

Investigator notes

Friday, February 14, 2024

8:40 AM

USA (Leipsic, OH) Air Tractor AT502B N5048S engine fire 04 August 2023. 1954 eastern daylight time, an Air Tractor AT-502B, N5048S, was substantially damaged when it was involved in an accident near Leipsic, Ohio. The pilot was not injured. The flight was operated as a Title 14 Code of Federal Regulations Part 137 aerial application flight. The pilot had been applying fungicide to several fields, during which he noted no engine performance anomalies. Shortly after starting the second spray run in a field, he heard a pop sound. He saw flames coming out of the engine exhaust stacks and the engine stopped producing power. He performed a forced landing to a neighboring field and the airplane ground-looped in the high crops. Examination of the wreckage by a Federal Aviation Administration inspector revealed that the airplane came to rest upright with substantial damage to the left wing. The NTSB is investigating.

As received

Friday, February 14, 2024
8:34 AM

WO 23-1215 reviewed

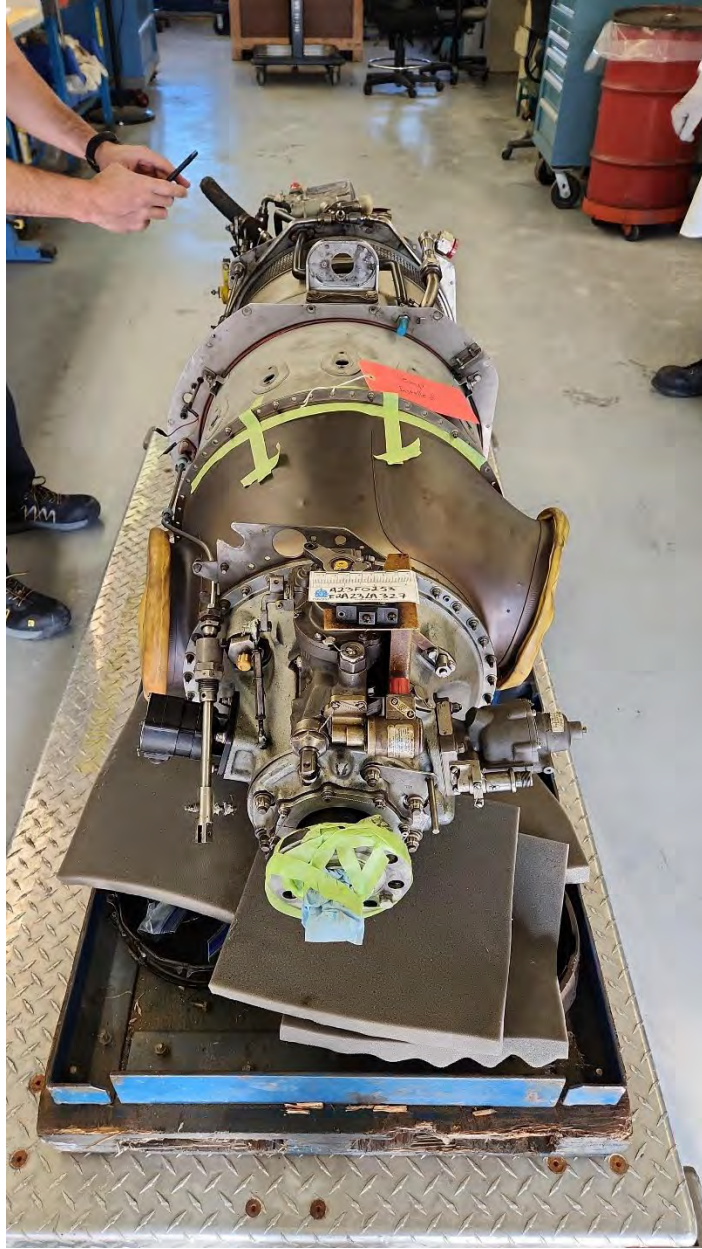


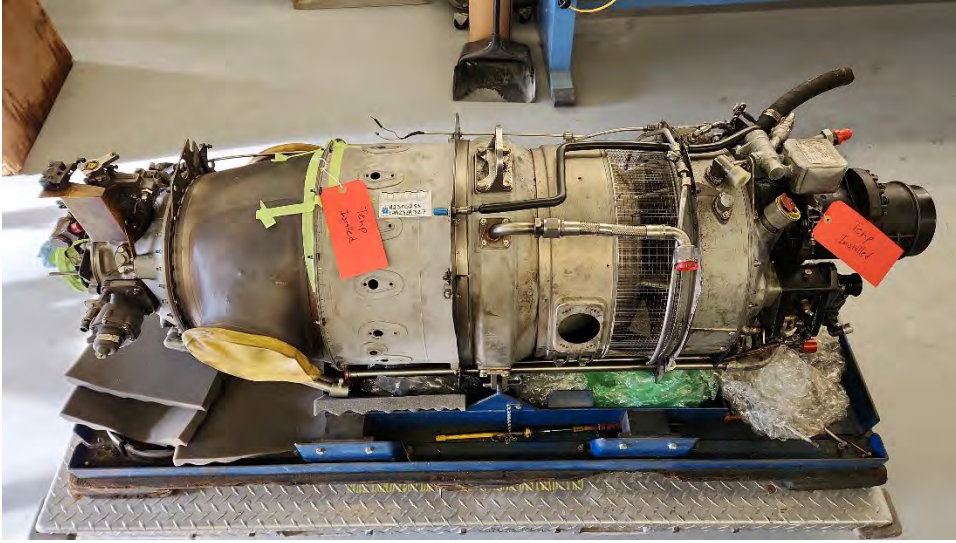






Casing split on c flange. Combustion can liner found missing from shipment









Group picture of all parts received



Exhaust

Friday, February 2, 2024
8:44 AM



Dimple damages from departing PT blades



PT shaft forward looking



FOD in exhaust

Combustion can

Friday, February 2, 2024
8:45 AM

Combustion liner missing in shipment

Oil Filter

Wednesday, February 14, 2024
4:48 PM



FCU

Friday, February 14, 2024
8:45 AM



Fuel pump

Friday, February 14, 2024
8:46 AM



Pt disk and blades

February 14, 2024
9:05 AM





Casting number on PT blades



PT wheel part number





PT Wheel deformation



PT wheel SN



Blade part number AE 3013102T. All blades will need to be removed from disk, analyzed and PN verified





5 blades were removed to confirm part numbers. Blades were identified.



