Air Methods Mosby Missouri

Arriel 1D1 Engine S/N 9872 Examination

AS350 B2 S/N 3728

Registration N352LN

Engine S/N 9872

Date: 12 October 2011

CEN11FA599 / A-2011-011 / RA-11-260

Turbomeca
SAFRAN Group

Introduction

- Agenda
  - Introduction
  - Proposed Examination Workscope
  - Conduct Examination
  - Debrief Examination

Introduction

- In Attendance
  - NTSB — Jim Silliman, Malcolm Brenner, Van McKenny
  - FAA — Scott Tyrrell, Jon Jordon
  - Air Methods — Dennis McCall, Michael Benton, Michael Keones, Don Lambert
  - Pilot Union — Brian Thomas
  - AEC — Lindsay Cunningham, Seth Buttner
  - Turbomeca — Marc Lanusse, Archie Whitten, Bryan Larimore

Introduction

- Preliminary Report
- Helicopter departed from Bethany MO with patient onboard, and was flying to Liberty MO. The pilot reported he was going to make a stop at Midwest National Air Center for fuel. The helicopter did not reach the airport and crashed approximately 1 mile north in a field in Kearny MO. The pilot, 2 medical crew members, and the patient all sustained fatal injuries. No post crash fire.

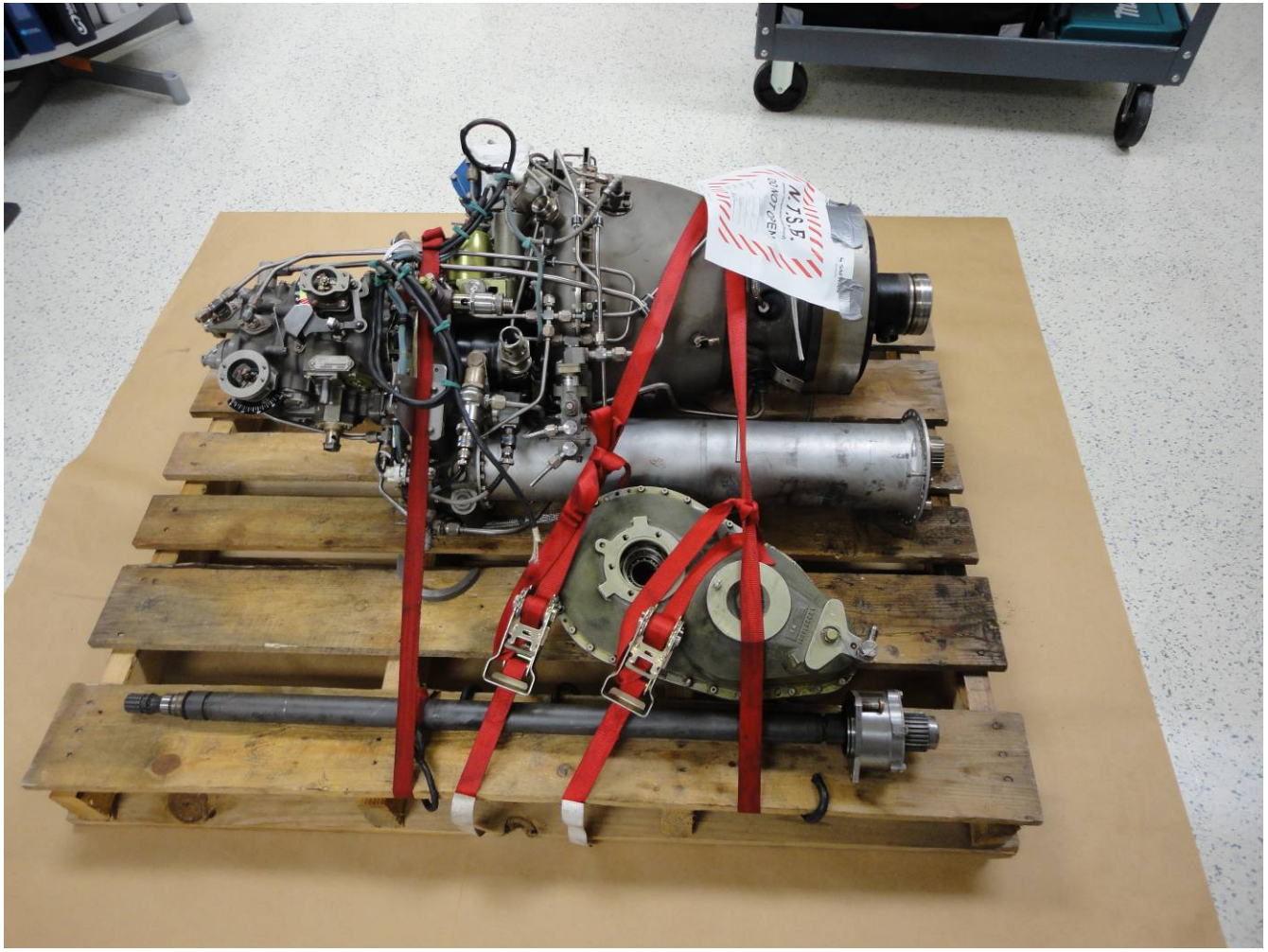
Proposed Examination Workscope

- Engine S/N 9872
  - **External examination of Engine and Boroscope**
    - **Boroscope 1st stage nozzle guide vane and turbine blades prior to disassembly to inspect for melted foreign material.**
    - **Boroscope unremarkable**
    - **Remove FCU and examine N1 and N2 drive shaft / splines.**
    - **Both drive shaft intact and rotation confirmed.**
    - **Remove external equipment from engine in preparation for modular disassembly.**
    - **The rotating assemblies (compressors, 1st and 2nd stage turbines, and power turbine) rotated freely. The free wheel shaft assembly and reduction gearbox (MO5) had been removed during wreckage examination on 29 Aug. 2011. The bleed valve was open. The magnetic plugs and chip detectors were clean. The oil filter, FCU fuel filter, and bleed air valve filter were clean. The oil filter clogging indicator was clear (not in by-pass).**
    - **Separate modules.**
    - **Module 1 : External examination of tower gear and check for gear train continuity. No further disassembly necessary.**
    - **MO1 removed; tower gear drive shaft intact; and gear train continuity confirmed.**
    - **Module 2 : Remove Axial compressor, Inspect IGV's for FOD damage.**
    - **MO2 removed; observed FOD to axial compressor and debris (metal shavings) in compressor case and bleed valve housing.**

