

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN23FA340

AIRWORTHINESS

Specialist's Factual Report

May 23, 2024

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A. ACCIDENT

Location: Oakdale, IL
Date: July 31, 2023
Time: 13:44 CDT
17:44 UTC
Helicopter: Richards Heavy Lift UH-1H

B. AIRWORTHINESS SPECIALIST

Specialist Van S. McKenny IV
National Transportation Safety Board, AS40
Washington, DC

C. SUMMARY

On July 31, 2023, about 1310 central daylight time, a Richard's Heavylift Helo Inc., UH-1H helicopter, N567VF, Kash Helicopter Services, LLC, was substantially damaged when it was involved in an accident near Oakdale, Illinois. The pilot was fatally injured. The helicopter was operated under the provisions of Title 14 *Code of Federal Regulations* Part 137 as an aerial application flight.

D. DETAILS OF THE INVESTIGATION

1.0 Helicopter Information

The Bell UH-1H is a single piloted, conventionally configured helicopter with a two bladed teetering main rotor and two bladed tail rotor, with a skid type landing gear (Figure 1). The helicopter is powered by a single Ozark T53 series, 1,100 horsepower (hp) turboshaft engine. The helicopter has a maximum gross weight of 9,500 pounds. The fuselage consists primarily of two longitudinal beams with transverse bulkheads and metal covering. The main beams are the supporting structure for the cabin, landing gear, fuel tanks, transmission, engine, and tailboom. The external cargo suspension unit is attached to the main beams near the center of gravity of the helicopter. The tailboom section is bolted to the aft end of the fuselage and extends to the aft end of the helicopter. The helicopter is a tapered, semi-monocoque structure comprised of skins, longerons, and stringers. The tailboom supports the tail rotor, vertical fin, and synchronized elevator and houses the tail rotor driveshaft and some electronic equipment.

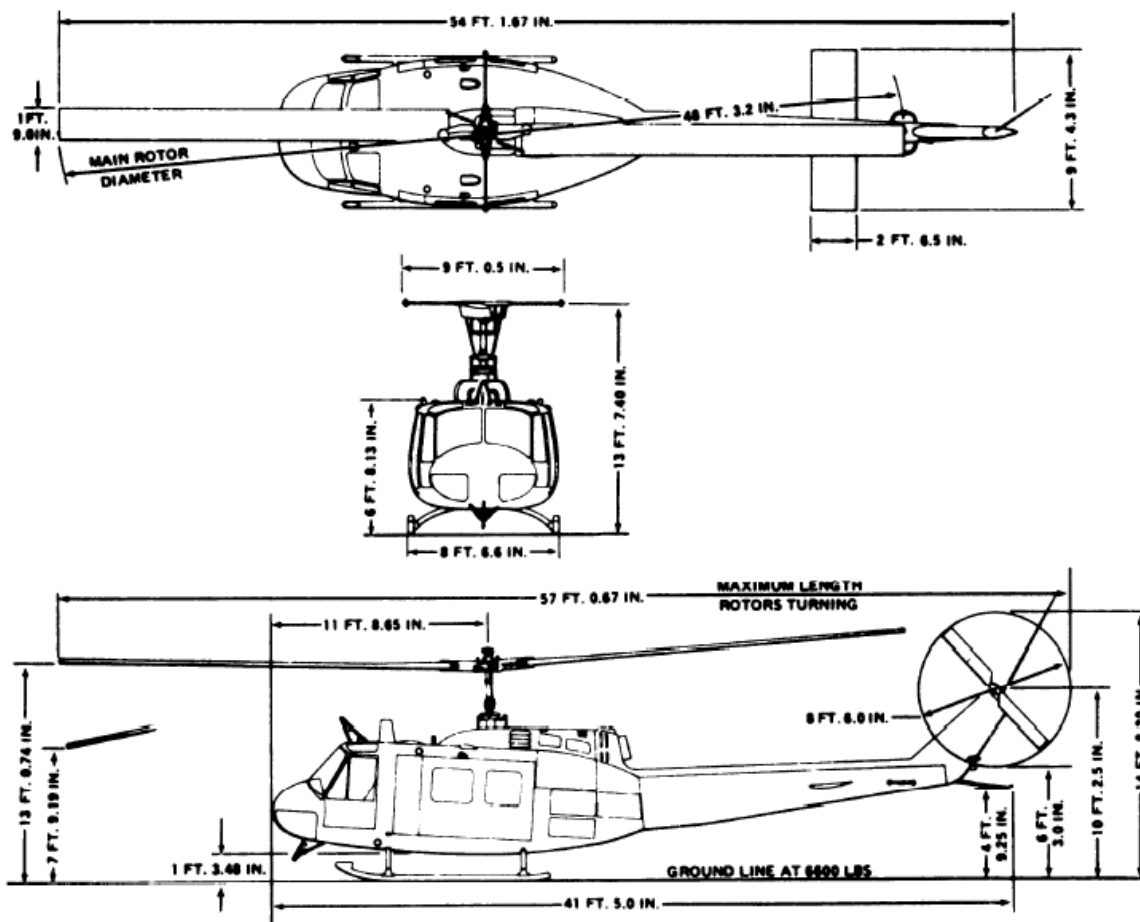


Figure 1. Fundamental helicopter dimensions

1.1 Accident Helicopter Information

The accident helicopter, Richards Heavylift Helo UH-1H, serial number (SN) 65-10016, was manufactured in 1965 by the Bell Helicopter Company for the United States (US) Army. Federal Aviation Administration (FAA) registration records document that the helicopter ownership was transferred from the US government to The Combat and Transport Aircraft Museum, Lafayette, Louisiana, in May 1995 and assigned registration number N134JL. In July 2000, ownership was then transferred to Dreamships Inc., Roanoke, Texas, and the registration number changed to N155GH in February 2002. In June 2008, the helicopter ownership was transferred to W. Coyte LLC and in September 2008, the registration number was changed to N567VF. In December 2011, ownership was transferred to Vertical Flight Technologies, Evansville, Indiana. In March 2012, aircraft registration application for N567VF recorded the aircraft manufacturer as Richards Heavy Lift. In January 2018, ownership was transferred to Kash Helicopter Services, Mt Vernon, Illinois.

The FAA airworthiness records document the following supplemental type certificates equipment installations or changes. Two Gill 7638-44 led acid batteries,

Isolair tank system, inlet barrier filter installation, Onboard Systems keeperless cargo hook, N1/N2 cycle counter, modified the alternating current (AC) electrical system to conform with Bell Model 205A-1, Bell cargo hook bumper kit, Pulselight landing and search light, Bell high skid cross tube installation, Van Horn tail rotor blades, Honeywell (Lycoming) T53-L-703 engine, left hand bubble window, pedal activated emergency cargo release, and various antennas.



Figure 2. Accident helicopter as configured before the accident (Internet photo).

2.0 Wreckage Documentation

The entire helicopter was recovered and transported to AMF Aviation LLC, Clarksville, Tennessee, for storage. A full wreckage examination was conducted on October 3-4, 2023, by the NTSB, representatives from Ozark Aeroworks, and the FAA.

2.1 Airframe and Cockpit

The wreckage consisted of 6 main sections. The cockpit, which was destroyed by impact fragmentation; the aft cabin, fuselage, and engine deck; the transmission; the tail and tail rotor; rotor head with main rotor blades; and engine. The landing gear skids had separated at the cross tube saddles. The right skid tube was fractured behind the skid toe. The forward cross tube had separated from the fuselage and aft cross tube remained attached to the fuselage. The engine had been removed from the airframe during the on-scene phase of the investigation and transported with the main wreckage to the storage facility.

The cockpit was extremely fragmented. Both pilot seats were present. The cockpit was configured with dual flight controls consisting of two collectives, two cyclics, and two sets of antitorque pedals; the majority of those were identified within the cockpit area. The instrument panel was partially intact, and the center console was fragmented with individual switch panels detached from the console.

Cockpit Instruments

The following table (Table 1) lists the cockpit instrument readings as recorded during the wreckage examination.

Table 1. Cockpit Instruments

Fuel Quantity	980 pounds (lbs)
Engine Oil Temp	0° C
Transmission Oil Press	0 pounds per square inch (psi)
Transmission Oil Temp	70° C
Main Gen [Generator] Load	38 Amps
DC [Direct Current] Volts	0 volts
AC [Alternating Current] Volts	0 volts
Torque oil press	0 psi
Gas Producer	0% revolutions per minute (rpm)
Exh Temp [Engine Exhaust Temperature]	640° C
Airspeed	50 knots
Altimeter	6860 feet / 30.10 inches of mercury (inHg)
Fire Light	Intact
Low Rotor RPM	Lens missing, 1 bulb missing, 1bulb broken
Master Caution	Lens missing, 2 bulbs present and intact
Double Tach (RPM)	R: 0 , Nf: 5600 (Green range: R: 325, Nf: 6450) ¹
Force Trim	OFF
Hyd Cont [Hydraulic Control]	ON
Start	OFF
Main Fuel	ON
Low RPM Audio	ON
Gov [Engine Governor]	AUTO
Int Aux Fuel [Internal Auxiliary Fuel]	Left: ON, Right: ON
De-Ice	ON

¹ "R" is the short needle on the triple tachometer and points to the rotor speed (rpm). "Nf" is the long needle pointing to the free turbine speed (rpm).

Hobbs	3229.4 hours
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Cockpit Seats

On scene photos of the cockpit show the right pilot seat, characterized by black seat covers, was intermingled with the right cyclic stick, which was still aligned with its associated gimbal assembly, positioned beneath the cockpit floor (Figure 3). The left cockpit seat did not appear to be in the immediate vicinity of the cockpit and the left cyclic stick was located some distance away from the main wreckage. During the wreckage layout, the left seat was located and both seats were set side by side for comparison. The left seat had a sheep skin cover over the cushions and some areas of red stains were observed on the sheep skin cover (Figure 4).



Figure 3. Wreckage view of the cockpit area with the right pilot seat and right cyclic stick identified.

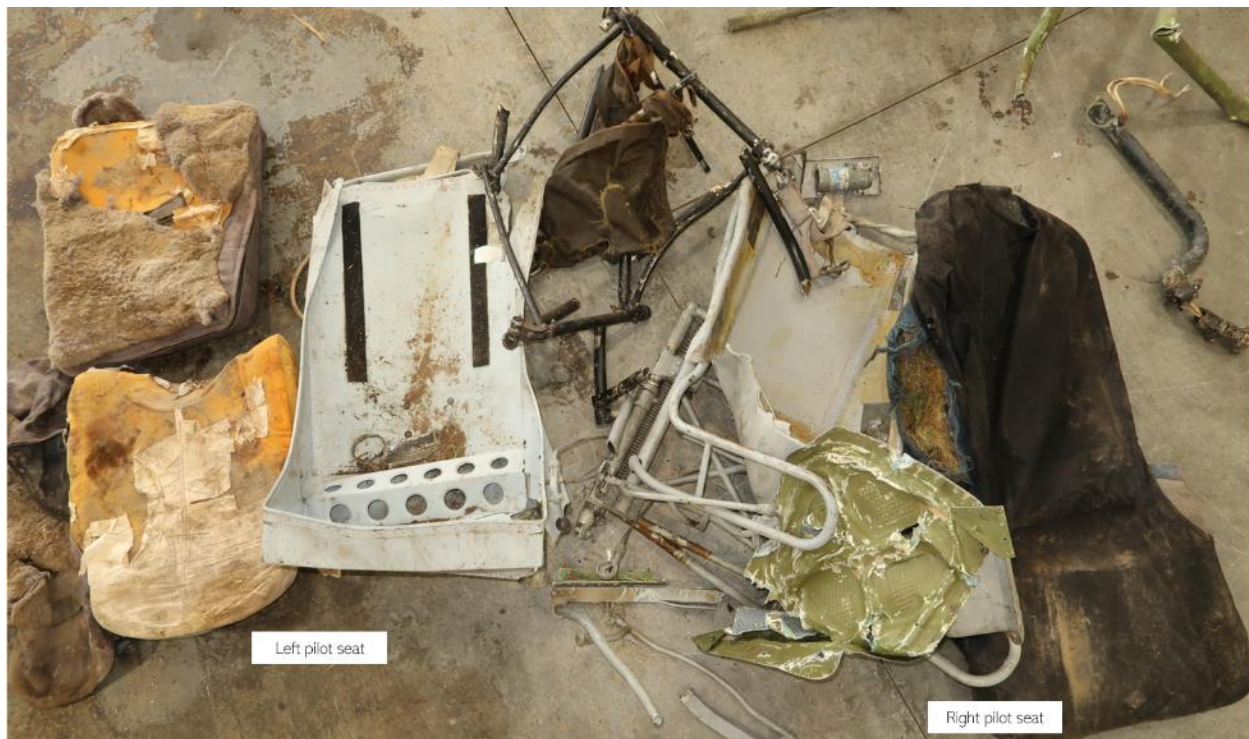


Figure 4. Pilot seat layout.

2.2 Flight Controls

Cyclic control system

The flight controls in the cockpit were highly fragmented. The right cyclic was in the wreckage, the left cyclic stick had been placed with the wreckage by recovery personnel. Both base assemblies of the two cyclics were with the cockpit wreckage and linking push-pull tubes were traced through all connections and bell cranks through the aft cabin, and up to the primary lateral control linkages on the stationary swash plate. Pitch linkages from the rotating swashplate to the rotor head were present. Both pitch horns on the main rotor blades had pulled out of the blade root.

Collective control system

Both collectives were identified in the cockpit area but had separated at their respective bases. The pilot's collective twist grip was in the FULL INCREASE position and matched the twist grip position as found on-scene. The collective, torque tube, and push-pull tubes were traced through multiple breaks to the collective flight control servo, and then to the collective lever.

Antitorque control system

The majority of the antitorque pedals and control push-pull rods were highly fragmented in the cockpit area. Control rods and bell cranks were traced through multiple breaks to the tail rotor control servo, then aft to the tail rotor control cable

sector. One side of the tail rotor control cable had parted with broomstraw characteristics near the sector bell crank. The cable ran up both sides of the tail to the control chain and tail rotor control sprocket. The tail rotor blades pitch changed when the control chain was manipulated.

Hydraulic system

The hydraulic pump remained attached to the transmission sump case, which had separated from the lower section of the transmission (Figure 8). The hydraulic pump rotated freely with no binding or grinding when driven by hand from the accessory gearbox drive gear. Hydraulic servos were present with in the fuselage, all linkages and hydraulic lines connected. The hydraulic system filter was disassembled. The filter bowl contained hydraulic fluid, and the filter element had no observable debris. All hydraulic line b-nut connections were checked for tightness and no evidence of any hydraulic fluid leaks were observed.

Elevator controls

The elevator controls were traced from the aft side of the stationary swash plate through the tail to the elevator.

2.2.1 Cyclic Sticks Examination²

The left and right cyclic controls (Figures 5 and 6) and their respective bases were received by the NTSB Materials Laboratory as shown. Both control sticks were fractured at the lower end just above the gimbal assembly with fracture surfaces on slant angles consistent with ductile overstress fracture. The forward side of the right control stick wall and aft side of the left control stick wall were flattened consistent with heavy contact with the respective sides of the control stick openings in the upper base plates for the gimbals. At the lower end of the gimbal assemblies, the forward lug at the lower end of the right control and both lugs at the lower end of the left control were fractured, and a heavy impact mark was observed on the forward side of the right control gimbal above the fractured lug. The gimbal lower lug fractures on both controls had uniform rough matte gray features consistent with overstress fracture. The floor structure around the base on each control was fractured and crushed, and fractures were on slant angles consistent with overstress fracture. On the left control, the right forward and right aft corners of the upper base plate for the gimbal were fractured, and visible fracture features had rough features consistent with ductile overstress fracture. The handle for the left control was substantially damaged and was fractured where it intersected the upper end of the control stick tube section. The handle fracture had relatively large mirror zones that transitioned to river markings and hackle features consistent with overstress fracture. No

² Examination performed by Matthew R. Fox, Ph.D., Chief Technical Advisor – Materials, National Transportation Safety Board.

indications of a progressive fracture mechanism or other preexisting damage were observed.



Figure 5. Left cyclic stick.



Figure 6. Right cyclic stick.

2.2.2 Flight Control Hydraulic Servos

The three upper flight control hydraulic servos (collective, left, and right cyclic) were harvested from the wreckage by the NTSB on February 9, 2024. The servos were examined and functionally tested at Woodward Inc, Santa Clarita, California (manufacturer) on April 8, 2024. No unusual anomalies or wear were noted on the servos; all three were placed on a hydraulic test bench and all functioned as designed (Attachment 2).

Fluid samples from each servo was collected and tested/examined for particulates. No contamination was visible in any of the samples. The test bench fluid was tested on April 5, 2024, and classified as National Aerospace Standard (NAS) 1638 Class³ 00. The fluid collected from each servo was tested and all three were classified as NAS 1638 Class 12 (Attachment 3). The US Army maintenance manual⁴ requires a visual inspection of the hydraulic fluid for contamination and does not require laboratory testing or NAS 1638 classification.

³ NAS 1638 cleanliness standard, scale is 00 through 12. The standard is based on the size and number of particles observed within the sample.

⁴ TM 55-1520-210-23, Chapter 7, section 7.5

2.3 Main Rotor Drive System

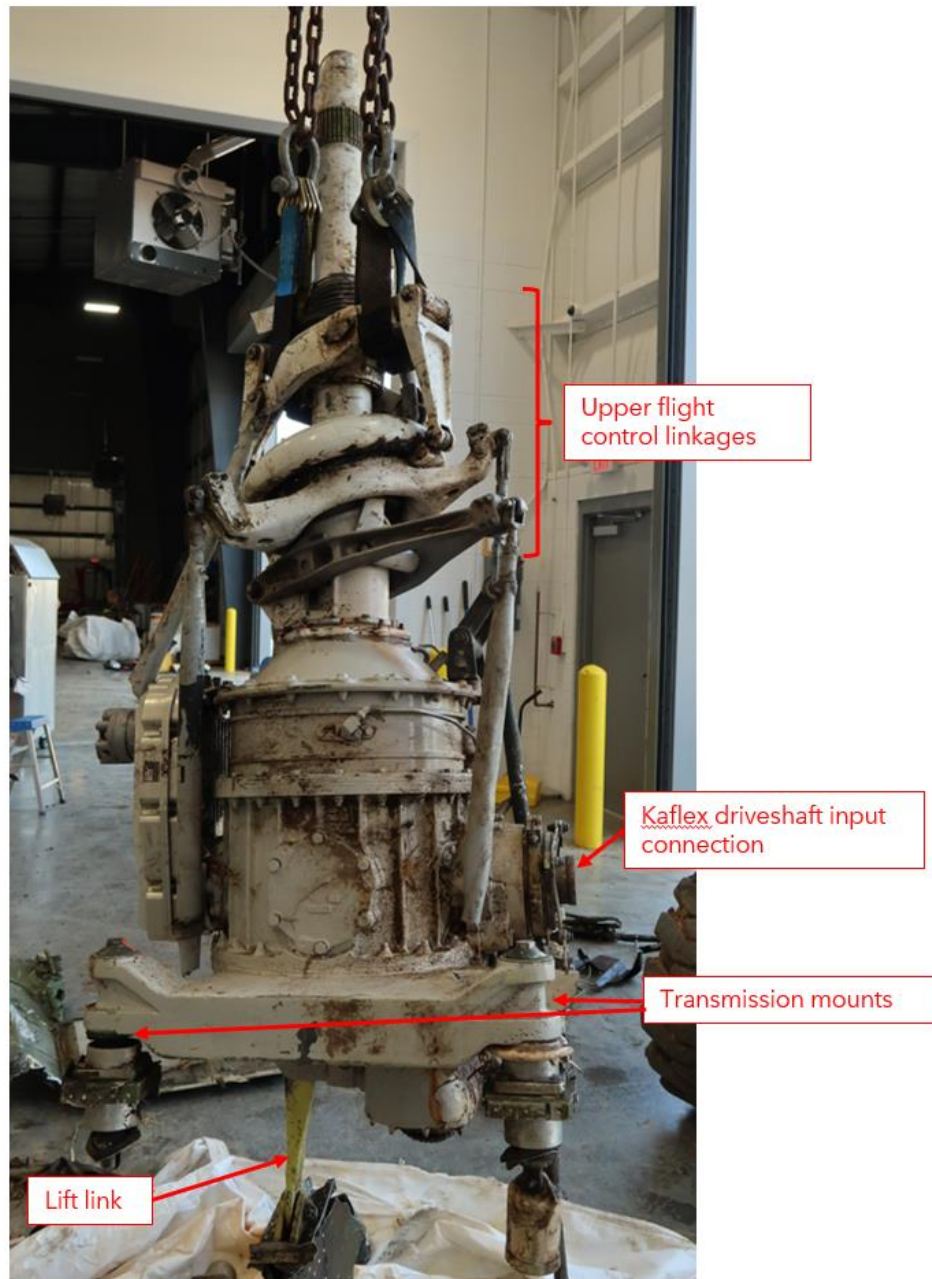


Figure 7. Transmission with rotor mast, collective lever, and swashplate assemblies attached.

The helicopter main transmission gear box (Figure 7) had separated from the fuselage by fracturing the lift beam, pulled the isolation mounts off the pylon structure, and the 5th mount beam had fractured in half at the 5th mount. The isolation mounts exhibited features of over travel and bent flanges, and the attached pylon structure had jagged edges and rivets sheared flush, all characteristics consistent with overload. The lift link remained attached to the lower portion of the transmission gear box and a jagged fragment of the fuselage lift beam was attached to the opposite end. The lower sump, with the tail rotor drive quill still attached, had separated from

the upper main transmission gearbox. Impact damage fractured the lower transmission case surrounding the oil filter (Figure 8). The interior of the main transmission gearbox was visually examined through the hole in the bottom of the case. The portion of the bull gear teeth that could be seen were undamaged and no metal chips or debris was observed within the case.

