INDEPENDENT ORBITER ASSESSMENT

WEIBULL
ANALYSIS
REPORT

14 DECEMBER 1987

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INDEPENDENT ORBITER ASSESSMENT WEIBULL ANALYSIS REPORT

14 DECEMBER 1987

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1.0 Summary

The Auxiliary Power Unit (APU) and Hydraulic Power Unit (APU) Space Shuttle Subsystems were reviewed as candidates for demonstrating the Weibull analysis methodology. Three hardware components were identified as analysis candidates: the turbine wheel, the gearbox, and the gas generator. Detailed review of subsystem level wearout and failure history revealed the lack of actual component failure data. In addition, component wearout data were not readily available or would require a separate data accumulation effort by the vendor. Without adequate component history data being available, the Weibull analysis methodology application to the APU and HPU subsystem group was terminated.

2.0 Objective

The purpose of this task is to employ and evaluate Weibull analysis techniques in Shuttle component reliability applications. These applications would be based upon available flight and test data for one or more selected components.

3.0 Scope

Components selected for this task were limited to the Shuttle Auxiliary Power Unit (APU) and Hydraulic Power Unit (HPU) subsystems. Additionally, all data were restricted to preclude use of industry generic data and to include only that data derived from actual Shuttle program experience.

4.0 Description of Weibull Analysis Techniques

A Weibull analysis is used primarily to quantify component reliability. The analysis process fits empirical data to a mathematical model of the Weibull distribution. Solutions are typically arrived at graphically rather than analytically.

The greatest usefulness of Weibull analysis is gained when actual failure data are plotted on Weibull probability paper and the resultant curve plot analyzed. The slope of the curve (also called the shaping parameter, Beta) is particularly significant and can provide insights into the nature of the failures being analyzed; for example, Table A identifies typical failure characteristics relative to the value of the slope. The accuracy of the plot and the resultant conclusions drawn therefrom are functions of the failure sample size and data quality.

Table A

Typical Failure Characteristics (Examples)*	Slope (Beta)
Infant Mortality o Inadequate burn-in, green run o Misassembly o Low Quality	Less than 1.0
Random Failures o Time Independent o Maintenance Errors o Electronics o Combined Problems	1.0
Early Wearout o Rapid Wear o Low Cycle Fatigue Old Age Wearout o Rapid Aging o Corrosion	Greater than 1.0

* Per Weibull Analysis Handbook, AFWAL-TR-83-2079

Most applications of Weibull analysis are based on a single failure class or mode from a single part or component. An ideal application would consist of a sample of 20 to 30 failures. Subsequent to the data accumulation process, the first step in establishing a Weibull plot is to order the data from low time to high time failure. This ordering is then employed to define median rank for each data point. (Median rank is typically obtained from Weibull analysis tables developed specifically for this purpose.) The points are then plotted on unique Weibull analysis graph paper and a line drawn through the data points.

The slope of the line is measured by rise over run. The resultant value, Beta (B), is employed to gain insight into the failure characteristics (reference Table A). Additionally, the characteristic life of the component which occurs at the 63.2 percentile of the distribution (relative to the median rank) is also obtained.

These data can be used to quantify risk as a function of accumulated time or as a function of both accumulated and expected additional time.

The aforementioned process is predicated upon the existence of an acceptable failure sample size (and known failure times). For those situations where there are too few or no known failures, or the age of the failed units is unknown, a Weibayes analysis is available. A Weibayes analysis is defined as a Weibull analysis with an assumed slope. This assumption requires judgment (typically obtained from experience or expert opinion) and is

regarded as an informal Bayesian procedure. Depending upon the situation, this may be a strong or weak assumption.

Additionally, for the case where no failures have occurred, the first failure is assumed to be imminent and therefore identical to a one failure case. For whatever case, the characteristic life (eta) is dependent upon this assumption and is calculated employing the assumed value. For the zero or one failure case, a good assumption would still only result in a confidence level of at least sixy-three percent (per AFWAL-TR-83-2079) that the true Weibull lies to the right of the Weibayes line.

5.0 Task History and Status

5.1 Review of Weibull Analysis Techniques

Upon receipt of this task, personnel initiated an in-depth review of the Weibull Analysis Handbook, AFWAL-TR-83-2079. A brief synopsis of this review was presented in Section 4.0 of this document.

5.2 Data Accumulation and Review

Three components were selected as candidates for Weibull analysis: the turbine wheel, the gearbox, and the gas generator - all part of the Shuttle APU system. Data were collected on all three and then reviewed to determine which one had sufficient data to perform a Weibull analysis.

Due to the scope and informal nature of this task (informal in that no directive or monies were specifically provided to support data accumulation), a limited data base which did not include component development or qualification test data was all that could be obtained. These data are presented in Appendix A and summarized in Table B.

Table B

Data Summary

Component	Number of Units Surveyed	Operation Time Range (minutes)	Number of failures
Turbine Wheel	19	104 - 1248	0
Gas Generator	30	73 - 847	0
Gearbox	16	189 - 1200	0

No other data regarding these components were found to complement or supplement the identified data base. As such, the sample size for each component was small and no failures were identified. These findings in turn prompted the determination that only a Weibayes analysis technique could

employ such data; however, this technique required significant judgment and would not satisfy the objective or scope of this task.

6.0 Conclusions

Because the available data could not support the performance of a Weibull analysis without significant judgment, it was determined prudent to terminate this task. It was recognized that the Weibayes technique could be performed with these data; however, it would not have satisfied the task objective.

APPENDIX A

COMPONENT HISTORY DATA

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
D3B001	310	-0201	SS	N/A	N/A	85/10/25	ALT. ATP		38.38
D3B001	310	-0201	102	N/A	3	85/12/08	WET		0
D3B001	310	-0201	102	61C	3	85/12/11	C/O RUN	1	7
D3B001	310	-0201	102	61C	3	85/12/19	ABORT	1	6
D3B001	310	-0201	102	61C	3	86/01/06	ABORT	1	11
D3B001	310	-0201	102	61C	3	86/01/12	FLIGHT	1	79
									141.38
D3B002	302	-0181	SS	N/A	N/A	84/09/28	FINAL ATP	1	38.07
D3B002	302	-0181	099-07	N/A	2	85/04/15	HOTFIRE	1	7
D3B002	302	-0181	099-07	51B	2	85/04/29	FLIGHT	3	105.92
D3B002	302	-0181	099-08	51F	2	85/07/12	FLIGHT	3	80.83
D3B002	302	-0181	099-09	61A	2	85/10/30	FLIGHT	2	109.78
D3B002	302	-0181	099-10	51L	2	86/01/28	FLIGHT	1	6
D3B002	302	-0181	099-10	51L	2	86/01/28	DESTRUCT		0
									347.60
D3B003	310	-0201	SS	N/A	N/A	85/10/16	GREEEN RUN		13.6
D3B003	310	-0201	SS	N/A	N/A	85/10/16	S.L. ATP		27.5
D3B003	310	-0201	SS	N/A	N/A	85/10/17	S.L. ATP		36.62
D3B003	310	-0201	SS	N/A	N/A	85/10/18	ALT. ATP		26.7
									104.42
D3B005	309	-0201	SS	N/A	N/A	85/06/07	S.L. ATP		38.12
D3B005	309	-0201	SS	N/A	N/A	85/06/07	GREEN RUN		9.07
D3B005	309	-0201	SS	N/A	N/A	85/07/15	S.L. ATP		22.13
D3B005	309	-0201	SS	N/A	N/A	85/07/16	S.L. ATP		36.58
D3B005	309	-0201	SS	N/A	N/A	85/09/26	S.L. ATP		6.82
D3B005	309	-0201	SS	N/A	N/A	85/11/02	S.L. ATP		35.80
D3B005	309	-0201	SS	N/A	N/A	85/11/04	GREEN RUN		34.53
D3B005	309	-0201	099	N/A	3	85/12/10	INSTL		0
D3B005	309	-0201	099-10	51L	3	86/01/28	DESTRUCT		0
D3B005	309	-0201	099-10	51L	3	86/01/28	FLIGHT	1	6
D3B005						86/01/04	C/O RUN	1	7
									196.05