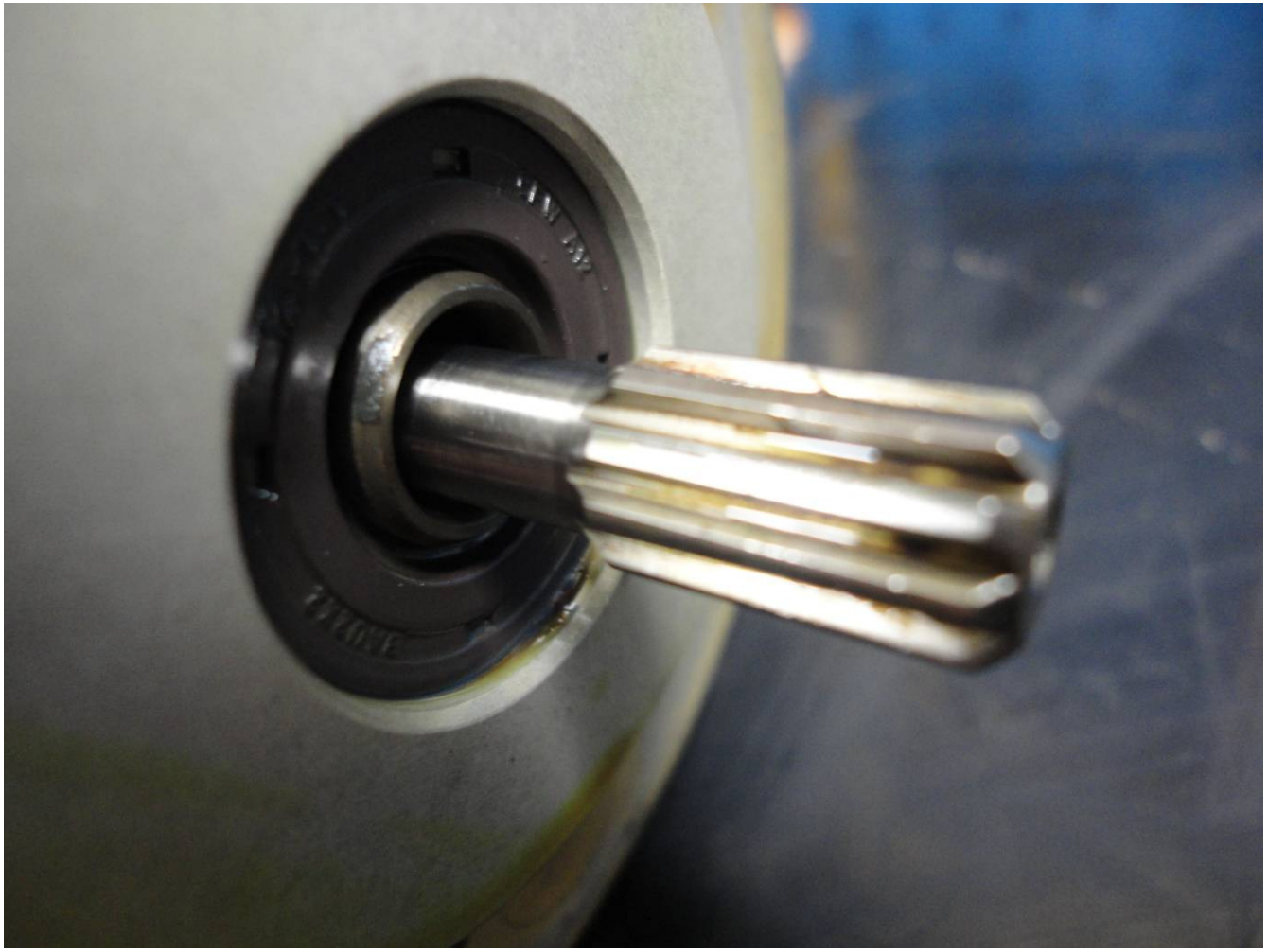
Proposed Examination Workscope

- Module 3 : Complete disassembly . Inspect for the presence of melted foreign material (aluminum from A/C intake).
- Disassembly revealed debris (metal shavings) distributed throughout the module. The centrifugal compressor, combustion chamber, and turbine blades exhibited a black substance (soot). No FOD observed to the turbine blades. The rear bearing was intact and rotated by hand.
- Module 4 : External examination. No further disassembly necessary.
- MO4 removed; The power turbine blades were intact (no blade shedding) and the turbine rotated freely.
- Module 5 : External examination and check for reduction gear continuity. No further disassembly necessary. Input pinion nut slippage mark examined in the field and found not to be misaligned.
- Gear train continuity confirmed.
- Determine findings and assign further actions as necessary.
- To expedite the examination, photos will be taken by one designated photographer and all photos will be distributed to the group at the end of the examination.

