER IS LUBRICATED
WITH AEROSHELL #5.
THIS GREASE MUST BE USED ON
ALL SUBSEQUENT LUBRICATIONS.
DECAL NO. A-3594-1
AeroShell
Grease/Graisse
5
Mineral grease for aircraft
Graisse minérale pour avions
MIL-G-3545C (obsolete)

AEROSHELL 6


AeroShell®/md
Grease/Graisse
6
General purpose mineral grease
for aircraft
Graisse minérale à usage général
pour avions
MIL-PRF-24139A
THIS PROPELLER IS LUBRICATED
WITH AEROSHELL #6.
THIS GREASE MUST BE USED ON
ALL SUBSEQUENT LUBRICATIONS.
DECAL NO. A-3594-2

Hartzell Propeller Owner's Manual 115N

If different grease types are accidentally mixed, the propeller must be disassembled and cleaned in accordance with the applicable overhaul/maintenance manual within three months or 30 flights whichever occurs first.

EXCEPTION: Aeroshell 5 and Aeroshell 6 greases both have a mineral oil base and the same thickening agent; therefore, mixing of these two greases is permitted in Hartzell propellers.

Nyco = No Mix. Aeroshell 5 and 6 mix if you insist.

CHECKING/CORRECTING LEAKING PROPELLER

- Clean blade of all traces of oil and dirt using a cloth dampened with mineral spirits.
- Run engine and cycle propeller at least five times
- Inspect blade for continued oil leakage and clean, if necessary, per step 1
- Repeat step 2
- Inspect blade. Leaking should be tapering off or completely stopped.
- If leaking has stopped, no further action is required.
- If leaking has decreased, continue operation for up to 20 hours.
- If leaking continues after 20 hours, propeller must be removed from aircraft and sent to be resealed.
  - SL 1998-24

2. OIL LEAKING

- DETERMINE IF THE OIL IS BLACK OR RED or if it is not oil at all, but grease.

IF OIL LEAKING IS BLACK

- REMOVE PROPELLER AND SEND TO
- PRECISION PROPELLER
- 4777 W. AERONCA ST.
- BOISE ID 83705
- FOR REPAIRS.

IF LEAKING OIL IS RED

- REMOVE PROPELLER AND SEND TO
- PRECISION PROPELLER
- 4777 W. AERONCA ST.
- BOISE ID 83705
- FOR REPAIRS.

INSTALLATION INS
INSTALL SHIMS AND SPINNER SH
CYLINDER. LIGHTLY PRESS SHA
SUPPORT AND CHECK ALIGNM
WITH HOLES IN BULKHEAD. A
UNTIL HOLES ARE APPROXI
IN TRUE ALIGNMENT. PUSH
HOLES ARE ALIGNED. A SL
SHIMS SHOULD BE USED
ALIGNMENT FOR SCRE
HARD AGAINST SHELL
WASHERS EQUALLY
INSTALL REMAININ

IF LEAKING IS GREASE?

- Refer back to slide 11

3. PROP WENT INTO FEATHER ON SHUT DOWN

- START LOCKS (ANTI-FEATHER LATCHES) FAIL TO LATCH ON SHUTDOWN
  - 1. PROPELLER WAS FEATHERED BEFORE SHUTDOWN
  - 2. SHUTDOWN OCCURRED AT HIGH RPM WITH PROP CONTROL OFF THE LOW PITCH STOP
  - 3. AIR CHARGE TOO HIGH.
  - 4. EXCESSIVE ENGINE TRANSFER BEARING OIL LEAKAGE
  - 5. EXCESSIVE GOVERNOR PUMP LEAKAGE
  - 6. BROKEN START LOCKS
  - 115N TESTING AND TROUBLESHOOTING 61-00-15
  - PROPELLER OWNER'S MANUAL.

PROBLEMS 1 AND 2 MAY BE SOLVED BY RESTARTING THE ENGINE, PLACING THE PROPELLER CONTROL IN THE PROPER SHUTDOWN POSITION AND THEN SHUTTING DOWN THE ENGINE.