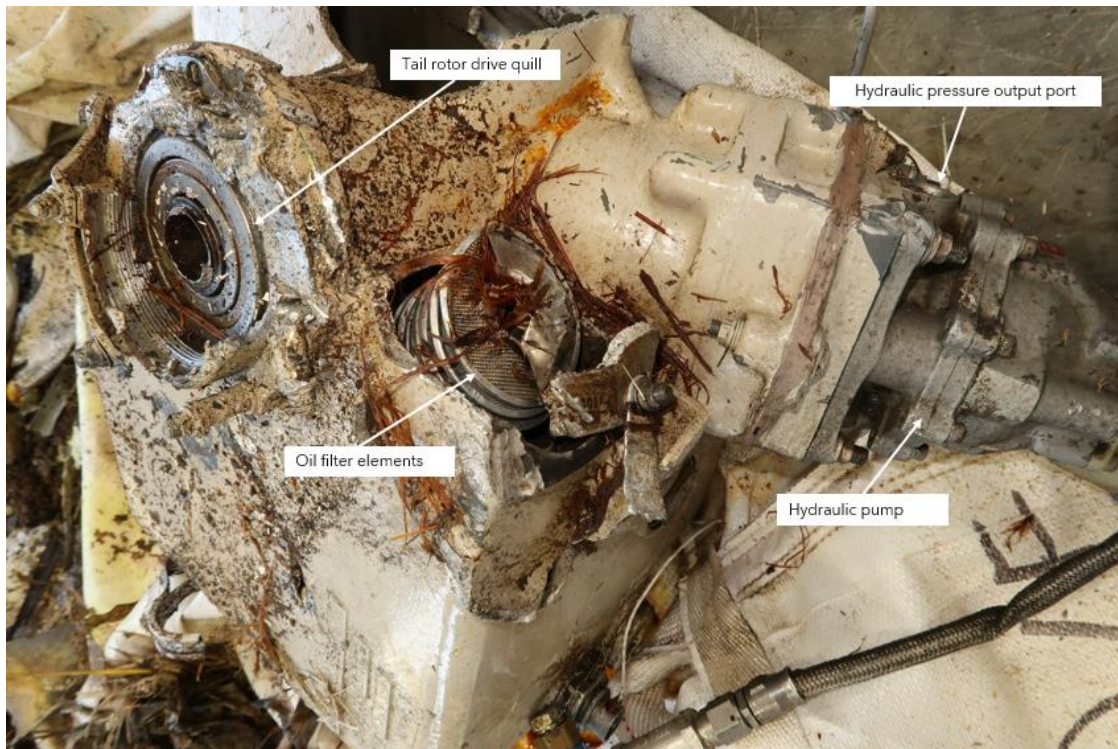


Figure 8. Transmission sump had separated from the bottom of the main gear box. Evidence of impact damage to the oil filter housing, hydraulic pump output port, and tail rotor drive quill.

A Kawak Aviation Tech gearbox and pump assembly was mounted to the auxiliary generator mounting pad (the auxiliary generator had been removed). The cover of the gearbox was removed revealing undamaged and oil wetted drive gears. The rotor head had separated from the mast at a point even with the bottom of the rotor head. The KAFlex drive shaft flex frames had fractured at both ends of the drive shaft, leaving both base ends attached to the transmission side and engine side (Figure 6). The main transmission drive input quill shaft with freewheeling coupling moved freely in the freewheel direction (counterclockwise (ccw)) but was seized in the drive direction (clockwise (cw)) when turned by hand. The quill shaft was pulled from the main transmission gearbox case; the clutch elements were undamaged and operated smoothly when manually manipulated. The unit freewheeled in the ccw direction and locked in the cw direction. The magnetic chip detector was removed and one small metallic flake was observed on it. The main transmission gearbox oil filter was disassembled; oil was observed in the canister and no particles were observed within the folds of the filter.



Figure 9. Illustration of an assembled KAFlex drive shaft (Source: Kamatics Corporation)



Figure 10. KAFlex drive shaft.

The KAFlex inner-connect drive shaft had flex frames attached at both ends and fragments of all frames were accounted for (Figure 10). All 10 bolt connections were identified on the engine side, and 8 bolt connections were identified on the transmission side. There were external rub marks on the engine side of the flange plate cup. The inner-connect had inward deformations the width of a flex frame segment. Both end flange cup portions of each end of the KAFlex retained their round characteristics.

2.4 Main Rotor

The main rotor head remained intact but had separated from the mast and the fracture surface was consistent with torsion overload. The mast end fracture was oval in shape and exhibited features consistent with torsional shear (Figure 11). The pitch horns on each blade had pulled out of their base. The stabilizer bar had separated from the rotor head, but all control links were attached at their fittings (Figure 11). The pitch links and pitch horns were attached to the stabilizer bar assembly. Both viscous dampers had separated from the rotor mast.



Figure 11. Rotor head had separated from the mast. Centered in the rotor head is a portion of the mast that had deformed into an oval shape.



Figure 12. Stabilizer bar

Rotor Blade 1 (Red)
Manufacturer: Bell Helicopter
Part Number (PN): 205-015-150-101
SN: A-FS471

The erosion strip at the tip of the blade was peeled back. About 60% of the blade afterbody had separated. A slight permanent aft bend of the blade was observed.

Rotor Blade 2 (White)
Manufacturer: Bell Helicopter
PN: 205-015-150-101
SN: A-FS432

The upper and lower skin panels had fracture lines along the 45° plies. A majority of the afterbody structure was attached to the spar. The blade weight pocket at the blade tip was empty.

2.5 Tail Rotor and Drive System

The tail rotor drive shaft end coupling that connects to the transmission was not located; the drive shaft had fractured just aft of that location. The remaining portion of the forward drive shaft was in the tail rotor drive shaft heat shield. The remaining tail rotor drive shafts were accounted for. The 42° drive shaft was fractured mid span coincident to external fin damage.

The tail rotor was intact and remained attached to the 90° trail rotor gearbox (Figure 11). The rotor rotated freely in conjunction with rotation of the tail rotor drive shaft. Both tail rotor blades were attached to the rotor head and pitch change beam. Both blades exhibited blade tip damage and skin delamination.



Figure 13. Tail rotor hub and blades.

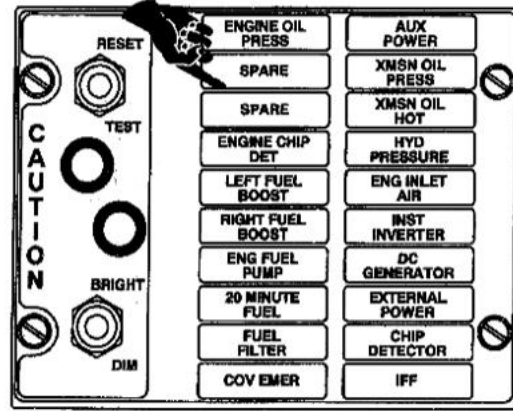
2.6 Fuel System

The lower fuel bladders were exposed. The right-side tank was punctured/breached and no fuel remained. The left tank was intact and contained 5 gallons of recovered fuel. The inspection covers of both lower fuel bladders were removed and visual and tactile inspection of the tanks was conducted. No debris or interior damage to the fuel bladders were identified. The airframe fuel filter bowl was removed, fuel was observed in the bowl, the filter element did not contain any observable debris.

Wreckage recovery personnel reported that at least 25 gallons of fuel was drained from the left tank before the wreckage was transported from the accident scene.

3.0 Cockpit Caution Panel

The caution (annunciator) panel from the accident aircraft was submitted to the Materials Laboratory for examination. The annunciator panel consisted of twenty annunciator lights, two columns with ten lights in each column (Figure 14). Each annunciator light contained two incandescent bulbs. The annunciator panel was partially disassembled to allow for visualization of the individual bulbs within the annunciator lights. The annunciator lights were radiographed to determine the filament status of each of the bulbs within the individual annunciator lights (Attachment 2). The layout of the panel with the filament status for each light is depicted in Table 2. The layout of the panel came from the operations manual and was visually verified by the NTSB laboratory. One annunciator labeled GOV EMER according to the manual drawing for the panel was marked as UNKNOWN due to a missing cover on the annunciator. Four annunciator lights ENGINE OIL PRESS, XMSN [transmission] OIL PRESS, HYD PRESSURE and DC GENERATOR, exhibited hot filament stretching in both light bulb filaments. No hot filament stretching was found in any other light bulb filaments in the accident panel.



CAUTION PANEL

MS026523

Figure 14. The caution panel as recovered from the cockpit instrument panel and a diagram of the typical caution panel layout.

Table 2. Caution panel lightbulb filament documentation

LEGEND:

IS- INTACT, HOT FILAMENT STRETCH PRESENT

INS- INTACT, NOT STRETCHED.

BNS- BROKEN, NOT STRETCHED.

ENGINE OIL PRESS	FUEL LOW
IS IS	BNS BNS
SPARE	XMSN OIL PRESS
BNS BNS	IS IS
SPARE	XMSN OIL HOT
BNS BNS	BNS BNS
ENGINE CHIP DET	HYD PRESSURE
BNS BNS	IS IS
LEFT FUEL BOOST	90 CHIP
BNS BNS	BNS BNS
RIGHT FUEL BOOST	INST INVERTER
INS BNS	BNS BNS

ENG FUEL PUMP	DC GENERATOR
BNS BNS	IS IS
20 MINUTE FUEL	EXTERNAL POWER
INS BNS	BNS BNS
FUEL FILTER	TRANS CHIP
INS INS	BNS BNS
[UNKNOWN/COVER MISSING]	42 CHIP
BNS BNS	INS INS

4.0 Engine

Manufacturer: Textron-Lycoming)
 Model: T53-L-703
 SN: LE-80246
 Manufacture Date: 12-20-1988

4.1 Engine Information

The accident helicopter was powered by a single Ozark Aeroworks LLC (formerly Honeywell, AlliedSignal, and Textron Lycoming) T53L-703 turboshaft engine. The T53L-703 is an upgraded variant of the T53L-13B, capable of 1,800 horsepower. It has a five-stage axial and single-stage centrifugal compressor, with an external annular combustion chamber, a two-stage gas producer (GP) turbine and a two-stage power turbine (PT) (Figure 16). The power shaft, which drives the reduction gearbox through the output shaft, rotates clockwise aft looking forward (ALF), the compressor rotates counterclockwise ALF, the GP rotates counterclockwise ALF, and the PT rotates clockwise ALF.

The engine logbook recorded that the engine had undergone an oil over temperature inspection (873.1 hours time since new (TSN)) on August 1, 2018, and a sudden stoppage inspection (TSN 1,506.1 hours TSN) on December 22, 2021. Both inspections were performed by Ozark Aeroworks, Springfield, Missouri. Total engine was 1,812.4 hours TSN at the time of the accident.

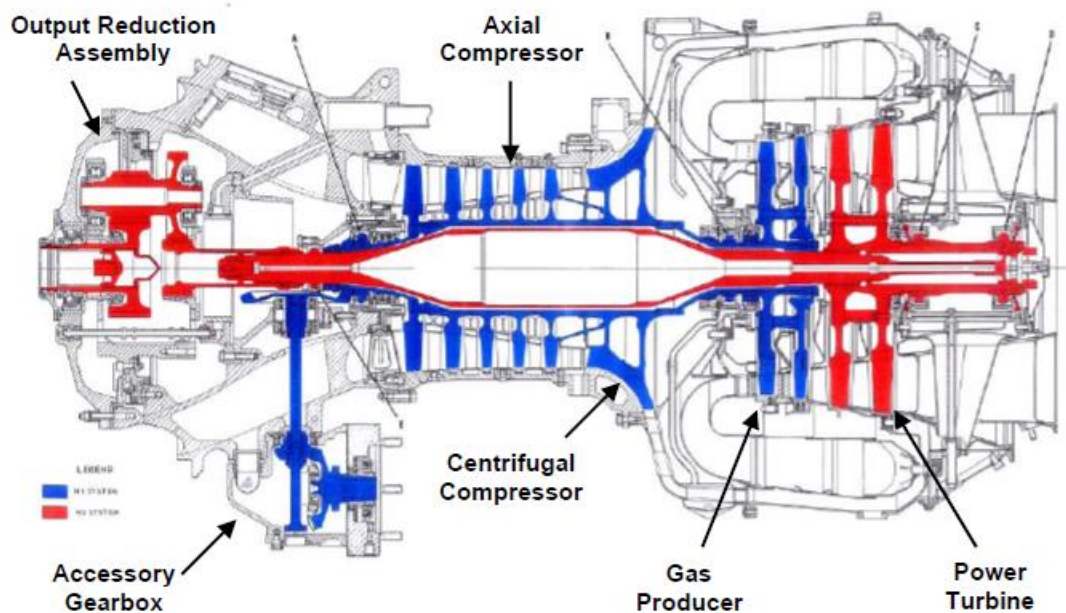


Figure 15. T53 N1 (gas producer (GP)) and N2 (power turbine (PT)) spool illustration.

4.2 Engine Examination

The engine sling was placed on the engine and then hoisted up for examination purposes (Figure 17). N2/PT (power turbine section) was smooth with free rotation when turned by hand. Continuity was confirmed through to the output shaft. No visual damage or defects were noted on the 2nd stage power turbine blades when looking through the engine exhaust. Looking through the inlet, foreign debris was found, and the 1st and 2nd stage compressor blades exhibited foreign debris damage (FOD). The debris in the inlet was left in place. The compressor (N1) did not rotate using the N1 tach drive on the accessory gearbox. The accessory gearbox chip detector was clean of debris. Captured and retained oil from the accessory gearbox contained no debris or contamination. The oil pump housing exhibited impact damage (Figure 18). The fuel control unit (FCU) pointer was observed in the max (maximum) power position; however, the linkages were fractured, and the pointer was free and easily moved. The fuel control strainer/filter was clean, with no observed contamination, and the sample was retained. The inlet guide vanes (IGV) manifold lines were disconnected, and a fluid (fuel) sample was retained. The FCU was detached from the engine and the main drive shaft splines were inspected; no defects were noted. Fuel was present in all lines when disconnected including fuel nozzle lines. The FCU was reinstalled onto the engine for transportation purposes.



Figure 16. Accident engine hanging from the hoist.

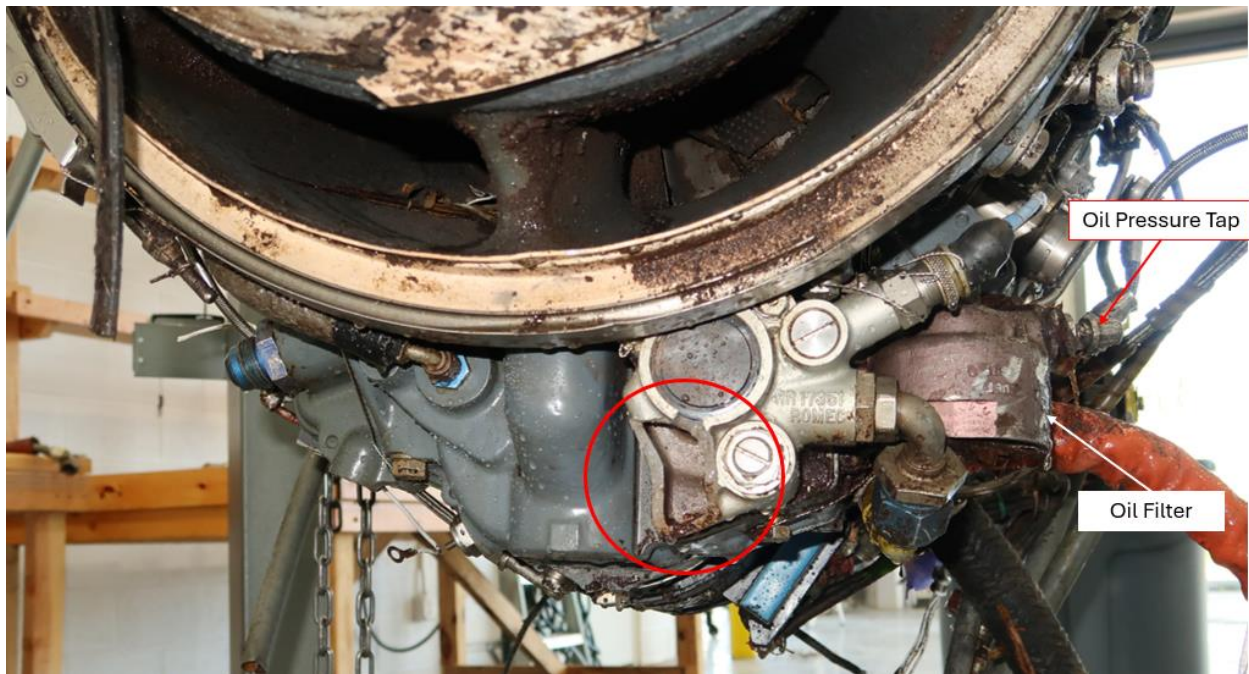


Figure 17. View of the lower front of the engine. Damage to the oil pump circled in red.

4.3 Engine Teardown Examination

On November 30, 2023, the engine was examined at Ozark Aeroworks, Springfield, Missouri, by the NTSB and technical representatives of Ozark Aeroworks.

Table 3. Engine Data Tag Information

Honeywell Data Tag Information:	Ozark Aeroworks Data Tag Information:
T53-L-703 SN: LE-80246 Contract No. DAAJ09-86-A270 MFR Model No. LTC1K-4G Accepted: 12.20.88 LB FT TOR vs PSI: 1125 vs 61.7	RPR Date: 07.31.2018 TSN: 870.1 1125 LBFT TQ @ 61.4 psi 875 LBFT TQ 47.5 Max RPM STD DAY 99.3 Max TO EGT STD DAY 1394

The engine was mounted on an adjustable engine stand (Figure 19). The combustor turbine section was removed. Metal spray was observed on the 2nd stage gas producer (GP) rotor assembly and turbine nozzle. Metal and organic debris was found in the 1st GP nozzle curl. The debris was probed with a magnet and ferrous material was collected. When the engine was rotated via the engine stand, the GP turbine freed up and could be rotated by hand. The accessory gearbox was removed from the engine case. Drive continuity was confirmed between the compressor drive gear to the accessory gearbox. The accessory gearbox input shaft was turned by hand with some stiffness. The engine oil pump was removed, and external impact damage was observed. The oil pump input drive shaft was very stiff to operate by hand. Once the oil pump was removed, the accessory gearbox gears rotated freely with no binding. All accessory gearbox drive pads (fuel control, start generator, tach generator) had drive continuity. The compressor/GP section rotated freely by hand.



Figure 18. Accident engine installed on the engine stand for examination.

The compressor housing and impeller housing halves were removed, and the compressor stators and all blade stages of the compressor rotor were exposed. There was leading edge tip damage and trailing edge damage observed on most stator nozzles and rotor blades. The impeller had light FOD damage to the leading edges. There was a light impeller rub mark identified on the impeller housing. Light weight debris of a metallic and organic nature was observed between the compressor stages. The 2nd stage GP rotor assembly was removed and no FOD damage was observed; however, metal spray was observed on the rotor disk blades leading edge and convex (suction) surfaces. The 2nd stage GP nozzle assembly was removed and no FOD damage was evident; however, metal spray was observed on the trailing edge convex surface. One 2nd stage nozzle airfoil had been blended. The 1st stage GP rotor assembly was removed. No noticeable FOD damage was observed to the leading edge of the nozzle vanes. Extensive metal spray on the back/concave side of the nozzle vanes was observed (Figure 20). Numerous 1st stage GP blades had leading edge FOD damage (Figure 21) and the blade concave trailing edges exhibited metal spray. The air deflector was undamaged. The power turbine section rotated freely, no

rubbing or FOD damage was identified. The fuel nozzles had normal operational wear signatures.

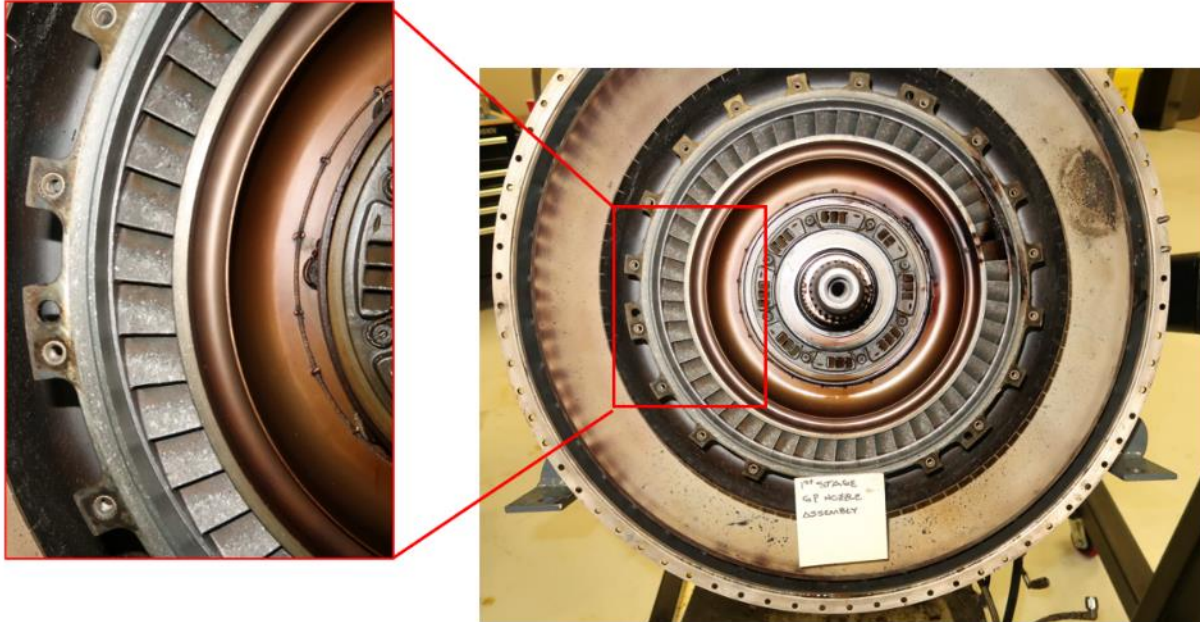


Figure 19. 1st stage gas producer nozzles exhibiting metal spray collected on the nozzle surfaces.