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
D3B006	307	-0201	SS	N/A	N/A	85/04/10	GREEN RUN		2.82
D3B006	307	-0201	SS	N/A	N/A	85/04/11	GREEN RUN		7.3
D3B006	307	-0201	SS	N/A	N/A	85/04/12	S.L. TEST		37.63
D3B006	307	-0201	SS	N/A	N/A	85/05/07	S.L. TEST		36.35
D3B006	307	-0201	SS	N/A	N/A	85/06/13	S.L. TEST		35.97
D3B006	307	-0201	104-01	51J	2	85/09/12	FRF		7.98
D3B006	307	-0201	104-01	51J	2	85/10/03	FLIGHT		81
D3B006	307	-0201	104-02	61B	2	85/11/26	FLIGHT		102.10
									311.15
D3B010	308	-0201	SS	N/A	N/A	85/04/26	GREEN RUN		45.47
D3B010	308	-0201	SS	N/A	N/A	85/06/10	S.L. ATP		36.47
D3B010	308	-0201	104-01	51J	3	85/09/12	FRF	1	8.02
D3B010	308	-0201	104-01	51J	3	85/10/03	FLIGHT	3	86
D3B010	308	-0201	104-02	61B	3	85/11/26	FLIGHT	3	77.35
									253.31
D7L002	204	-0011	SS	N/A	N/A	79/03/11	LAB	1	18.03
D7L002	204	-0011	SS	N/A	N/A	79/03/12	LAB	1	27.45
D7L002	204	-0011	SS	N/A	N/A	79/03/13	LAB	1	27.02
D7L002	204	-0011	102	N/A	2	79/11/01	C/O	7	87.77
D7L002	204	-0071	SS	N/A	N/A	81/05/07	LAB	1	0.20
D7L002	204	-0071	SS	N/A	N/A	81/07/15	LAB	1	4.12
D7L002	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	7.6
D7L002	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	1.48
D7L002	204	-0011	SS	N/A	N/A	81/10/12	LAB	1	7.30
D7L002	204	-0011	SS	N/A	N/A	81/10/13	LAB	1	37.18
D7L002	204	-0071	SS	N/A	N/A	81/10/14	LAB	1	35.27
D7L002	204	-0071	102-03	3	1	82/02/26	HOTFIRE	1	7.10
D7L002	204	-0071	102-03	3	1	82/03/22	FLIGHT	2	98
D7L002	204	-0071	102-04	4	1	82/06/27	FLIGHT	3	84.48
D7L002	204	-0071	102-05	5	1	82/11/11	FLIGHT	3	86.40
D7L002	204	-0071	102-06	9	1	83/10/11	C/O	1	6.98
D7L002	204	-0071	102-06	9	1	83/11/28	FLIGHT	2	85.20
									621.58

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
D7L006	205	-0011	SS	N/A	N/A	79/03/16	LAB	3	73.15
D7L006	205	-0061	SS	N/A	N/A	80/01/16	LAB	5	86.06
D7L006	205	-0071	SS	N/A	N/A	80/10/15	LAB	2	76.90
D7L006	205	-0071	SS	N/A	N/A	81/02/02	LAB	1	36.85
D7L006	205	-0071	SS	N/A	N/A	81/02/04	LAB	1	37.02
D7L006	205	-0071	102-05	5	3	82/09/28	HOTFIRE	1	7
D7L006	205	-0071	102-05	5	3	82/11/11	FLIGHT	2	100.05
D7L006	205	-0071	102-06	9	3	83/10/11	C/O	1	7.15
D7L006	205	-0071	102-06	9	3	83/11/28	FLIGHT	1	78.7
D7L006	205	-0081	SS	N/A	N/A	83/12/27	S.L. ATP	1	37
D7L006	205	-0081	SS	N/A	N/A	84/10/20	GREEN RUN	1	2.15
D7L006	205	-0081	SS	N/A	N/A	84/10/25	S.L. ATP	1	38.45
D7L006	205	-0081	SS	N/A	N/A	84/11/17	S.L. ATP	1	39.95
D7L006	205	-0081	SS	N/A	N/A	84/12/19	S.L. ATP		0.42
D7L006	205	-0081	SS	N/A	N/A	85/01/22	ATP		38.42
D7L006	205	-0081	SS	N/A	N/A	85/01/22	ATP		2.33
D7L006	205	-0081	099-07	N/A	1	85/04/15	HOTFIRE	1	7
D7L006	205	-0181	099-07	51B	1	85/04/29	FLIGHT	2	85.45
D7L006	205	-0181	099-08	51F	1	85/07/12	FLIGHT	2	44.41
D7L006	205	-0181	099-09	61A	1	85/10/30	FLIGHT	3	88.35
D7L006	205	-0181	099-10	51L	1	86/01/28	FLIGHT	1	6
D7L006	205	-0181	099-10	51L	1	86/01/28	FLIGHT		0
									892.81
D7L008	203	-0011	SS	N/A	N/A	79/03/07	GREEN RUN	3	18.57
D7L008	203	-0011	SS	N/A	N/A	79/03/09	ATP		54.17
D7L008	203	-0011	102	N/A	3	79/11/01	GR. CHECK	6	83.87
D7L008	203	-0061	SS	N/A	N/A	80/04/16	GREEN RUN	4	20.48
D7L008	203	-0061	SS	N/A	N/A	80/04/17	ATP		35.73
D7L008	203	-0061	SS	N/A	N/A	80/04/21	ATP		51.13
D7L008	203	-0071	SS	N/A	N/A	80/10/24	ATP	1	36
D7L008	203	-0071	102	N/A	1	81/01/23	C/O	1	2
D7L008	203	-0071	102-01	1	1	81/02/20	FRF	1	10.7
D7L008	203	-0071	102-01	1	1	81/04/12	FLIGHT	3	62.63
D7L008	203	-0071	102-02	2	1	81/11/04	RECYCLE	1	7.38
D7L008	203	-0071	102-02	2	1	81/11/12	FLIGHT	2	81.12
D7L008	203	-0071	SS	N/A	N/A	82/01/20	BUBL TEST	1	21.18
D7L008	203	-0071	SS	N/A	N/A	82/01/22	BUBL TEST	1	8
D7L008	203	-0071	SS	N/A	N/A	82/01/26	BUBL TEST	1	10.32
D7L008	203	-0071	SS	N/A	N/A	82/01/28	BUBL TEST	1	11.07
D7L008	203	-0071	SS	N/A	N/A	82/01/29	BUBL TEST	1	9.07
D7L008	203	-0071	SS	N/A	N/A	82/02/01	BUBL TEST	1	10.07

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TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
D7L008	203	-0071	SS	N/A	N/A	82/02/02	BUBL TEST	1	7.07
D7L008	203	-0071	SS	N/A	N/A	82/02/03	BUBL TEST	1	20
D7L008	203	-0071	SS	N/A	N/A	82/02/04	BUBL TEST	1	5.07
D7L008	203	-0071	SS	N/A	N/A	82/02/05	BUBL TEST	1	11.07
D7L008	203	-0071	SS	N/A	N/A	82/02/11	BUBL TEST	1	6.6
D7L008	203	-0131	SS	N/A	N/A	83/02/10	GREEN RUN	4	9.53
D7L008	203	-0131	SS	N/A	N/A	83/02/14	FINAL ATP		36.52
D7L008	203	-0131	SS	N/A	N/A	83/02/14	SL TEST		36.27
D7L008	203	-0131	099	N/A	3	83/08/02	GR. CHECK	1	7
D7L008	203	-0131	099-03	8	3	83/08/30	FLIGHT	3	83.7
D7L008	203	-0161	SS	N/A	N/A	84/02/04	LAB	1	36.47
D7L008	203	-0161	099-05	41C	1	84/03/20	FRF	1	7.02
D7L008	203	-0161	099-05	41C	1	84/04/06	FLIGHT	2	103.83
D7L008	203	-0161	099-06	41G	1	84/10/05	FLIGHT	2	73.57
D7L008	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		12.50
D7L008	203	-0201	SS	N/A	N/A	85/09/14	FINAL ATP		37.11
D7L008	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		2.3
D7L008	203	-0201	102	N/A	2	85/12/08	WET		0
D7L008	203	-0201	102	61C	2	85/12/11	C/O RUN	1	7
D7L008	203	-0201	102	61C	2	85/12/19	ABORT	1	6
D7L008	203	-0201	102	61C	2	86/01/06	ABORT	1	11
D7L008	203	-0201	102	61C	2	86/01/12	FLIGHT	1	75
									1128.10
D7L014	207	-0011	SS	N/A	N/A	79/11/07	LAB	3	75.80
D7L014	207	-0011	SS	N/A	N/A	80/01/11	LAB	5	88.32
D7L014	207	-0071	SS	N/A	N/A	80/10/23	LAB	1	36.50
D7L014	207	-0071	102-01	1	2	81/01/23	C/O	1	2
D7L014	207	-0071	102-01	1	2	81/02/20	FRF	1	10.08
D7L014	207	-0071	102-01	1	2	81/04/12	FLIGHT	2	83.95
D7L014	207	-0071	SS	N/A	N/A	81/07/00	ENG. VIB		10.37
D7L014	207	-0071	SS	N/A	N/A	81/07/25	S.L. ATP	6	30.27
D7L014	207	-0071	SS	N/A	N/A	81/07/27	ALT. ATP		49.10
									386.39
D8B004	208	-0061	SS	N/A	N/A	80/01/13	LAB	3	82.53
D8B004	208	-0071	SS	N/A	N/A	80/10/21	LAB	5	112.85
D8B004	208	-0071	SS	N/A	N/A	80/10/30	LAB	1	36.47
D8B004	208	-0071	102	N/A	3	81/01/23	C/O	1	2
D8B004	208	-0071	102-01	1	3	81/02/20	FRF	1	10.05