- Problem 3 Refer to Air Charge in the Maintenance Practices 61-00-15

Temperature ° F	Temperature ° C	PSI ± 3 PSI	Kpa ± 21 Kpa
70 to 100	21 to 38	75	517
40 to 70	4 to 21	71	490
0 to 40	-18 to 4	66	455
-30 to 0	-34 to -18	61	421

Table 6-11
Accumulator Air Charge Pressure

- Problem 4
- CHECK FOR EXCESSIVE OIL LEAKAGE AT ENGINE TRANSFER BEARING.
- Problem 5
- PERFORM A CHECK OF THE GOVERNOR FUNCTION, INCLUDING THE UNFEATHERING ACCUMULATOR, IF APPLICABLE.
- TESTING AND TROUBLESHOOTING 61-00-15

Problem 6

Broken start locks

- REMOVE PROPELLER AND SEND TO
- PRECISION PROPELLER
- 4777 W. AERONCA ST.
- BOISE ID 83705
- FOR REPAIRS.

4. VIBRATION

- ANY VIBRATION THAT OCCURS SUDDENLY, OR IS ACCOMPANIED BY UNEXPLAINED GREASE LEAKAGE SHOULD BE INVESTIGATED IMMEDIATELY BEFORE FURTHER FLIGHT.

- TESTING AND TROUBLESHOOTING 61-00-15

- VIBRATION PROBLEMS BECAUSE OF PROPELLER SYSTEM IMBALANCE ARE NORMALLY FELT THROUGHOUT THE RPM RANGE, WITH THE INTENSITY OF VIBRATION INCREASING WITH RPM.
- VIBRATION PROBLEMS THAT OCCUR IN A NARROW RPM RANGE ARE A SYMPTOM OF RESONANCE, THAT IS POTENTIALLY HARMFUL TO THE PROPELLER. AVOID OPERATION UNTIL THE PROPELLER CAN BE CHECKED BY
-
- PRECISION PROPELLER
- 4777 W. AERONCA ST.
- BOISE ID 83705

VIBRATION CHECKLIST.

- Control surfaces, cowl flaps, exhaust system, landing gear doors, etc. for excessive play , which may be causing vibration unrelated to the propeller.
- Secure attachment of engine mounted hardware.
- Engine mount wear.
- Uneven or over lubrication or propeller.
- Proper engine/propeller flange mating
- Blade track.
- Blade angles
- Spinner for cracks, improper installation, or “wobble” during operation.
- Static balance
- Airfoil profile identical between blades
- Propeller installation
- Hub or Blade damage or cracking
- Grease or oil leakage