UNITED
TECHNOLOGIES
PRATT & WHITNEY
CANADA

Quality Assurance Procedures

QAP No.: 12-5
Rev No.: 2
Section: N/A
Page: 2 of 5
Date: 21 JUN. 95

1.1 suite / cont'd

<u>PREFIXE/PREFIX</u>	<u>FOURNISSEUR/SUPPLIER</u>
# J	Misco Bet Shemesh Limited, Israel
K	PCC Airfoils Inc., Minerva, Ohio
L	HOWMET Casting Laporte, Laporte, Indiana
M	HOWMET Whitehall Casting, Whitehall, Michigan
# P	Experimental Foundry P&WA
# R	Misco Division of HOWMET Corporation, Muskegon, Michigan
S	PCC Airfoils Inc., Sherwood Metal Products Inc., Wickcliffe, Ohio
# V	Misco Division of HOWMET Corp., Hampton, Virginia
# Z	Hitchiner Mfg. Co., Aerospace Division, Wallingford, Conn.

1.2 Lettres utilisées sur les aubes usinées de turbine apposées comme préfixe au numéro de pièce, avec une séparation d'au moins un espace, ou comme suffixe au code de coulée, ou comme identification séparée, par le fournisseur de l'usinage.

1.2 Letters used on machined turbine blades and vanes - applied as a prefix separated from the part number by at least one space, as a suffix to the heat code, or as a separate identification, by the machining supplier

<u>PREFIXE/PREFIX</u>	<u>FOURNISSEUR/SUPPLIER</u>
AE	A E Turbine Components Limited, U.K.
R	Iscar Blades Limited, Nahariya, Israel
# C	TRW Inc., Cleveland, Ohio
# D	TRW Inc., Danville, Pa.
# E	Johnson Mold & Manufacturing Co., Muskegon, Mich.
F	Ex-Cell-o Corporation, Epsom, Ohio
# G	Walbar Inc., Peabody, Mass.
# J	Mitsubishi Heavy Industries Limited, Nagoya, Japan
# K	Kelley-Hales Jackson, Michigan

Information from blade provenance. The prefixes AE means it comes from an approved PWC vendor in UK

PT shroud

February 14, 2024
9:15 AM



PT shroud



Departing blades impact marks



Ovalized shape of PT shroud

Interstage baffle

February 14, 2024
9:33 AM



Stator vanes between CT and PT seen from trailing edge with damages on PT side



Interstage baffle inner part number



Leading edge's view (center part show evidence of rotational signature with CT disk due to rubbing evidence)



STI 72-50-4802 ROO part number therefore not PWC number



STI part number

CT

February 14, 2024
9:51 AM



CT wheel Trailing edge looking aft





CT blades were turned with starter gen outlet and free to spin no rubbing or noises.
Back of CT blades show evidence of rubbing on inter baffle section vane

