



ATTACHMENT 6

AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT

MIA-08-MA-203

Turbomecca Engine Run Data

ENGINE FAMILY	ENGINE S/N	DATE OF REPORT	WARRANTY CLAIM	COMMERCIAL FILE
Arriel 1C1	No. 1 5102 No. 2 5060	13 November 2008		
OPERATOR	DATE OF EXAM	REASON FOR ENGINE EXAM		
Maryland State Police	3-4 November 2008	Accident Investigation		
ACCIDENT	INCIDENT			
YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>			
REFERENCE ACCIDENT				
FIRST INFO REPORT N° A-2008-022				

ENGINE MODULE	S / N	WORKS PERFORMED	TOTAL HOURS	TOTAL CYCLES	HOURS SINCE OH	CYCLES SINCE OH
Engine	5102	Engine Test Cell Run	7077.3	16566		
Module 1	2472					
Module 2	2740					
Module 3	5264					
Module 4	5102					
Module 5	4381					
FCU	B099B	FCU Test Bench Run				
Tach Box	749B	N/A				

ENGINE MODULE	S / N	WORKS PERFORMED	TOTAL HOURS	TOTAL CYCLES	HOURS SINCE OH	CYCLES SINCE OH
Engine	5060	Engine Test Cell Run	7426.5	17560		
Module 1	2438					
Module 2	2599					
Module 3	5168					
Module 4	5072					
Module 5	4180					
FCU	A468B	FCU Test Bench Run				
Tach Box	574B	N/A				

Circumstances Reported to Turbomeca:

According to American Eurocopter's preliminary report, the helicopter was enroute to Prince George's Hospital Center with two patients from an accident scene when it encountered bad weather. The pilot radioed Andrews Air force Base that he intended to divert there to transfer the patients to an ambulance to complete the mission. The aircraft was subsequently lost from radar and radio communications were lost. The accident site was identified in a park near District Heights, Maryland, approximately three miles north of Andrews Air Force Base.

VALIDATION		APPROVAL	
Signature	Date	Signature	Date
	13 November 2008		

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Accident Investigation and Safety

INVESTIGATION REPORT
TMUSA - 2008-5102

CONCLUSION

Both engines ran in the test cell and both fuel control units ran on the test bench. As a result, the NTSB did not require disassembly of the engines or fuel control units or any testing of the tachometer boxes. All components were released by the NTSB to be stored with the rest of the wreckage at Anglin Aircraft Recovery Services in Delaware.

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Form: MGTWI-101-10 B (31-May-07)

Date Printed: 4-Dec-08

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1 TECHNICAL REPORT

1.1 FINDINGS ON ARRIVAL

On 3 November 2008, in the presence of the NTSB, the shipping crates were unsealed and the engines removed. An arrival inspection was conducted for each engine. The engines were then evaluated to determine whether they could be run in the test cell. Both engines were borescoped, and after further examination, it was decided to attempt to run the engines. All airframe components were then removed from the engines. Due to impact damage to the fuel control units, they were also removed. A shuttle fuel control unit was used during the test cell runs.

No. 1 Engine S/N 5102

The exhaust was crushed and dented. The linking tube was dented. The front support was undamaged.

All rotating assemblies rotated freely and no abnormal sounds were heard.

The borescopic inspection revealed rub marks on the second stage nozzle.

All magnetic plugs, chip detectors, and fuzz burner were clean. The MO1, MO5, and TU 208 strainers were clean. The oil filter was clean. The oil filter clogging indicator was clear. The bleed valve filter was not inspected.

No. 2 Engine S/N 5060

The exhaust was crushed and dented. The linking tube was dented. The front support was undamaged.

All rotating assemblies rotated freely and no abnormal sounds were heard.

The borescopic inspection revealed rub marks on the second stage nozzle.

All magnetic plugs, chip detectors, and fuzz burner were clean. The MO1, MO5, and TU 208 strainers were clean. The oil filter was clean. The oil filter clogging indicator was clear. The bleed valve filter was not inspected.

The oil inlet check valve was damaged; it was removed and replaced.

No. 1 Fuel Control Unit S/N B099B

The lead seal was missing from the temperature compensating capsule; all others were present.

The P2 chamber was wet with what appeared to be water mixed with a small amount of fuel.

The filter was clean.