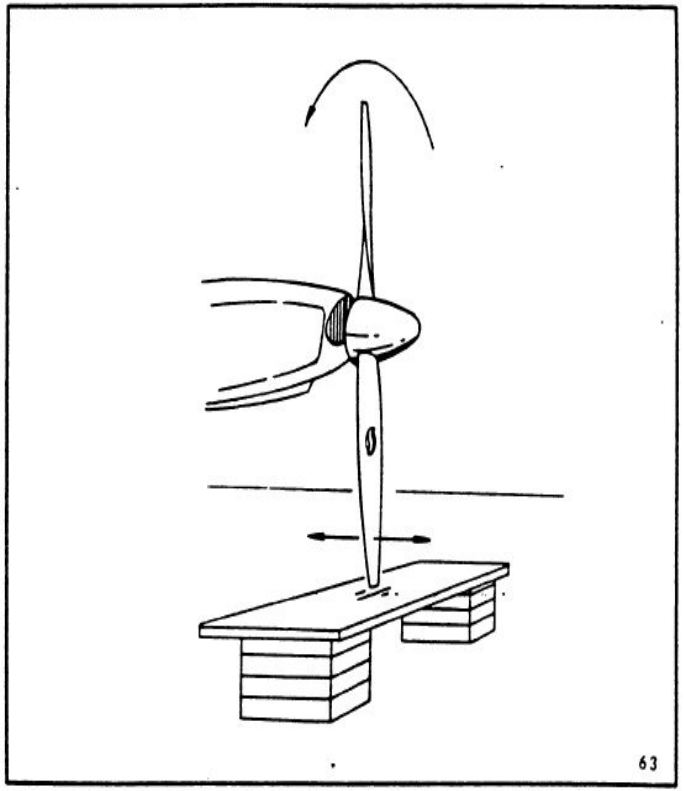
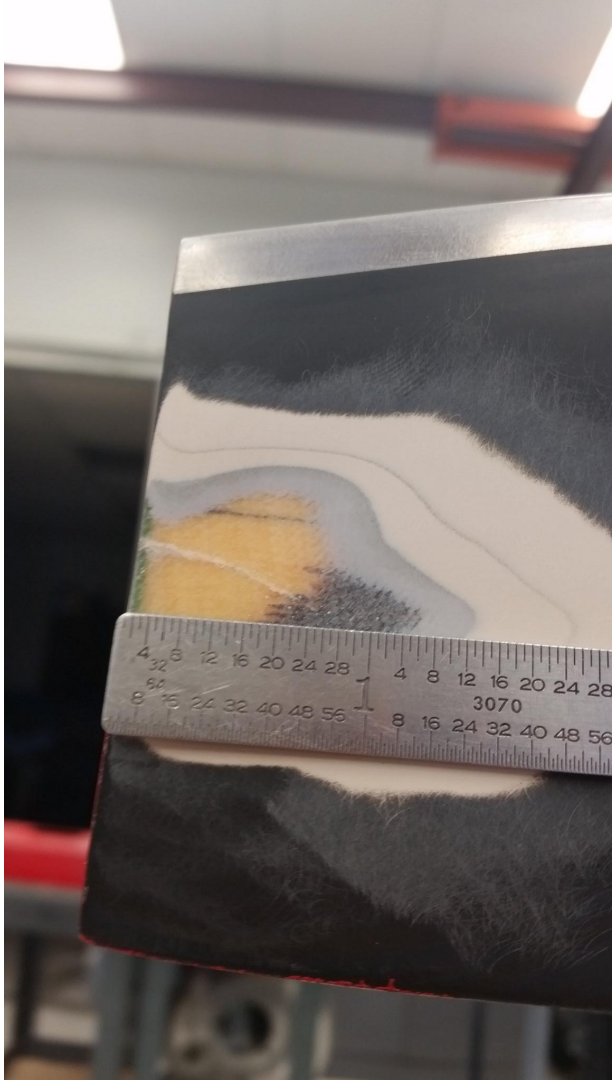


Figure 8-3. Checking Blade Track

- Dynamic balancing is recommended after installing or performing maintenance on a propeller. While normally an optional task, it may be required by the engine or airframe manufacturer to make certain the propeller/engine combination is balanced correctly before operation. Refer to the engine or airframe manuals, and the Maintenance Practices chapter of this manual.
  - Testing and Troubleshooting 61-00-15
  - Page 4-12

5. Cracks in Composite Blade Paint

- As Composite blades become more common, it has become common to see props with stress cracks in the paint.
- In Composite props the remedy is removing all paint and observing the primer for damage.
- If damage is found in primer layer, all primer will need removal and the fiberglass and carbon fiber layers will need to be inspected for cracks.
- If damage is found in fiberglass and carbon fiber layers affected areas need to be removed and composite layers below need to be inspected for cracks.
- Cracks or damage in any composite layer rejects blade or needs factory overhaul.