RGB chip plug

February 14, 2024

12:29 PM



RGB chip plug with metal

T5 housing

February 14, 2024
12:32 PM



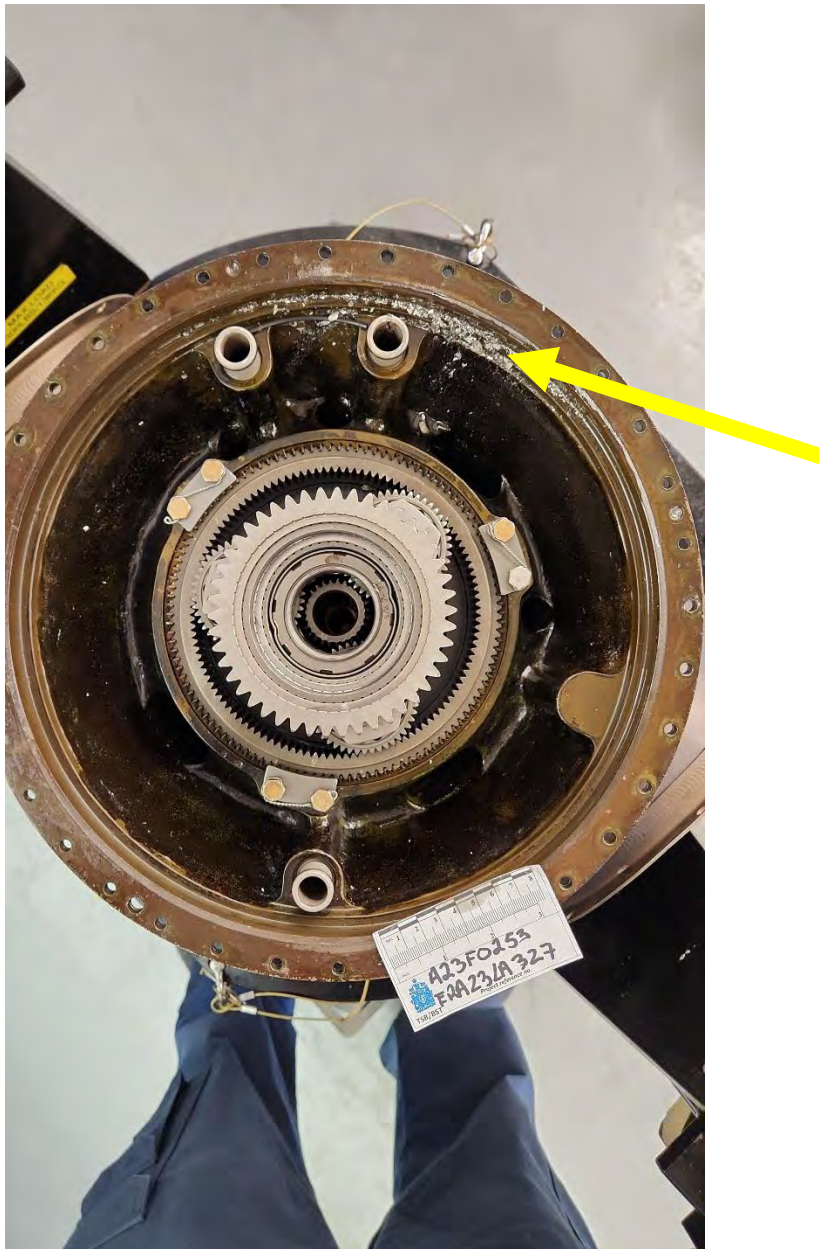
T5 casing with damages



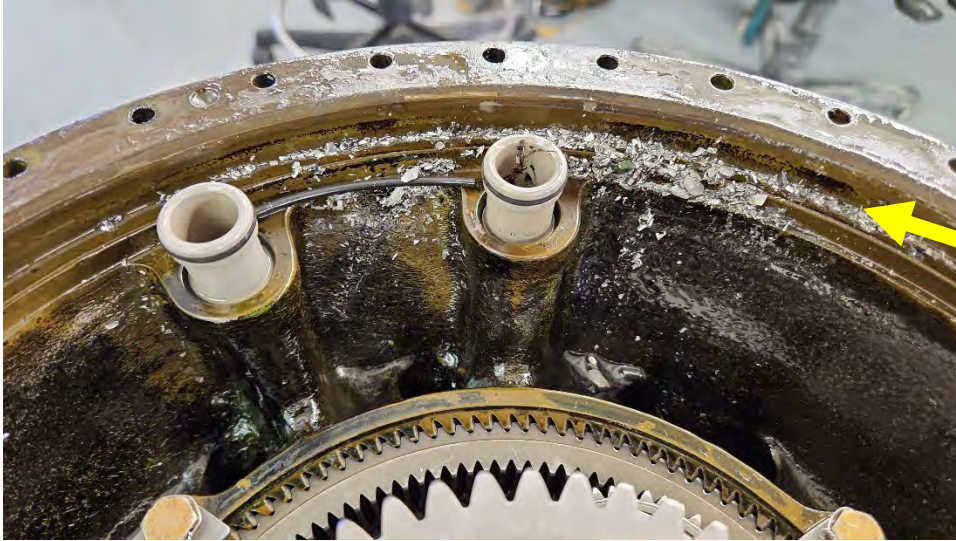
RGB aft

February 14, 2024
12:39 PM

Second RGB stage gears



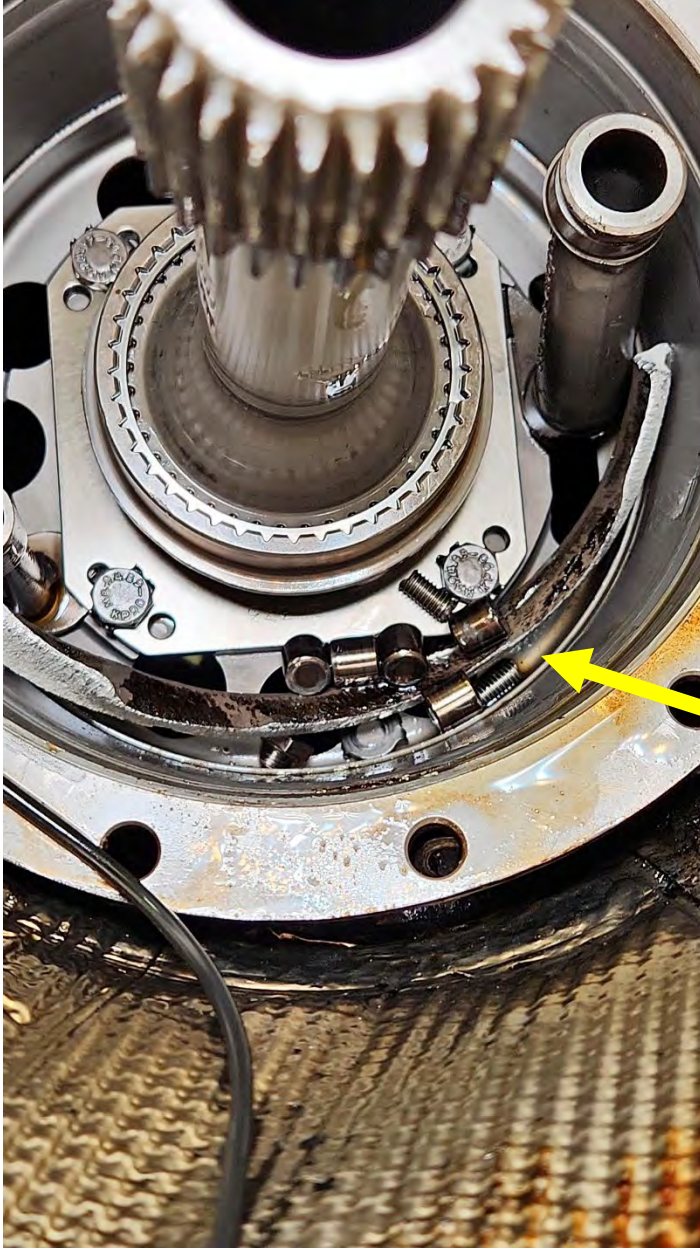
First stage gears with debris



Debris at the bottom of RGB rear casing (hold first stage gears)



All bolts on gear RGB rear case found sheared and #3 roller bearing at bottom (please do not mind the light...)