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TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
D8B004	208	-0071	102-01	1	3	81/04/12	FLIGHT	2	83.75
D8B004	208	-0071	102-02	2	3	81/11/04	RECYCLE	1	7.38
D8B004	208	-0071	102-02	2	3	81/11/12	FLIGHT	2	98.82
D8B004	208	-0071	102-03	3	3	82/03/22	FLIGHT	3	85.25
D8B004	208	-0071	102-04	4	3	82/06/27	FLIGHT	2	79.25
D8B004	208	-0071	JSC	N/A	N/A	82/09/24	JSC	4	71.60
D8B004	208	-0131	SS	N/A	N/A	83/04/13	GREEN RUN	9	12.68
D8B004	208	-0131	SS	N/A	N/A	83/04/21	ACCEP TES		76.65
D8B004	208	-0131	SS	N/A	N/A	83/06/15	GREEN RUN		8.37
D8B004	208	-0131	SS	N/A	N/A	82/06/16	ACCEPT TES		71.23
D8B004	208	-0161	SS	N/A	N/A	84/02/19	FINAL ATP	1	35.57
D8B004	208	-0161	099-05	41C	3	84/03/20	FRF	1	7.18
D8B004	208	-0161	099-05	41C	3	84/04/06	FLIGHT	2	73.33
D8B004	208	-0161	SS	N/A	N/A	84/07/26	LAB	1	36.58
D8B004	208	-0161	SS	N/A	N/A	84/07/26	LAB	1	36.68
D8B004	208	-0161	JSC	N/A	N/A	84/12/13	TTA	2	20.20
D8B004	208	-0161	JSC	N/A	N/A	84/12/14	TTA	1	20.03
D8B004	208	-0161	JSC	N/A	N/A	85/01/10	TTA	1	44
D8B004	208	-0161	SS	N/A	N/A	85/02/08	LAB	1	45.20
D8B004	208	-0161	SS	N/A	N/A	85/03/15	LAB	1	42.77
D8B004	208					85/05/23	LAB	1	36.3
									1236.72
D8B013	301	-0121	SS	N/A	N/A	81/08/26	GREEN RUN	5	3.22
D8B013	301	-0121	SS	N/A	N/A	81/08/27	GREEN RUN		8.23
D8B013	301	-0121	SS	N/A	N/A	81/11/19	GREEN RUN	5	9.43
D8B013	301	-0121	SS	N/A	N/A	81/20/19	LAB		75.10
D8B013	301	-0121	099-01	6	2	82/12/18	FRF-1	1	7.08
D8B013	301	-0121	099-01	6	2	83/01/25	FRF-2	1	5.78
D8B013	301	-0121	099-01	6	2	83/04/04	FLIGHT	3	82.20
D8B013	301	-0121	099-02	7	2	83/06/18	FLIGHT	2	73.53
D8B013	301	-0121	099-03	8	2	83/08/30	FLIGHT	2	75.72
D8B013	301	-0161	SS	N/A	N/A	84/02/09	ATP	1	36.47
D8B013	301	-0161	099-05	41C	2	84/03/20	FRF	1	7.10
D8B013	301	-0161	099-05	41C	2	84/04/06	FLIGHT	3	76.80
D8B013	301	-0161	099-06	41G	2	84/10/05	FLIGHT	2	90.72
D8B013	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		12.95
D8B013	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		2.70
D8B013	301	-0201	SS	N/A	N/A	85/08/27	S.L. ATP		37.82
D8B013	301	-0201	102	N/A	1	85/12/08	WET		0
D8B013	301	-0201	102	61C	1	85/12/11	C/O RUN	1	7

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
D8B013	301	-0201	102	61C	1	85/12/19	ABORT	1	6
D8B013	301	-0201	102	61C	1	86/01/06	ABORT	1	11
D8B013	301	-0201	102	61C	1	86/01/12	FLIGHT	1	101
									729.85
D8B018	302	-0121	N/A	N/A	N/A	81/06/05	GREEN RUN	3	21.08
D8B018	302	-0121	N/A	N/A	N/A	81/06/08	ACCEPT TE		37.5
D8B018	302	-0121	N/A	N/A	N/A	81/06/09	LAB		35.87
D8B018	302	-0121	099-01	6	3	82/12/18	FRF-1	1	7.08
D8B018	302	-0121	099-01	6	3	83/01/25	FRF-2	1	5.78
D8B018	302	-0121	099-01	6	3	83/04/04	FLIGHT	2	76.62
D8B018	302	-0121	099-02	7	3	83/06/18	FLIGHT	3	89.98
									273.91
D8B024	303	-0121	SS	N/A	N/A	81/09/25	GREEN RUN	2	1.15
D8B024	303	-0121	SS	N/A	N/A	81/10/01	GREEN RUN		1.57
D8B024	303	-0121	SS	N/A	N/A	81/11/12	GREEN RUN	4	2.10
D8B024	303	-0121	SS	N/A	N/A	81/11/13	ACCEP TES		37.83
D8B024	303	-0121	SS	N/A	N/A	81/11/13	GREEN RUN		7.45
D8B024	303	-0121	SS	N/A	N/A	81/11/16	LAB		35.93
D8B024	303	-0121	099-01	6	1	82/12/18	FRF-1	1	7.10
D8B024	303	-0121	099-01	6	1	83/01/25	FRF-2	1	5.78
D8B024	303	-0121	099-01	6	1	83/04/04	FLIGHT	2	97.35
D8B024	303	-0121	099-02	7	1	83/06/18	FLIGHT	2	95.55
D8B024	303	-0121	099-03	8	1	83/08/30	FLIGHT	2	90.70
D8B024	303	-0161	SS	N/A	N/A	84/02/05	S.L.	4	40.55
D8B024	303	-0161	SS	N/A	N/A	84/02/07	S.L.		36.60
D8B024	303	-0161	SS	N/A	N/A	84/02/29	GREEN RUN		2.57
D8B024	303	-0161	SS	N/A	N/A	84/03/01	S.L.		36.37
D8B024	303	-0161	103-01	41D	1	84/06/01	FRF	1	7.58
D8B024	303	-0161	103-01	41D	1	84/06/26	ABORT	1	6.05
D8B024	303	-0161	103-01	41D	1	84/08/29	FLIGHT	2	85.17
D8B024	303	-0161	103-02	51A	1	84/11/08	FLIGHT	2	83.35
D8B024	303	-0161	103-03	51C	1	85/01/24	FLIGHT	2	85.30
D8B024	303	-0161	103-04	51D	1	85/04/12	FLIGHT	2	79
D8B024	303	-0161	103-05	51G	1	85/06/17	FLIGHT	2	106
D8B024	303	-0161	103-06	51I	1	85/08/24	FLIGHT	2	85.43
D8B024	303	-0161	103-06	62A	1		FLIGHT		
D8B024	303	-0201	SS	N/A	N/A	85/10/04	S.L. ATP		36.5