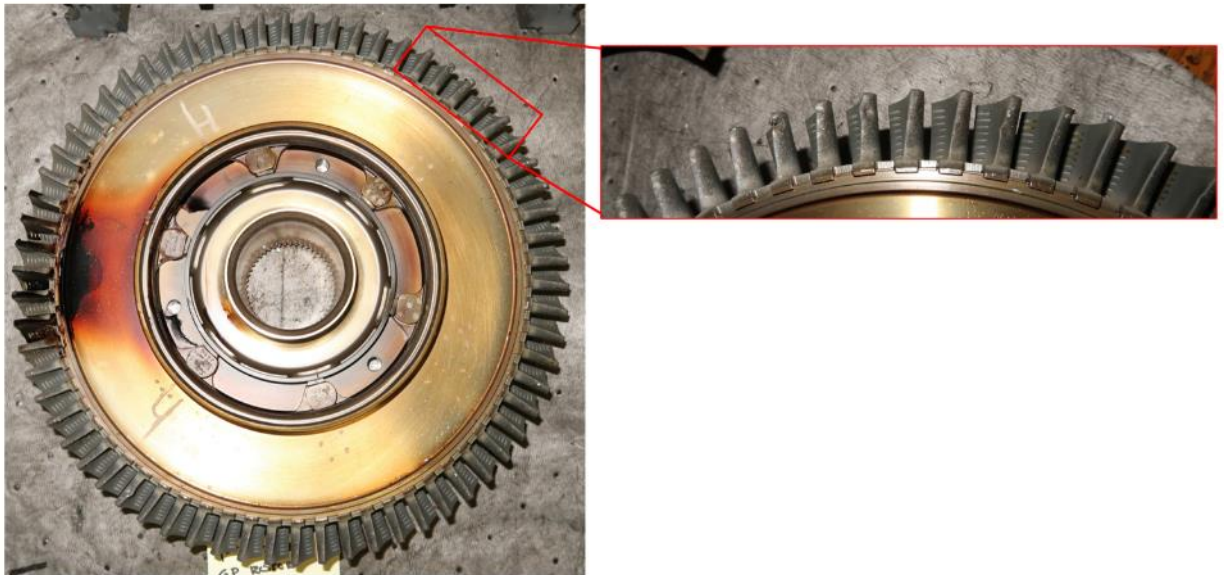


Figure 20. 1st stage gas producer rotor exhibiting FOD.

4.4 Fuel Control Unit (FCU) Examination and Testing

FCU model TA-7, SN: 100770 A6, was removed from the engine and tested separately (Figure 22).

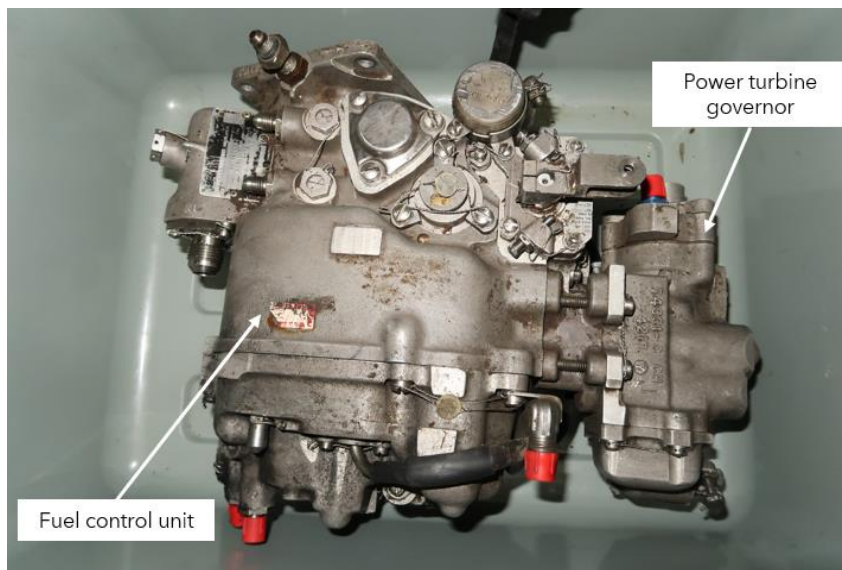


Figure 21. Fuel control unit with power governor attached.

The main inlet fuel filter was checked for debris or blockages, and none were observed. The main fuel filter element was checked for debris or blockages with none observed. The FCU was mounted in the test fixture on the calibrated test bench. Upon the initial application of fuel to the FCU, a fuel leak from the power turbine (PT) governor body was observed. When setting the initial test bench conditions and FCU to standard test conditions, fuel flow was observed as 270 pph (pounds per hour) at 4200 rpm input, the normal value should be 930 pph, at 4200 rpm input. The test set up was double checked and the setup was retested, fuel flow remained 273 pph. The emergency mode (bypasses the metering function) was tested at 4200 rpm input and flow rate was 200 pph (normal is 200-210 pph). The governor was removed from the FCU body. The governor plunger was fully extended and not movable by hand. A factory provided governor simulator was installed on the FCU body and testing continued within normal operational parameters (Attachment 1).

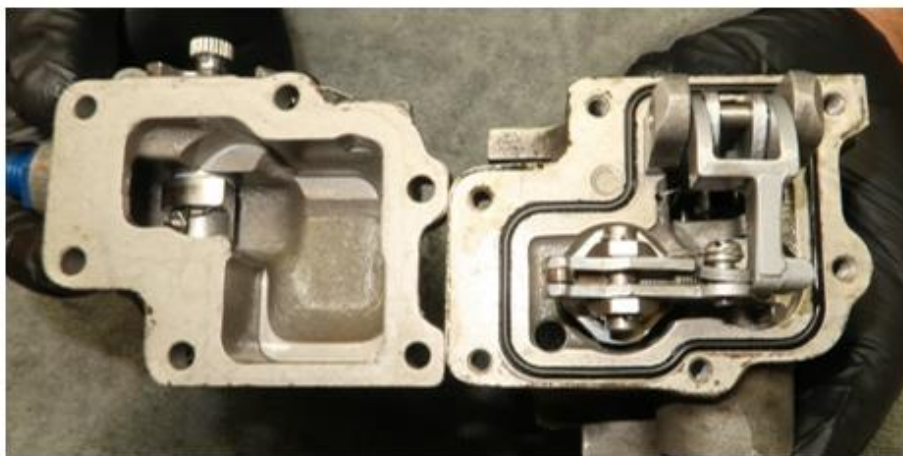


Figure 22. Power turbine governor.

The FCU power turbine (PT) governor examination was conducted next (Figure 23). All safety wire was present and intact. The end cover of the PT was removed to reveal the guide assembly. The guide assembly stack up was disassembled. Stack up elements were all present and no unusual wear was observed. The fly weight cover plate and bearing were removed. Examination of the fly weight (Figure 24) showed it was free to move, no binding, and the fly weight sapphire bearing was chipped at one corner. The serialized valve and sleeve moved freely, no binding. No scoring or other wear marks on the slide or metering edges were observed. The serial numbers matched: 72-565. The fly weight assembly yoke and pin moved freely. No unusual wear was identified. The fly weight base had been displaced away from the housing by 0.0635 inch from nominal. The piston rod was fully down (not the usual position for this item). The carbon seal in the plate and bearing assembly was observed pushed flush to the housing. It normally has a raised lip measuring around 0.032 inch (proud). A witness mark was identified on the interior lower cover opposite of an external impact witness mark. The misalignment of carbon seal was the likely source of the fuel leak identified while the unit was pressurized on the test fixture.

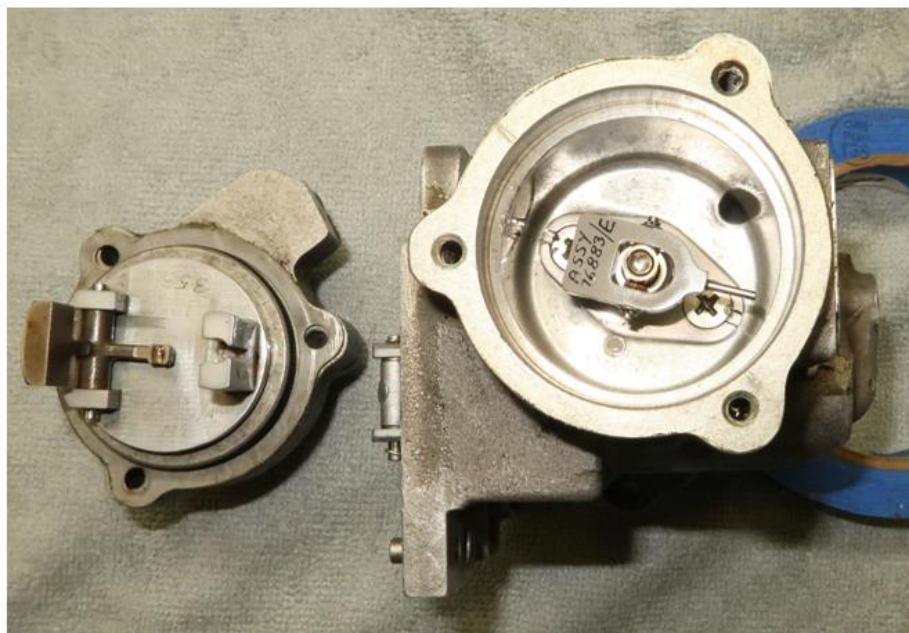


Figure 23. Fly weight and yoke assembly.

5.0 Maintenance Records Review

Table 5 lists the significant maintenance recorded in the airframe and engine maintenance logbooks for the 4 months (130 hours) prior to the accident.

Table 4. Recorded maintenance activity.

Date	Hobbs	ACTT	Maintenance Activity
4/1/2023			Isolar annual inspection.
6/7/2023	3,094.50	8,113.50	Phase 1-6. 300 hr spar inspection. 150 hr firewall inspection

7/3/2023	3,103.10	8,122.10	Installed isolair spray tank & Kawak drive shaft.
7/7/2023	3,119.90	8,138.90	Removed and replaced loose rivets on left and right vertical fin aft of spar. Fabricated new doubler.
7/11/2023	3,125.90	8,144.90	Removed and replaced hard point mount FS 84.5 with serviceable part.
7/13/2023	3,134.90	8,153.90	Pilot's upper forward door frame doubler cracked. Fabricated new doubler.
7/18/2023	3,175.90	8,194.90	Torque gauge erratic. Cleaned electrical connections.
7/28/2023	3,223.20	8,242.20	Removed and replaced oil cooler blower and bearings.
7/30/2023	3,224.70	8,243.70	Performed track and balance.

E. LIST OF ATTACHMENTS

Attachment 1 - Radiograph images of the caution panel light bulbs.

Attachment 2 - Fuel control test data sheet.

Attachment 3 - Flight control servo test data sheets and hydraulic fluid analysis.

Submitted by:

Van S. McKenny IV
Aerospace Engineer (Helicopters)

FACTUAL REPORT - ATTACHMENT 1

Radiograph images of the caution panel light blulbs

AIRWORTHINESS

CEN23FA340



42 degree gear box chip lights

5000 μm 80 kV 120 μA Z0x-ray 01
User: ???

Part01

2023.09.05 16:36



42 degree gear box chip light

1000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:29



90 degree gear box chip lights

5000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:30



90 degree gear box chip 1

1000 μ m

80 kV 120 μ A Z0

x-ray 01
User: ???



90 degree gear box chip 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:31

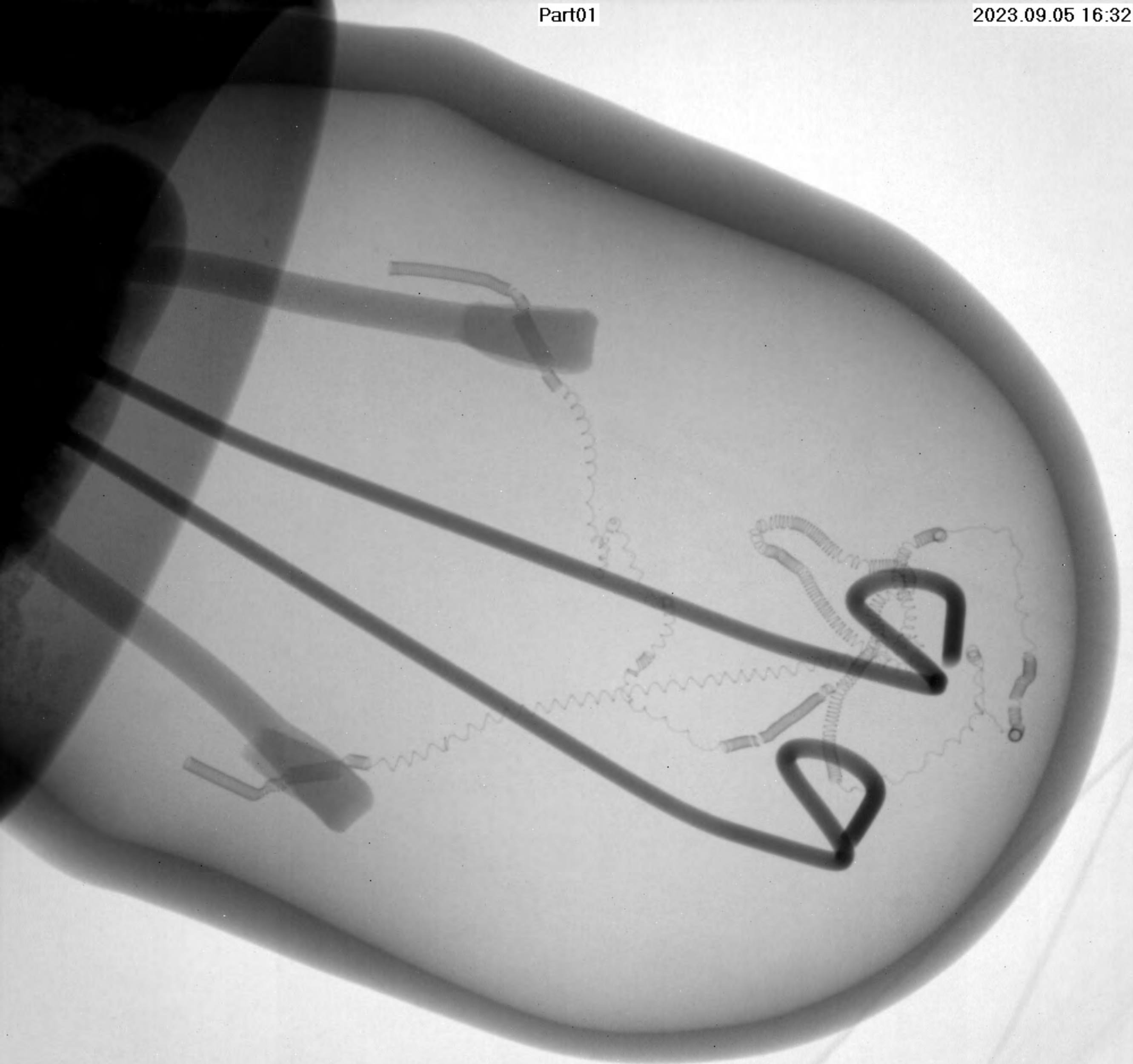


DC Generator lights

5000 μ m

80 kV 120 μ A Z0

x-ray 01
User: ???



Part01

2023.09.05 16:33

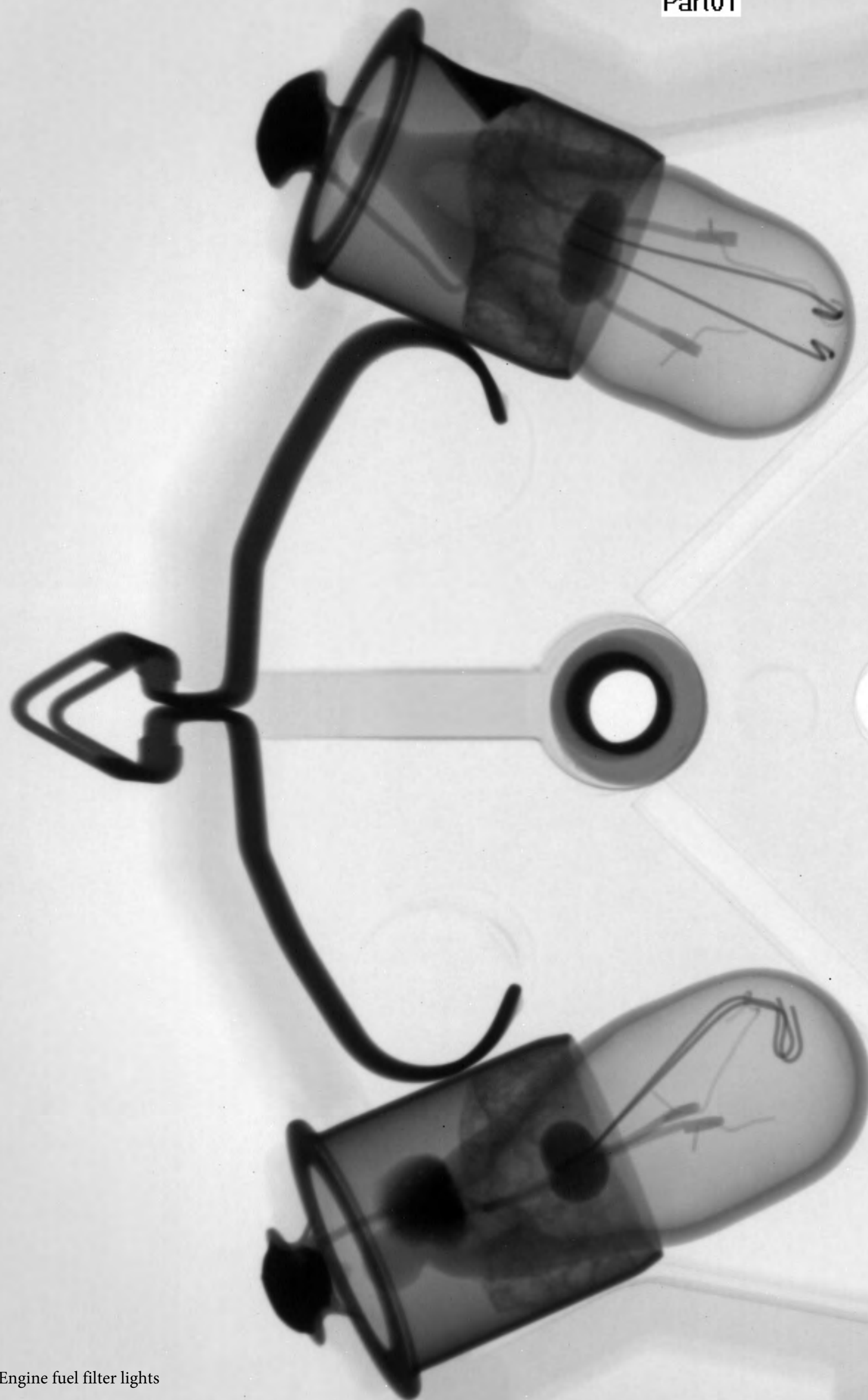


DC Generator light 2

1000 μm

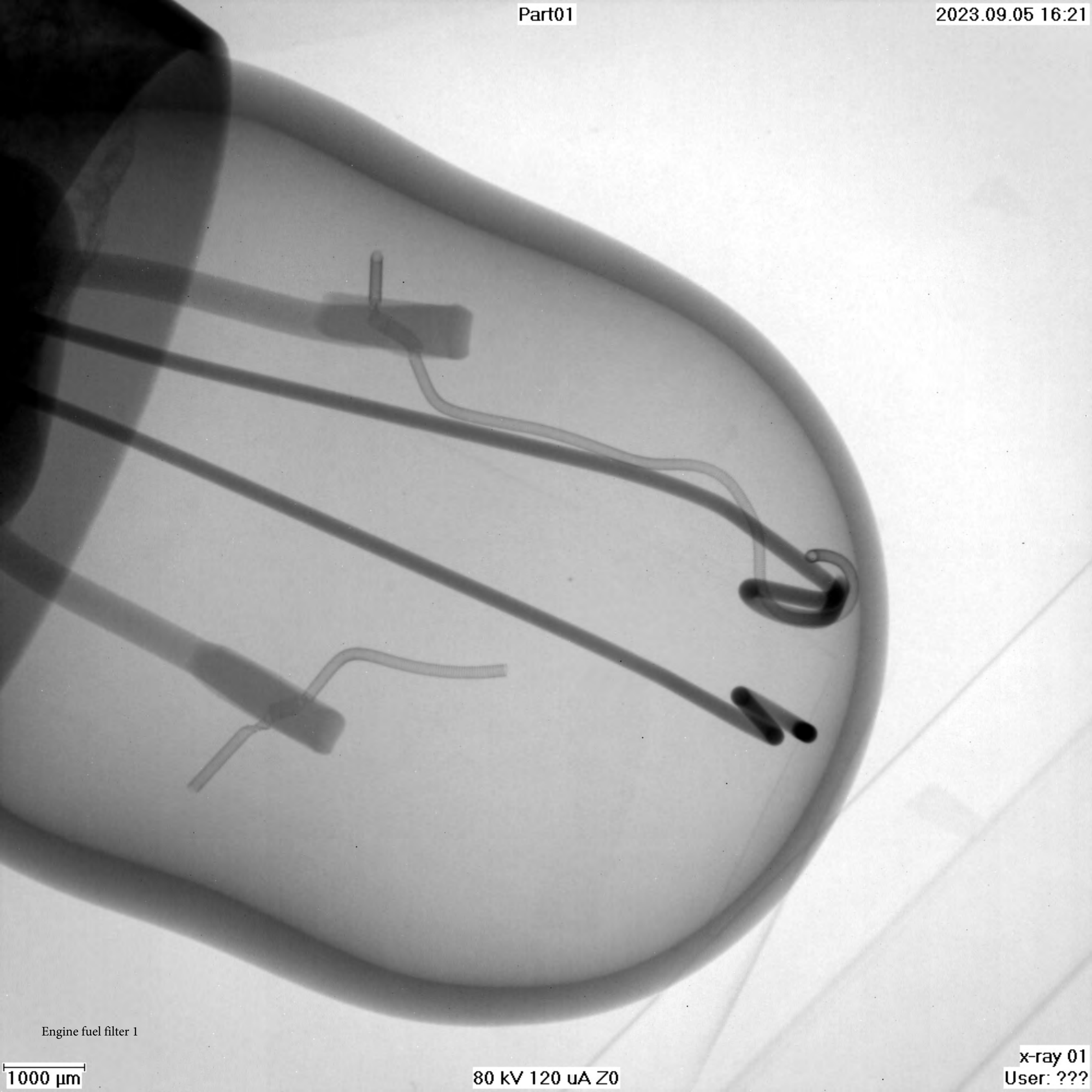
80 kV 120 uA Z0

x-ray 01
User: ???