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No. 2 Fuel Control Unit S/N A468B

The lead seal was missing from the temperature compensating capsule; all others were present.

No anomalies were noted with the P2 chamber.

The filter was clean.

Due to impact damage to the No. 2 fuel control unit, the bush and fuel outlet barrel were replaced with those from the No. 1 fuel control unit.

1.2 FINDINGS ON TEST BENCH

No. 1 Engine S/N 5102

The No. 1 engine was started on the test cell and was run at idle.

A visual check for vibrations at various points was found to be good.

Black smoke was seen rising out of the test cell exhaust stack. The engine was shut down, and the oil lines from the test cell to the engine were tightened. The engine was restarted and it was run up to 100% Ng. The black smoke continued until 90% Ng was reached, above which no more smoke was observed.

No. 2 Engine S/N 5060

The No. 2 engine, during the first start attempt, was shut down by the test cell safety prior to an over temp of the turbine inlet temperature. The safety is set at 810° Celsius.

The start electrovalve and the start drain valve were removed and replaced and a second start attempted. Again, the engine was shut down by the test cell safety prior to an over temp.

The pressurizing valve was removed and replaced, and a third start attempted, and, again, the engine was shut down prior to an over temp. The original pressurizing valve was then reinstalled and the drain valve was removed and replaced.

On the fourth start attempt, the engine started, a visual check for vibrations at various points was found to be good, and the engine was run up to 80% Ng. A few small flames and some sparks were seen exiting the exhaust pipe. The engine was then run up to 95% Ng, which is bleed valve close speed. Due to the flames and sparks, the engine was not taken to 100% Ng.

No. 1 Fuel Control Unit S/N B099B

The No. 1 fuel control unit was mounted on the test bench, and air was purged from the system.

Due to impact damage to the anticipator control unit and the unknown position of the cam and flyweight, it was not possible to test the power turbine speed governor.

The fuel control unit was then tested through the acceleration curve and the starting curve. All parameters were within reasonable limits for a unit that had been in service.

No. 2 Fuel Control Unit S/N A468B

The No. 2 fuel control unit was mounted on the test bench, and air was purged from the system.

Due to impact damage to the anticipator control unit and the unknown position of the cam and flyweight, it was not possible to test the power turbine speed governor.

A fuel leak was observed at the cap screw of the strainer. The safety wire was removed from the cap screw and the screw tightened. The fuel leak remained. The cap screw was removed in order to add a crush washer; the hole for the cap screw appeared elongated. A crush washer was added behind the cap screw and the cap screw reinstalled. The fuel leak was no longer observed.

The fuel control unit was then tested through the acceleration curve and the starting curve. All parameters were within reasonable limits for a unit that had been in service.

1.3 FINDINGS ON DISASSEMBLY

1.3.1 MAIN FINDINGS

No. 1 Engine S/N 5102

Since the engine ran on the test cell, no disassembly was required.

No. 2 Engine S/N 5060

Since the engine ran on the test cell, no disassembly was required.

No. 1 Fuel Control Unit S/N B099B

Since the fuel control unit ran on the test bench, no disassembly was required.

No. 2 Fuel Control Unit S/N A468B

Since the fuel control unit ran on the test bench, no disassembly was required.