3070

MT-PROPELLER * D94315 STRAUBING *
P23BO
MTV-15-B/210-58
S/No. 071411
11/07
NEW


TOYOTA

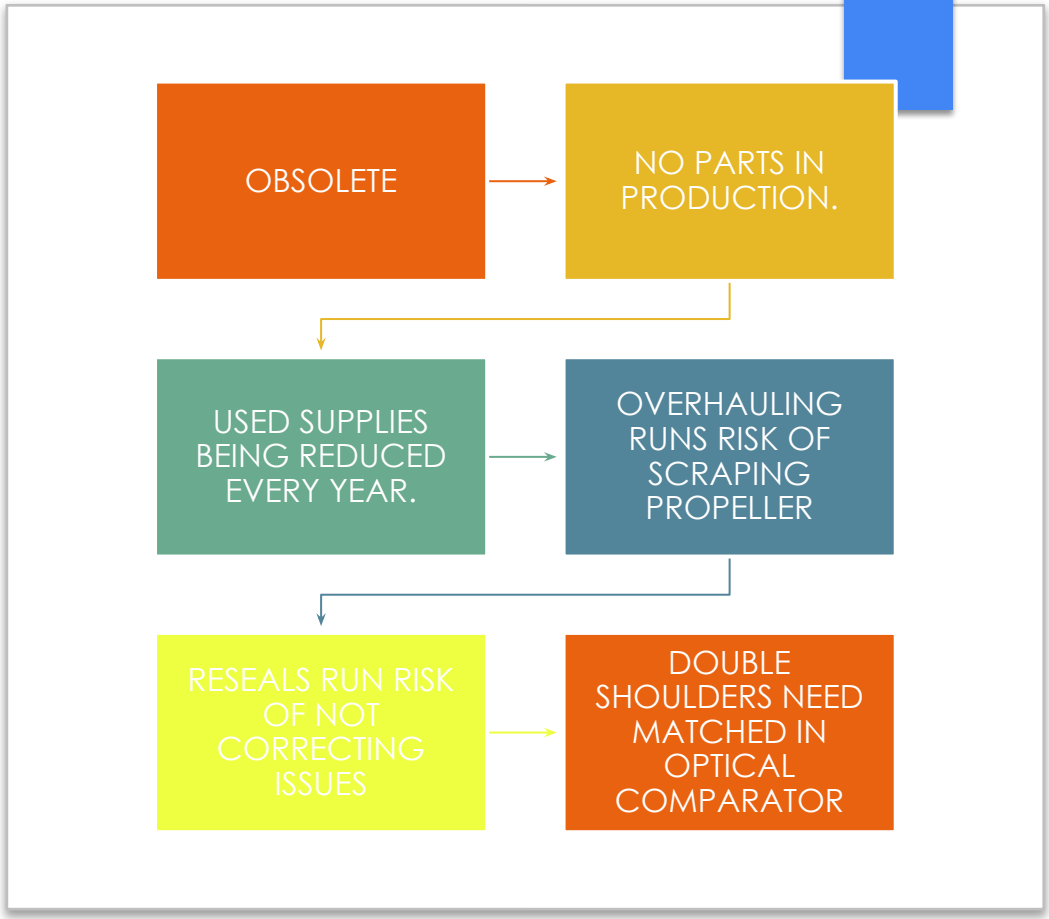
6. DAMAGE IN ALUMINUM BLADE

- SURFACE CORROSION - The loss of surface metal due to chemical or electrochemical action with visible oxidation, usually produces a contrasting color and texture to the base metal.REMOVING PAINT AND CORROSION PROTECTION, SUCH AS WHEN POLISHING BLADES, IS NOT RECOMMENDED.
- PITTING - Pits consist of visible corrosion cavities extending inward from the metal surface. They can grow on the surface, under decals, or under improperly installed de-ice boots. PITS COULD BE A PRECURSOR TO THE INITIATION OF CRACKS.
- INTERGRANULAR CORROSION - Occurs in grain boundaries, may be the result of the continued presence of moisture, occurs more often in forgings or rolled sheets, less often in castings, sometimes appears as cracks on a blade leading edge.