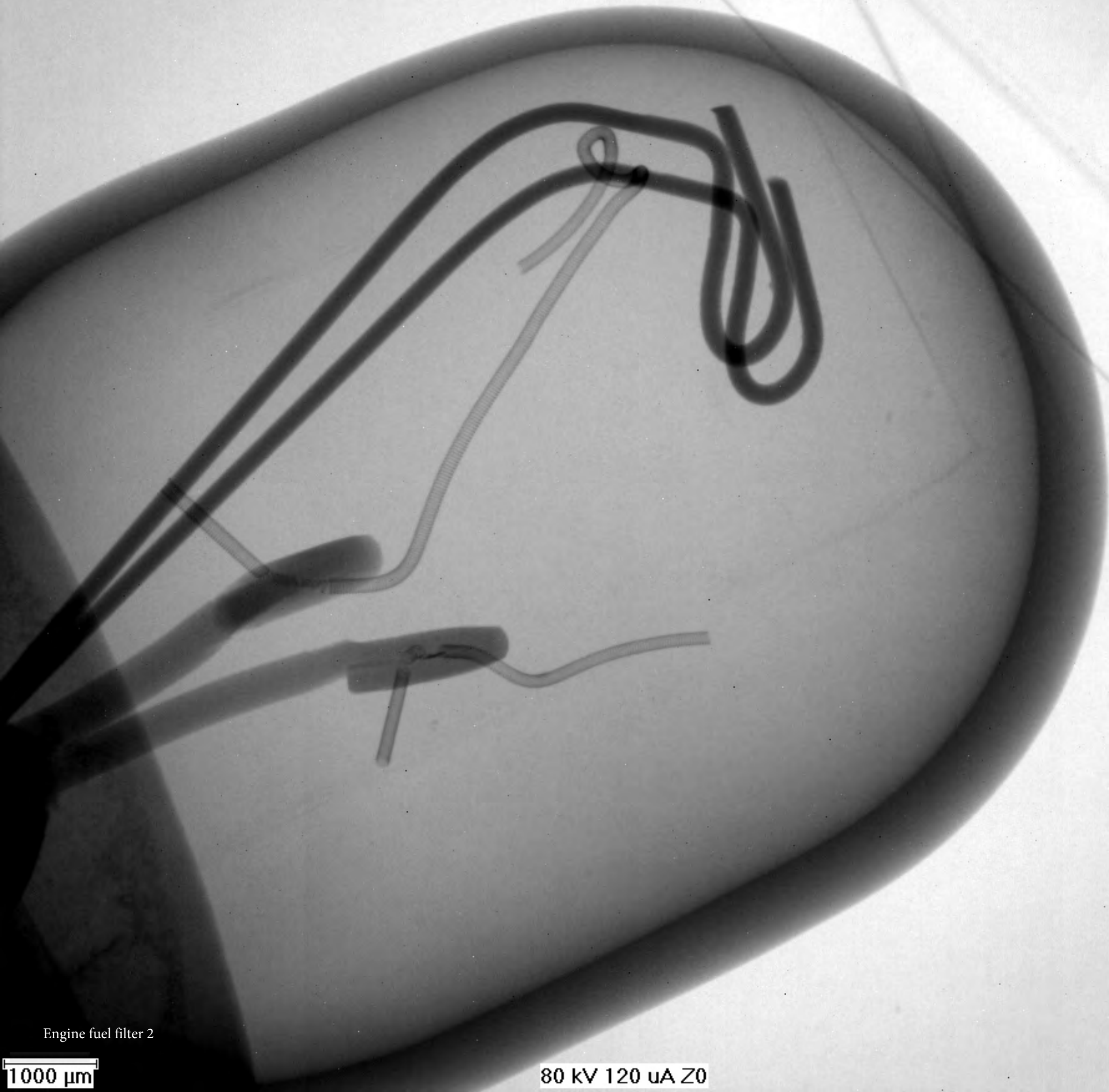
Engine fuel filter lights

5000 μm 80 kV 120 μA Z0x-ray 01
User: ???



Engine fuel filter 1

1000 μm 80 kV 120 μA Z0x-ray 01
User: ???





Engine fuel pump lights

5000 μm 80 kV 120 μA Z0x-ray 01
User: ???

Part01

2023.09.05 16:18



Engine fuel pump 1

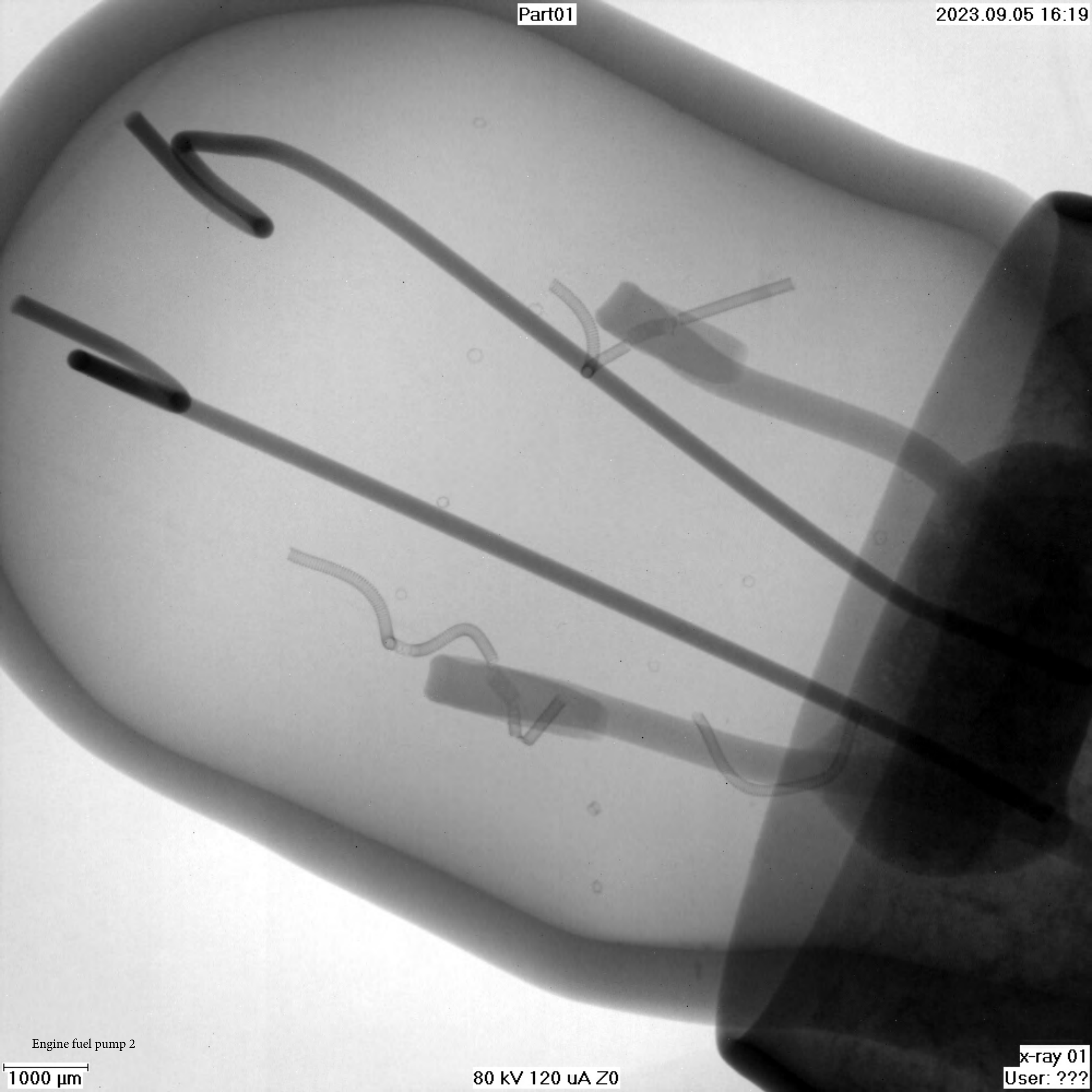
1000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:19



Engine fuel pump 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

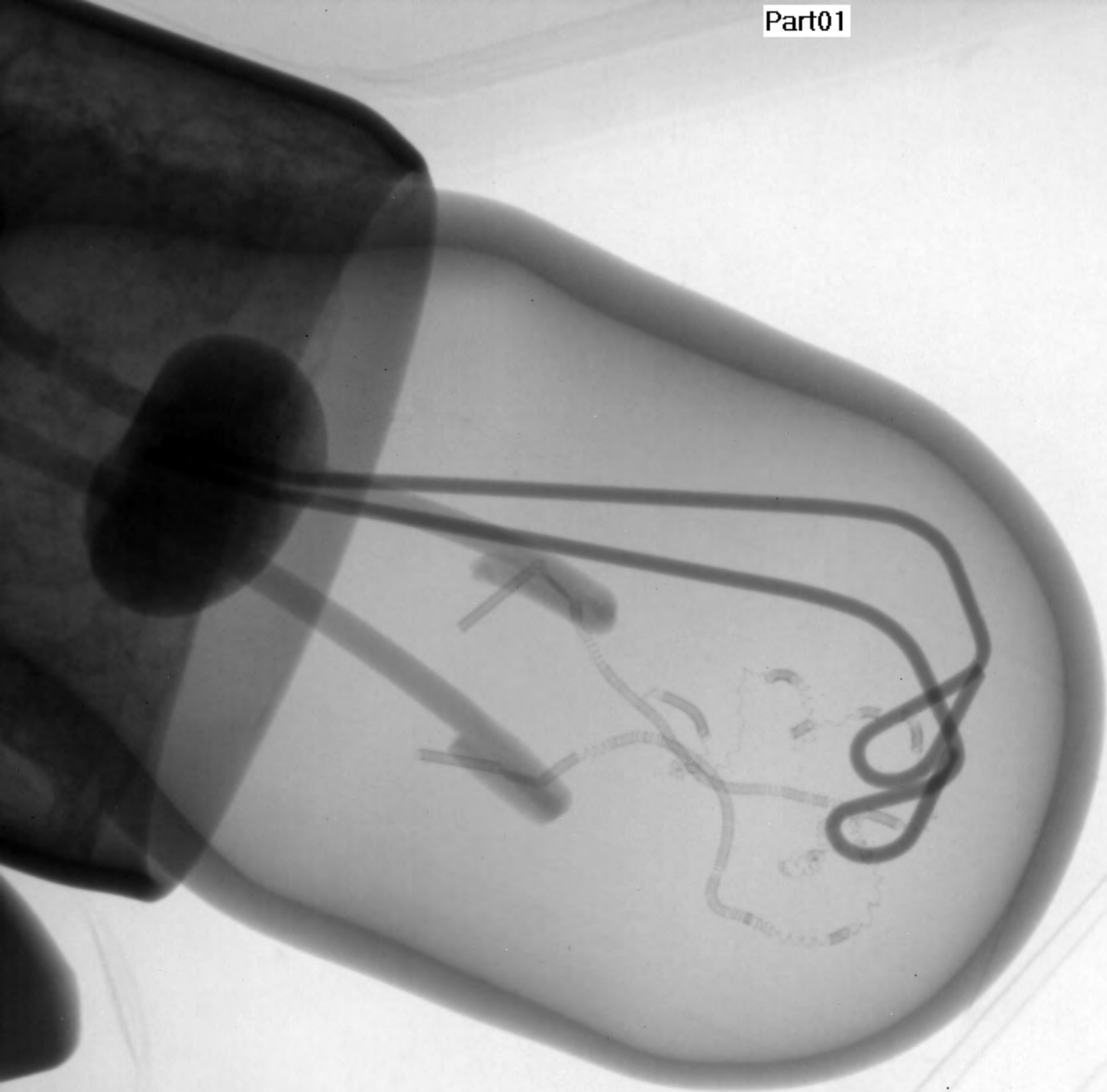


Engine oil pressure lights

5000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

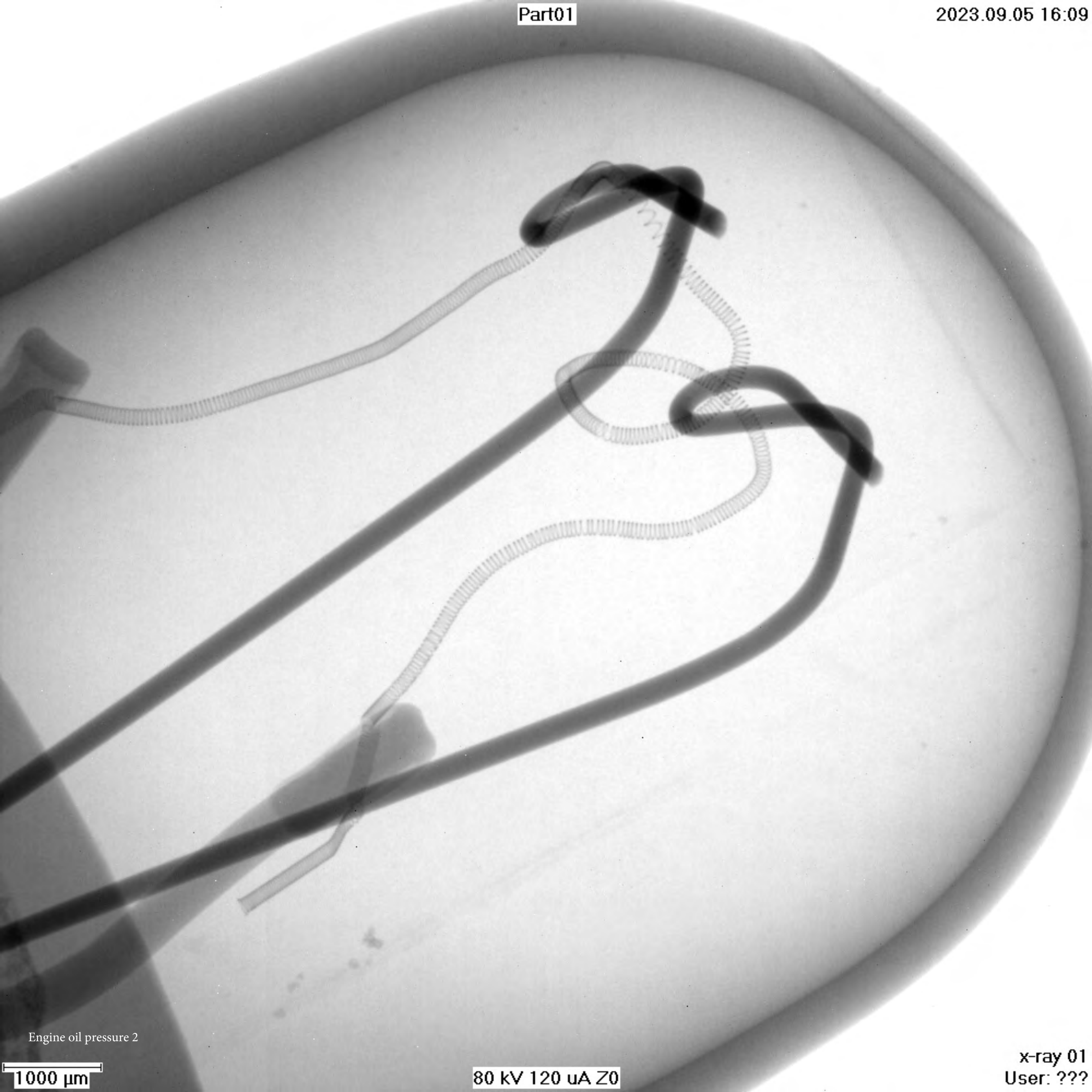


Engine oil pressure 1

2000 μm 80 kV 120 μA Z0x-ray 01
User: ???

Part01

2023.09.05 16:09



Engine oil pressure 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:26



Hydraulic pressure lights

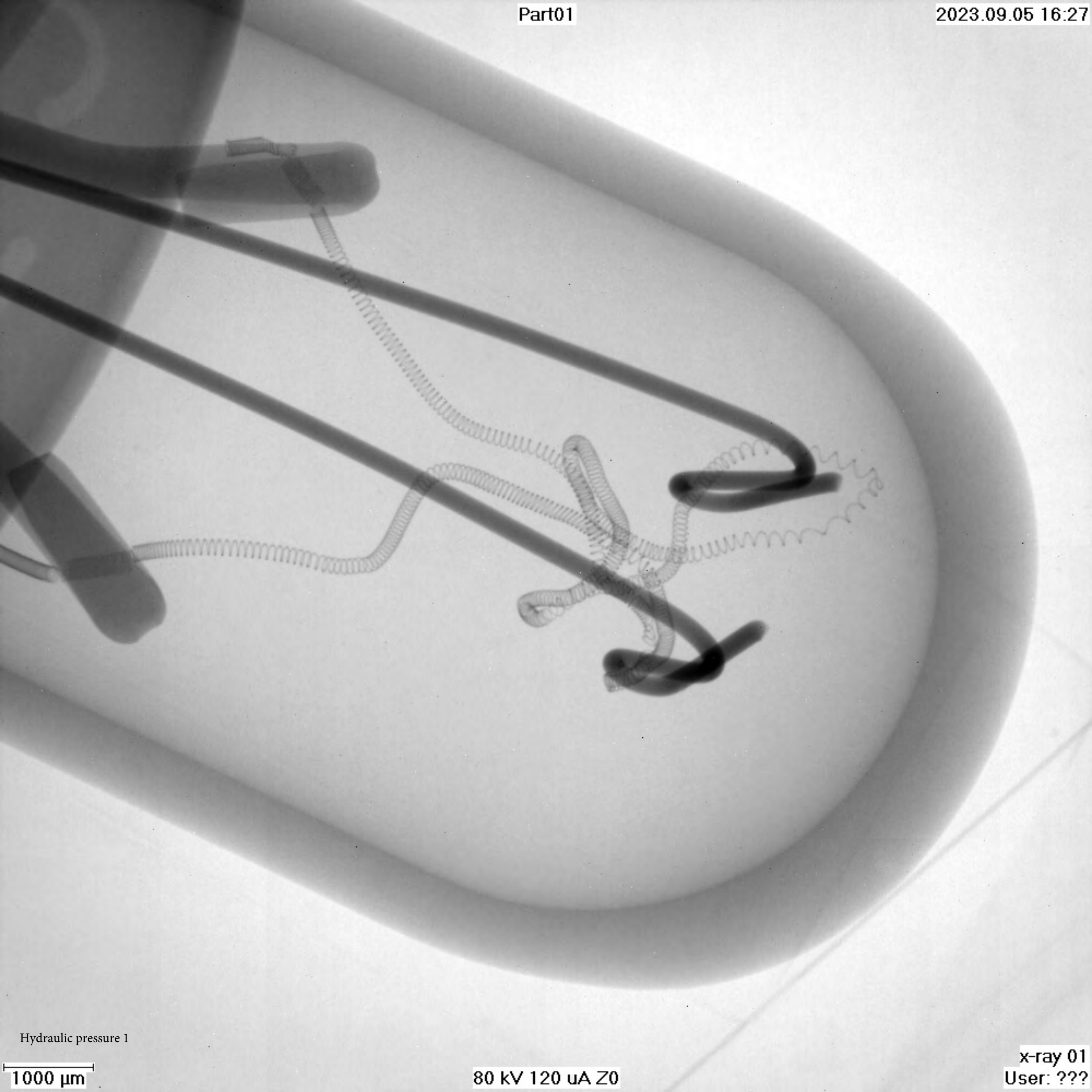
5000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:27