Bearing 3 roller found loose at bottom of case. Bearing #3 race attachment bolts found sheared with part found at bottom of the case. Bearing #4 race bolts were found secured but damaged (bent)



PT Shaft with damage



Bottom of RGB rear casing with debris



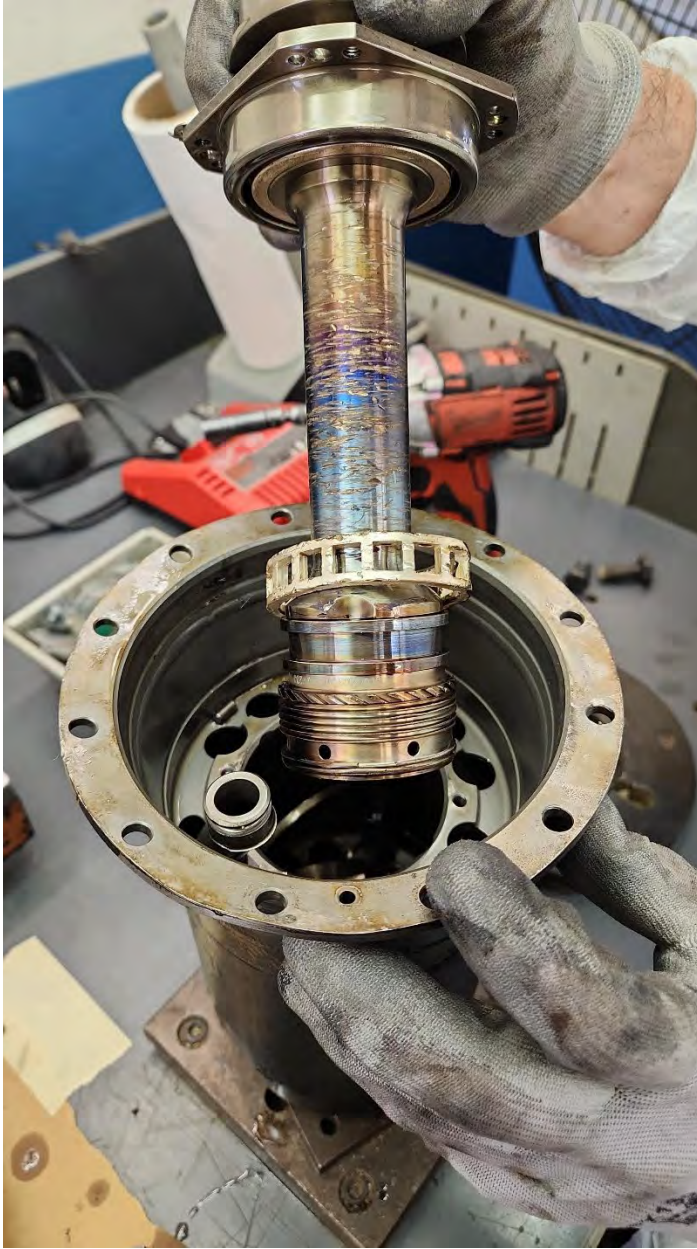
Exhaust Casing liner found offset



RGB strainer with debris



RGB rear case all bolts found sheared



PT Shaft between bearing 3 and 4 found with heat damage evidence and impact damage most likely from bearing cage spinning around after release of the rollers



Bearing #3 race found in 2 separate parts no evident signs of scraping or overheat on the race
All 4 bolts holding the race found sheared



Bearing roller found with heat damage and rubbing



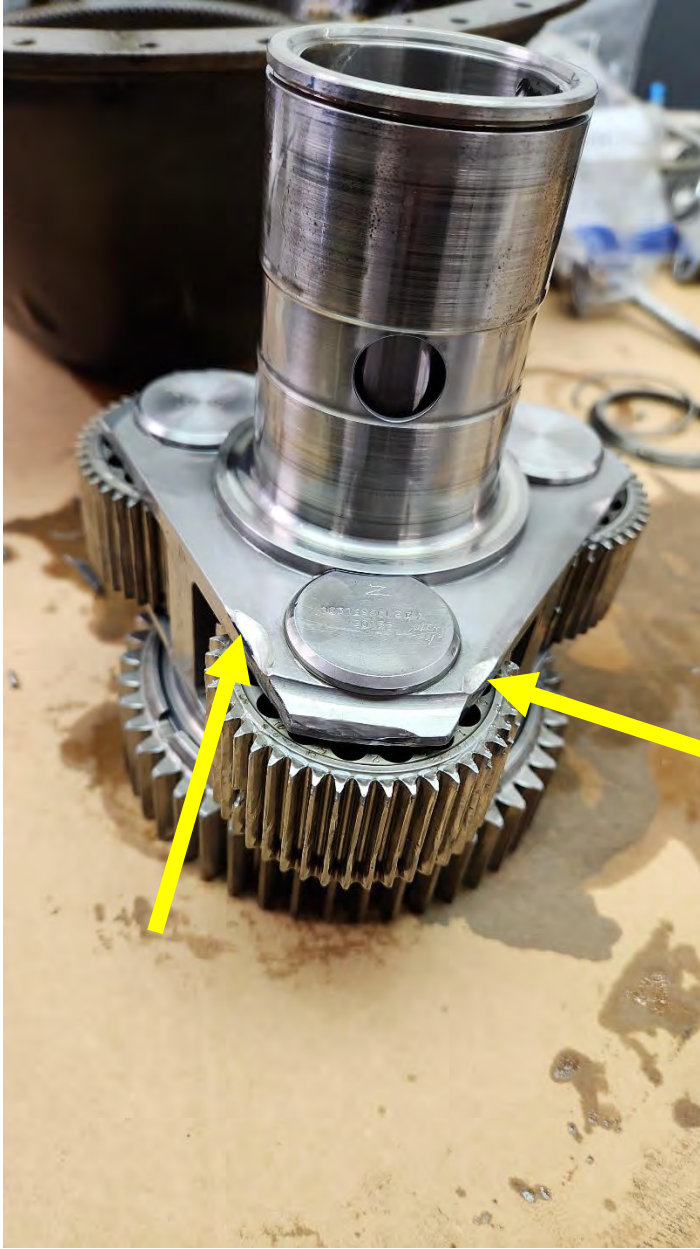
2 bearing roller indicated signs of rubbing and overheat signatures