- 4. NICKS - A sharp, notch-like displacement of metal usually found on leading and trailing edges. ALL NICKS ARE POTENTIAL CRACK STARTERS.
- 5. EROSION - The loss of material from blade surface by the action of small particles such as sand or water and is usually present on the leading edge close to the tip. THIS DESTROYS THE BLADES CORROSION PROTECTION, WHICH MIGHT LEAD TO BLADE FAILURE.
- 6. CRACKS - WHEN FOUND ANYWHERE IN A PROPELLER IT IS CAUSE FOR IMMEDIATE REMOVAL AND DETAILED INSPECTION.
- 7. DENTS - Dents cause local stress risers around their perimeter and at the bottom under the surface. Removing material should repair dents. FILLING DENTS DOES NOTHING TO CORRECT THE STRESS RISER AND IS NOT APPROVED. FAILURE MAY OCCUR.

- 8. LIGHTNING STRIKE - A lightning strike on a metal blade may be indicated by a small burned and melted area on the blade, a trail of small pits along the blade, or may show no indication at all. REMOVE PROPELLER IMMEDIATELY AND SEND TO
  - PRECISION PROPELLER
  - 4777 W. AERONCA ST.
  - BOISE ID 83705
- 9. OVERSPEED - Propeller may give no indication of the event, however the event may have severely damaged the propeller due to the dramatic increase in centrifugal loads. If propeller is suspected of having been operated in an overspeed condition see above. (8)

7.THREADED MCCAULEY/HARTZELL DOUBLE SHOULDER



8. CANNOT ACHIEVE RPM (FIXED PITCH)

- There will usually be at least one cruise pitch setting and one climb pitch setting for every fixed pitch application. As a rule of thumb, every inch of pitch change will reduce or increase the resulting engine rpm at the same power setting by 30 to 50 rpm.
- Manufacturers put out blade angle charts for each pitch allowed.
- Pitch outside the manufacturers angle charts are considered “EXPERIMENTAL” and will be stamped as such.
- McCauley allows endless pitch change over the course of the props life.
- Sensenich allows 8” total pitch change over the course of the props life.

Duncan Aviation Response

Workforce Data

Mechanic and Pilot Shortage

- January 2023 report, *Not Enough Aviation Mechanics*, published by Oliver Wyman
- Forecast based on responses from maintenance, repair, and overhaul (MRO) segment of aviation and FAA government data