Hydraulic pressure 1

1000 μm

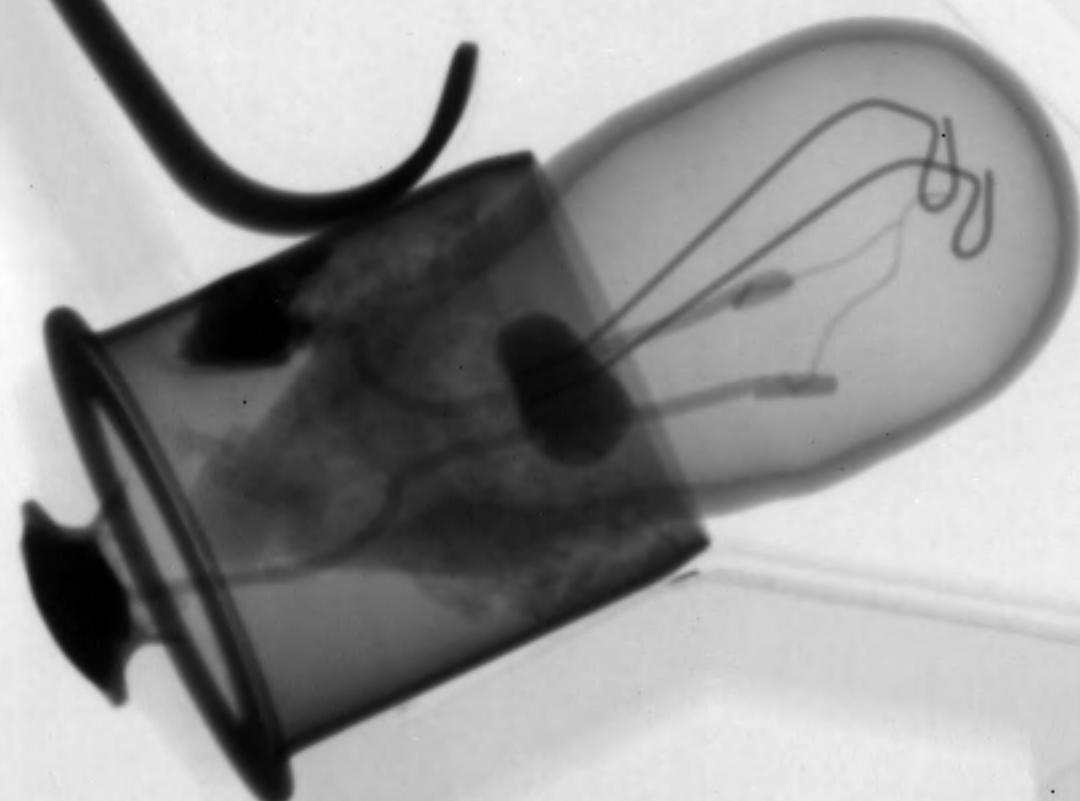
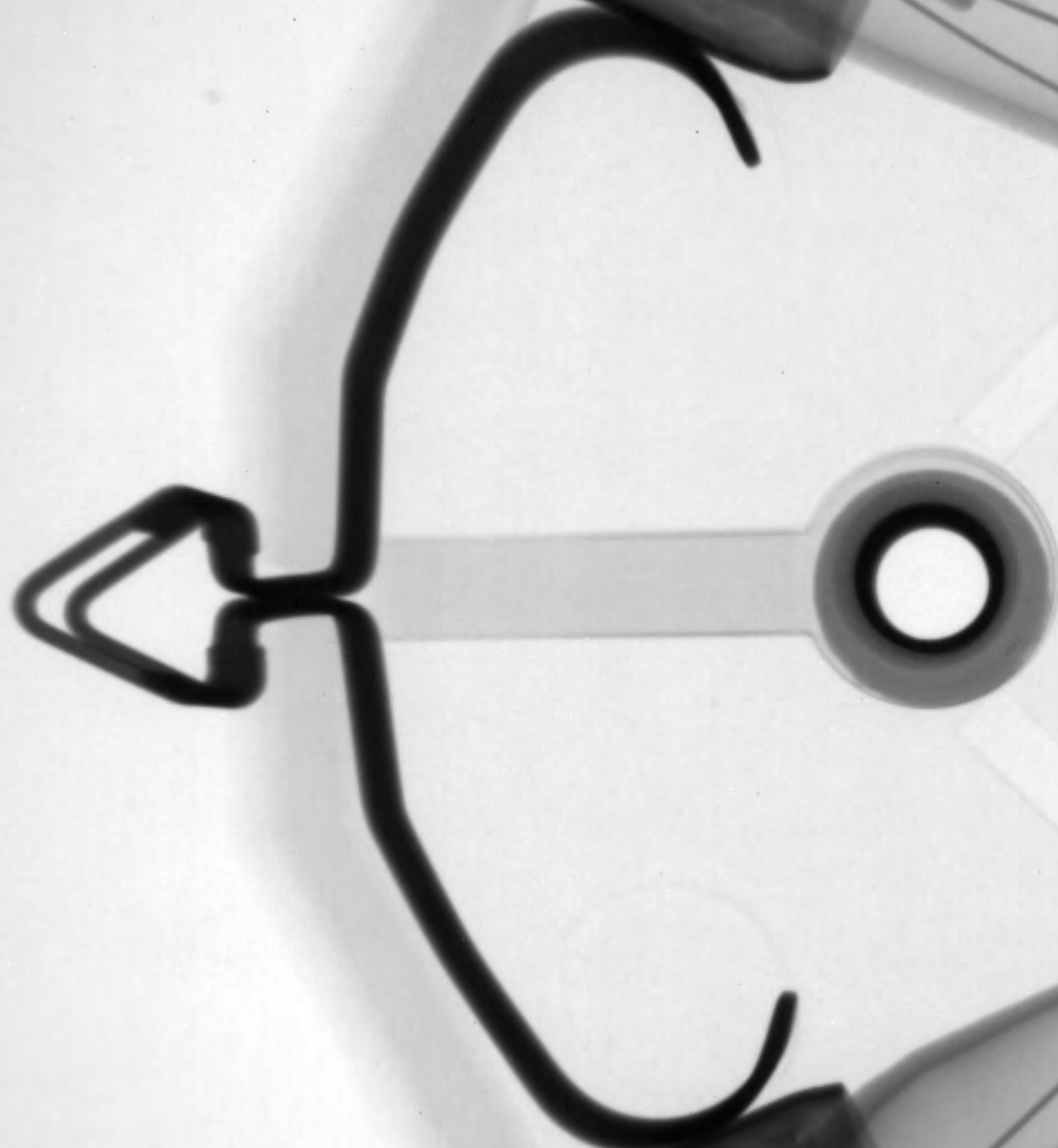
80 kV 120 μA Z0

x-ray 01
User: ???



Part01

2023.09.05 16:13



Left fuel boost lights

5000 μ m

80 kV 120 μ A Z0

x-ray 01
User: ???



Left fuel boost 1

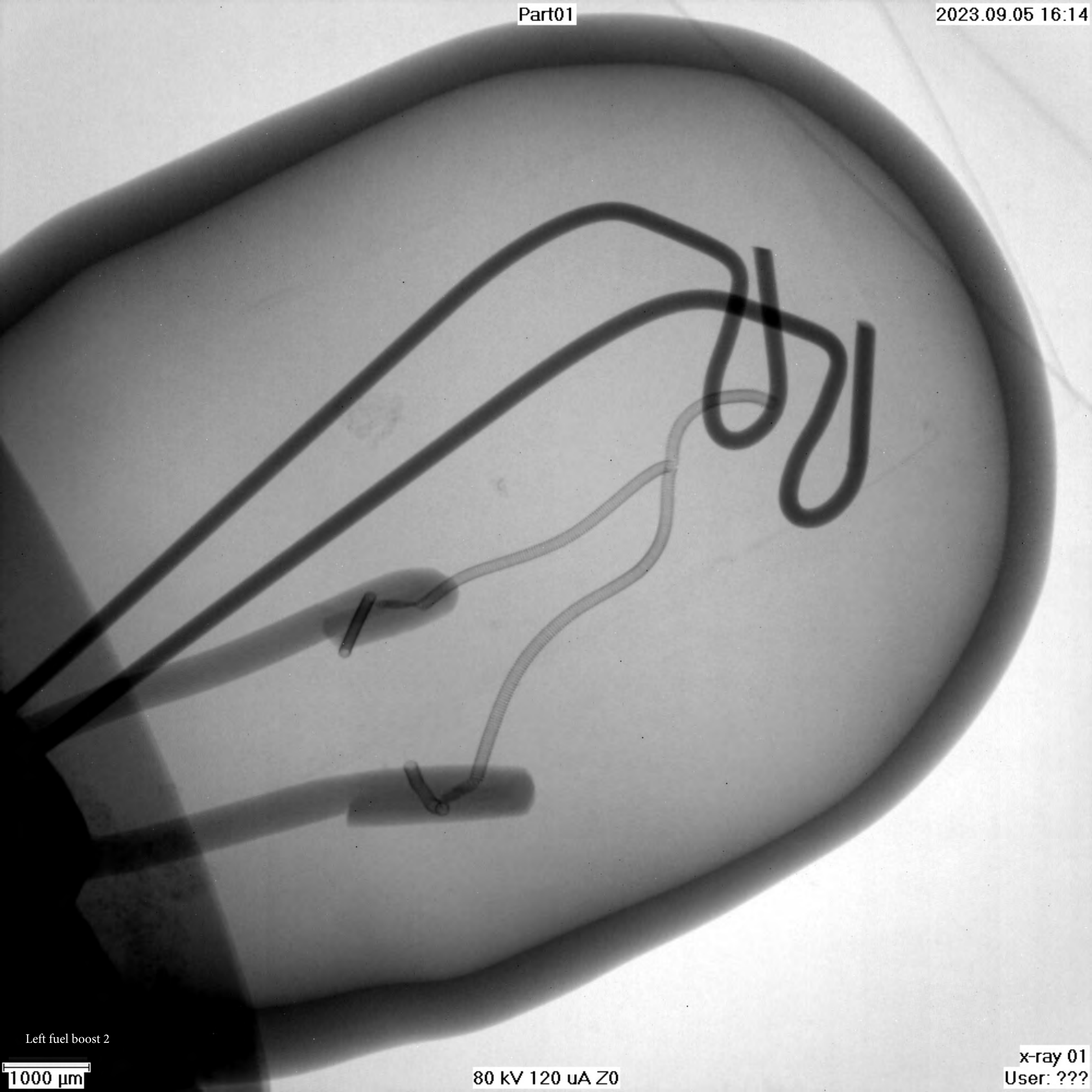
1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:14



Left fuel boost 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???



Right Fuel boost lights

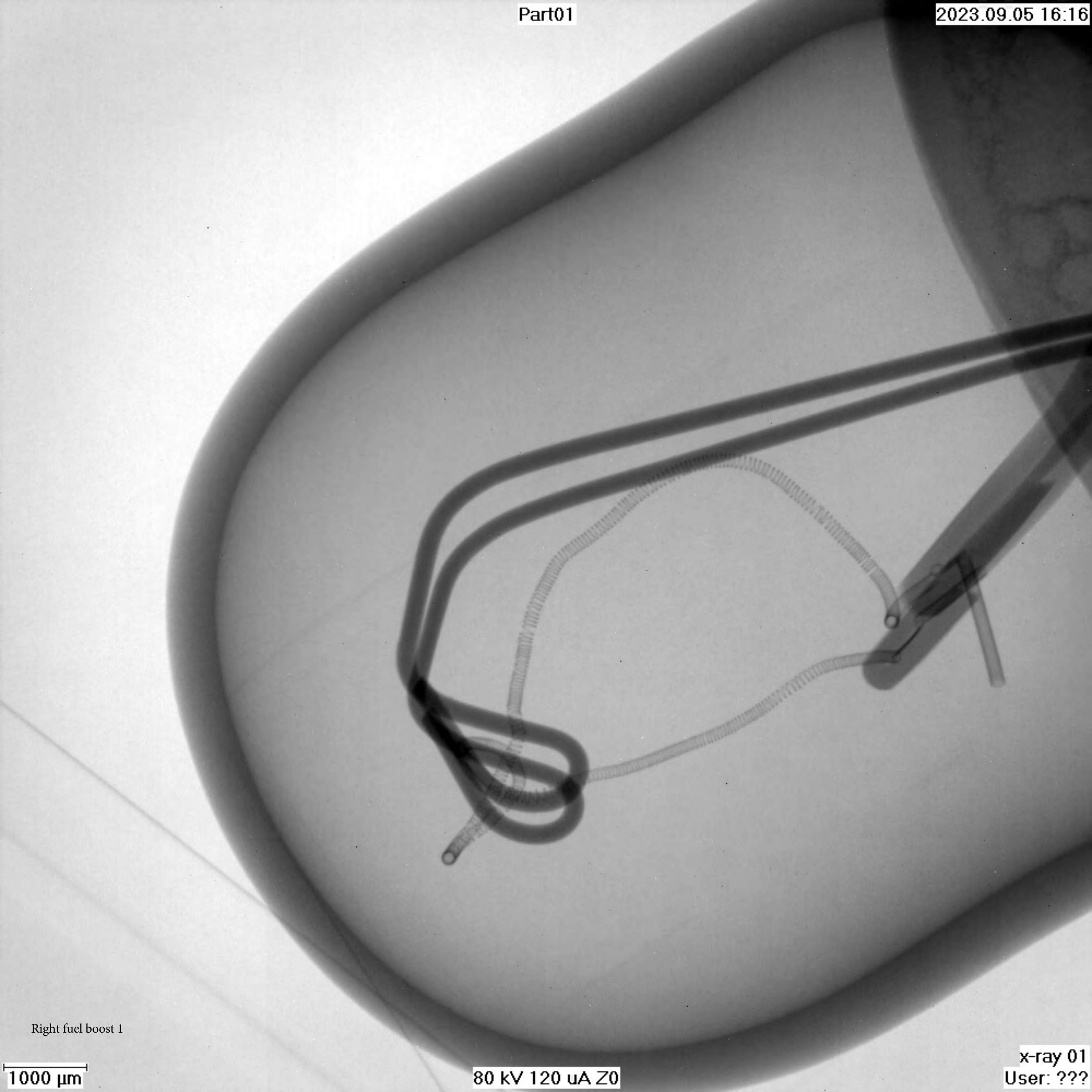
5000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:16



Right fuel boost 1

1000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:17



Right fuel boost 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:34

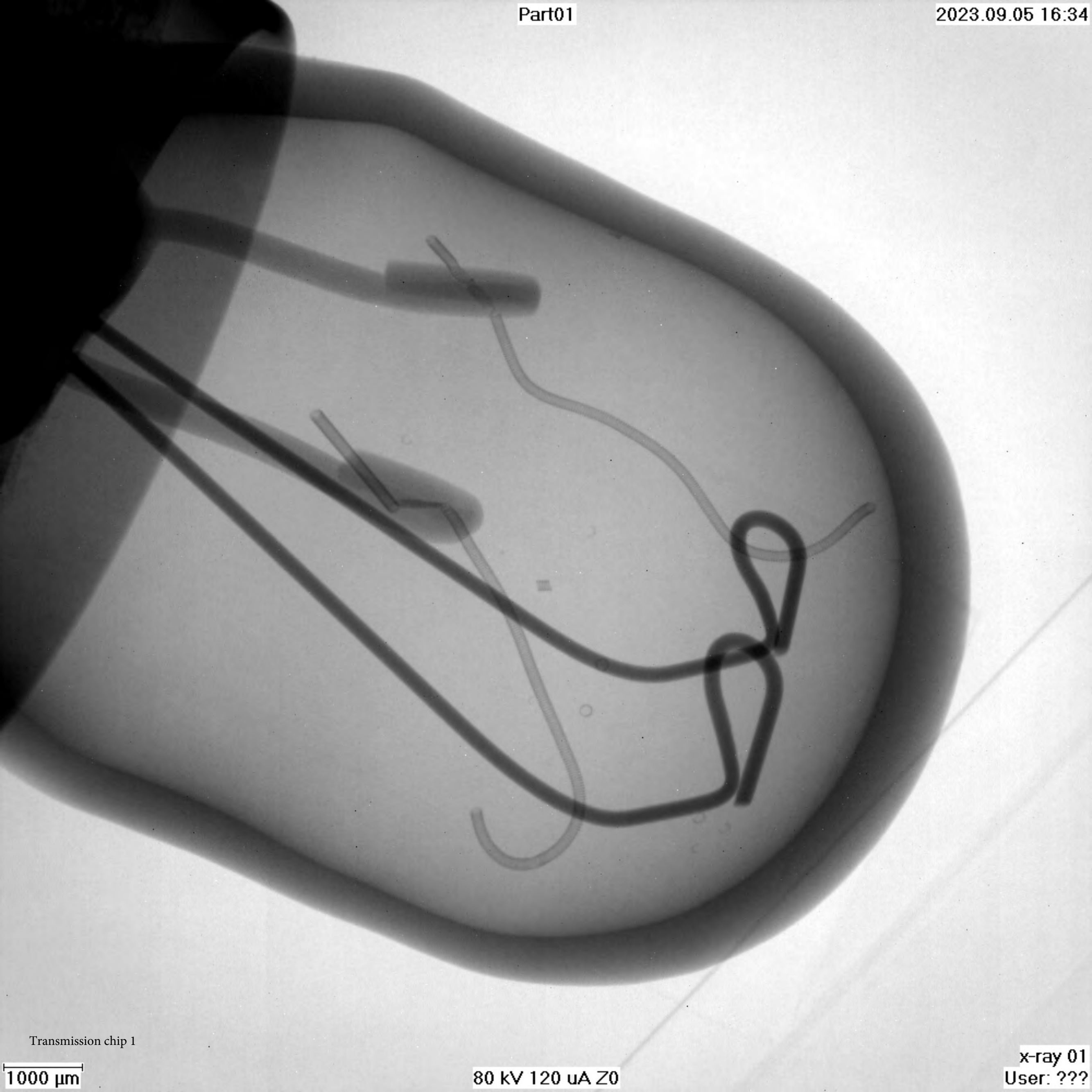


Transmission chip lights

2000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

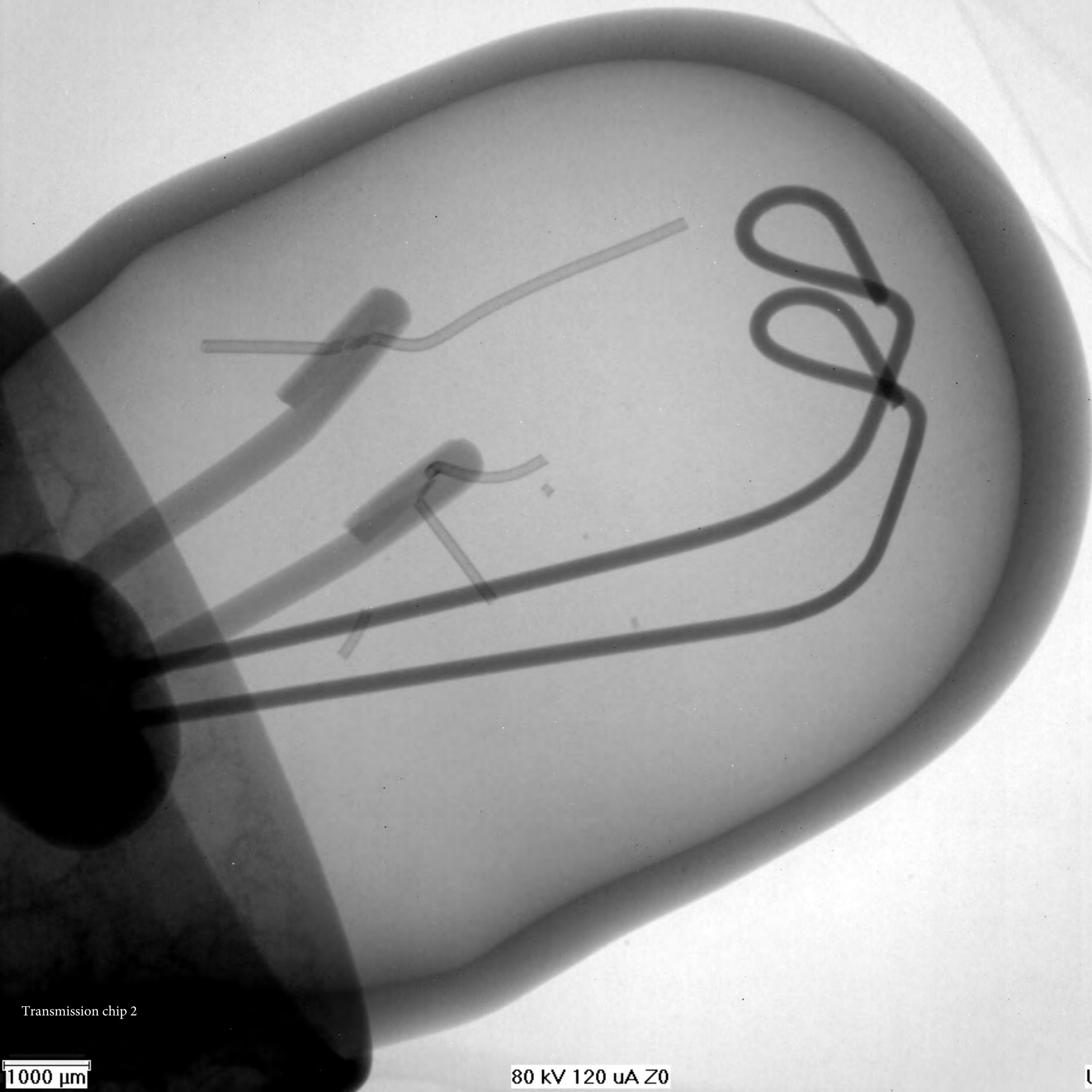


Transmission chip 1

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???