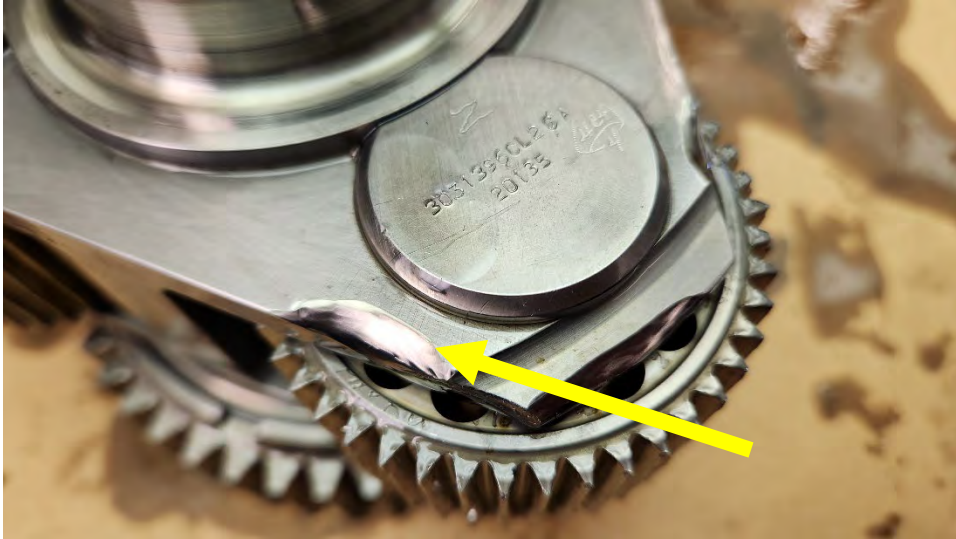
PT shaft overheat signature.







First stage planetary gears balancing (metal removed from triangular plate)



All sun/planetary gears turned without issues. Material missing is part of balancing process but need verification from PWC



Two imprints inside tube FWD of bearing #4



Imprint inside tube that enclose shaft forward to 3-4 showed an exact imprint of a roller bearing. Most likely one roller got stuck, rubbed and overheat. Shaft shows also sign of rubbing





Scoring/rubbing on PT shaft



Most likely this roller was stuck between shaft and tube



Damages found on first stage planetary gears



Torque plate scoring. No visible damage found on ring gear



Bearing 3 race and found roller (One roller was not found). #3 bearing race did not exhibit sign of overheat or heavy scoring



Bearing #3 rollers



Power turbine shaft cap between PT shaft housing and PT wheel exhibit evidence of crushing and torsional force