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
D8B024	303	-0201	SS	N/A	N/A	86/01/14	GREEN RUN		1.8
D8B024	303	-0201	SS	N/A	N/A	86/01/14	GREEN RUN		12.43
D8B024	303	-0201	SS	N/A	N/A	86/01/22	GREEN RUN		1.57
D8B024	303	-0201	SS	N/A	N/A	86/01/22	GREEN RUN		12.3
D8B024	303	-0201	SS	N/A	N/A	86/01/22	S.L. ATP		36.45
D8B024	303	-0201	SS	N/A	N/A	86/01/22	ALT ATP		0.6
D8B024	303	-0201	SS	N/A	N/A	86/01/22	ALT ATP		36.07
D8B024	303	-0201	SS	N/A	N/A	86/02/27	ALT ATP		36.23
D8B024	303	-0201	SS	N/A	N/A	86/06/12	GREEN RUN		2.13
D8B024	303	-0201	SS	N/A	N/A	86/06/13	ALT ATP		35.8
									1248.36
D8B029	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	19.93
D8B029	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	28.20
D8B029	206	-0011	SS	N/A	N/A	79/05/07	LAB	1	27.27
D8B029	206	-0011	SS	N/A	N/A	79/09/19	LAB	3	73.73
D8B029	206	-0011	102	N/A	1	79/11/01	C/O	7	89.33
D8B029	206	-0011	SS	N/A	N/A	80/04/28	LAB	1	0.43
D8B029	206	-0011	SS	N/A	N/A	80/07/09	LAB	1	18.07
D8B029	206	-0011	SS	N/A	N/A	80/10/00	LAB		0
D8B029	206	-0071	SS	N/A	N/A	80/11/18	LAB	3	94.22
D8B029	206	-0071	102-02	2	2	81/09/15	HOTFIRE	1	7.77
D8B029	206	-0071	102-02	2	2	81/11/04	RECYCLE	1	7.38
D8B029	206	-0071	102-02	2	2	81/11/12	FLIGHT	3	85.25
D8B029	206	-0071	102-03	3	2	82/03/22	FLIGHT	2	82.03
D8B029	206	-0071	102-04	4	2	82/09/27	FLIGHT	2	98.25
D8B029	206	-0071	102-05	5	2	82/11/11	FLIGHT	2	81.37
D8B029	206	-0071	102-06	9	2	83/10/11	C/O	1	7.1
D8B029	206	-0071	102-06	9	2	83/11/28	FLIGHT	2	74.13
									794.46
D9M006	306	-0131	SS	N/A	N/A	82/05/02	LAB	6	119.87
D9M006	306	-0131	SS	N/A	N.A	82/08/25	LAB	6	88.12
D9M006	306	-0131	099-04	41B	2	84/01/26	FRF	1	10.13
D9M006	306	-0131	099-04	41B	2	84/02/03	FLIGHT	2	95.23
D9M006	306	-0131	SS	N/A	N/A	84/07/18	LAB		43.07
D9M006	306	-0131	SS	N/A	N/A	84/09/00	LAB	2	76.8
D9M006	306	-0131	SS	N/A	N/A	84/10/00	LAB		0
D9M006	306	-0131	SS	N/A	N/A	84/10/00	LAB	1	10.63

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TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
D9M006	306	-0131	SS	N/A	N/A	84/10/00	LAB	3	48.43
D9M006	306	-0131	SS	N/A	N/A	84/11/15	LAB	1	39.3
D9M006	306	-0131	104-01	51J	1	85/09/12	FRF	1	7.95
D9M006	306	-0131	104-01	51J	1	85/10/03	FLIGHT	2	108
D9M006	306	-0131	104-02	61B	1	85/11/26	FLIGHT	2	73.63
									721.16
D9M007	207					82/11/08			473.98
									473.98
D9M013	305	-0131	SS	N/A	N/A	82/03/11	GREEN RUN	6	12.2
D9M013	305	-0131	SS	N/A	N/A	82/03/15	S.L. TEST		39.37
D9M013	305	-0131	SS	N/A	N/A	82/03/18	ALT APT		36.82
D9M013	305	-0131	SS	N/A	N/A	82/03/29	LAB		36.56
D9M013	305	-0131	099-04	41B	3	84/01/26	FRF	1	10.23
D9M013	305	-0131	099-04	41B	3	84/02/03	FLIGHT	2	74.1
D9M013	305	-0161	SS	N/A	N/A	84/03/19	LAB	1	36.48
D9M013	305	-0161	103-01	41D	3	84/06/01	FRF	1	7.68
D9M013	305	-0161	103-01	41D	3	84/06/26	ABORT	1	6.03
D9M013	305	-0161	103-01	41D	3	84/08/29	FLIGHT	2	107.92
D9M013	305	-0161	103-02	51A	3	84/11/08	FLIGHT	3	87.55
D9M013	305	-0161	103-03	51C	3	85/01/24	FLIGHT	2	113.7
D9M013	305	-0161	103-04	51D	3	85/04/12	FLIGHT	3	87
D9M013	305	-0161	103-05	51G	3	85/06/17	FLIGHT	3	89
D9M013	305	-0161	103-06	51I	3	85/08/24	FLIGHT	2	79.05
									823.69
D9M014	304	-0131	SS	N/A	N/A	82/02/05	GREEN RUN	5	2.1
D9M014	304	-0131	SS	N/A	N/A	82/02/10	GREEN RUN		7.87
D9M014	304	-0131	SS	N/A	N/A	82/03/03	S.L. ALT.		37.58
D9M014	304	-0131	SS	N/A	N/A	82/04/01	S.L. ALT.		36.52
D9M014	304	-0131	SS	N/A	N/A	82/04/02	LAB		35.67
D9M014	304	-0131	099-04	41B	1	84/01/26	FRF	1	10.3
D9M014	304	-0131	099-04	41B	1	84/02/03	FLIGHT	3	79.18
D9M014	304	-0161	SS	N/A	N/A	84/03/15	S.L.	1	37.67
D9M014	304	-0161	103-01	41D	2	84/06/01	FRF	1	7.63
D9M014	304	-0161	103-01	41D	2	84/06/26	ABORT	1	6.05

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TURBINE WHEEL OPERATING HISTORY

TUBN WHL S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
D9M014	304	-0161	103-01	41D	2	84/08/29	FLIGHT	3	88.77
D9M014	304	-0161	103-02	51A	2	84/11/08	FLIGHT	2	110.67
D9M014	304	-0161	103-03	51C	2	85/01/24	FLIGHT	3	90.65
D9M014	304	-0161	103-04	51D	2	85/04/12	FLIGHT	2	111
D9M014	304	-0161	103-05	51G	2	85/06/17	FLIGHT	2	80
D9M014	304	-0161	103-06	51I	2	85/08/24	FLIGHT	2	105.32
D9M014	304	-0161	103-07	62A	2		FLIGHT		
									847.28

NS = NEW SEAT
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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
1008AM	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	19.93
1008AM	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	28.2
1008AM	206	-0011	SS	N/A	N/A	79/05/07	LAB	1	27.27
1008AM	206	-0011	SS	N/A	N/A	79/09/19	LAB	3	73.73
1008AM	206	-0011	102	N/A	1	79/11/01	C/O	7	89.33
									238.46
1009C	207	-0011	SS	N/A	N/A	79/11/07	LAB	3	75.8
1009C	207	-0011	SS	N/A	N/A	80/01/11	LAB	5	88.32
1009C	207	-0071	SS	N/A	N/A	80/10/23	LAB	1	36.5
1009C	207	-0071	102-01	1	2	81/01/23	C/O	1	2
1009C	207	-0071	102-01	1	2	81/02/20	FRF	1	10.08
1009C	207	-0071	102-01	1	2	81/04/12	FLIGHT	2	83.95
1009C	207	-0131	SS	N/A	N/A	82/11/09	GREEN RUN	4	10.95
1009C	207	-0131	SS	N/A	N/A	82/11/10	S.L. ATP		38.1
1009C	207	-0131	SS	N/A	N/A	82/11/11	ATP		36.38
									382.08
1009R	309	-0201	SS	N/A	N/A	85/06/07	GREEN RUN		9.07
1009R	309	-0201	SS	N/A	N/A	85/06/07	S.L. ATP		38.12
1009R	309	-0201	SS	N/A	N/A	85/07/15	S.L. ATP		22.13
1009R	309	-0201	SS	N/A	N/A	85/07/16	S.L. ATP		36.58
1009R	309	-0201	SS	N/A	N/A	85/09/26	S.L. ATP		6.82
1009R	309	-0201	SS	N/A	N/A	85/11/02	S.L. ATP		35.8
1009R	309	-0201	SS	N/A	N/A	85/11/04	GREEN RUN		34.53
1009R	309	-0201	099	N/A	3	85/12/10	INSTL		0
1009R	309	-0201	099-10	51L	3	86/01/28	FLIGHT	1	6
1009R	309	-0201	099-10	51L	3	86/01/28	DESTRUCT		0
									189.05
1013XM	203	-0011	SS	N/A	N/A	79/03/07	GREEN RUN	3	18.57
1013XM	203	-0011	SS	N/A	N/A	79/03/09	ATP		54.17
1013XM	203	-0011	102	N/A	3	79/11/01	GR. CHECK	6	83.87
1013XM	207	-0071	SS	N/A	N/A	81/07/00	ENG. VIB		10.37
1013XM	207	-0071	SS	N/A	N/A	81/07/25	S.L. ATP	6	30.27
1013XM	207	-0071	SS	N/A	N/A	81/07/27	ALT. ATP		49.1
									246.35

