

Test Report

TO

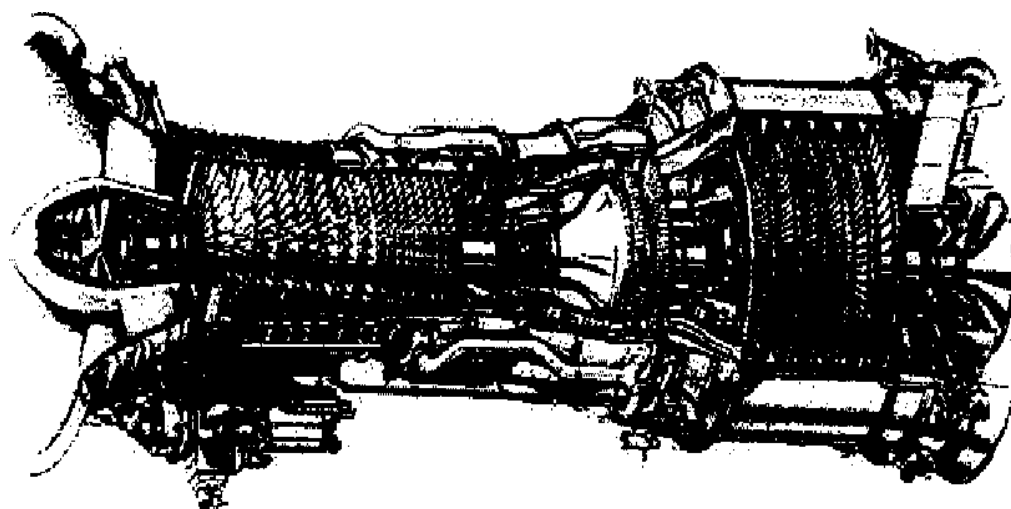
ATTN.

FROM ; Kvatrier Energy as

SUBJECT : Acceptance test of GG sin 481-531

DATE March 1998

KEN REF.



1. Introduction.

Gas Generator (GG) sin 481-531 has been leased by KIS.
The engine was received at KEN September 1997.

Date: March 1998.

After hot section overhaul and prior to dynamic testing, KEN test equipment was installed. In general this equipment consists of the following :

- A. Thrust mounting, to support engine in test dolly.
- B. For Gas generator test: exhaust nozzle, to simulate back pressure from power turbine. This enables test run to max. power output.
- C. Bell mouth and bullet nose.
- D. For Gas Generator test: 6 each vibration pickups, located both horizontal and vertical for each of the 3 main bearing sumps (A, B and C).
- E. Additional instrumentation for monitoring of pressures and temperatures.

The test dolly with the engine was then transported to the test cell and supported in a thrust frame.

Fuel, oil, start air and ^{instrument} lines were connected between engine and test cell.

At this time the VSV system was rigged statically in accordance with GEK 97310.

3. Seal break-1n run.

Date: March 1998.

During warm up at idle speed, the test cell was entered and the engine inspected.

A minor leakage was detected in fuel supply tube. Due to this leakage, we had to stop the engine-

After replacement of tube the engine was restarted at 16:49 hrs.

During warm up at idle speed, the test cell was entered and the engine inspected. No irregularities were detected.

A functional test on VSV-system and seal break-in run was then performed. Minor adjustments on VSV were carried out.

4. Performance test.

Date; March 1998.

After a dry prestart procedure the engine was started up at 08:54 hrs. During warm up at idle speed, the test cell was entered and the engine inspected. No irregularities were detected.

The highest steady state vibration in the power range was recorded on the Turbine Mid Frame Vertical (TMFV) pickup at 9010 rpm, with a level of 1,0 mils. (OE1(50357 limit: 2.8 mils).

Prior to shut down, the test cell was entered and the engine inspected. No irregularities were detected.

The finger filters on the Cube and scavenge pump were checked and a borescope inspection performed. No irregularities were detected.

The engine was *then* released from the test cell and returned to the workshop.

The test was run with Jet-A1 fuel and customer supplied duplex fuel nozzles.

The engine was then prepared for a power turbine spin test

5. Test result.

Calculated engine performance for both corrected fuel flow and exhaust gas temperature vs. corrected isentropic gas horsepower are within new engine criteria.