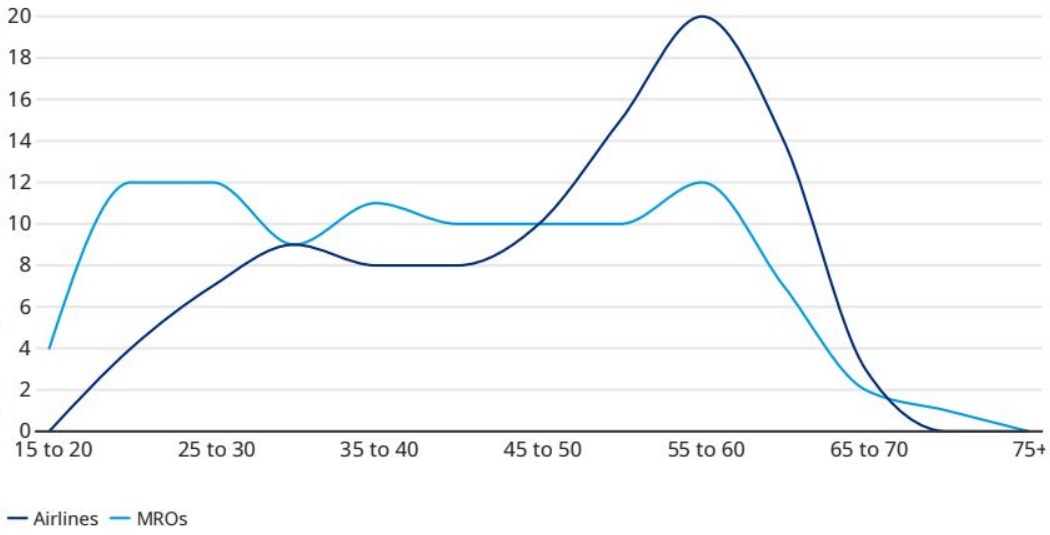
Workforce Data

Age of Work Force

Average, 30-50 years old

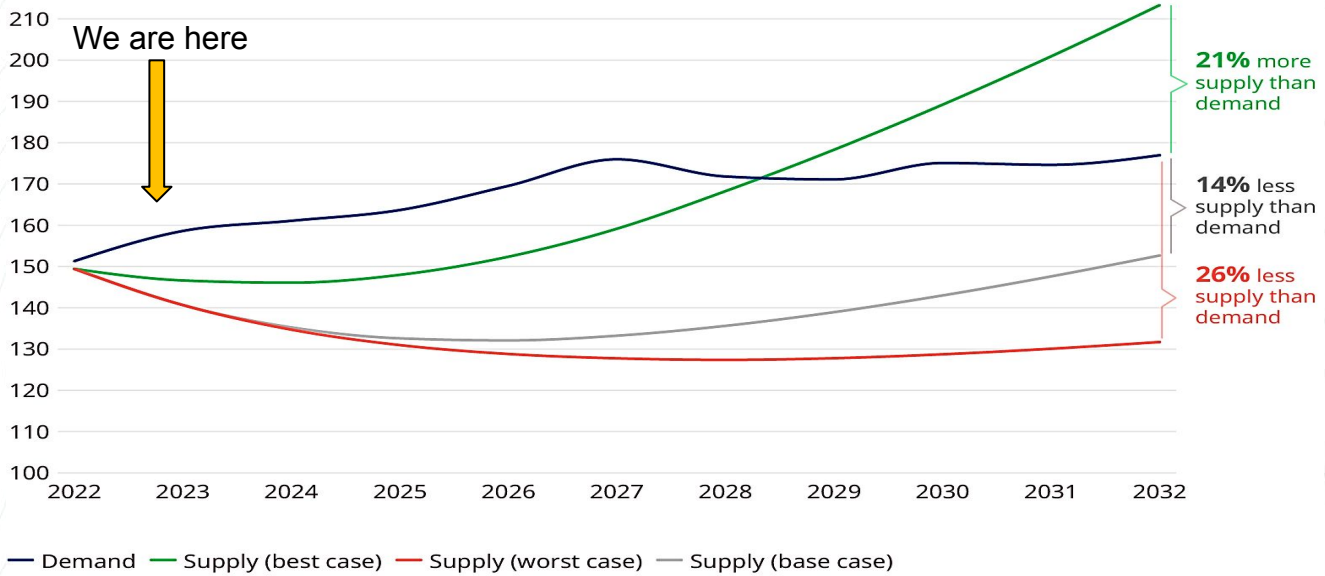
Over 20% are age 64+

Exhibit 3: North America aviation maintenance technician age profiles by employer type