NS = NEW SEAT
R# = REBUILT

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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
1014XM	205	-0011	SS	N/A	N/A	79/03/16	LAB	3	73.15
									73.15
1015XM	204	-0011	SS	N/A	N/A	79/03/11	LAB	1	18.03
1015XM	204	-0011	SS	N/A	N/A	79/03/12	LAB	1	27.45
1015XM	204	-0011	SS	N/A	N/A	79/03/13	LAB	1	27.02
1015XM	204	-0011	102	N/A	2	79/11/01	C/O	7	87.77
									160.27
3002	208	-0061	SS	N/A	N/A	80/01/13	LAB	3	82.53
3002	208	-0071	SS	N/A	N/A	80/10/21	LAB	5	112.85
3002	208	-0071	SS	N/A	N/A	80/10/30	LAB	1	36.47
3002	208	-0071	102	N/A	3	81/01/23	C/O	1	2.00
3002	208	-0071	102-01	1	3	81/02/20	FRF	1	10.05
3002	208	-0071	102-01	1	3	81/04/12	FLIGHT	2	83.75
3002	208	-0071	102-02	2	3	81/11/04	RECYCLE	1	7.38
3002	208	-0071	102-02	2	3	81/11/12	FLIGHT	2	98.82
3002	208	-0071	102-03	3	3	82/03/22	FLIGHT	3	85.25
3002	208	-0071	102-04	4	3	82/06/27	FLIGHT	2	79.25
3002	208	-0071	JSC	N/A	N/A	82/09/24	JSC	4	71.60
3002	208	-0131	SS	N/A	N/A	83/04/13	GREEN RUN	9	12.68
3002	208	-0131	SS	N/A	N/A	83/04/21	ACCEP TES		76.65
3002	208	-0131	SS	N/A	N/A	83/06/15	GREEN RUN		8.37
3002	208	-0131	SS	N/A	N/A	83/06/16	ACCEP TES		71.23
									838.88
3003	205	-0061	SS	N/A	N/A	80/01/16	LAB	5	86.06
3003	205	-0071	SS	N/A	N/A	80/10/15	LAB	2	76.90
3003	205	-0071	SS	N/A	N/A	81/02/02	LAB	1	36.85
3003	205	-0071	SS	N/A	N/A	81/02/04	LAB	1	37.02
3003	205	-0071	102-05	5	3	82/09/28	HOTFIRE	1	7.00
3003	205	-0071	102-05	5	3	82/11/11	FLIGHT	2	100.05
3003	205	-0071	102-06	9	3	83/10/11	C/O	1	7.15
3003	205	-0071	102-06	9	3	83/11/28	FLIGHT	3	78.70
3003	205	-0071	SS	N/A	N/A	83/12/27	S. L. ATP	1	37.00
									466.73

NS = NEW SEAT
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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
3004	303	-0121	SS	N/A	N/A	81/09/25	GREEN RUN	2	1.15
3004	303	-0121	SS	N/A	N/A	81/10/01	GREEN RUN		1.57
3004	303	-0121	SS	N/A	N/A	81/11/12	GREEN RUN	4	2.10
3004	303	-0121	SS	N/A	N/A	81/11/13	GREEN RUN		7.45
3004	303	-0121	SS	N/A	N/A	81/11/13	ACCEP TES		37.83
3004	303	-0121	SS	N/A	N/A	81/11/16	LAB		35.93
3004	303	-0121	099-01	6	1	82/12/18	FRF-1	1	7.10
3004	303	-0121	099-01	6	1	83/01/25	FRF-2	1	5.78
3004	303	-0121	099-01	6	1	83/04/04	FLIGHT	2	97.35
3004	303	-0121	099-02	7	1	83/06/18	FLIGHT	2	95.55
3004	303	-0121	099-03	8	1	83/08/30	FLIGHT	2	90.70
									382.51
3006	203	-0061	SS	N/A	N/A	80/04/16	GREEN RUN	4	20.48
3006	203	-0061	SS	N/A	N/A	80/04/17	ATP		35.73
3006	203	-0061	SS	N/A	N/A	80/04/21	ATP		51.13
3006	203	-0071	SS	N/A	N/A	80/10/24	ATP	1	36
3006	203	-0071	102	N/A	1	81/01/23	C/O	1	2
3006	203	-0071	102-01	1	1	81/02/20	FRF	1	10.7
3006	203	-0071	102-01	1	1	81/04/12	FLIGHT	3	62.63
3006	203	-0071	102-02	2	1	81/11/04	RECYCLE	1	7.38
3006	203	-0071	102-02	2	1	81/11/12	FLIGHT	2	81.12
3006	203	-0071	SS	N/A	N/A	82/01/20	BUBL TEST	1	21.18
3006	203	-0071	SS	N/A	N/A	82/01/22	BUBL TEST	1	8
3006	203	-0071	SS	N/A	N/A	82/01/26	BUBL TEST	1	10.32
3006	203	-0071	SS	N/A	N/A	82/01/28	BUBL TEST	1	11.07
3006	203	-0071	SS	N/A	N/A	82/01/29	BUBL TEST	1	9.07
3006	203	-0071	SS	N/A	N/A	82/02/01	BUBL TEST	1	10.07
3006	203	-0071	SS	N/A	N/A	82/02/02	BUBL TEST	1	7.07
3006	203	-0071	SS	N/A	N/A	82/02/03	BUBL TEST	1	20
3006	203	-0071	SS	N/A	N/A	82/02/04	BUBL TEST	1	5.07
3006	203	-0071	SS	N/A	N/A	82/02/05	BUBL TEST	1	11.07
3006	203	-0071	SS	N/A	N/A	82/02/11	BUBL TEST	1	6.6
3006	203	-0131	SS	N/A	N/A	83/02/10	GREEN RUN	4	9.53
3006	203	-0131	SS	N/A	N/A	83/02/14	FINAL ATP		36.52
3006	203	-0131	SS	N/A	N/A	83/02/14	SL TEST		36.27
3006	203	-0131	099	N/A	3	83/08/02	GR. CHECK	1	7
3006	203	-0131	099-03	8	3	83/08/30	FLIGHT	3	83.7
									599.71

NS = NEW SEAT
R# = REBUILT

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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
3006R	307	-0201	SS	N/A	N/A	85/04/10	GREEN RUN		2.82
3006R	307	-0201	SS	N/A	N/A	85/04/11	GREEN RUN		7.3
3006R	307	-0201	SS	N/A	N/A	85/04/12	S.L. TEST		37.63
3006R	307	-0201	SS	N/A	N/A	85/05/07	S.L. TEST		36.35
3006R	307	-0201	SS	N/A	N/A	85/06/13	S.L. TEST		35.97
3006R	307	-0201	104-01	51J	2	85/09/12	FRF	1	7.98
3006R	307	-0201	104-01	51J	2	85/10/03	FLIGHT	2	81
3006R	307	-0201	104-02	61B	2	85/11/26	FLIGHT	2	102.1
									311.15
3007	206	-0011	SS	N/A	N/A	80/04/28	LAB	1	0.43
3007	206	-0011	SS	N/A	N/A	80/07/09	LAB	1	18.07
3007	206	-0011	SS	N/A	N/A	80/10/00	LAB		0
3007	206	-0071	SS	N/A	N/A	81/11/18	LAB	3	94.22
3007	206	-0071	102-02	2	2	81/09/15	HOTFIRE	1	7.77
3007	206	-0071	102-02	2	2	81/11/04	RECYCLE	1	7.38
3007	206	-0071	102-02	2	2	81/11/12	FLIGHT	3	85.25
3007	206	-0071	102-03	3	2	82/03/22	FLIGHT	2	82.03
3007	206	-0071	102-04	4	2	82/06/27	FLIGHT	2	98.25
3007	206	-0071	102-05	5	2	82/11/11	FLIGHT	2	81.37
3007	206	-0071	102-06	9	2	83/10/11	C/O	1	7.1
3007	206	-0071	102-06	9	2	83/11/28	FLIGHT	2	74.13
									556
3007/R	308	-0201	SS	N/A	N/A	85/04/26	GREEN RUN		44.47
3007/R	308	-0201	SS	N/A	N/A	85/06/10	S.L. ATP		36.47
3007/R	308	-0201	104-01	51J	3	85/09/12	FRF	1	8.02
3007/R	308	-0201	104-01	51J	3	85/10/03	FLIGHT	3	86
3007/R	308	-0201	104-02	61B	3	85/11/26	FLIGHT	3	77.35
									252.31
3008	204	-0071	SS	N/A	N/A	81/05/07	LAB	1	0.2
3008	204	-0071	SS	N/A	N/A	81/07/15	LAB	1	4.12
3008	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	1.48
3008	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	7.6
3008	204	-0071	SS	N/A	N/A	81/10/12	LAB	1	7.3
3008	204	-0071	SS	N/A	N/A	81/10/13	LAB	1	37.18
3008	204	-0071	SS	N/A	N/A	81/10/14	LAB	1	35.27