April, 1998

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TEST REPORT

Page 1 IV/ Of

LM 2500 PERFORMANCE PROGRAM Version
4.00 481-531 / P01

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ENGINE/Reading:	(psis)	14.764
GAS GENERATOR itslt.,1) AS	(psia)	14.764
A: <i>TM</i> DATE:	(psia)	258.84
	(Fl)	37.70
Barometric Pressure. PANS	(F)	780.00
P2	(F)	1 4 3 0
PS3 Converted	(PFH)	10906
P54 Converted	(Grains/LB)	21
T2	(inches ²)	53.59
T3	(BTU/LB)	18520
T54	(RPM)	9193

WFM. Fuel Flow

Humidity

A4

Lower Heating Value

Nrk

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 . ■ s s p R E . M M M I M M I M i j o u t i f f i k i m m n

CALCULATED AT TEST CELL CONDITIONS

FUEl Air Ratio	(LB/LB)	FAR54	0.02065
T5413. Calculated	(R)	1548	1896
P3	(psia)	P3	268,78
AE8 Calculated	(in ²)	AE8	215.98
Exhaust Node Flow Function		itt-12	112.39
Delta T54	(R)	DELT54	6.32
Isentropic Gas HP		IGHP	32633
Compressor airflow	(PPS)	W2	148.93
Compressor efficiency		ETAC	0-9406
Corrected speed	(RPM)	<i>NGC3K</i>	9387.8

CORRECTED TO STANDARD CONDITIONS AND 211.2in²
(59F.SEA LEVEL- NO HUMIDITY.NO LOSSES)

Isentropic Gas HP			33198
Fuel Flow	(PPS)	WPC	11152
Specific Fuel Consumption	(LB/HP-HR)	SFCK	0.336
T54I	(R)	1541K	197.3
Compressor airflow	tRPS)	W2K	145.16

The following provides a comparison to average NEW ENGINES

FUEl Flow, WFM is Above Nominal by 0.90 Percent
 E: aurt Gas Temp. is Above Nominal by 12.47 Deg.F
 T54 derived from measured fuel flow deviation, is Above Nominal by 26.2 Deg.F
 Compressor Efficiency is Below Nominal by 2.428 Percent.

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TEST REPORT

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LM 2500 PERFORMANCE PROGRAM Version 4.00
481-531 / P02

ENGINE/Reading:
GAS GENERATOR it,:a1) AS A: PE
TEST DATE:

-----INPUT

Barometric	P	(psia)	14.774
Pressure. P2		(psia)	14.774
PS3 Converted		(psia)	255.40
P54 Converted		(psia)	56.94
T2		(F)	38.00
T3		(F)	772.00
T54		(F)	1410
WPM, Fuel Flow		(FPH)	10663
Humidity		(Grains/LB)	21
14		(inches ²)	53.59
Lower Heating Value		(BTU/LB)	18520
NOG		(RPM)	9109

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CALCULATED AT EtI CELL CONDITIONS

Fuel Air Ratio	(LB/LB)	FAR54	0.02036
7548. Calculated	(R)	T548	1878
P3	(psia)	P3	265.24
AE8 Calculated	(in ²)	AE8	214.94
Exhaust Nozzle Flow Function		itt12	111.88
Delta T54	(R)	DELT54	8.70
Isentropic Gas HP		IGHP	31880
Compressor airflow	(PPS)	W2	147.74
Compressor efficiency		ETAC	0.8451
Corrected speed	(RPM)	NGGK	9299.2

CORREL 11D 77) STANDARD CONDITIONS AND 211.2in²
(59P. LEVEL- NO I-MIDI 17.N° LOSSES)

Isentropic Gas HP		IGHPK	32400
Fuel Flow	(PPS)	WFMK	10913
Specific Fuel Consumption (1.8/HP-HR)		SFCK	0.337
T54I	(R)	T54IK	1955.4
Compressor airflow	(PPS)	W2K	143.95

The following provides a comparison to average NEW ENGINES

FuelFlow. WFM is Above Nominal by 0.74 Percent
Exhaust Gas Temp. is Above Nominal by 5.86 Deg.F
T54 derived from measured fuel flow deviation, is Above Nominal by 21.2 Deg.?
Compressor Efficiency is Below Nominal by 2.117 Percent