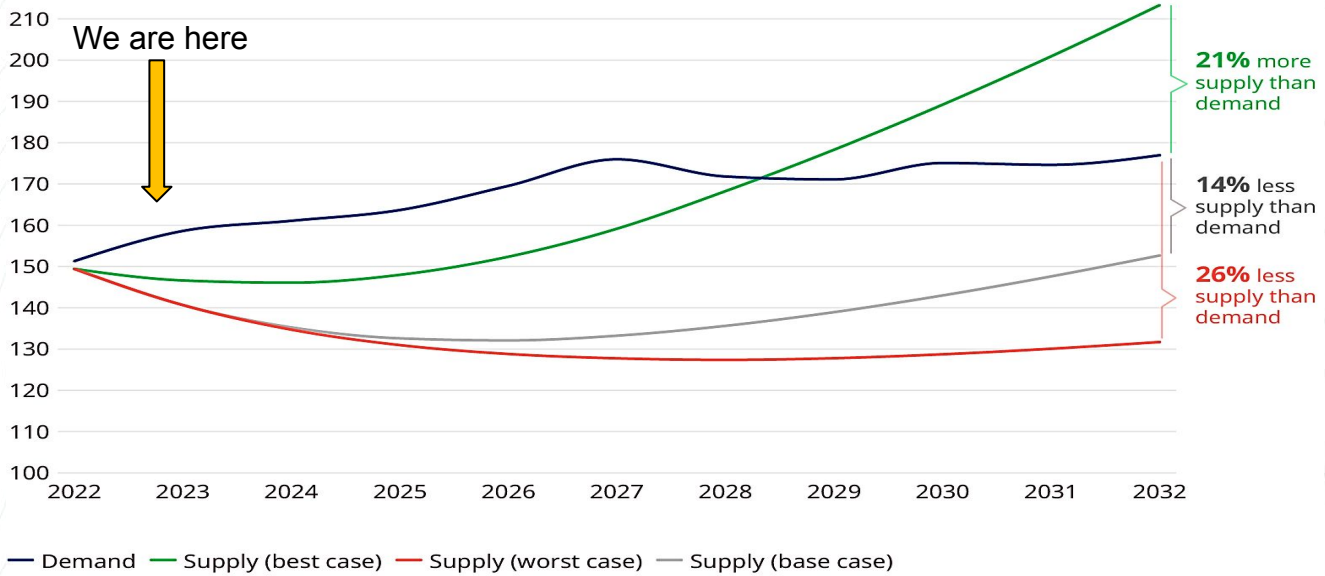
Source: Oliver Wyman analysis

Workforce Data



As many as 610,000 new civil maintenance technicians are needed over next 20 years, according to Boeing's Pilot and Technician Outlook for 2022-2041

Workforce Data



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Outside The Box

MROs are mitigating the impact

- More outreach to female and minority populations
- Local outreach into high schools and even middle schools
- More cutting-edge technology in training, including AI, VR, and drones
- Changing how mechanics are trained – Apprenticeship Programs

Apprenticeship Program

Duncan Aviation has always preferred to promote from within. Why start an Apprentice Program?

- Concept began in 2018
- Program development began with Airframe, March 2019
- Final approval of Powerplant, August 2019

Apprenticeship Program

Program is DOL Approved

- 24 months per certificate

Recognized by the VA

- Can receive VA benefits while enrolled

Not an FAA Part 147 School

- On the Job Experience (OJE)