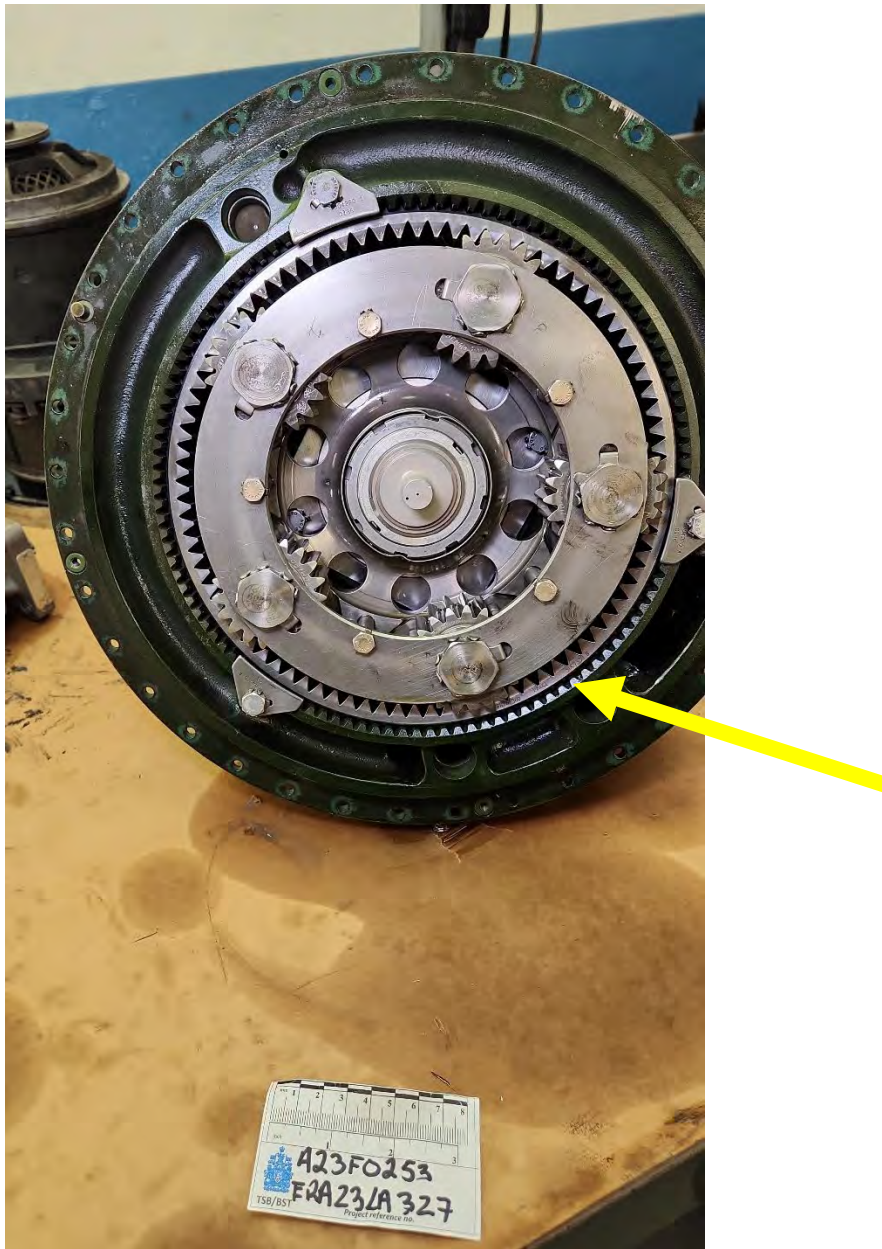


Tip of power turbine shaft casing between bearing 3 and PT wheel

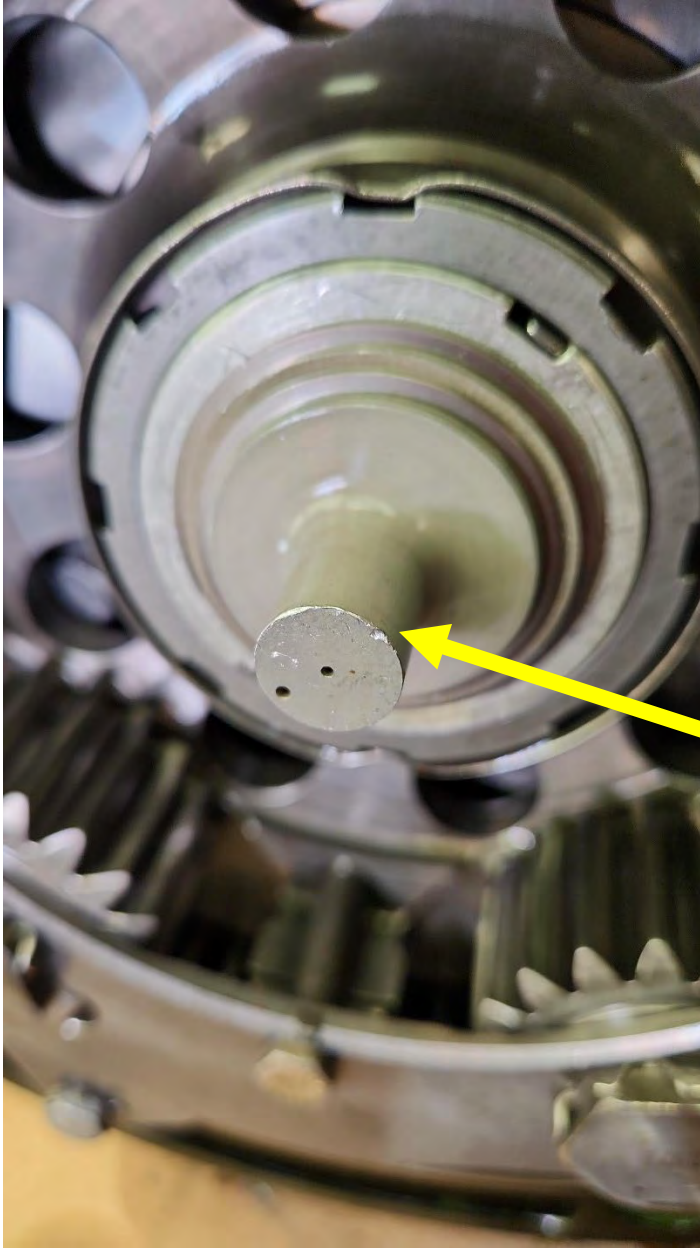
RGB forward

February 15, 2024

8:04 AM



Forward RGB behind looking forward. The part number and serial number visible on the ring gear (5 o'clock) is indicative that the ring gear is installed the right way. Note that the 3 tabs are not engaged in the ring gear groove therefore not preventing axial play forward.