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TEST REPORT

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LM 2500 PERFORMANCE PROGRAM Version 4.00

ENGINE/Reading; 481-531 / P03
 GAS GENERATOR ItsRED AS A: PE
 TEST DATE:
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Barometric Pressure. PM. (psia)	14.774
P2 (psia)	14.774
PS3 Converted (psia)	251.47
P54 Converted (psia)	57.96
T2 (F)	37.40
amaInarapIII=CIL T3	761.00(F)
154	1390 (F)
wf14 Fuel Flow (PPM)	10380
Humidity (Grains/LB)	21
)	53.59
A4 (inches-2)	18520
Lower Heating Value (BTU/LB)	9010
NGG (RPM)	

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CONDITIONS

Fuel Air Ratio (LB/LB)	FAP54	0.01999
T54B. Calculated (R)	T54B	1856
P3 (psia)	P3	261.18
AE8 Calculated (in-2)	AES	215.22
Exhaust Nozzle Flow Function	IFFT2	112.07
Delta T54 (R)	DEL T54	6.22
Isentropic Gas HP	IGHP	30877
Compressor airflow (PPS)	W2	146.44
Compressor efficiency	ETAC	0.8502
Corrected speed (RPM)	NGGK	9203.7
CORRECTED TO STANDARD CONDITIONS AND 211.2in*2 (59F.SEA LEVEL- NO (UMIDLTY.NO LOSSES)		
Isentropic Gas HP	WW1 (31401
Fuel Flow (PPS)	WFMK	10635
Specific Fuel Consumption (LB/HPHR)	SF CK	0.339
'1 4I (R)	T54IK	1939.0
Compressor airflow (PPS)	W2K	142.60

The following provides a comparison to average NEW ENGINES

Fuel Flow. WTI is Above Nominal by 0.72 Percent
 Must Gas Temp. is Above Nominal by 8.07 Deg,F
 T54 derived from measured fuel flow deviation.is Above Nominal by 20.4
 Deg.F Compressor Efficiency is Below Nominal by 1.692 Percent

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ARMVIRLE

PERFORMANCE CURVE

Side / Pigs avid

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ENG. S/N : 481-531 TEST

ORDER No. : 13-1165

TYPE : Acceptance

DATE : March 1999

CUSTOMER

LM 2500 PERFORMANCE PROGRAM Version 4.00

ENGINE Reading:

481-531 / P04

GAS GENERATOR 1=tra.) AS A: PE

TEST DATE:

19.03.98

Barometric Pressure. PAM (psia)	Fuel Flow vs Gas Horsepower	4.774
P2 LM2500 Gas Generator	(psia)	14.774
PS3 Converted	(psia)	235.27
P54 Converted	(psia)	54.27
T2 • -IMMUNE	(F)	37.00
T3 B=4" FUEL ROW	(F)	733.00
T54	(F)	1325
WFM. Fuel Flow	(PPH)	9393
Humidity		21
	(Grains/LE)	53.59
1		18520
A4	(inches ²)	8806
Lower Heating Value	(BTU/LB)	
Or.n.	(RPM)	

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RESULTS

CALCULATED AT TEST CELL		0.01896
Fuel Air Ratio	(LB/LB) FAR54	1793
T548, Calculated	(R) T548	244.46
P3	(psia) P3	215.12
AE8 Calculated	(in ²) Am	112.12
Exhaust Nozzle Flow Function		8.67
Delta T54	(P.) DELT54	27236
Isentropic Gas HP	IGHP	139.76
Compressor airflow	(PPS) W2	0.8553
Compressor efficiency	ETAC	8998.9
Corrected speed	(RPM) NGGK	
CORRECTED TO STANDARD CONDITIONS AND 211.2in ² (59F,SEA LEVEL- NO HUMIDITY,NO LOSSES)		
Isentropic Gas HP	IGHPX	27710
Fuel Flow	(PPS) WFMK	963
Specific Fuel Consumption (LE/HP-HR)	SPCK	0.348
•r 41	(R) T541K	1874.9
Compressor airflow	(PPS) W2K	136.04

Wj11K vs. IGHPK Baseline Performance Curve 1242500-
PE Model Gas Turbines Only.