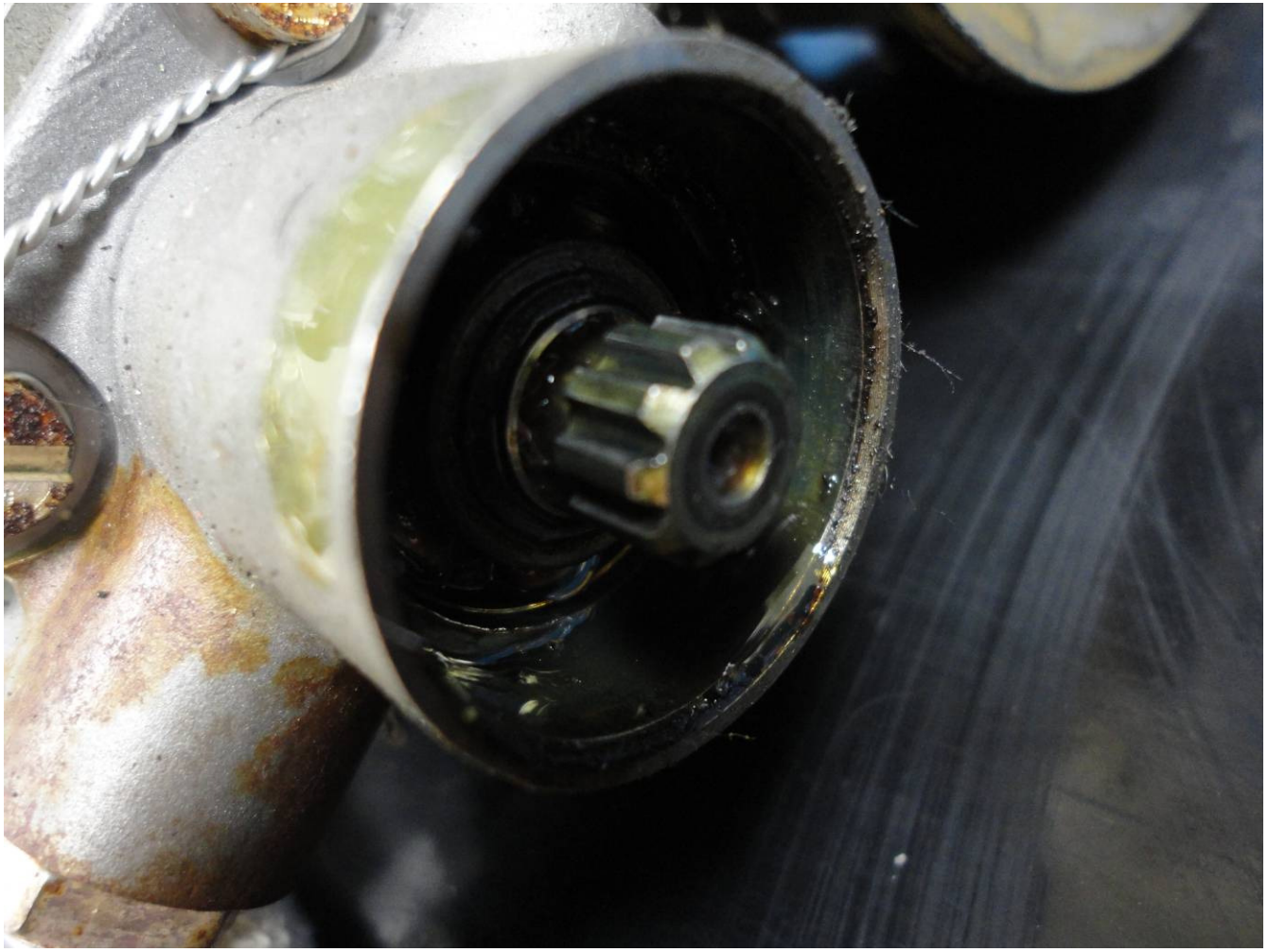
Photos / Engine as received



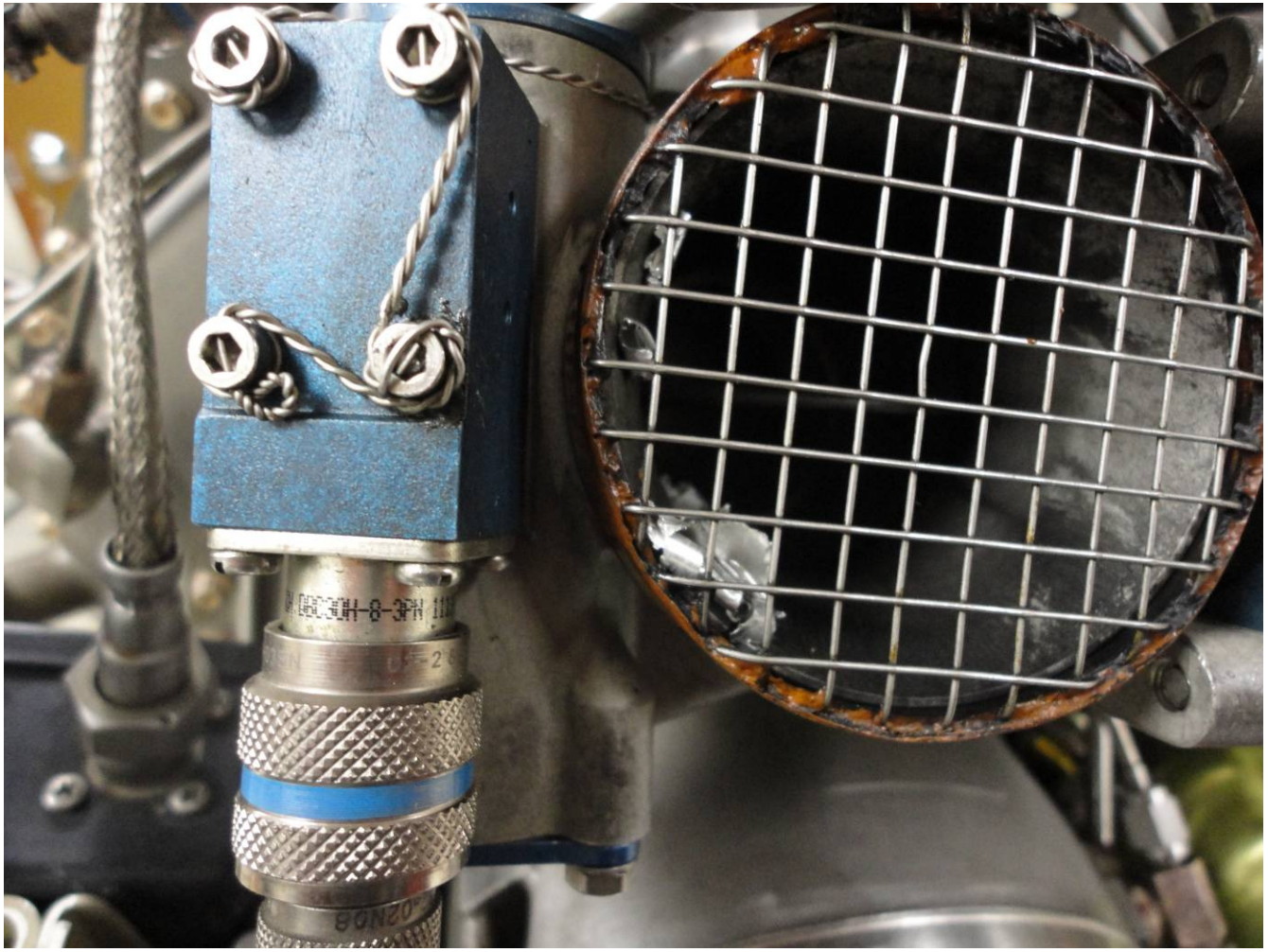
Photos / FCU Ng drive



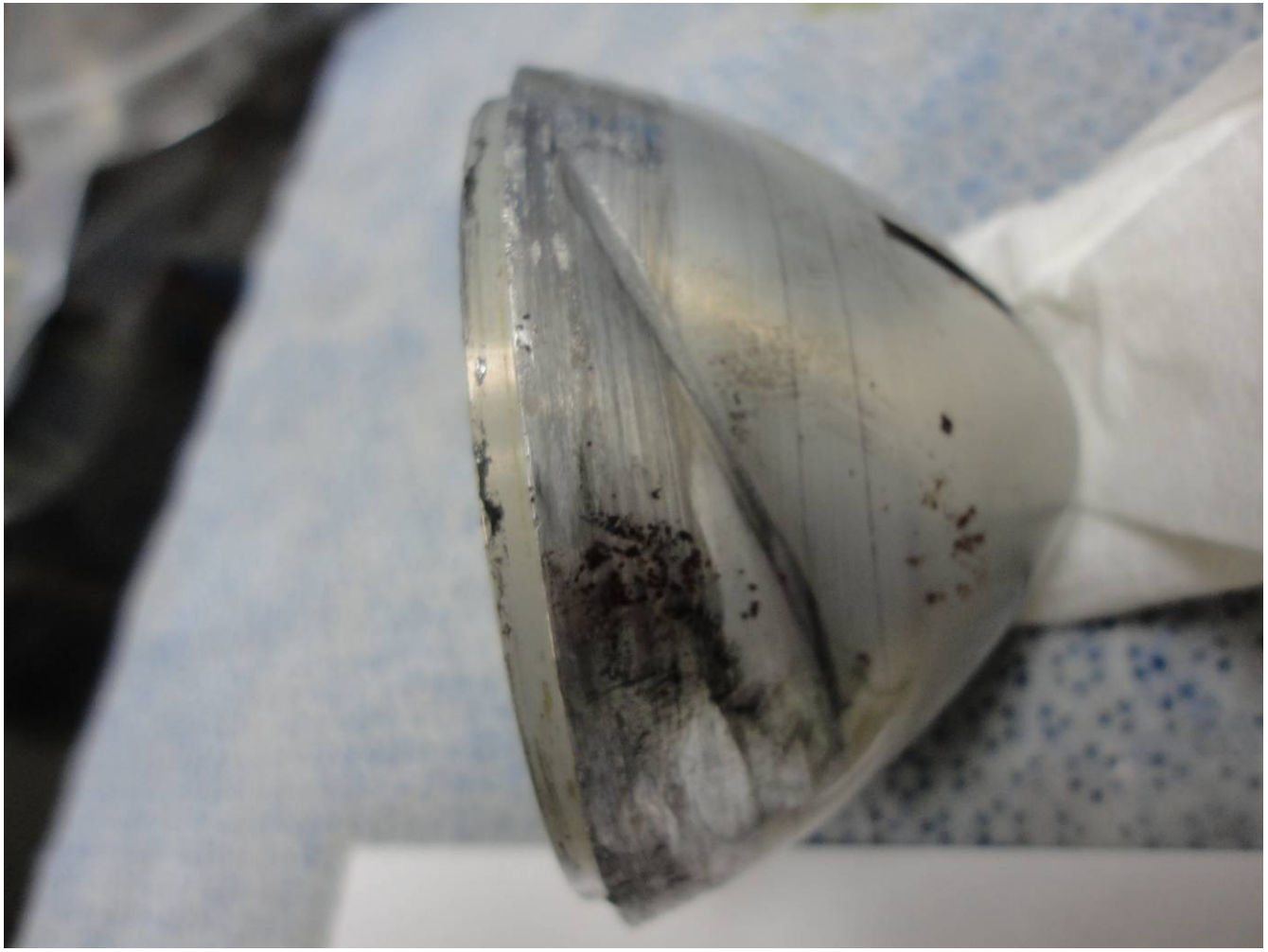
Photos / FCU NTL drive



Photos / Bleed valve

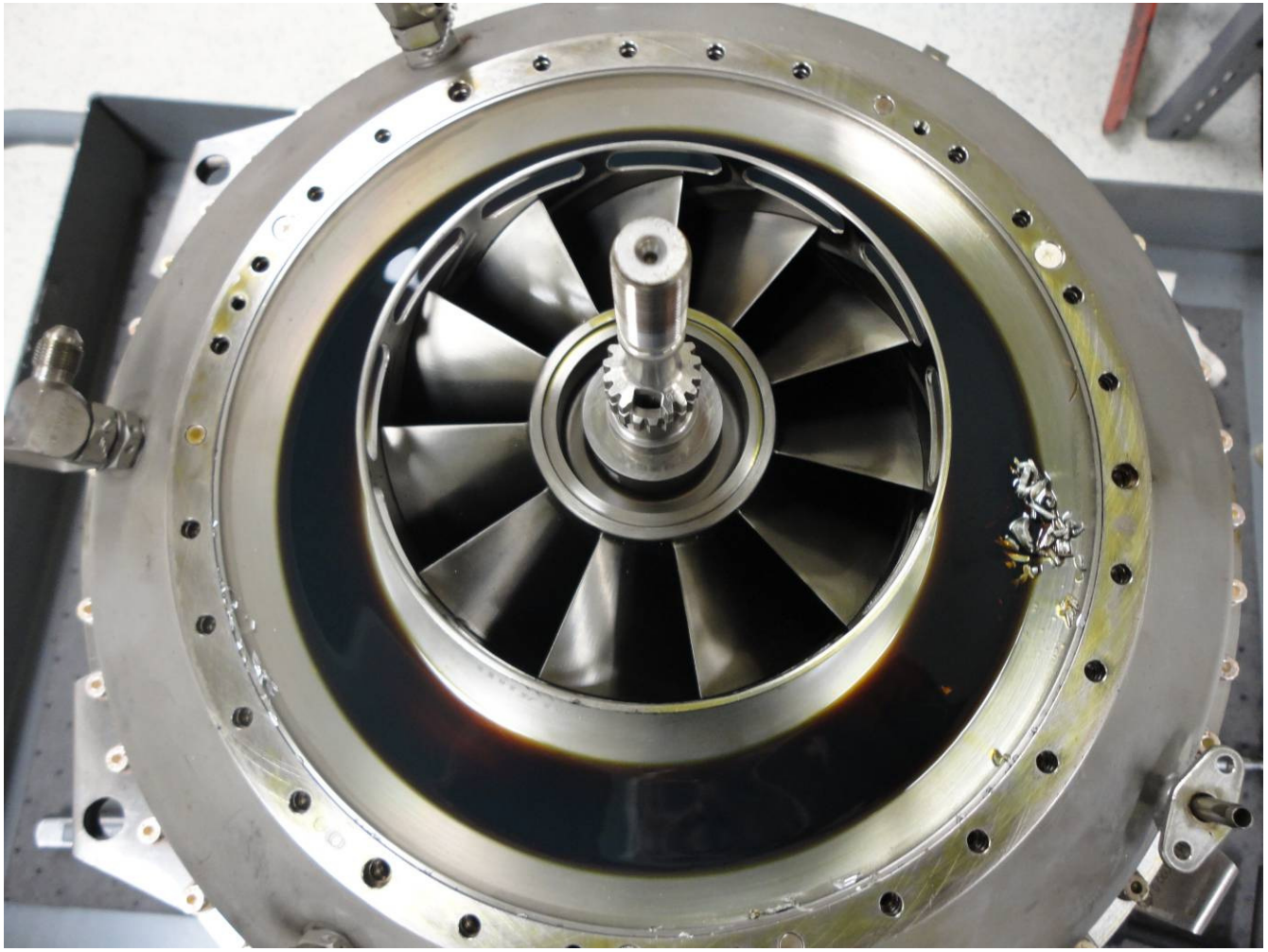