Oil nozzle with damages



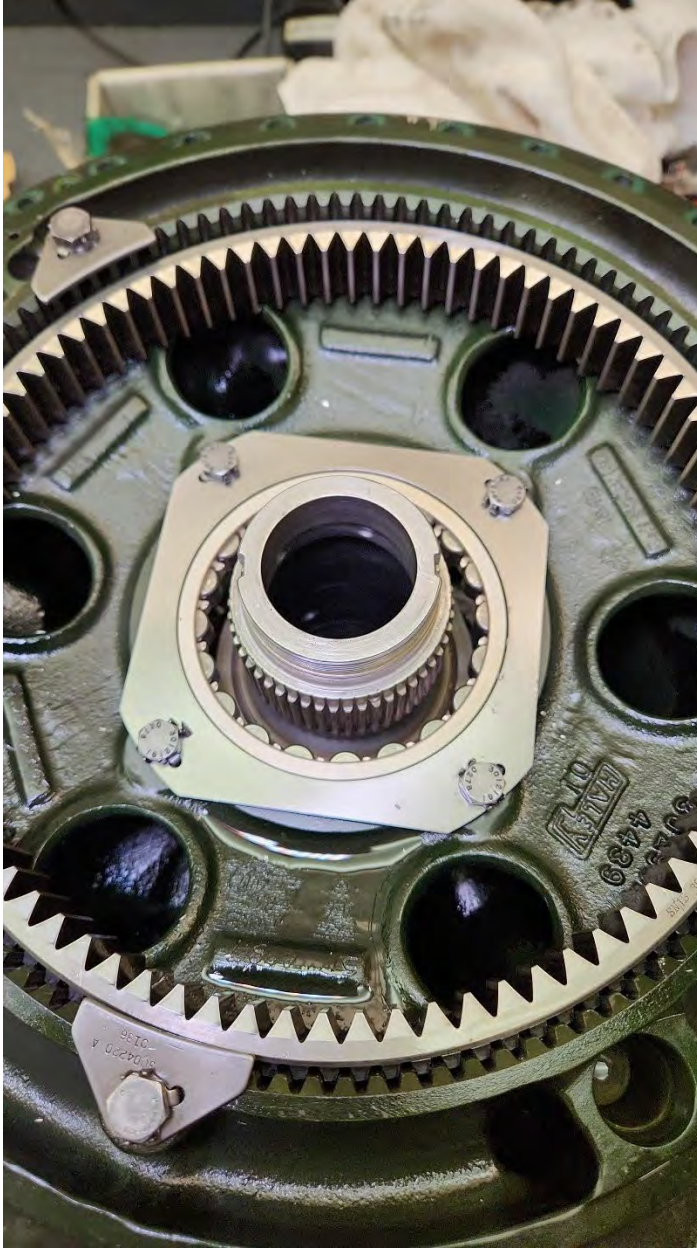
Inner core with damages



Planetary gear second stage



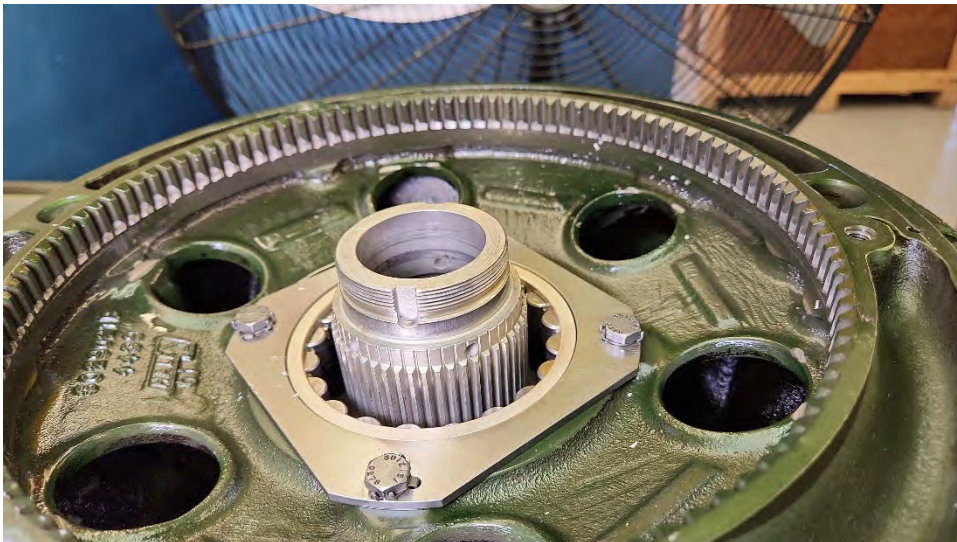
Second stage planetary gear with damages



Bearing 5 no visible issues. Note Ring gear not installed correctly (tab no in grooves)



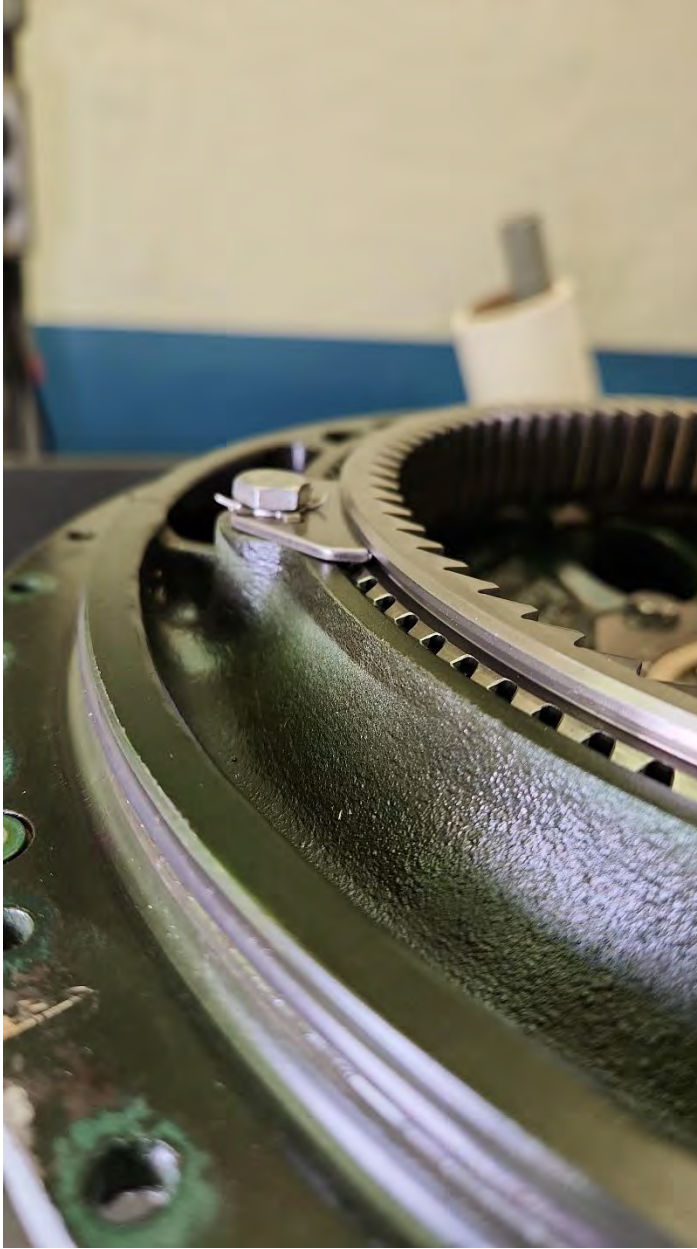
Bottom FWD RGB casing ring gear insert damaged