2 PICTURES

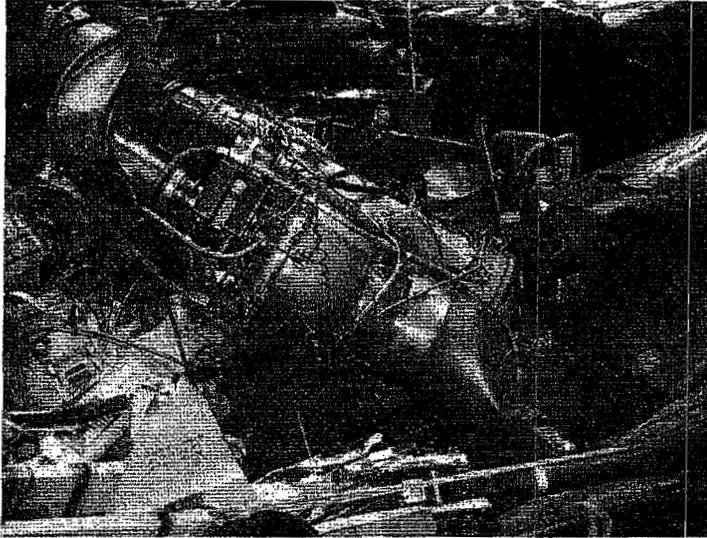


Figure 1. No. 2 Engine S/N 5060 – At Accident Site

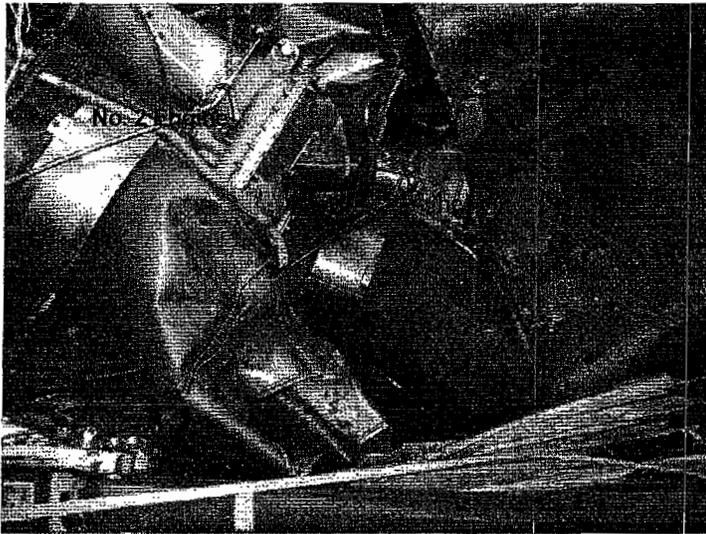


Figure 2. No. 1 Engine S/N 5102 – At Accident Site

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INVESTIGATION REPORT
TMUSA-2008-5102

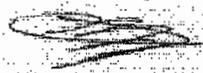
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Accident Investigation and Safety

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TMUSA - 2008-5102

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No. 2 Fuel Control Unit S/N A468B