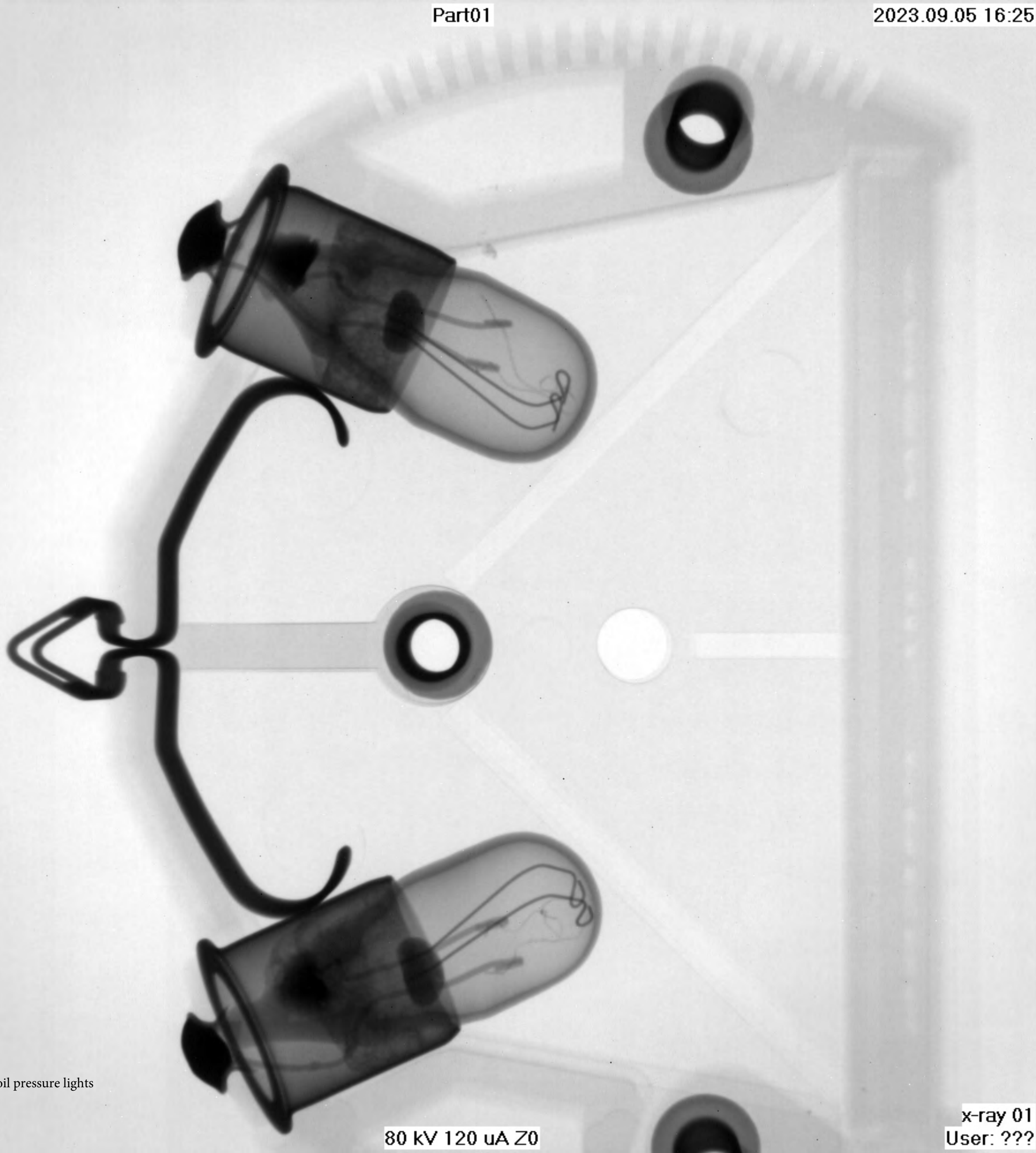


Transmission chip 2

1000 μm

80 kV 120 uA Z0

x-ray 01
User: ???



Transmission oil pressure lights

5000 μm 80 kV 120 μA Z0x-ray 01
User: ???

Part01

2023.09.05 16:24



Transmission oil pressure 1

1000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

Part01

2023.09.05 16:25



Transmission oil pressure 2

1000 μm

80 kV 120 μA Z0

x-ray 01
User: ???

FACTUAL REPORT - ATTACHMENT 2

Fuel Control Unit (FCU) test data sheets

AIRWORTHINESS

CEN23FA340

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: AI1009

TASK	TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
Date: <u>11-29-23</u> Part List: <u>100770A6</u> Operator: <u>[REDACTED]</u>	NOV 29 2023 [REDACTED]	
Test Performed I.A.W.: <u>73-20-03</u> Stand: <u>LTCT 319</u>		

GENERAL

- Service limits in this section can be used for a second source testing and service evaluation of field returned units. Service limits are not to be used for overhaul or reconditioning. All overhaul requirements apply during service testing except for the service limits included in this section. Service limits are used stated above to eliminate minor test equipment correlation problems. Units meeting service testing requirements are considered functionally serviceable with accrued service time. They may not be zero timed.
- On units meeting service testing and local inspection and quality requirements, it is recommended that information pertinent to the following areas be reviewed and evaluated prior to release of unit for reinstallation on engine:
 - Consideration of remaining serviceable time
 - Physical condition and seal integrity
 - Evidence of internal contamination
 - Fuel control log entries
 - Service data
 - Data on suspected problem areas

STANDARD SETTINGS AND CONDITIONS

- The following conditions must be set and maintained during final test procedures, unless otherwise specified:

N ₁	Limits per test requirements ± 4 RPM
P _B	4 ± 2 PSIG
P ₁	29.92 ± 0.05 inches of mercury (Hg) absolute
P _N	200 ± 20 psig (1379 ± 137.9 kPa) at 300 ± 10 psig at 900 pph
Quad	100 ± 0.5 degrees, using test quadrant STD62480
T ₁	$59 \pm 3^{\circ}\text{F}$
W _f	Limits per test requirement
IGV Lever	For units with IGV indicator plates, at 60 degree or greater mark. For units without the IGV indicator plate, between CCW position and horizontal position
Solenoid	In automatic system operation position
Igniter Line	Line closed
Fuel Inlet Temperature	65° to 85°F
Test Fluid	Calibrating fluid, Type 2 (ref. MIL-PRF-7024, Type II)

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: A11009

TASK	TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
SERVICE LIMITS TESTING		
1. Conduct service limits test procedures under the same conditions, and in the same manner as final test procedures found in the Final Test Data Form, OAW-F-200-058. The following tests differ from those in the final test procedures as indicated, except for air-bleed limits. They are the same as in the Final Test Data Form, OAW-F-200-058.	NOV 29 2023	
2. Preliminary Leak Test (with governor mounted on regulator)		
A. Reduce outlet pressure (P_N) to zero by shutting down N_1 drive and N_2 drive. Set inlet temperature at 55°F to 85°F.	NOV 29 2023	
B. Increase inlet pressure (P_B) 45 to 50 PSIG. Measure leakage at N_1 and N_2 seal drains during several one-minute periods.	NOV 29 2023	NOV 29 2023
C. Set N_1 speed at 4300 RPM and N_2 speed at 4600 RPM, with inlet pressure (P_B) at 45 to 50 psig. Close the throttling valve to obtain 600 to 620 PSIG. Measure discharge pressure leakage at N_1 and N_2 seal drains during several one-minute periods.	NOV 29 2023	NOV 29 2023
D. At no time must the combined leakage from N_1 and N_2 seal drains exceed one cc per minute. No other external leakage is permitted.	NOV 29 2023	
2. Emergency (Manual) Flow Schedule		
A. Apply 14 volts DC and switch solenoid to emergency position. Switchover (fuel flow) should occur in one second maximum. Shut off current to ensure solenoid is mechanically held in emergency position.	NOV 29 2023	
B. Run emergency flow schedule (Table 2) using standard conditions, except as specified.	NOV 29 2023	
NOTE: Use emergency maximum flow valve wrench (STD64917) when adjusting maximum flow valve (201, Figure 107).		
C. Run lines one through three, setting quadrant and N_1 speed in the increasing direction. Then record corresponding W_f values.	NOV 29 2023	

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AN EAGLE PARTNER

P/N: 1-170-780-01

Model #: TA-7

S/N: 692AS8895

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W.O. #: AI1009

TASK						TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
D. Make a hysteresis check at line two, setting quadrant in the decreasing direction.						NOV 29 2023	
E. Switch solenoid back to automatic system, at test completion. Shut off current to ensure solenoid is mechanically held in automatic position.						NOV 29 2023	
TABLE 2: EMERGENCY (MANUAL) FLOW SCHEDULE (DC=14V)							
Line	N ₁ ± 10	Quad + 0.5	Fuel Flow			NOV 29 2023	
			Minimum	Actual	Maximum		
1	1800	21	105	135	123		
2	2600	55	186	200	226		
3	4100	100	675	722	725		
3. High Pressure Relief Valve Test							
A. Set standard conditions and N ₁ speed at 3500 ± 20 RPM for a fuel flow (W _f) of 620 ± 26 PPH.						NOV 29 2023	NOV 29 2023
B. Fully close throttling valve (13, Figure 704). The high-pressure relief valve must maintain at a differential pressure of 850 ± 50 PSIG (P _{N1} minus P _B) at no flow.						NOV 29 2023	NOV 29 2023
850 ✓							
4. Stopcock Valve Test							
A. Set standard conditions, and then set N ₁ speed at 0 RPM. Set quadrant at zero degree and inlet pressure (P _B) at 10 ± 5 PSIG.						NOV 29 2023	NOV 29 2023
B. Disconnect throttling valve (13, Figure 704) from P _N port of fuel regulator. Measure leakage at discharge port for several one-minute periods.						NOV 29 2023	NOV 29 2023
C. At no time shall leakage at P _N port exceed two drops per minute. If leakage exceeds this limit, shims (122 and 124, Figure 107) must be reduced in thickness, each by the same amount (refer to Figure 519 in the Assembly section of 73-20-30 Manual.						NOV 29 2023	

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: A11009

TASK								TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
5. Acceleration and face cam schedule— T_1 at 59°F: Table 3 in the Final Test Data Form, OAW-F-200-058, is replaced by Table 1 in this form. All other steps in the performance of the test must be followed in the same sequence as the Final Test Data Form, OAW-F-200-058.								NOV 29 2023 	
TABLE 1: ACCELERATION AND FACE CAM SCHEDULE: T_1 AT 59°F									
Line	P_1 (in. Hg abs)	N_1 (RPM)			Fuel Flow				
		Min	Act	Max	Min	Act	Max		
1	29.92	546	550	554	59	80	75		
2	29.92	1696	1700	1704	167	187	185		
3*	29.92	2096	2100	2104	204	223	226		
4	29.92	3696	3700	3704	706	725	770		
5	29.92	4196	4200	4204	915	920	945		
*HYSTERESIS LIMITS: ± 2 PERCENT OF ACTUAL VALUE OBTAINED ON UP-RUN									
NOTE: Set N_1 speed at 850 RPM. Reduce quadrant until dumping occurs, and record quadrant setting. Quadrant setting must be 18 degrees or less, and fuel flow must be within ± 15 PPH of fuel flow obtained at a quadrant setting of 100 degrees.									
Quadrant setting: 10°									
6. Altitude (P_1) Schedule at 3700 RPM								NOV 29 2023 	
Table 4 in the Final Test Data form, OAW-F-200-058, is replaced by Table 2 in this form. All other steps in the performance of the test must be followed in the same sequence as in the Final Test Data form, OAW-F-200-058.									

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: A11009

TASK						TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE		
TABLE 2: ALTITUDE (P₁) SCHEDULE						NOV 29 2023	NOV 29 2023		
Line	P ₁ (in. Hg abs)	N ₁ (± 4 RPM)	Fuel Flow						
			Min	Act	Max				
1*	11	3700	262	285	288				
2	15	3700	353	378	387				
3	29.92	3700	706	730	770				
*HYSTERESIS CHECK MADE BY DECREASING P ₁ PRESSURE									
7. Throttle Shaft Lever Schedule Table 5 in the <i>Final Test Data</i> form, OAW-F-200-058, is replaced by Table 3 in this form. All other steps in the performance of the test must be followed in the same sequence as in the <i>Final Test Data</i> form, OAW-F-200-058.						NOV 29 2023			
TABLE 3: THROTTLE SHAFT LEVER SCHEDULE						NOV 29 2023	NOV 29 2023		
Line	Quad (± 0.5°)	Fuel Flow			N ₁				
		Min	Act	Max	Min			Act	Max
1	23	150	188	156	2155			2200	2235
2	26	150	188	156	2155			2220	2235
3	38	255	260	265	2980			3015	3060
4	42	255	260	265	2980			3033	3060
5*	100	833	900	900	4566	4550	4624		
*SET MAXIMUM THROTTLE ADJUSTING SCREW WITH CONDITIONS OF LINE FIVE STABILIZED. APPROACH QUADRANT SETTINGS FROM LOW-SIDE.									
8. Deceleration Setting Table 6 in the <i>Final Test Data</i> form, OAW-F-200-058, is replaced by Table 4 in this form. All other steps in the performance of the test must be followed in the same sequence as in the <i>Final Test Data</i> form, OAW-F-200-058.						NOV 29 2023			

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NOTE: USE IN CONJUNCTION WITH FINAL TEST DATA FORM, OAW-F-200-058

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P/N: 1-170-780-01

Model #: TA-7

S/N: 692AS8895

W.O. #: AI1009

TASK						TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE																											
TABLE 4: DECELERATION SETTING <table border="1"> <thead> <tr> <th rowspan="2">Line</th> <th rowspan="2">P₁ (in. Hg abs)</th> <th rowspan="2">N₁ (± 10 RPM)</th> <th colspan="3">Fuel Flow</th> </tr> <tr> <th>Min</th> <th>Act</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>29.92</td> <td>4200</td> <td>257</td> <td>279</td> <td>283</td> </tr> <tr> <td>2</td> <td>29.92</td> <td>2800</td> <td>127</td> <td>144</td> <td>141</td> </tr> </tbody> </table>						Line	P ₁ (in. Hg abs)	N ₁ (± 10 RPM)	Fuel Flow			Min	Act	Max	1	29.92	4200	257	279	283	2	29.92	2800	127	144	141	NOV 29 2023	NOV 29 2023						
Line	P ₁ (in. Hg abs)	N ₁ (± 10 RPM)	Fuel Flow																															
			Min	Act	Max																													
1	29.92	4200	257	279	283																													
2	29.92	2800	127	144	141																													
9. N ₁ Governor Droop Schedule Table 7 in the <i>Final Test Data</i> form, OAW-F-200-058, is replaced by Table 5 in this form. All other steps in the performance of the test must be followed in the same sequence as in the <i>Final Test Data</i> form, OAW-F-200-058.						NOV 29 2023																												
TABLE 5: N₁ GOVERNOR DROOP SCHEDULE <table border="1"> <thead> <tr> <th rowspan="2">Line</th> <th colspan="3">N₁</th> <th colspan="3">Fuel Flow</th> </tr> <tr> <th>Min</th> <th>Act</th> <th>Max</th> <th>Min</th> <th>Act</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>1*</td> <td>4531</td> <td>4550</td> <td>4589</td> <td>882</td> <td>900</td> <td>918</td> </tr> <tr> <td>2</td> <td>---</td> <td>4600</td> <td>---</td> <td>---</td> <td>850</td> <td>---</td> </tr> </tbody> </table>						Line	N ₁			Fuel Flow			Min	Act	Max	Min	Act	Max	1*	4531	4550	4589	882	900	918	2	---	4600	---	---	850	---	NOV 29 2023	NOV 29 2023
Line	N ₁			Fuel Flow																														
	Min	Act	Max	Min	Act	Max																												
1*	4531	4550	4589	882	900	918																												
2	---	4600	---	---	850	---																												
*HYSTERESIS LIMIT: WITHIN 12 RPM N ₁ SPEED FOR SAME FUEL FLOW (W _F) AS ON UP-RUN																																		
10. Acceleration and Face Cam Schedule (T ₁ at -30°F) A. Subject T ₁ sensor bulb to a temperature of -30° ± 3°F. Set P ₁ at 11.0 inches H _g absolute, N ₁ at 3900 ± 4 RPM, and record actual fuel flow (W _i). Actual fuel flow: _____ NOTE: Fuel flow must be within the limits of 391 to 441 PPH.						NOV 29 2023																												
B. Set P ₁ at 22.5 inches H _g absolute, and adjust N ₁ speed to obtain a fuel flow of 842 to 874 PPH. Record actual fuel flow and adjusted N ₁ speed. Adjusted N ₁ speed must be within the limits of 4365 to 4452 RPM. Actual fuel flow: _____ Adjusted N ₁ speed: _____																																		

P/N: 1-170-780-01

Model #: TA-7

S/N: 692AS8895

W.O. #: AI1009

TASK								TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
11. Acceleration and Face Cam Schedule (T_1 at 100°F) Table 9 in the <i>Final Test Data</i> form, OAW-F-200-058, is replaced by Table 6 in this form. All other steps in the performance of the test must be followed in the same sequence as in the <i>Final Test Data</i> form, OAW-F-200-058.								NOV 29 2023 	
TABLE 6: ACCELERATION AND FACE CAM SCHEDULE (T_1 AT 100°F)									
Line	P_1 (in. H_g Abs)	N_1 (± 4 RPM)			W_f PPH				
		Min	Act	Max	Min	Act	Max		
1	29.92	1196	1200	1204	97	123	113		
2	29.92	2896	2900	2904	323	360	345		
3	29.92	3696	3700	3704	645	790	703		
4*	22.50	4425	4466	4489	652	660	678		
*Face cam schedule									
12. Air-bleed trigger line schedule Table 11 in the <i>Final Test Data</i> form, OAW-F-200-058, is replaced by Table 7 in this form. All other steps in the performance of the test must be followed in the same sequence as in the <i>Final Test Data</i> form, OAW-F-200-058.								NOV 29 2023 	
13. Air-Bleed Trigger Line Test NOTE: The following air-bleed trigger line test is performed utilizing air-bleed trigger line fixture (STD62532). Fuel regulator air-bleed scheduling is defined by signal pressure (PSIG). A. Remove test cover (STD62510) and standpipe cover (STD64841). Install the bridge assembly on the fuel regulator. Then secure with locking cup (14) and screw (13), and with washer (16) and screw (15). Tighten screw (13) to a torque value of 54 to 60 inch-pounds, and tighten screw (15) to a torque value of 26 to 32 inch-pounds. Stake locking cup (14) and lockwire screw (15). • CT #: _____ Cal. Due Date: _____								NOV 29 2023 	

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: AI1009

TASK	TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
B. Mount N ₂ simulator fixture (STD62526) on governor mounting pad as shown in Figure 713. Check that fixture W _f adjusting screw is in contact with, but not depressing, bridge plunger (10, Figure 101).	NOV 29 2023 [Redacted]	
C. Connect the air-bleed trigger line fixture (STD62532) to P ₃ port on regulator cover as shown in Figure 713.	NOV 29 2023 [Redacted]	
D. Set N ₁ speed at 3672 ±4 RPM. Adjust W _f adjusting screw of fixture (STD62526) to obtain a fuel flow of 595 to 605 PPH	NOV 29 2023 [Redacted]	
E. Set P ₃ air pressure supply regulator on fixture (STD62532) to obtain 40.0 PSIG, and leave this pressure throughout test, unless otherwise noted.	NOV 29 2023 [Redacted]	
F. Adjust air-bleed block to obtain a signal pressure (PSIG) of 30.6 ±0.25 PSIG.	NOV 29 2023 [Redacted]	
G. Run air-bleed line schedule of Table 11. Approach PSIG of 31.6 to ±0.25 or 30.6 ±0.25 PSIG from lower pressure and PSIG of 33.4 ±0.25 or 32.6 ±0.25 PSIG from higher pressure, respectively. NOTE: Several procedures may be used to run the air-bleed schedule. Set N ₁ speeds roughly to mid-tolerances, set signal pressure (PSIG) using N ₂ simulator fixture (STD62526), and read fuel flow. If W _f is not within limits at all points, select a higher or lower N ₁ speed, and repeat procedure. If fuel flow limits cannot be obtained within prescribed N ₁ limits, repeat preceding steps 16.a. through 16.c.	NOV 29 2023 [Redacted]	
H. Vary N ₁ speed to approximately 3800 RPM until air-bleed valve button (38, Figure 102) completely covers the orifice in block (49). Increase P ₃ air pressure supply to 85.0 PSIG. PSIG gauge must not be less than 84.0 PSIG. • Recorded PSIG: <u>84.5</u>	NOV 29 2023 [Redacted]	NOV 29 2023

P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: AI1009

TASK									TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
TABLE 7: AIR-BLEED TRIGGER LINE SCHEDULE: T_1-59° ±3										
	PSIG (± 0.25)	T_1 (±3°F)	Fuel Flow (PPH)			N_1 (RPM)				
			Min	Act	Max	Min	Act	Max		
OPEN	30.6	59	784	800	816	3902	4020	3978		
CLOSED	32.6	59	784	800	816	3965	4077	4055	NOV 29 2023	
OPEN	30.6	59	392	400	408	3315	3402	3385		
CLOSED	32.6	59	392	400	408	3367	3445	3457		NOV 29 2023
OPEN	30.6	59	324	330	336	3185	3252	3255		
CLOSED	32.6	59	324	330	336	3235	3301	3311		
OPEN	30.6	59	220	225	230	3127	3152	3197		
CLOSED	32.6	59	220	225	230	3170	3190	3260		
14. IGV Schedule (T_1 at 59°F) (P/N: 100770A3, 106500A1, and subsequent)										
NOTE: Check main fuel regulator cover assembly to determine that feedback cam arm (2, Figure 102) is indexed two teeth counterclockwise from the scribe line on the cam shaft.										
A. Adjust T_1 temperature to 59° ±2°F. Then connect two lines with two 0 to 200 PSI gauges to the two IGV pressure ports (CYL 1 and CYL 2) as shown in Figure 705.										
B. Startup test stand and adjust N_1 speed so as to obtain a fuel flow (W_f) of 600 ±10PPH, and set control discharge pressure (P_N) to 50 ±5 PSIG.									NOV 29 2023	
C. Set N_1 speed at 3992 ±4 RPM, and move feedback cam arm until the two pressure gauge readings are equal or stable within no more than 20 PSIG of each other. Shut down test stand, and disconnect the two 0 to 200 PSIG gauges from the regulator.									NOV 29 2023	

**OZARK
AEROWORKS**

AN EAGLE PARTNER

NOTE: USE IN CONJUNCTION WITH FINAL TEST DATA FORM, OAW-F-200-058

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P/N: 1-170-780-01 Model #: TA-7 S/N: 692AS8895 W.O. #: AI1009

TASK	TECHNICIAN INITIALS & DATE	INSPECTOR STAMP & DATE
D. With these conditions set, the edge of the feedback cam arm must align with the edge of the IGV boss on the cover, farthest from the air-bleed cover, within ± 15 degrees. If this position cannot be obtained, re-index the feedback cam arm on its shaft as required, and recheck the null position. NOTE: Indexing one tooth on the spline will change the feedback cam arm approximately 10 degrees. A range of ± 2 teeth in position from the nominal position is permitted. The scribe line on the shaft is in line with the open end in the feedback cam arm when the arm is in the nominal position.	NOV 29 2023	
E. When the pressure gauge readings have been stabilized and the null position of the feedback cam arm has been obtained, shut down the test equipment and disconnect both IGV gauges.	NOV 29 2023	
F. Set N_1 speed at 550 ± 4 RPM, and set P_1 at 29.92 inches H_g absolute. Move the feedback cam arm from full counterclockwise position to a horizontal position, checking fuel flow during the cam arm travel. Fuel flow must remain between 60 and 74 PPH. Record actual fuel flow. Actual Fuel Flow: <u>81</u> CAUTION: DO NOT ROTATE FEEDBACK CAM ARM BEYOND THE HORIZONTAL POSITION.	NOV 29 2023	
G. Rotate feedback cam arm counterclockwise from the horizontal position and leave in that position for the remainder of final test.	NOV 29 2023	

FACTUAL REPORT - ATTACHMENT 3

Flight control servo test data sheets and hydraulic fluid analysis.