NS = NEW SEAT
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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
3008	204	-0071	102-03	3	1	82/02/26	HOTFIRE	1	7.1
3008	204	-0071	102-03	3	1	82/03/22	FLIGHT	2	98
3008	204	-0071	102-04	4	1	82/06/27	FLIGHT	3	84.48
3008	204	-0071	102-05	5	1	82/11/11	FLIGHT	3	86.4
3008	204	-0071	102-06	9	1	83/10/11	C/O	1	6.98
3008	204	-0071	102-06	9	1	83/11/28	FLIGHT	2	85.2
									461.31
3008R	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		12.5
3008R	203	-0201	SS	N/A	N/A	85/09/14	FINAL ATP		37.11
3008R	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		2.3
3008R	203	-0201	102	N/A	2	85/12/08	WET		0
3008R	203	-0071	102	61C	2	85/12/11	C/O RUN	1	7
3008R	203	-0071	102	61C	2	85/12/19	ABORT	1	6
3008R	203	-0071	102	61C	2	86/01/06	ABORT	1	11
3008R	203	-0071	102	61C	2	86/01/12	FLIGHT	1	75
									150.91
3009/R	207	-0171	SS	N/A	N/A	84/08/08	S.L. ATP		37.3
3009/R	207	-0171	SS	N/A	N/A	84/08/08	S.L. ATP	2	7.52
3009/R	207	-0171	099	N/A	3	84/09/13	C/O	1	7
3009/R	207	-0171	099-06	41G	3	84/10/05	FLIGHT	3	76.78
3009/R	207	-0171	099-07	51B	3	85/04/29	FLIGHT	2	74.8
3009/R	207	-0171	099-08	51F	3	85/07/12	FLIGHT	2	100.17
3009/R	207	-0171	099-09	61A	3	85/10/30	FLIGHT	2	84.98
									388.55
3010	304	-0161	103-07	62A	2		FLIGHT		
3010	304	-0131	SS	N/A	N/A	82/02/05	GREEN RUN	5	2.1
3010	304	-0131	SS	N/A	N/A	82/02/10	GREEN RUN		7.87
3010	304	-0131	SS	N/A	N/A	82/03/03	S.L. ALT		37.58
3010	304	-0131	SS	N/A	N/A	82/04/01	S.L. ALT		36.52
3010	304	-0131	SS	N/A	N/A	82/04/02	LAB		35.67
3010	304	-0131	099-04	41B	1	84/01/26	FRF	1	10.3
3010	304	-0131	099-04	41B	1	84/02/03	FLIGHT	3	79.18
3010	304	-0161	SS	N/A	N/A	84/03/15	S.L.	1	37.67
3010	304	-0161	103-01	41D	2	84/06/01	FRF	1	7.63
3010	304	-0161	103-01	41D	2	84/06/26	ABORT	1	6.05

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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
3010	304	-0161	103-01	41D	2	84/08/29	FLIGHT	3	88.77
3010	304	-0161	103-02	51A	2	84/11/08	FLIGHT	2	110.67
3010	304	-0161	103-03	51C	2	85/01/24	FLIGHT	3	90.65
3010	304	-0161	103-04	51D	2	85/04/12	FLIGHT	2	111
3010	304	-0161	103-05	51G	2	85/06/17	FLIGHT	2	80
3010	304	-0161	103-06	51I	2	85/08/24	FLIGHT	2	105.32
									846.98
3011	301	-0121	SS	N/A	N/A	81/08/26	GREEN RUN	5	3.22
3011	301	-0121	SS	N/A	N/A	81/08/27	GREEN RUN		8.23
3011	301	-0121	SS	N/A	N/A	81/11/19	GREEN RUN	5	9.43
3011	301	-0121	SS	N/A	N/A	81/20/19	LAB		75.1
3011	301	-0121	099-01	6	2	82/12/18	FRF-1	1	7.08
3011	301	-0121	099-01	6	2	83/01/25	FRF-2	1	5.78
3011	301	-0121	099-01	6	2	83/04/04	FLIGHT	3	82.2
3011	301	-0121	099-02	7	2	83/06/18	FLIGHT	2	73.53
3011	301	-0121	099-03	8	2	83/08/30	FLIGHT	2	75.72
									340.29
3011/R	205	-0181	SS	N/A	N/A	84/10/20	GREEN RUN	1	2.15
3011/R	205	-0181	SS	N/A	N/A	84/10/25	S.L. ATP	1	38.45
3011/R	205	-0181	SS	N/A	N/A	84/11/17	S.L. ATP	1	39.95
3011/R	205	-0181	SS	N/A	N/A	84/12/19	S.L. ATP		0.42
3011/R	205	-0181	SS	N/A	N/A	85/01/22	ATP		2.33
3011/R	205	-0181	SS	N/A	N/A	85/01/22	ATP		38.42
3011/R	205	-0181	099-07	N/A	1	85/04/15	HOTFIRE	1	7
3011/R	205	-0181	099-07	51B	1	85/04/29	FLIGHT	2	85.45
3011/R	205	-0181	099-08	51F	1	85/07/12	FLIGHT	2	44.41
3011/R	205	-0181	099-09	61A	1	85/10/30	FLIGHT	3	88.35
3011/R	205	-0181	099-10	51L	1	86/01/28	FLIGHT	1	6
3011/R	205	-0181	099-10	51L	1	86/01/28	DESTRUCT		0
									352.93
3012	305	-0161	103-06	62A	3		FLIGHT		
3012	305	-0131	SS	N/A	N/A	82/03/11	GREEN RUN	6	12.2
3012	305	-0131	SS	N/A	N/A	82/03/15	S.L. TEST		39.37
3012	305	-0131	SS	N/A	N/A	82/03/18	ALT APT		36.82
3012	305	-0131	SS	N/A	N/A	82/03/29	LAB		36.56

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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
3012	305	-0131	099-04	41B	3	84/01/26	FRF	1	10.23
3012	305	-0131	099-04	41B	3	84/02/03	FLIGHT	2	74.1
3012	305	-0161	SS	N/A	N/A	84/03/19	LAB	1	36.48
3012	305	-0161	103-01	41D	3	84/06/01	FRF	1	7.68
3012	305	-0161	103-01	41D	3	84/06/26	ABORT	1	6.03
3012	305	-0161	103-01	41D	3	84/08/29	FLIGHT	2	107.92
3012	305	-0161	103-02	51A	3	84/11/08	FLIGHT	3	87.55
3012	305	-0161	103-03	51C	3	85/01/24	FLIGHT	2	113.7
3012	305	-0161	103-04	51D	3	85/04/12	FLIGHT	3	87
3012	305	-0161	103-05	51G	3	85/06/17	FLIGHT	3	89
3012	305	-0161	103-06	51I	3	85/08/24	FLIGHT	2	79.05
									823.69
3013	306	-0131	SS	N/A	N/A	82/05/02	LAB	6	119.87
3013	306	-0131	SS	N/A	N/A	82/08/25	LAB	6	88.12
3013	306	-0131	099-04	41B	2	84/01/26	FRF	1	10.13
3013	306	-0131	099-04	41B	2	84/02/03	FLIGHT	2	95.23
									313.35
3013R	310	-0201	SS	N/A	N/A	85/10/16	GREEN RUN		13.6
3013R	310	-0201	SS	N/A	N/A	85/10/16	S.L. ATP		27.5
3013R	310	-0201	SS	N/A	N/A	85/10/17	S.L. ATP		36.62
3013R	310	-0201	SS	N/A	N/A	85/10/18	ALT. ATP		26.7
3013R	310	-0201	SS	N/A	N/A	85/10/25	ALT. ATP		38.38
3013R	310	-0201	102	N/A	3	85/12/08	WET		0
3013R	310	-0201	102	61C	3	85/12/11	C/O RUN	1	7
3013R	310	-0201	102	61C	3	85/12/19	ABORT	1	6
3013R	310	-0201	102	61C	3	86/01/06	ABORT	1	11
3013R	310	-0201	102	61C	3	86/01/12	FLIGHT	1	79
									245.8
3014	302	-0121	N/A	N/A	N/A	81/06/05	GREEN RUN	3	21.08
3014	302	-0121	N/A	N/A	N/A	81/06/08	ACCEPT TE		37.5
3014	302	-0121	N/A	N/A	N/A	81/06/09	LAB		35.87
3014	302	-0121	099-01	6	3	82/12/18	FRF-1	1	7.08
3014	302	-0121	099-01	6	3	83/01/25	FRF-2	1	5.78
3014	302	-0121	099-01	6	3	83/04/04	FLIGHT	2	76.62
3014	302	-0121	099-02	7	3	83/06/18	FLIGHT	3	89.98
									273.91