Photos / Nose cone



Photos / Axial compressor removed

Photos / Module 2 Removed

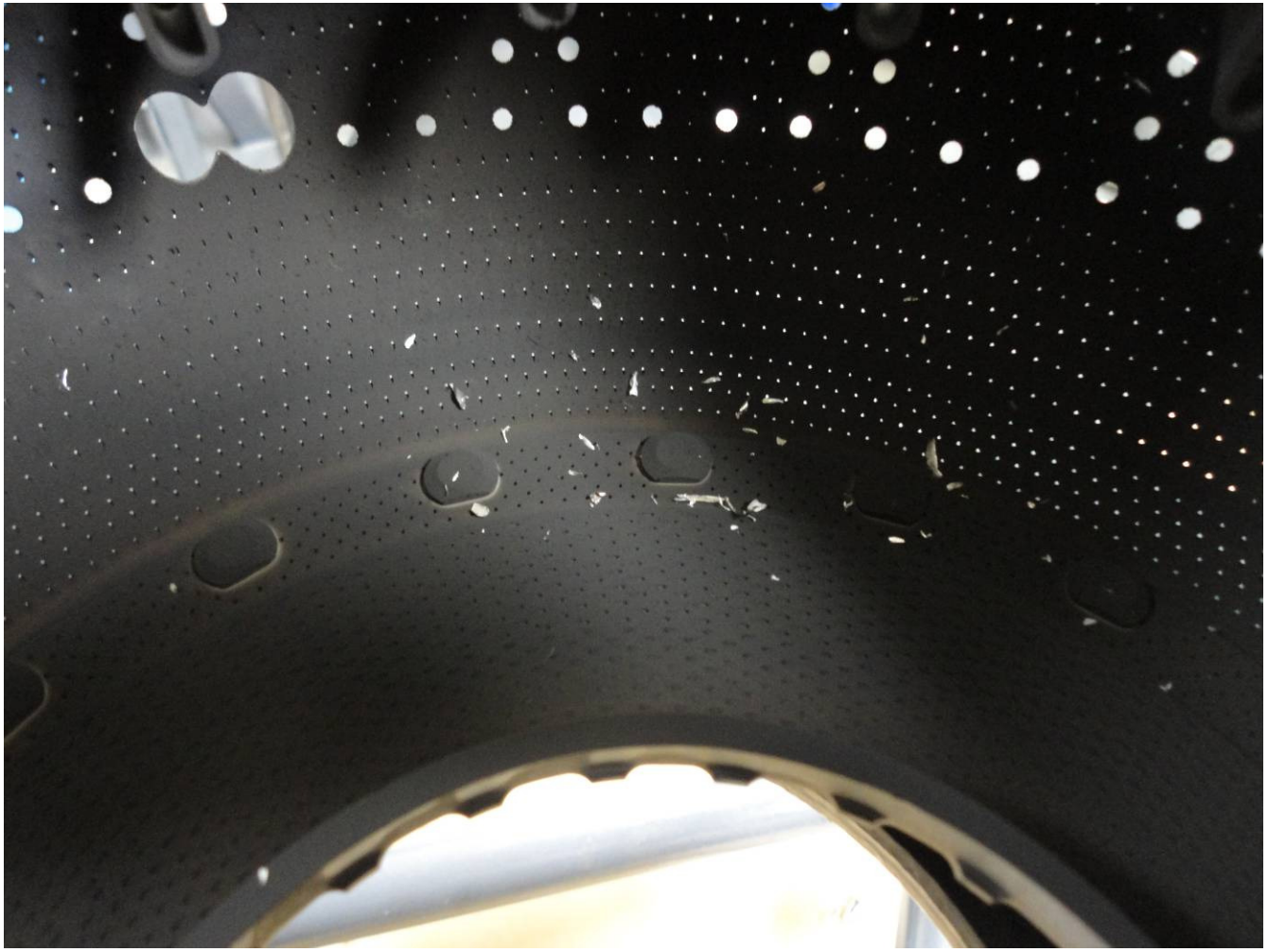


Photos / Compressor cover removed

Photos / Inside of compressor cover

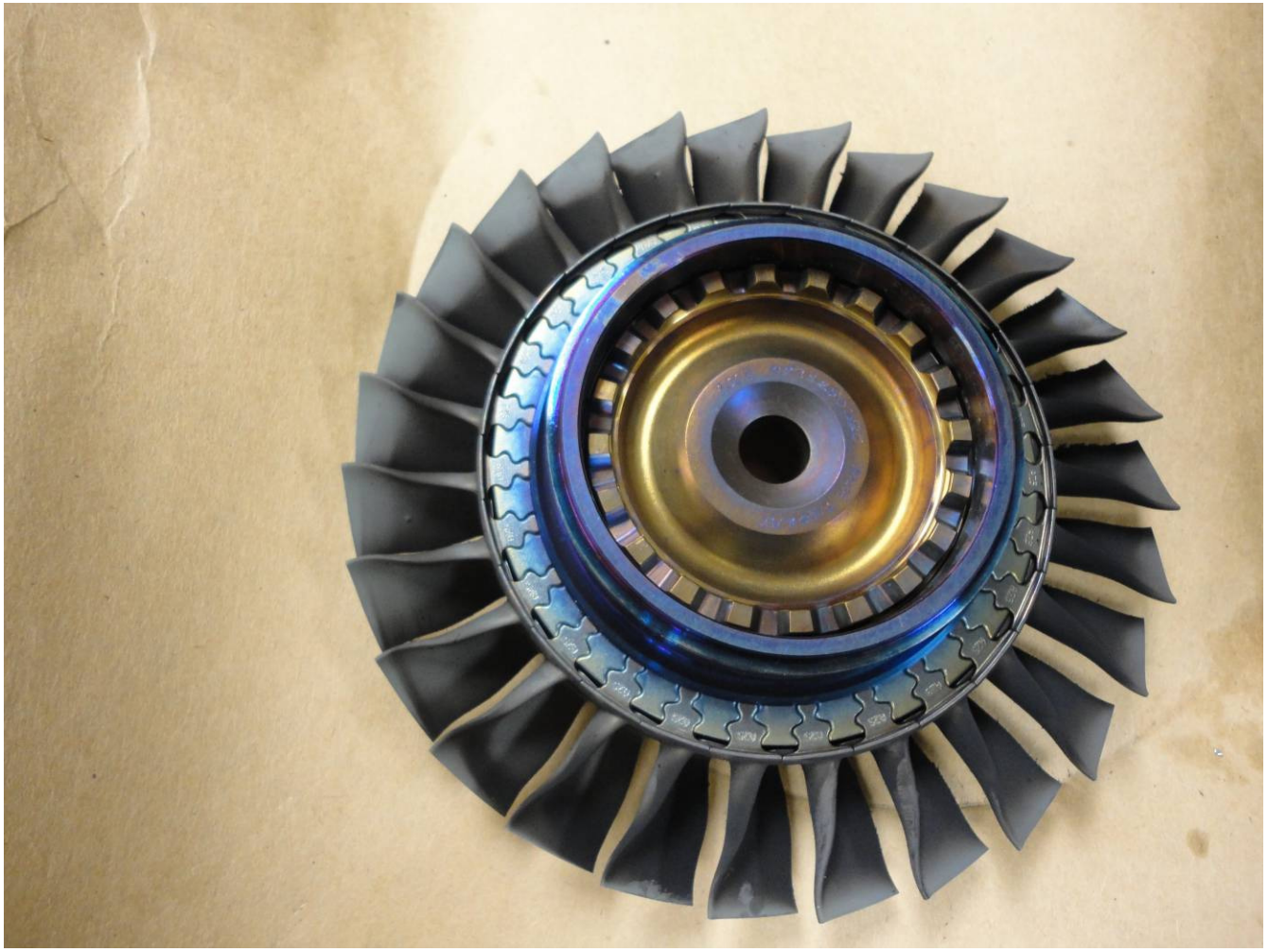
Photos / Inside of turbine case