AIRWORTHINESS

CEN23FA340

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

DATA SHEET

WO # _____

Assy. Date _____

Test Date

4/8/2024

S/N _____

ACTUATOR #1

Customer Name _____

BELL HELICOPTER

Customer Specification _____

205-076-056

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	THIS ASSEMBLY IS DESIGNATED A FLIGHT SAFETY PART. CRITICAL CHARACTERISTICS  HAVE SPECIAL HANDLING REQUIREMENTS AS SHOWN IN THIS PROCEDURE. BHT APPROVAL IS REQUIRED (IN WRITING) PRIOR TO ANY REWORK OR DISASSEMBLY OF CRITICAL CHARACTERISTICS  NOT SPECIFICALLY COVERED IN THIS DOCUMENT.	<u>N/A</u>	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS			RESULTS	STAMP & DATE
30.0	ASSEMBLY				
30.1	<u>Traceability</u>				
	<u>Part No.</u>	<u>Part Name</u>	<u>S/N or BATCH#</u>		
	100615 Prim. Part	Piston	_____	<u>Check</u>	<u>N/A</u>
	41006783- _____	Housing	_____	<u>Check</u>	<u> </u>
	204-076-201-5 F.S.P.	Bell Housing	_____	<u>Check</u>	<u> </u>
	204-076-202-7 Prim. Part	Nut	_____	<u>Check</u>	<u>N/A</u>


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. _____

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
30.3	<u>Assemble the Bearing Mount</u>			
	Assemble per paragraph 30.3.1	<u>Check</u>	N/A	
	Assemble per paragraph 30.3.2	<u>Check</u>		
	Assemble per paragraph 30.3.3	<u>Check</u>		
30.4	<u>Torque Retaining Nut</u>			
30.4.1	Torque the #5 Nut to 1100 to 1180 inch pounds (92 to 98 ft. lbs.).	<u>Check</u>		
		QA Verify		
30.4.2	Lockwire the #5 Nut to the #4 Housing two (2) places.	<u>Check</u>		
	Assemble per paragraph 30.5.1.	<u>Check</u>		
	Assemble per paragraph 30.5.2	<u>Check</u>		
	Assemble per paragraph 30.5.3	<u>Check</u>		
30.6	<u>Torque the Bearing Housing Retainer</u>			
30.6.1	Torque the #13 Retainer to 600 to 650 inch pounds. (50 to 54 ft. lbs.).	<u>Check</u>		
		QA Verify		
30.6.2	Torque the #15 Lock Nut to 400 to 450 inch pounds. (33.3 to 37.5 ft. lbs.).	<u>Check</u>		
		QA Verify		
			N/A	



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

ACTUATOR # 1

Serial No.

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
30.7	Route the unit to the Test department	<u>Check</u>	N/A	
40.0	TEST			
	Test per paragraphs 40.1 through 40.2.1.	<u>Check</u>	✓	
40.3	<u>Input Force and Null Setting</u>			
40.3.2	Establish mechanical null.	<u>Check</u>	N/A	
40.3.2.1	Pilot input lever must travel between 0.130 to 0.174.	<u>Actual</u>	.145	
40.3.3	*Set hydraulic null.	<u>Check</u>	.001 ✓	
	Requirement			
	Hydraulic Null within ± 0.0015 of Mechanical Null.	<u>Inches</u>	.001	
40.3.3.1	Bending of tabs (mandatory Q.A. inspection)	<u>QA</u>	N/A	
	Second Test Technician verification required	<u>Verify</u>	N/A	
40.3.3.2	Torque the #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>	N/A	
40.3.4	Input force shall not exceed 8 ounces. • 5 Oz EXTEND 2 Oz RETRACT	<u>Push oz.</u>	.5 Oz EXT. 2.0 Oz RET.	
40.3.3.*	*If shimming is required, tighten lock nut snug to tab washer and bend washer tabs per 40.3.3.1. (No radial or axial movement of washer allowed).	<u>Check</u>	N/A	
	Second Test Technician verification required	<u>QA</u>	N/A	
		<u>Verify</u>	N/A	
	NOTE: Spool must move without binding.			

✓ COLLECTED 1 Full Stroke

~ 125 mL of Rtn Fluid



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. ACTVATOR # 1

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.3.5	<u>Stroke</u> Actuator stroke shall be 5.44 to 5.56.	<u>Check</u>	<u>N/R</u>
40.4	<u>Pressure/Return Proof Pressure</u> Requirement: There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	<u>Check</u>	<u>N/R</u>
40.5	<u>Normal Operation</u> Paragraphs 40.5.1 and 40.5.2. Requirements: <u>External Leakage</u> a. Leakage shall be zero (0) at each external dynamic seal during the first 300 full cycles. If zero (0) leakage is noted, disregard paragraphs (b), (c) and (d). 1 DROP @ 200 CYCLES FROM GLAND ON PISTON (LOWER) 4 DROP @ 200 CYCLES VAN OK WITH SHIPPING ADDITIONAL CYCLING	In Brd	Out Brd


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. *ACTUATOR #1*

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	b. If the leakage is 15 drops or less during first 300 full cycles, wipe until dry and cycle unit for another 300 cycles and record leakage. Test is successful if unit does not leak more than 10 drops per seal during second set of 300 cycles. If this requirement is met, disregard paragraphs (c) and (c) and stamp N/R. ME and QE are not required for stamp at this step. Number of cycles before 1st drop in 2nd set of 300 cycles. Total number of drops in 2nd set of 300 cycles (maximum allowed is 10 drops per seal).	N/R No. of Cycles In Brd Out Brd	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. *ACTUATOR #1*

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	Rejects Only, If passing previous tests stamp N/R. ME and QE are not required for stamp at this step.		
	c. If number of drops per seal are more than 15 during first 300 cycles, reject the unit Total number of drops during 1 st set of 300 cycles.	<i>N/R</i> In Brd Out Brd	
	d. If the number of drops are more than 10 during second 300 cycles, reject the unit (maximum allowed is 10 drops per rod seal).	<i>N/R</i> In Brd Out Brd	
40.6	<u>Check Valve Operation</u>		
40.6.1	<u>Actuator Inlet Check Valve Operation</u>		
40.6.2	Crack within 2 to 5 psig.	<i>psig</i> <u>3.0</u>	
40.6.3	Requirement		
	Reseat within 1 psig of crack.	<i>psig</i> <u>2.7</u>	



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. ACTUATOR #1

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.7	<u>Accumulator isolator Check Valve Operation</u> Paragraphs 40.7.1 and 40.7.2 Requirement Crack within 2 to 5 psig. <u>psig</u> <u>3.8</u> Reseat within 1 psig of crack. <u>psig</u> <u>2.8</u>		
40.8	<u>Accumulator Inlet Check Valve Operation</u> Paragraphs 40.8.1 and 40.8.2. * LEAKAGE, PENCIL LINE OBSERVED, COMING FROM TEST PORT 3. 40CC/MIN LEAKAGE Requirement * 120CC @ 144 Crack within 2 to 5 psig. 4 psig (CRACKING) <u>psig</u> <u>*</u> Reseat within 1 psig of crack. ** RESEAT @ 3.2 40 CC/MIN LEAKAGE <u>psig</u> <u>**</u>		
40.9	<u>Accumulator Inlet Check Valve Leakage Test</u> Paragraph 40.9.1 through 40.9.3. Requirement Leakage maximum one (1) drop in 20 minutes. <u>Check</u> + 1 DROP @ 10 MINUTES 2 DROP @ 17 MINUTES No additional Drops @ 26 MINUTE		
40.8	AFTER PERFORMING 40.10 * NOTED NO LEAKAGE. CAME BACK TO THIS TEST (40.8) * RE TESTED CRACK 3.8 psig RESEAT 3.4 psig		


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

Serial No.

ACTUATOR #1

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.10	<u>Accumulator Isolation Check Valve Leakage Test</u> Paragraphs 40.10.1 and 40.10.5. Requirement Leakage maximum one (1) drop in 20 minutes. <i>Ø</i>	<u>Check</u> <i>✓</i>	
40.11	<u>Servo Head Assembly Leakage</u> Paragraphs 40.11.1 and 40.11.2. Requirement The leakage shall not exceed 30 cc/minute.	<i>LEAKAGE</i> <u>Neutral cc</u> <i>7cc</i> <u>Extend cc</u> <i>8cc</i> <u>Retract cc</u> <i>10cc</i>	
40.12	<u>Sequence Valve Operation</u> Paragraph 40.12.1 and 40.12.2. Requirement Valve shall flow between 525 to 575 psig. Full flow 1.25 GPM. <i>* NO, 1.0 GPM Max Flow Achieved @ 650 psig</i> Between 600 to 650 psig. No flow at 475 to 550 psig.	<u>Check</u> <i>575 psig</i> <u>Check</u> <i>575 psig</i> <u>Check</u> <i>*</i> <u>Check</u> <i>560 psig</i>	

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.13	<u>Sequence Valve Leakage</u> Paragraphs 40.13.1 and 40.13.2. Leakage shall not exceed 2 drops in 20 minutes. 10 MINUTES		0 DROPS AFTER 10 MINUTES _____	_____
40.14	<u>Differential Relief Valve Operation</u> Paragraphs 40.14.1 and 40.14.2. Requirement Valve shall crack between 1500 to 1600 psig.	Check 1ST ATTEMPT 1690 psig AFTER TIGHTENING psig 1600 psig	_____	_____
40.15	<u>Thermal Relief Valve Operation</u> Paragraphs 40.15.1 and 40.15.2. Requirement Valve shall crack between 2100 to 2300 psig.	psig	2380 psig	_____
40.16	<u>Thermal Relief Valve Reseat</u> Paragraphs 40.16.1 and 40.16.2. Requirement The leakage shall not exceed four (4) drops per minute. 4 10 DROPS	Drops	10 DROPS MINUTE _____	_____



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. ACTUATOR # 1

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.17	<u>Accumulator Operation</u> Paragraphs 40.17.1 and 40.17.2. Requirement The volume of fluid shall be a minimum of 0.45 cubic inches (7.38 cc).	cc	<u>12cc</u>
40.18	<u>Manual Operation</u> Paragraph 40.18.1. Requirement Forty-two (42) pounds maximum force to move actuator full stroke in either direction.	lbs	* <u>36 lb EXT</u> <u>45 RET</u>
40.19	<u>Low Pressure Return</u> Requirement No leakage around crank arm seal after 5 minutes.	STEPS APPROX 1.5" FROM END. (BEGINNING OF CHAMBER) OR PISTON Check	✓ NO LEAKAGE
40.20	<u>Actuator Irreversibility</u> Requirement Actuator shall not move with a 50 pound max. force.	Check	✓ NO MOVEMENT
40.20.1	There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	Check	✓
40.21	<u>Install Port Covers</u>	Check	✓

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. ACTUATOR #1

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.22.1	Install #8 Shims so the Servo spool neutral corresponds with the input link neutral position.	<u>Check</u>	<u>N/A</u>	
40.22.2	Torque #74 Screws to 25 to 30 inch pounds.	<u>Check</u>		
40.22.3	Torque #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>		
40.22.4	Torque #29 Plug to 40 to 50 inch pounds.	<u>Check</u>		
40.22.5	Witness security of #7 Lock Tab after final adjustment of #8 Shims (installed at paragraph 40.3.3.1).	<u>Check</u>		
			<u>N/A</u>	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
50.0	ASSEMBLY			
50.1	#15 Nut Lockwire 	<u>QA</u>	<u>N/A</u>	
50.2	Lockwire per 41000970.	<u>Check</u>		
60.0	ASSEMBLY, FINAL			
	Assemble per paragraphs 60.1 through 60.1.9.	<u>Check</u>		
60.1	<u>Lockwire</u>			
60.1.1	Ensure three cotter pins are installed.	<u>Check</u>		
60.1.2	Ensure bearing housing is lockwired in two places.	<u>Check</u>		
60.1.3	Install the #7 Plugs, 2 places.	<u>Check</u>		
60.1.4	Ensure the #12* Tab Washer's tabs are bent.	<u>Check</u>		
60.1.5	Ensure the #34** I.D. Plate and the #77** Mod. Plate is installed.	<u>Check</u>		
60.1.6	Identify	<u>Check</u>		
60.1.7	Install the two #1 Decals.	<u>Check</u>	<u>N/A</u>	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
70.0	INSPECTION			
70.1	Verify conformance to specification.	<u>Check</u>	N/A	
70.2	Verify torque seal applied where required.	<u>Check</u>		
70.3	*Verify tab washers are bent correctly (one tab min. must be bent).	<u>Check</u>		
70.4	Verify part number ink stamped on the bearing housing.	<u>Check</u>		
70.5	HRFS must precede S/N.	<u>Check</u>	N/A	
*NOTE: Ref. ATIP 41004948 **NOTE: Ref. ATIP 41000970-102 or 41000970-103				

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

DATA SHEET

WO # _____

Assy. Date _____ Test Date _____ S/N HR3219Customer Name BELL HELICOPTERACTIVATOR # 2Customer Specification 205-076-056

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	THIS ASSEMBLY IS DESIGNATED A FLIGHT SAFETY PART. CRITICAL CHARACTERISTICS  HAVE SPECIAL HANDLING REQUIREMENTS AS SHOWN IN THIS PROCEDURE. BHT APPROVAL IS REQUIRED (IN WRITING) PRIOR TO ANY REWORK OR DISASSEMBLY OF CRITICAL CHARACTERISTICS  NOT SPECIFICALLY COVERED IN THIS DOCUMENT.		

ASSEMBLY, TEST & INSPECTION PROCEDURE

 REV. T

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BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

 Serial No. HR3219

PARA	REQUIREMENTS			RESULTS	STAMP & DATE
30.0	ASSEMBLY				
30.1	<u>Traceability</u>				
	<u>Part No.</u>	<u>Part Name</u>	<u>S/N or BATCH#</u>		
	100615 Prim. Part	Piston	_____	<u>Check</u>	<u>N/A</u>
	41006783- _____	Housing	_____	<u>Check</u>	<u>N/A</u>
	204-076-201-5 F.S.P.	Bell Housing	_____	<u>Check</u>	<u>N/A</u>
	204-076-202-7 Prim. Part	Nut	_____	<u>Check</u>	<u>N/A</u>


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

HR3219

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
30.3	<u>Assemble the Bearing Mount</u>			
	Assemble per paragraph 30.3.1	<u>Check</u>	<u>N/A</u>	
	Assemble per paragraph 30.3.2	<u>Check</u>	<u>N/A</u>	
	Assemble per paragraph 30.3.3	<u>Check</u>	<u>N/A</u>	
30.4	<u>Torque Retaining Nut</u>			
30.4.1	Torque the #5 Nut to 1100 to 1180 inch pounds (92 to 98 ft. lbs.).	<u>Check</u>	<u>N/A</u>	
		<u>QA Verify</u>	<u>N/A</u>	
30.4.2	Lockwire the #5 Nut to the #4 Housing two (2) places.	<u>Check</u>	<u>N/A</u>	
	Assemble per paragraph 30.5.1.	<u>Check</u>	<u>N/A</u>	
	Assemble per paragraph 30.5.2	<u>Check</u>	<u>N/A</u>	
	Assemble per paragraph 30.5.3	<u>Check</u>	<u>N/A</u>	
30.6	<u>Torque the Bearing Housing Retainer</u>			
30.6.1	Torque the #13 Retainer to 600 to 650 inch pounds. (50 to 54 ft. lbs.).	<u>Check</u>	<u>N/A</u>	
		<u>QA Verify</u>	<u>N/A</u>	
30.6.2	Torque the #15 Lock Nut to 400 to 450 inch pounds. (33.3 to 37.5 ft. lbs.).	<u>Check</u>	<u>N/A</u>	
		<u>QA Verify</u>	<u>N/A</u>	



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. 4123219

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
30.7	Route the unit to the Test department	<u>Check</u>	<u>N/A</u>	
40.0	TEST			
	Test per paragraphs 40.1 through 40.2.1.	<u>Check</u>	<u>N/A</u>	
40.3	<u>Input Force and Null Setting</u>			
40.3.2	Establish mechanical null. <u>.073/.073</u>	<u>Check</u>	<u>✓</u>	
40.3.2.1	Pilot input lever must travel between 0.130 to 0.174.	<u>Actual</u>	<u>.146</u>	
40.3.3	*Set hydraulic null.	<u>Check</u>	<u>N/A</u>	
	Requirement		<u>-.0045"</u>	
	Hydraulic Null within ± 0.0015 of Mechanical Null.	<u>Inches</u>	<u>-.0055"</u>	
40.3.3.1	Bending of tabs (mandatory Q.A. inspection) 	<u>QA</u>	<u>N/A</u>	
	Second Test Technician verification required	<u>Verify</u>	<u>N/A</u>	
40.3.3.2	Torque the #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>	<u>N/A</u>	
40.3.4	Input force shall not exceed 8 ounces. <u>.25 Oz Ext.</u> <u>1.50 Oz Ret.</u>	<u>Push oz.</u>		
40.3.3.*	*If shimming is required, tighten lock nut snug to tab washer and bend washer tabs per 40.3.3.1. (No radial or axial movement of washer allowed).	<u>Check</u>	<u>N/A</u>	
		<u>QA</u>	<u>N/A</u>	
	Second Test Technician verification required	<u>Verify</u>	<u>N/A</u>	
	NOTE: Spool must move without binding.			



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

423219

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.3.5	<u>Stroke</u> Actuator stroke shall be 5.44 to 5.56.	<u>Check</u> N/A	
40.4	<u>Pressure/Return Proof Pressure</u> Requirement: There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	<u>Check</u> N/A	
40.5	<u>Normal Operation</u> Paragraphs 40.5.1 and 40.5.2. Requirements: <u>External Leakage</u> a. Leakage shall be zero (0) at each external dynamic seal during the first 300 full cycles. If zero (0) leakage is noted, disregard paragraphs (b), (c) and (d). <i>Only Leakage</i> <i>INPUT CRANK MOVES IN OR SLIGHTLY AWAY</i>	In Brd Out Brd	

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

AR3219

PARA	REQUIREMENTS	RESULTS	STAMP & DATE								
	b. If the leakage is 15 drops or less during first 300 full cycles, wipe until dry and cycle unit for another 300 cycles and record leakage. Test is successful if unit does not leak more than 10 drops per seal during second set of 300 cycles. If this requirement is met, disregard paragraphs (c) and (c) and stamp N/R. ME and QE are not required for stamp at this step. Number of cycles before 1st drop in 2nd set of 300 cycles. Total number of drops in 2nd set of 300 cycles (maximum allowed is 10 drops per seal).	<table><tr><td colspan="2">N/A</td></tr><tr><td colspan="2">No. of Cycles</td></tr><tr><td colspan="2">N/A</td></tr><tr><td>In Brd</td><td>Out Brd</td></tr></table>	N/A		No. of Cycles		N/A		In Brd	Out Brd	
N/A											
No. of Cycles											
N/A											
In Brd	Out Brd										


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. 403219

PARA	REQUIREMENTS	RESULTS	STAMP & DATE								
	Rejects Only, If passing previous tests stamp N/R. ME and QE are not required for stamp at this step. c. If number of drops per seal are more than 15 during first 300 cycles, reject the unit Total number of drops during 1st set of 300 cycles. d. If the number of drops are more than 10 during second 300 cycles, reject the unit (maximum allowed is 10 drops per rod seal).	<table><tr><td colspan="2">N/A</td></tr><tr><td>In Brd</td><td>Out Brd</td></tr><tr><td colspan="2">N/A</td></tr><tr><td>In Brd</td><td>Out Brd</td></tr></table>	N/A		In Brd	Out Brd	N/A		In Brd	Out Brd	
N/A											
In Brd	Out Brd										
N/A											
In Brd	Out Brd										
40.6	<u>Check Valve Operation</u>										
40.6.1	<u>Actuator Inlet Check Valve Operation</u>										
40.6.2	Crack within 2 to 5 psig. 3.6 psig	psig 3.6									
40.6.3	Requirement										
	Reseat within 1 psig of crack. 2.8 psig	psig 2.8									



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

Serial No. *HR 3219*

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.7	<u>Accumulator isolator Check Valve Operation</u> Paragraphs 40.7.1 and 40.7.2 Requirement Crack within 2 to 5 psig. 3.6 psig Reseat within 1 psig of crack. 2.6 psig	psig psig	3.6 2.6
40.8	<u>Accumulator Inlet Check Valve Operation</u> Paragraphs 40.8.1 and 40.8.2. Requirement Crack within 2 to 5 psig. 3.6 psig Reseat within 1 psig of crack. 2.6 psig	psig psig	3.6 2.6
40.9	<u>Accumulator Inlet Check Valve Leakage Test</u> Paragraph 40.9.1 through 40.9.3. Requirement Leakage maximum one (1) drop in 20 minutes. 0 DROPS in 10 MINUTES	Check	✓


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

Serial No.