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2 PICTURES

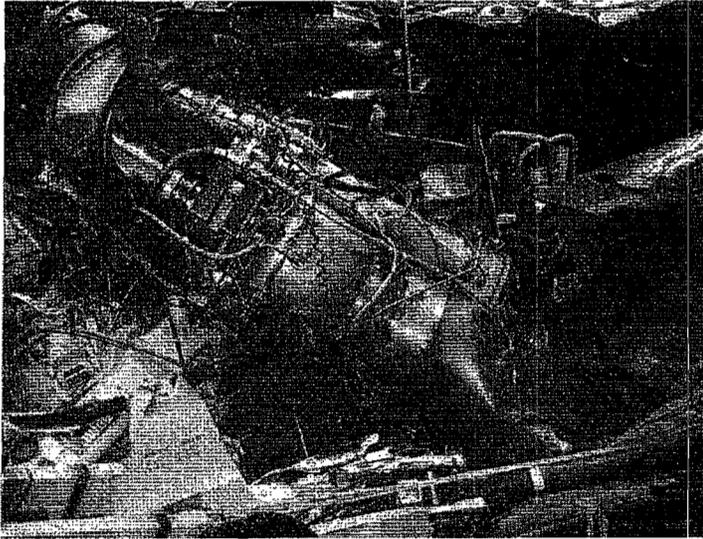


Figure 1. No. 2 Engine S/N 5060 – At Accident Site

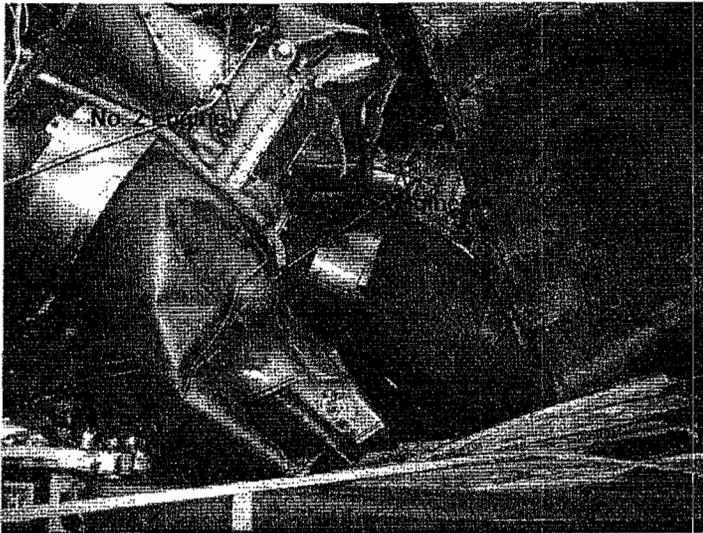


Figure 2. No. 1 Engine S/N 5102 – At Accident Site

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#1

TURBOMECA
ARRIEL 1 TURBOSHAFT ENGINE
OVERHAUL MANUAL

FCU S/N:	W/O:	FUEL CONTROL UNIT ADJUSTMENT
B099B	M100870	

Table 1b - Acceleration curve

NG (rpm)	Inj. P (kPa)	P2-P0 (kPa)	Q (l/h) metering valve only	Q (l/h) with barostat			Q (l/h) with by-pass
				min.	max.	Recorded	
950	200	0		30	36	29.2	(1)
1,230	235	20		34.6	40.6	32.5	
1,760	250	40		39	45	37.2	
2,370	305	80		49	55	47.5	
2,580	335	100		54	60	51.7	
2,810	380	130		63	69	63.3	
3,250	510	200		83	90	87.5	(1)
3,500	635	250		100	108.5	104	
3,725	825	300		121	128.5	121.5	
3,910	930	350		146.5	154	146.5	
4,050	1,110	400		171.5	178.5	171.7	(1)
4,305	1,475	500		208.5	215	212.3	(1)
4,540	1,810	600		239	248	240.5	
4,780	2,110	700		250	255	245.3	
4,850	2,210	750		250	255	245.3	

(1) Check sealing of by-pass valve

Table 1c - Starting curve

Lever	15°	20°	25°	30°	35°	40°	45°
P2 (kPa)	0	25	35	75	200	350	490
NG (rpm)	950	1,000	1,500	2,000	3,250	3,910	4,140
Inj P (kPa)	200	230	250	320	510	800	1,200
Q (l/h) requested	13 ± 2	18 ± 2	29 ± 2	45 ± 2	70 ± 2	100 ± 5	155 ± 10
Q (l/h) adjusted	13.8	21	31	42.5	71.8	101.9	158

Test of F.C.U. assembly
Refer to O.M. chapter 73-20-00 page 1301

Date:	Stamp:

Effectivity: C-C1-D

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Note Book
Page 48
30 June 2007

The information included in this manual is covered by the notice appearing on the information page

#2

TURBOMECA
ARRIEL 1 TURBOSHAFT ENGINE
OVERHAUL MANUAL

FCU S/N:	W/O:	FUEL CONTROL UNIT ADJUSTMENT
A468B	MI00880	

Table 1b - Acceleration curve

NG (rpm)	Inj. P (kPa)	P2-P0 (kPa)	Q (l/h) metering valve only	Q (l/h) with barostat			Q (l/h) with by-pass
				min.	max.	Recorded	
950	200	0		30	36	31.3	(1)
1,230	235	20		34.6	40.6	34.6	
1,760	250	40		39	45	40.0	
2,370	305	80		49	55	50.5	
2,580	335	100		54	60	57.4	
2,810	380	130		63	69	69	
3,250	510	200		83	90	91	(1)
3,500	635	250		100	108.5	109.2	
3,725	825	300		121	128.5	128.5	
3,910	930	350		146.5	154	153.2	
4,050	1,110	400		171.5	178.5	178	(1)
4,305	1,475	500		208.5	215	216	(1)
4,540	1,810	600		239	248	245	
4,780	2,110	700		250	255	251	
4,850	2,210	750		250	255	251.5	

(1) Check sealing of by-pass valve

Table 1c - Starting curve

Lever	15°	20°	25°	30°	35°	40°	45°
P2 (kPa)	0	25	35	75	200	350	490
NG (rpm)	950	1,000	1,500	2,000	3,250	3,910	4,140
Inj P (kPa)	200	230	250	320	510	800	1,200
Q (l/h) requested	13 ± 2	18 ± 2	29 ± 2	45 ± 2	70 ± 2	100 ± 5	155 ± 10
Q (l/h) adjusted	18	22.5	31	42.6	76.5	110	156.5

Test of F.C.U. assembly
Refer to O.M. chapter 73-20-00 page 1301

Date:	Stamp:

Effectivity: C-C1-D