Photos / Inside of combustion chamber



Photos / 1st stage turbine

Photos / 2nd stage turbine



Photos / Oil filter

Photos / Fuel filter

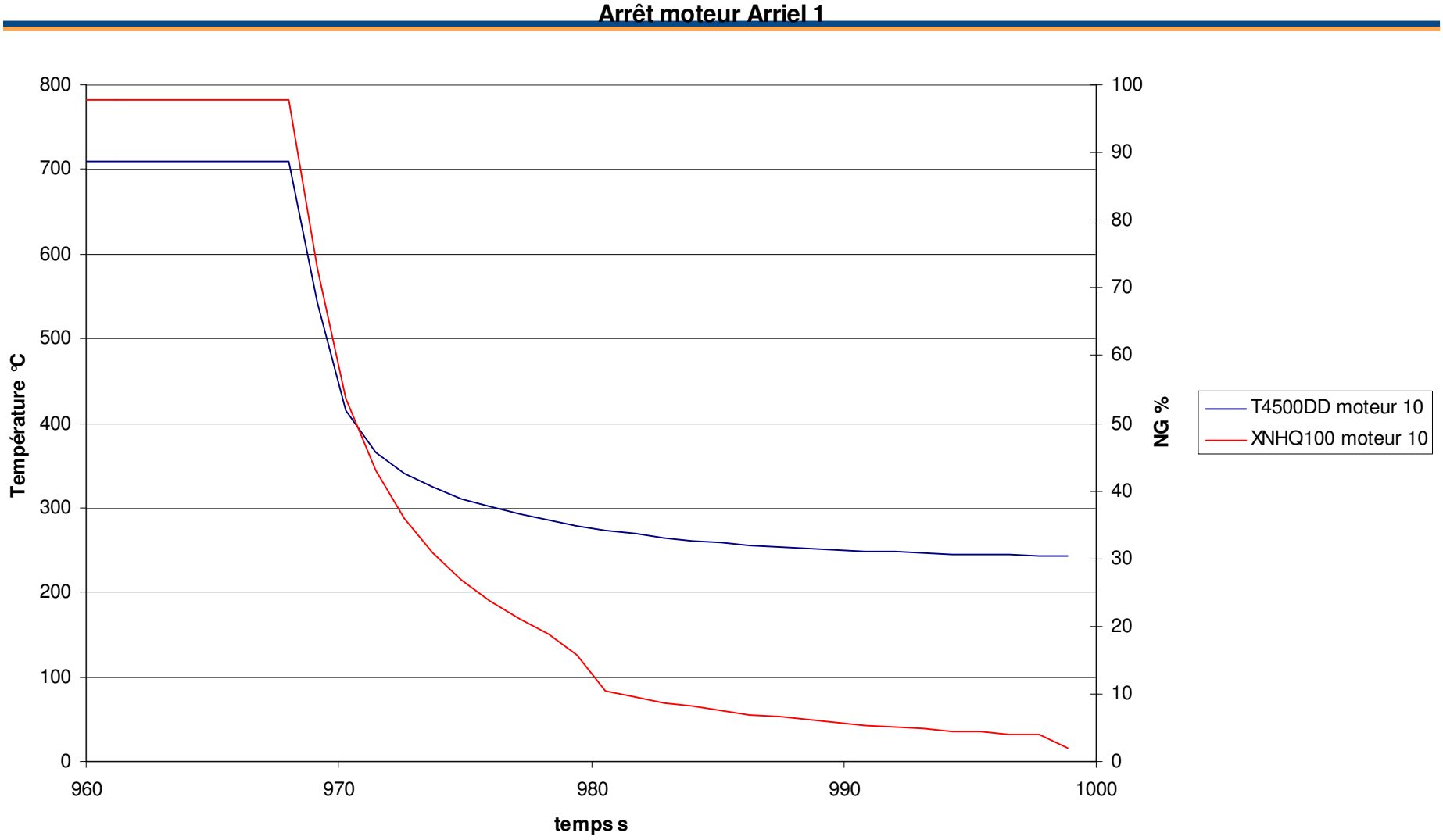
Photos / Magnetic plugs

Debrief Examination

- **Conclusions:**

  Due to the presence of aluminum shavings throughout the engine without being melted it can be concluded that the engine was flamed out at the time of impact. The substantial damage to the axial compressor would indicate the gas generator was at a high rate of rpm at the time of impact. According to the attached Arriel 1 coast down chart, after shutdown the gas generator drops from 97% Ng to 30% within 5 seconds, and is to 15% after 11 seconds. Due to the amount of blade curling of the axial compressor and significant FOD damage it can be estimated that impact occurred within the 1st 10 seconds after flameout. Please see chart on the next page.

Debrief Examination



Turbomeca
SAFRAN Group

Future Actions

- **Next steps**
  - **Upon release by the NTSB the engine will be shipped back to:**

Dodson Air Salvage

2155 Vermont Road
Rantoul, Kansas 66079