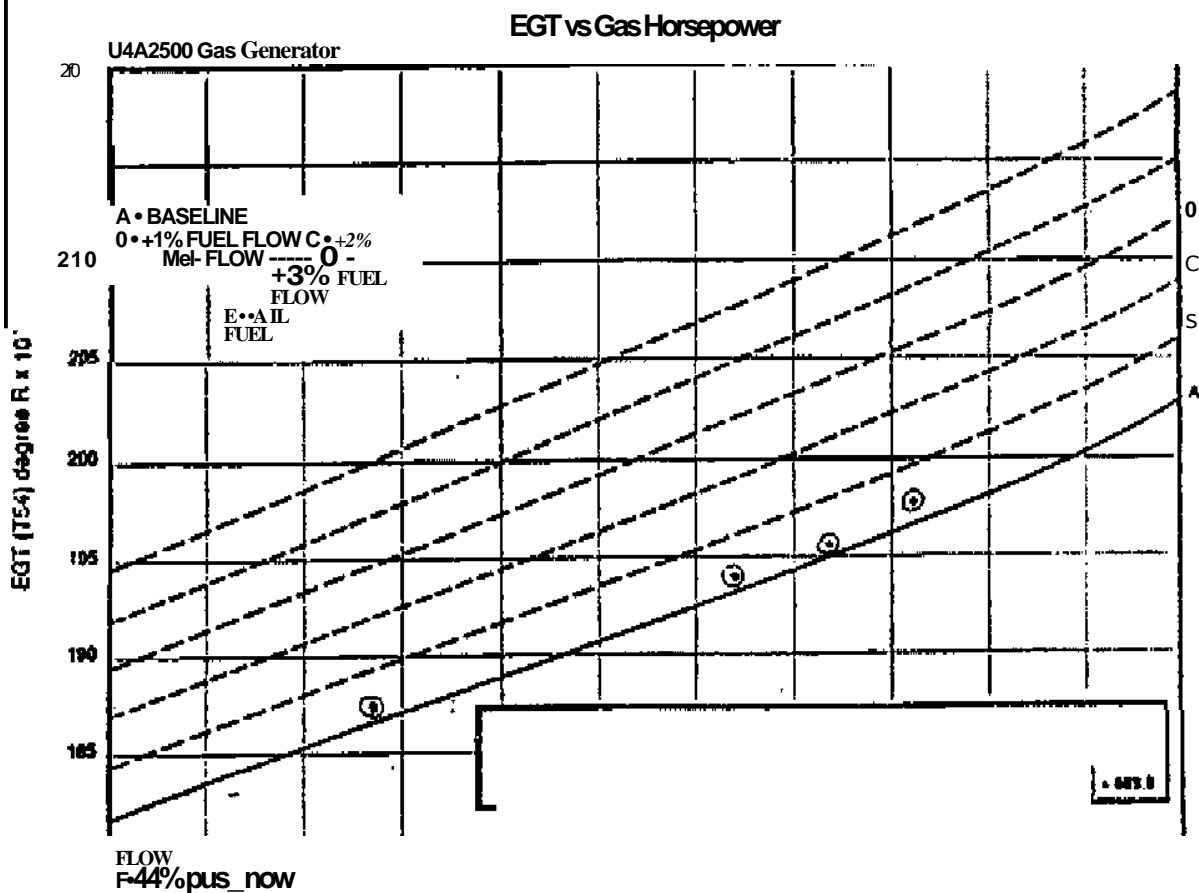
verage NEW ENGINES

Fuel Flow. WFM is Above Nominal by 0.90 Percent
Exhaust Gas Temp. is Above Nominal by 8.70 Deg.F
T54 derived from measured fuel flow deviation is Above Nominal by 24.0 Deg.F
Compressor Efficiency is Below Nominal by 1.596 Percent

PERFORMANCE CURVE

ENG. S/N 481-531
 TEST TYPE : Acceptance
 CUSTOMER

ORDER No. : 13-1165
 DATE March 1998



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 K0471(HAMM-721.000M)TO31,000HP

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