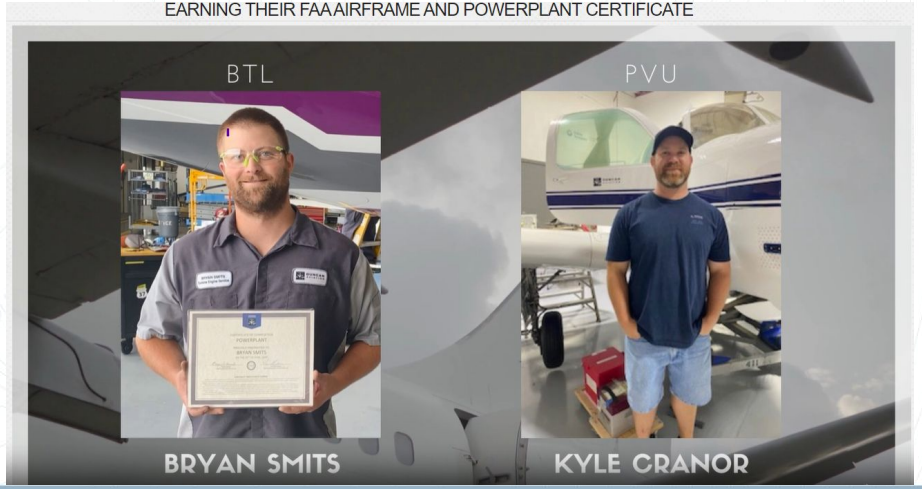
Apprenticeship Program

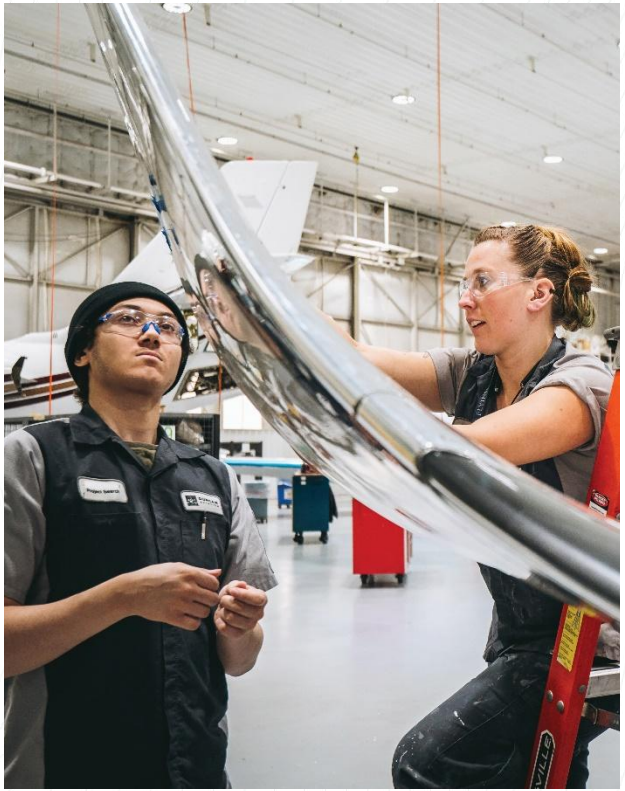
Program development has allowed us knowledge on how to help employees navigate the journey to receive authorization to test from the FAA.

- A&P School graduates who have no
- Military veteran's

Apprenticeship Program

More than100 team members have received an FAA AMT Certification since the program began





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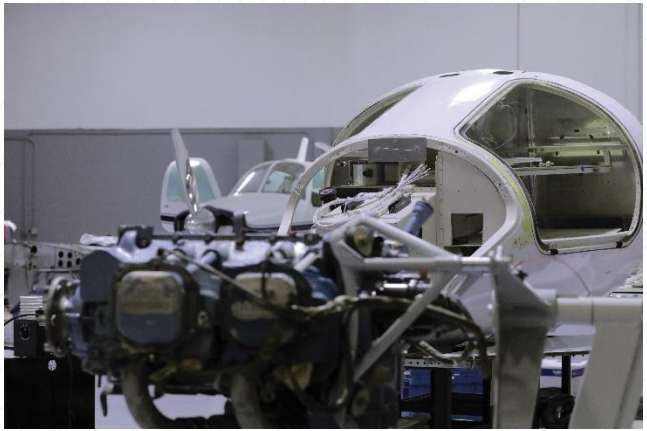

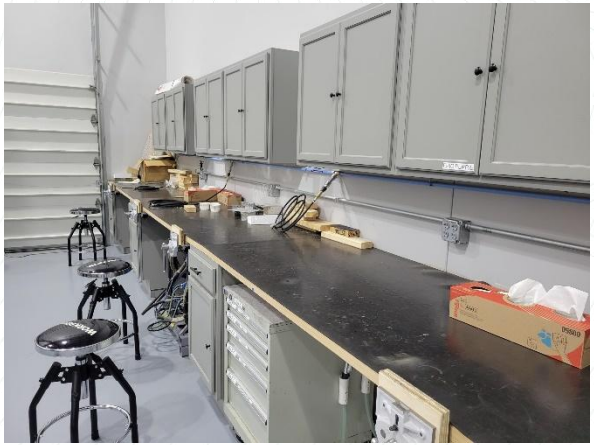


Learjet
Authorized Service Facility
Collins Aerospace

Robust Internship Program

- 70-75 summer interns enterprise-wide in 2023
- Airframe, Engine, Avionics, Interior, Paint, Accessory
- Engineering, Quality, Safety, FBO
- Marketing, HR, Professional Development, Executive

Internships & Apprenticeship Program