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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
3014/R	302	-0181	SS	N/A	N/A	84/09/28	FINAL ATP	1	38.07
3014/R	302	-0181	099-07	N/A	2	85/04/15	HOTFIRE	1	7
3014/R	302	-0181	099-07	51B	2	85/04/29	FLIGHT	3	105.92
3014/R	302	-0181	099-08	51F	2	85/07/12	FLIGHT	3	80.83
3014/R	302	-0181	099-09	61A	2	85/10/30	FLIGHT	2	109.78
3014/R	302	-0181	099-10	51L	2	86/01/28	DESTRUCT		0
3014/R	302	-0181	099-10	51L	2	86/01/28	FLIGHT	1	6
									347.6
3015	203	-0161	SS	N/A	N/A	84/02/04	LAB	1	36.47
3015	203	-0161	099-05	41C	1	84/03/20	FRF	1	7.02
3015	203	-0161	099-05	41C	1	84/04/06	FLIGHT	2	103.83
3015	203	-0161	099-06	41G	1	84/10/05	FLIGHT	2	73.57
									220.89
3016	301	-0161	SS	N/A	N/A	84/02/09	ATP	1	36.47
3016	301	-0161	099-05	41C	2	84/03/20	FRF	1	7.1
3016	301	-0161	099-05	41C	2	84/04/06	FLIGHT	3	76.8
3016	301	-0161	099-06	41G	2	84/10/05	FLIGHT	2	90.72
									211.09
3017	303	-0161	103-06	62A	1		FLIGHT		
3017	303	-0161	SS	N/A	N/A	84/02/05	S.L.	4	40.55
3017	303	-0161	SS	N/A	N/A	84/02/07	S.L.		36.6
3017	303	-0161	SS	N/A	N/A	84/02/29	GREEN RUN		2.57
3017	303	-0161	SS	N/A	N/A	84/03/01	S.L.		36.37
3017	303	-0161	103-01	41D	1	84/06/01	FRF	1	7.58
3017	303	-0161	103-01	41D	1	84/06/26	ABORT	1	6.05
3017	303	-0161	103-01	41D	1	84/08/29	FLIGHT	2	85.17
3017	303	-0161	103-02	51A	1	84/11/08	FLIGHT	2	83.35
3017	303	-0161	103-03	51C	1	85/01/24	FLIGHT	2	85.3
3017	303	-0161	103-04	51D	1	85/04/12	FLIGHT	2	79
3017	303	-0161	103-05	51G	1	85/06/17	FLIGHT	2	106
3017	303	-0161	103-06	51I	1	85/08/24	FLIGHT	2	85.43
									653.97

NS = NEW SEAT
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GAS GENERATOR OPERATING HISTORY

G/G S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
3018R	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		12.95
3018R	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		2.7
3018R	301	-0201	SS	N/A	N/A	85/08/27	S.L. ATP		37.82
3018R	301	-0201	102	N/A	1	85/12/08	WET		0
3018R	301	-0201	102	61C	1	85/12/11	C/O RUN	1	7
3018R	301	-0201	102	61C	1	85/12/19	ABORT	1	6
3018R	301	-0201	102	61C	1	86/01/06	ABORT	1	11
3018R	301	-0201	102	61C	1	86/01/12	FLIGHT	1	101
									178.47
3019	208	-0161	SS	N/A	N/A	84/02/19	FINAL ATP	1	35.57
3019	208	-0161	099-05	41C	3	84/03/20	FRF	1	7.18
3019	208	-0161	099-05	41C	3	84/04/06	FLIGHT	2	73.33
3019	208	-0161	SS	N/A	N/A	84/07/26	LAB	1	36.58
3019	208	-0161	SS	N/A	N/A	84/07/26	LAB	1	36.68
3019	208	-0161	JSC	N/A	N/A	84/12/13	TTA	2	20.2
3019	208	-0161	JSC	N/A	N/A	84/12/14	TTA	1	20.03
3019	208	-0161	JSC	N/A	N/A	85/01/10	TTA	1	44
3019	208	-0161	SS	N/A	N/A	85/02/08	LAB	1	45.2
3019	208	-0161	SS	N/A	N/A	85/03/15	LAB	1	42.77
									361.54
3020	207	-0131	SS	N/A	N/A	84/06/00	N/A		0
3020	306	-0161	SS	N/A	N/A	84/07/18	LAB		43.07
3020	306	-0161	SS	N/A	N/A	84/09/00	LAB	2	76.8
3020	306	-0161	SS	N/A	N/A	84/10/00	LAB	3	48.43
3020	306	-0161	SS	N/A	N/A	84/10/00	LAB	1	10.63
3020	306	-0161	SS	N/A	N/A	84/10/00	LAB		0
3020	306	-0161	SS	N/A	N/A	84/11/15	LAB	1	39.3
3020	306	-0161	104-01	51J	1	85/09/12	FRF	1	7.95
3020	306	-0161	104-01	51J	1	85/10/03	FLIGHT	2	108
3020	306	-0161	104-02	61B	1	85/11/26	FLIGHT	2	73.63
									407.81

COM PRT

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GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
ROK001	301	-0121	SS	N/A	N/A	81/08/26	GREEN RUN	5	3.22
ROK001	301	-0121	SS	N/A	N/A	81/08/27	GREEN RUN		8.23
ROK001	301	-0121	SS	N/A	N/A	81/11/19	GREEN RUN	5	9.43
ROK001	301	-0121	SS	N/A	N/A	81/20/19	LAB		75.1
ROK001	301	-0121	099-01	6	2	82/12/18	FRF-1	1	7.08
ROK001	301	-0121	099-01	6	2	83/01/25	FRF-2	1	5.78
ROK001	301	-0121	099-01	6	2	83/04/04	FLIGHT	3	82.2
ROK001	301	-0121	099-02	7	2	83/06/18	FLIGHT	2	73.53
ROK001	301	-0121	099-03	8	2	83/08/30	FLIGHT	2	75.72
ROK001	301	-0161	SS	N/A	N/A	84/02/09	ATP	1	36.47
ROK001	301	-0161	099-05	41G	2	84/03/20	FRF	1	7.1
ROK001	301	-0161	099-05	41G	2	84/04/06	FLIGHT	3	76.8
ROK001	301	-0161	099-06	41G	2	84/10/05	FLIGHT	2	90.72
ROK001	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		12.95
ROK001	301	-0201	SS	N/A	N/A	85/08/26	GREEN RUN		2.7
ROK001	301	-0201	SS	N/A	N/A	85/08/27	S.L. ATP		37.82
ROK001	301	-0201	102	N/A	1	85/12/08	WET		0
ROK001	301	-0201	102	61C	1	85/12/11	C/O RUN	1	7
ROK001	301	-0201	102	61C	1	85/12/19	ABORT	1	6
ROK001	301	-0201	102	61C	1	86/01/06	ABORT	1	11
ROK001	301	-0201	102	61C	1	86/01/12	FLIGHT	1	101
									729.85
ROM001	302	-0121	N/A	N/A	N/A	81/06/05	GREEN RUN	3	21.08
ROM001	302	-0121	N/A	N/A	N/A	81/06/08	ACCEPT TE		37.5
ROM001	302	-0121	N/A	N/A	N/A	81/06/09	LAB		35.87
ROM001	302	-0121	099-01	6	3	82/12/18	FRF-1	1	7.08
ROM001	302	-0121	099-01	6	3	83/01/25	FRF-2	1	5.78
ROM001	302	-0121	099-01	6	3	83/04/04	FLIGHT	2	76.62
ROM001	302	-0121	099-02	7	3	83/06/18	FLIGHT	3	89.98
ROM001	302	-0181	SS	N/A	N/A	84/09/28	FINAL ATP	1	38.07
ROM001	302	-0181	099-07	N/A	2	85/04/15	HOTFIRE	1	7
ROM001	302	-0181	099-07	51B	2	85/04/29	FLIGHT	3	105.92
ROM001	302	-0181	099-08	51F	2	85/07/12	FLIGHT	3	80.83
ROM001	302	-0181	099-09	61A	2	85/10/30	FLIGHT	2	109.78
ROM001	302	-0181	099-10	51L	2	86/01/28	FLIGHT	1	6
ROM001	302	-0181	099-10	51L	2	86/01/28	DESTRUCT		0
									621.51