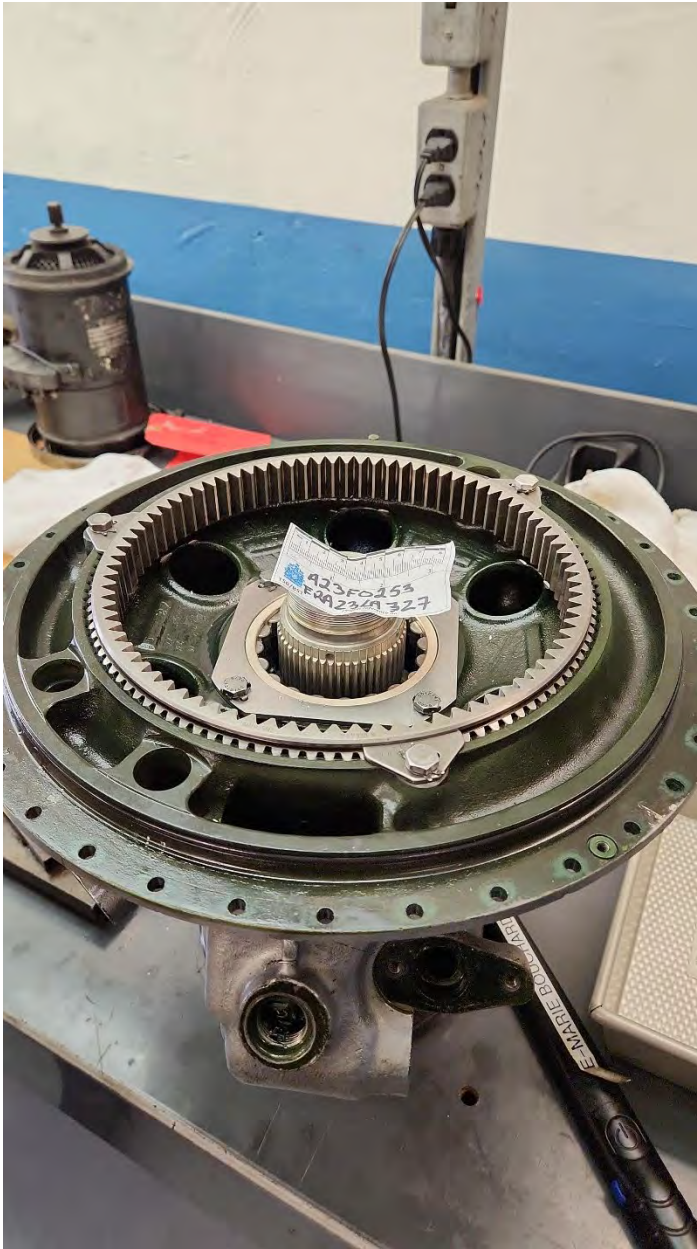
Damage on RGB ring gear most likely due to ring gear migrating FWD.



For demonstration ONLY. Ring gear correctly installed in groove to prevent axial play



For demonstration ONLY- Ring gear correctly installed in groove to prevent axial play. With ring installed incorrectly the ring would migrate forward until such point that the planetary gear would have spun the ring gear and damage the casing. At this point the theory would be that no power would be transferred to the prop and PT wheel would overspeed.



For demonstration only- Ring gear correctly installed in groove to prevent axial play



When the gear went forward it wear the bottom casing ring gear. Damage on the ring gear is indicative of that



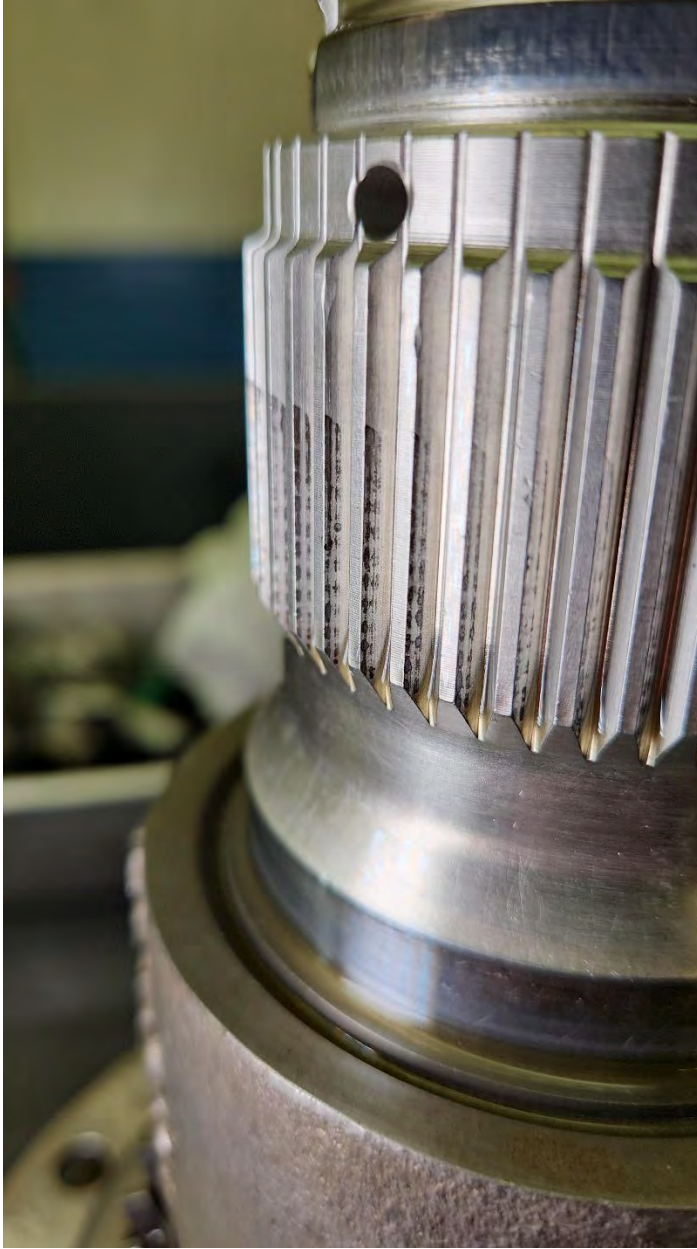
Ring gear part number. PN and SN were visible and therefore the groove on the ring gear was installed the right way (aft)



Wear on top of brackets may indicate it was installed properly at some point during the life of the ring gear/tabs



FWD prop shaft



Prop shaft gear teeth damage



Demonstration ONLY tab in groove