HR 3219

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.10	<u>Accumulator Isolation Check Valve Leakage Test</u> Paragraphs 40.10.1 and 40.10.5. Requirement Leakage maximum one (1) drop in 20 minutes.	<u>Check</u>	<u>0 Drops in 10 min.</u>
40.11	<u>Servo Head Assembly Leakage</u> Paragraphs 40.11.1 and 40.11.2. Requirement The leakage shall not exceed 30 cc/minute.	<u>Neutral cc</u> <u>Extend cc</u> <u>Retract cc</u>	<u>6 cc</u> <u>7 cc</u> <u>9 cc</u>
40.12	<u>Sequence Valve Operation</u> Paragraph 40.12.1 and 40.12.2. Requirement Valve shall flow between 525 to 575 psig. Full flow 1.25 GPM. Between 600 to 650 psig. No flow at 475 to 550 psig.	<u>Check</u> <u>Check</u> <u>Check</u>	<u>575 psig</u> <u>✓</u> <u>✓</u>

1.25 GPM @ 650 psig

540/550 psig
No Movement


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

HR 3219

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.13	<u>Sequence Valve Leakage</u> Paragraphs 40.13.1 and 40.13.2. Leakage shall not exceed 2 drops in 20 minutes.		ϕ_{12} 10 MIN.	
40.14	<u>Differential Relief Valve Operation</u> Paragraphs 40.14.1 and 40.14.2. Requirement Valve shall crack between 1500 to 1600 psig.	<u>Check</u> psig	1730	
40.15	<u>Thermal Relief Valve Operation</u> Paragraphs 40.15.1 and 40.15.2. Requirement Valve shall crack between 2100 to 2300 psig.	psig	2475/ 2500 psig	
40.16	<u>Thermal Relief Valve Reseat</u> Paragraphs 40.16.1 and 40.16.2. Requirement The leakage shall not exceed four (4) drops per minute.	Drops	6	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

H23219

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.17	<u>Accumulator Operation</u> Paragraphs 40.17.1 and 40.17.2. Requirement The volume of fluid shall be a minimum of 0.45 cubic inches (7.38 cc).	cc	12cc	
40.18	<u>Manual Operation</u> Paragraph 40.18.1. Requirement Forty-two (42) pounds maximum force to move actuator full stroke in either direction.	EXT 36 Ret 42 lbs		
40.19	<u>Low Pressure Return</u> Requirement No leakage around crank arm seal after 5 minutes.	Check	✓	
40.20	<u>Actuator Irreversibility</u> Requirement Actuator shall not move with a 50 pound max. force.	Check	✓	
40.20.1	There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	Check	✓	
40.21	<u>Install Port Covers</u>	Check	N/A	

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BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.22.1	Install #8 Shims so the Servo spool neutral corresponds with the input link neutral position.	<u>Check</u>	<u>N/A</u>	_____
40.22.2	Torque #74 Screws to 25 to 30 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.3	Torque #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.4	Torque #29 Plug to 40 to 50 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.5	Witness security of #7 Lock Tab after final adjustment of #8 Shims (installed at paragraph 40.3.3.1).	<u>Check</u>	<u>N/A</u>	_____


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
50.0	ASSEMBLY			
50.1	#15 Nut Lockwire 	<u>QA</u>	<u>N/A</u>	_____
50.2	Lockwire per 41000970.	<u>Check</u>	<u>N/A</u>	_____
60.0	ASSEMBLY, FINAL			
	Assemble per paragraphs 60.1 through 60.1.9.	<u>Check</u>	<u>N/A</u>	_____
60.1	<u>Lockwire</u>			
60.1.1	Ensure three cotter pins are installed.	<u>Check</u>	<u>N/A</u>	_____
60.1.2	Ensure bearing housing is lockwired in two places.	<u>Check</u>	<u>N/A</u>	_____
60.1.3	Install the #7 Plugs, 2 places.	<u>Check</u>	<u>N/A</u>	_____
60.1.4	Ensure the #12* Tab Washer's tabs are bent.	<u>Check</u>	<u>N/A</u>	_____
60.1.5	Ensure the #34** I.D. Plate and the #77** Mod. Plate is installed.	<u>Check</u>	<u>N/A</u>	_____
60.1.6	Identify	<u>Check</u>	<u>N/A</u>	_____
60.1.7	Install the two #1 Decals.	<u>Check</u>	<u>N/A</u>	_____

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
70.0	INSPECTION		
70.1	Verify conformance to specification.	<u>Check</u> <u>N/A</u>	
70.2	Verify torque seal applied where required.	<u>Check</u> <u>N/A</u>	
70.3	*Verify tab washers are bent correctly (one tab min. must be bent).	<u>Check</u> <u>N/A</u>	
70.4	Verify part number ink stamped on the bearing housing.	<u>Check</u> <u>N/A</u>	
70.5	HRFS must precede S/N.	<u>Check</u> <u>N/A</u>	
*NOTE: Ref. ATIP 41004948			
**NOTE: Ref. ATIP 41000970-102 or 41000970-103			

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

DATA SHEET

WO # _____

Assy. Date _____ Test Date _____ S/N HR 864Customer Name BELL HELICOPTER ACTUATOR #3Customer Specification 205-076-056

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	THIS ASSEMBLY IS DESIGNATED A FLIGHT SAFETY PART. CRITICAL CHARACTERISTICS  HAVE SPECIAL HANDLING REQUIREMENTS AS SHOWN IN THIS PROCEDURE. BHT APPROVAL IS REQUIRED (IN WRITING) PRIOR TO ANY REWORK OR DISASSEMBLY OF CRITICAL CHARACTERISTICS  NOT SPECIFICALLY COVERED IN THIS DOCUMENT.		

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS			RESULTS	STAMP & DATE
30.0	ASSEMBLY				
30.1	<u>Traceability</u>				
	<u>Part No.</u>	<u>Part Name</u>	<u>S/N or BATCH#</u>		
	100615 Prim. Part	Piston	_____	<u>Check</u>	<u>N/A</u>
	41006783- _____	Housing	_____	<u>Check</u>	<u>N/A</u>
	204-076-201-5 F.S.P.	Bell Housing	_____	<u>Check</u>	<u>N/A</u>
	204-076-202-7 Prim. Part	Nut	_____	<u>Check</u>	<u>N/A</u>


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. _____

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
30.3	<u>Assemble the Bearing Mount</u>		
	Assemble per paragraph 30.3.1	<u>Check</u> <u>N/A</u>	_____
	Assemble per paragraph 30.3.2	<u>Check</u> <u>N/A</u>	_____
	Assemble per paragraph 30.3.3	<u>Check</u> <u>N/A</u>	_____
30.4	<u>Torque Retaining Nut</u>		
30.4.1	Torque the #5 Nut to 1100 to 1180 inch pounds (92 to 98 ft. lbs.).	<u>Check</u> <u>N/A</u>	_____
		<u>QA Verify</u> <u>N/A</u>	_____
30.4.2	Lockwire the #5 Nut to the #4 Housing two (2) places.	<u>Check</u> <u>N/A</u>	_____
	Assemble per paragraph 30.5.1.	<u>Check</u> <u>N/A</u>	_____
	Assemble per paragraph 30.5.2	<u>Check</u> <u>N/A</u>	_____
	Assemble per paragraph 30.5.3	<u>Check</u> <u>N/A</u>	_____
30.6	<u>Torque the Bearing Housing Retainer</u>		
30.6.1	Torque the #13 Retainer to 600 to 650 inch pounds. (50 to 54 ft. lbs.).	<u>Check</u> <u>N/A</u>	_____
		<u>QA Verify</u> <u>N/A</u>	_____
30.6.2	Torque the #15 Lock Nut to 400 to 450 inch pounds. (33.3 to 37.5 ft. lbs.).	<u>Check</u> <u>N/A</u>	_____
		<u>QA Verify</u> <u>N/A</u>	_____



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. HR364

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
30.7	Route the unit to the Test department	<u>Check</u>	<u>N/A</u>	
40.0	TEST			
	Test per paragraphs 40.1 through 40.2.1.	<u>Check</u>	<u>N/A</u>	
40.3	<u>Input Force and Null Setting</u>			
40.3.2	Establish mechanical null.	<u>Check</u>	<u>N/A</u>	
40.3.2.1	Pilot input lever must travel between 0.130 to 0.174.	<u>Actual</u>	<u>.149</u>	
40.3.3	*Set hydraulic null.	<u>Check</u>	<u>✓</u>	
	Requirement			
	Hydraulic Null within ± 0.0015 of Mechanical Null.	<u>Inches</u>	<u>.0055</u>	
40.3.3.1	Bending of tabs (mandatory Q.A. inspection) 	<u>QA</u>	<u>N/A</u>	
	Second Test Technician verification required	<u>Verify</u>	<u>N/A</u>	
40.3.3.2	Torque the #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>	<u>N/A</u>	
40.3.4	Input force shall not exceed 8 ounces.	<u>Push oz.</u>	<u>402 EXT. 502 RET.</u>	
40.3.3.*	*If shimming is required, tighten lock nut snug to tab washer and bend washer tabs per 40.3.3.1. (No radial or axial movement of washer allowed).	<u>Check</u>	<u>N/A</u>	
		<u>QA</u>	<u>N/A</u>	
	Second Test Technician verification required	<u>Verify</u>	<u>N/A</u>	
	NOTE: Spool must move without binding.			


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

HA 364

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.3.5	<u>Stroke</u> Actuator stroke shall be 5.44 to 5.56.	<u>Check</u>	<i>N/A</i>	
40.4	<u>Pressure/Return Proof Pressure</u> Requirement: There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	<u>Check</u>	<i>N/A</i>	
40.5	<u>Normal Operation</u> Paragraphs 40.5.1 and 40.5.2. Requirements: <u>External Leakage</u> a. Leakage shall be zero (0) at each external dynamic seal during the first 300 full cycles. If zero (0) leakage is noted, disregard paragraphs (b), (c) and (d). <i>2 Drops @ 300 cycles</i>			
			In Brd	Out Brd

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. 42364

PARA	REQUIREMENTS	RESULTS	STAMP & DATE								
	b. If the leakage is 15 drops or less during first 300 full cycles, wipe until dry and cycle unit for another 300 cycles and record leakage. Test is successful if unit does not leak more than 10 drops per seal during second set of 300 cycles. If this requirement is met, disregard paragraphs (c) and (c) and stamp N/R. ME and QE are not required for stamp at this step. Number of cycles before 1st drop in 2nd set of 300 cycles. Total number of drops in 2nd set of 300 cycles (maximum allowed is 10 drops per seal).	<table><tr><td colspan="2">N/A</td></tr><tr><td colspan="2">No. of Cycles</td></tr><tr><td colspan="2">N/A</td></tr><tr><td>In Brd</td><td>Out Brd</td></tr></table>	N/A		No. of Cycles		N/A		In Brd	Out Brd	
N/A											
No. of Cycles											
N/A											
In Brd	Out Brd										


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

H2364

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
	Rejects Only, If passing previous tests stamp N/R. ME and QE are not required for stamp at this step.		
	c. If number of drops per seal are more than 15 during first 300 cycles, reject the unit		
	Total number of drops during 1 st set of 300 cycles.	<i>WIA</i>	
		In Brd	Out Brd
	d. If the number of drops are more than 10 during second 300 cycles, reject the unit (maximum allowed is 10 drops per rod seal).	<i>WIA</i>	
		In Brd	Out Brd
40.6	<u>Check Valve Operation</u>		
40.6.1	<u>Actuator Inlet Check Valve Operation</u>		
40.6.2	Crack within 2 to 5 psig.	<i>psig</i> <u>3.4</u>	
40.6.3	Requirement		
	Reseat within 1 psig of crack.	<i>psig</i> <u>3.0</u>	



BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No. *AR 364*

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.7	<u>Accumulator isolator Check Valve Operation</u> Paragraphs 40.7.1 and 40.7.2 Requirement Crack within 2 to 5 psig. Reseat within 1 psig of crack.	psig psig	3.2 2.8
40.8	<u>Accumulator Inlet Check Valve Operation</u> Paragraphs 40.8.1 and 40.8.2. Requirement Crack within 2 to 5 psig. Reseat within 1 psig of crack.	psig psig	3.4 3.0
40.9	<u>Accumulator Inlet Check Valve Leakage Test</u> Paragraph 40.9.1 through 40.9.3. Requirement Leakage maximum one (1) drop in 20 minutes. Ø Drops 10 MINUTES	Check	✓


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

Serial No.

HR 964

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.10	<u>Accumulator Isolation Check Valve Leakage Test</u> Paragraphs 40.10.1 and 40.10.5. Requirement Leakage maximum one (1) drop in 20 minutes. <i>0 DROPS in 10 MINUTES</i>	<u>Check</u>	☒	
40.11	<u>Servo Head Assembly Leakage</u> Paragraphs 40.11.1 and 40.11.2. Requirement The leakage shall not exceed 30 cc/minute.	<u>Neutral cc</u> <u>Extend cc</u> <u>Retract cc</u>	<i>10cc</i> <i>11cc</i> <i>12cc</i>	
40.12	<u>Sequence Valve Operation</u> Paragraph 40.12.1 and 40.12.2. Requirement Valve shall flow between 525 to 575 psig. Full flow 1.25 GPM. Between 600 to 650 psig. <i>1.25 G 640 psig</i> No flow at 475 to 550 psig. <i>470 psig</i>	<u>Check</u> <u>Check</u> <u>Check</u>	<i>520 psig</i> ☒ ☒	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

H2364

PARA	REQUIREMENTS	RESULTS	STAMP & DATE
40.13	<u>Sequence Valve Leakage</u> Paragraphs 40.13.1 and 40.13.2. Leakage shall not exceed 2 drops in 20 minutes.	<u>Check</u> 0 DROPS 10 MINUTES	
40.14	<u>Differential Relief Valve Operation</u> Paragraphs 40.14.1 and 40.14.2. Requirement Valve shall crack between 1500 to 1600 psig.	<u>psig</u> 1750 psig	
40.15	<u>Thermal Relief Valve Operation</u> Paragraphs 40.15.1 and 40.15.2. Requirement Valve shall crack between 2100 to 2300 psig.	<u>psig</u> ✓	
40.16	<u>Thermal Relief Valve Reseat</u> Paragraphs 40.16.1 and 40.16.2. Requirement The leakage shall not exceed four (4) drops per minute.	RAISED TO 2450 PSIG VALVE DID NOT CRACK <u>Drops</u> N/A	


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.17	<u>Accumulator Operation</u> Paragraphs 40.17.1 and 40.17.2. Requirement The volume of fluid shall be a minimum of 0.45 cubic inches (7.38 cc).	cc	3cc	
40.18	<u>Manual Operation</u> Paragraph 40.18.1. Requirement Forty-two (42) pounds maximum force to move actuator full stroke in either direction.	lbs	41 RETRACT 39 EXTEND	
40.19	<u>Low Pressure Return</u> Requirement No leakage around crank arm seal after 5 minutes.	Check	✓	
40.20	<u>Actuator Irreversibility</u> Requirement Actuator shall not move with a 50 pound max. force.	Check	✓	
40.20.1	There shall be no evidence of distortion or permanent set, nor shall there be any external leakage other than a slight wetting insufficient to form a drop. No leakage around crank assembly mounting pad.	Check	✓	
40.21	<u>Install Port Covers</u>	Check	N/A	

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
40.22.1	Install #8 Shims so the Servo spool neutral corresponds with the input link neutral position.	<u>Check</u>	<u>N/A</u>	_____
40.22.2	Torque #74 Screws to 25 to 30 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.3	Torque #10 Retainer to 110 to 120 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.4	Torque #29 Plug to 40 to 50 inch pounds.	<u>Check</u>	<u>N/A</u>	_____
40.22.5	Witness security of #7 Lock Tab after final adjustment of #8 Shims (installed at paragraph 40.3.3.1).	<u>Check</u>	<u>N/A</u>	_____


BHT FLIGHT SAFETY PART

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
50.0	ASSEMBLY			
50.1	#15 Nut Lockwire 	<u>QA</u>	<u>N/A</u>	
50.2	Lockwire per 41000970.	<u>Check</u>	<u>N/A</u>	
60.0	ASSEMBLY, FINAL			
	Assemble per paragraphs 60.1 through 60.1.9.	<u>Check</u>	<u>N/A</u>	
60.1	<u>Lockwire</u>			
60.1.1	Ensure three cotter pins are installed.	<u>Check</u>	<u>N/A</u>	
60.1.2	Ensure bearing housing is lockwired in two places.	<u>Check</u>	<u>N/A</u>	
60.1.3	Install the #7 Plugs, 2 places.	<u>Check</u>	<u>N/A</u>	
60.1.4	Ensure the #12* Tab Washer's tabs are bent.	<u>Check</u>	<u>N/A</u>	
60.1.5	Ensure the #34** I.D. Plate and the #77** Mod. Plate is installed.	<u>Check</u>	<u>N/A</u>	
60.1.6	Identify	<u>Check</u>	<u>N/A</u>	
60.1.7	Install the two #1 Decals.	<u>Check</u>	<u>N/A</u>	

**BHT FLIGHT SAFETY PART**

PART NUMBER

205-076-056-107

FLIGHT SAFETY PARTS NO CHANGES PERMITTED WITHOUT CUSTOMER APPROVAL

Serial No.

PARA	REQUIREMENTS		RESULTS	STAMP & DATE
70.0	INSPECTION			
70.1	Verify conformance to specification.	<u>Check</u>	<u>N/A</u>	_____
70.2	Verify torque seal applied where required.	<u>Check</u>	<u>N/A</u>	_____
70.3	*Verify tab washers are bent correctly (one tab min. must be bent).	<u>Check</u>	<u>N/A</u>	_____
70.4	Verify part number ink stamped on the bearing housing.	<u>Check</u>	<u>N/A</u>	_____
70.5	HRFS must precede S/N.	<u>Check</u>	<u>N/A</u>	_____
*NOTE: Ref. ATIP 41004948				
**NOTE: Ref. ATIP 41000970-102 or 41000970-103				

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.154
Remarks: SERVO CONTROL E D L
APRIL 09,2024
Time: 08:48:45
Volume: 5 mL/RUN
Viscosity: 15.3 mm2/s

SERVO #1

Serial #: 071109311
Sample Mode: BOTTLE
Flowrate: 50 mL/min
Oil Temp: 22.1 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	380120	376080	373320	376506.67
15-25µm	26100	18720	26080	23633.33
25-50µm	15780	11740	16520	14680.00
50-100µm	4040	3980	4860	4293.33
≥100µm	1540	560	1160	1086.67

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.153
Remarks: SERVO CONTROL E D L
APRIL 09,2024
Time: 08:47:52
Volume: 5 mL/RUN
Viscosity: 15.6 mm2/s

Serial #: 071109311
Sample Mode: BOTTLE
Flowrate: 50 mL/min
Oil Temp: 22.1 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	378780	375020	373920	375906.67
15-25µm	21980	23960	22660	22866.67
25-50µm	15100	18280	13640	15673.33
50-100µm	4420	4920	4100	4480.00
≥100µm	1540	1720	560	1273.33

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.152
Remarks: SERVO CONTROL E D L
APRIL 09,2024
Time: 08:46:49
Volume: 5 mL/RUN
Viscosity: 16.4 mm2/s

Serial #: 071109311
Sample Mode: BOTTLE
Flowrate: 50 mL/min
Oil Temp: 22.0 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	403340	389760	379320	390806.67
15-25µm	24260	27080	19160	23500.00
25-50µm	13560	18240	13440	15080.00
50-100µm	4360	5880	3940	4726.67
≥100µm	1420	1540	920	1293.33

PODS
OIL SAMPLE REPORT

ACTUATOR
2

Sample: SAMPLENAME.165
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 12:59:31 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 14.0 mm2/s Oil Temp: 22.2 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	395780	404140	391300	397073.33
15-25µm	27080	29400	29520	28666.67
25-50µm	15040	16280	18300	16540.00
50-100µm	3980	3560	3820	3786.67
≥100µm	500	180	360	346.67

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.164
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 12:57:50 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 14.1 mm2/s Oil Temp: 22.1 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	390860	379960	377120	382646.67
15-25µm	34020	26080	26220	28773.33
25-50µm	21420	17140	13260	17273.33
50-100µm	5100	3680	2940	3906.67
≥100µm	680	800	560	680.00

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.163
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 12:56:46 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 15.4 mm2/s Oil Temp: 22.0 C

Reported Concentration: Parts/100 mL
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15µm	401480	399160	390020	396886.67
15-25µm	33480	33700	30200	32460.00
25-50µm	19640	16040	15720	17133.33
50-100µm	4780	3980	2640	3800.00
≥100µm	500	740	680	640.00

PODS
OIL SAMPLE REPORT

ACTIVATOR
3

Sample: SAMPLENAME.169
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 14:17:45 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 13.4 mm2/s Oil Temp: 23.7 C

Reported Concentration: Parts/100 ml
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15 μ m	2690980	2697420	2687720	2692040.00
15-25 μ m	322160	320700	327140	323333.33
25-50 μ m	192860	187020	194760	191546.67
50-100 μ m	33460	29960	35720	33046.67
$\geq 100\mu$ m	2340	2640	3140	2706.67

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.168
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 14:16:39 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 13.5 mm2/s Oil Temp: 23.7 C

Reported Concentration: Parts/100 ml
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15 μ m	2714440	2764980	2732920	2737446.67
15-25 μ m	337880	339480	339300	338886.67
25-50 μ m	200040	196900	194320	197086.67
50-100 μ m	38680	37020	35300	37000.00
$\geq 100\mu$ m	3440	3260	3200	3300.00

PODS
OIL SAMPLE REPORT

Sample: SAMPLENAME.167
Remarks: SERVO CONTROL E D L
APRIL 09, 2024 Serial #: 071109311
Time: 14:15:51 Sample Mode: BOTTLE
Volume: 5 mL/RUN Flowrate: 50 mL/min
Viscosity: 14.8 mm2/s Oil Temp: 23.6 C

Reported Concentration: Parts/100 ml
NAS Class: 12

SIZES	RUN1	RUN2	RUN3	AVG
5-15 μ m	2654080	2724940	2744940	2707986.67
15-25 μ m	355460	348020	352500	351993.33
25-50 μ m	220540	210900	211960	214466.67
50-100 μ m	42240	42800	40460	41833.33
$\geq 100\mu$ m	4300	3680	3440	3806.67