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GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
R1C001	303	-0121	SS	N/A	N/A	81/09/25	GREEN RUN	2	1.15
R1C001	303	-0121	SS	N/A	N/A	81/10/01	GREEN RUN		1.57
R1C001	303	-0121	SS	N/A	N/A	81/11/12	GREEN RUN	4	2.1
R1C001	303	-0121	SS	N/A	N/A	81/11/13	ACCEP TES		37.83
R1C001	303	-0121	SS	N/A	N/A	81/11/13	GREEN RUN		7.45
R1C001	303	-0121	SS	N/A	N/A	81/11/16	LAB		35.93
R1C001	303	-0121	099-01	6	1	82/12/18	FRF-1	1	7.1
R1C001	303	-0121	099-01	6	1	83/01/25	FRF-2	1	5.78
R1C001	303	-0121	099-01	6	1	83/04/04	FLIGHT	2	97.35
R1C001	303	-0121	099-02	7	1	83/06/18	FLIGHT	2	95.55
R1C001	303	-0121	099-03	8	1	83/08/30	FLIGHT	2	90.7
R1C001	303	-0161	SS	N/A	N/A	84/02/05	S.L.	4	40.55
R1C001	303	-0161	SS	N/A	N/A	84/02/07	S.L.		36.6
R1C001	303	-0161	SS	N/A	N/A	84/02/29	GREEN RUN		2.57
R1C001	303	-0161	SS	N/A	N/A	84/03/01	S.L.		36.37
R1C001	303	-0161	103-01	41D	1	84/06/01	FRF	1	7.58
R1C001	303	-0161	103-01	41D	1	84/06/26	ABORT	1	6.05
R1C001	303	-0161	103-01	41D	1	84/08/29	FLIGHT	2	85.17
R1C001	303	-0161	103-02	51A	1	84/11/08	FLIGHT	2	83.35
R1C001	303	-0161	103-03	51C	1	85/01/24	FLIGHT	2	85.3
R1C001	303	-0161	103-04	51D	1	85/04/12	FLIGHT	2	79
R1C001	303	-0161	103-05	51G	1	85/06/17	FLIGHT	2	106
R1C001	303	-0161	103-06	51I	1	85/08/24	FLIGHT	2	85.43
R1C001	303	-0161	103-06	62A	1		FLIGHT		
									1036.5
R1M001	304	-0131	SS	N/A	N/A	82/02/05	GREEN RUN	5	2.1
R1M001	304	-0131	SS	N/A	N/A	82/02/10	GREEN RUN		7.87
R1M001	304	-0131	SS	N/A	N/A	82/03/03	S.L. ALT		37.58
R1M001	304	-0131	SS	N/A	N/A	82/04/01	S.L. ALT		36.52
R1M001	304	-0131	SS	N/A	N/A	82/04/02	LAB		35.67
R1M001	304	-0131	099-04	41B	1	84/01/26	FRF	1	10.3
R1M001	304	-0131	099-04	41B	1	84/02/03	FLIGHT	3	79.18
R1M001	304	-0161	SS	N/A	N/A	84/03/15	S.L.	1	37.67
R1M001	304	-0161	103-01	41D	2	84/06/01	FRF	1	7.63
R1M001	304	-0161	103-01	41D	2	84/06/26	ABORT	1	6.05
R1M001	304	-0161	103-01	41D	2	84/08/29	FLIGHT	3	88.77
R1M001	304	-0161	103-02	51A	2	84/11/08	FLIGHT	2	110.67
R1M001	304	-0161	103-03	51C	2	85/01/24	FLIGHT	3	90.65
R1M001	304	-0161	103-04	51D	2	85/04/12	FLIGHT	2	111
R1M001	304	-0161	103-05	51G	2	85/06/17	FLIGHT	2	80
R1M001	304	-0161	103-06	51I	2	85/08/24	FLIGHT	2	105.32
R1M001	304	-0161	103-07	62A	2		FLIGHT		
									846.98

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GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
R1M002	305	-0131	SS	N/A	N/A	82/03/11	GREEN RUN	6	12.2
R1M002	305	-0131	SS	N/A	N/A	82/03/15	S.L. TEST		39.37
R1M002	305	-0131	SS	N/A	N/A	82/03/18	ALT APT		36.82
R1M002	305	-0131	SS	N/A	N/A	82/03/29	LAB		36.56
R1M002	305	-0131	099-04	41B	3	84/01/26	FRF	1	10.23
R1M002	305	-0131	099-40	41B	3	84/02/03	FLIGHT	2	74.1
R1M002	305	-0161	SS	N/A	N/A	84/03/19	LAB	1	36.48
R1M002	305	-0161	103-01	41D	3	84/06/01	FRF	1	7.68
R1M002	305	-0161	103-01	41D	3	84/06/26	ABORT	1	6.03
R1M002	305	-0161	103-01	41D	3	84/08/29	FLIGHT	2	107.92
R1M002	305	-0161	103-02	51A	3	84/11/08	FLIGHT	3	87.55
R1M002	305	-0161	103-03	51C	3	85/01/24	FLIGHT	2	113.7
R1M002	305	-0161	103-04	51D	3	85/04/12	FLIGHT	3	87
R1M002	305	-0161	103-05	51G	3	85/06/17	FLIGHT	3	89
R1M002	305	-0161	103-06	51I	3	85/08/24	FLIGHT	2	79.05
R1M002	305	-0161	103-06	62A	3		FLIGHT		
									823.69
R2A001	306	-0131	SS	N/A	N/A	82/05/02	LAB	6	119.87
R2A001	306	-0131	SS	N/A	N/A	82/08/25	LAB	6	89.12
R2A001	306	-0131	099-04	41B	2	84/01/26	FRF	1	10.13
R2A001	306	-0131	099-04	41B	2	84/02/03	FLIGHT	2	95.23
R2A001	306	-0161	SS	N/A	N/A	84/07/18	LAB		43.07
R2A001	306	-0161	SS	N/A	N/A	84/09/00	LAB	2	76.8
R2A001	306	-0161	SS	N/A	N/A	84/10/00	LAB		0
R2A001	306	-0161	SS	N/A	N/A	84/10/00	LAB	3	48.43
R2A001	305	-0161	SS	N/A	N/A	84/10/00	LAB	1	11.63
R2A001	306	-0161	SS	N/A	N/A	84/11/15	LAB	1	39.3
R2A001	306	-0161	104-01	51J	1	85/09/12	FRF	1	7.95
R2A001	306	-0161	104-01	51J	1	85/10/03	FLIGHT	2	108
R2A001	305	-0161	104-02	61B	1	85/11/26	FLIGHT	2	73.63
									721.16
R4D001	307	-0201	SS	N/A	N/A	85/04/10	GREEN RUN		2.82
R4D001	307	-0201	SS	N/A	N/A	85/04/11	GREEN RUN		7.3
R4D001	307	-0201	SS	N/A	N/A	85/04/12	S.L. TEST		37.63
R4D001	307	-0201	SS	N/A	N/A	85/05/07	S.L. TEST		36.35
R4D001	307	-0201	SS	N/A	N/A	85/06/13	S.L. TEST		35.97
R4D001	307	-0201	104-01	51J	2	85/09/12	FRF	1	7.98
R4D001	307	-0201	104-01	51J	2	85/10/03	FLIGHT	2	81
R4D001	307	-0201	104-02	61B	2	85/11/26	FLIGHT	2	102.1
									311.15

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GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
R5A001	308	-0201	SS	N/A	N/A	85/04/26	GREEN RUN		44.47
R5A001	308	-0201	SS	N/A	N/A	85/06/10	S.L. ATP		36.47
R5A001	308	-0201	104-01	51J	3	85/09/12	FRF	1	8.02
R5A001	308	-0201	104-01	51J	3	85/10/03	FLIGHT	3	86
R5A001	308	-0201	104-02	61B	3	85/11/26	FLIGHT	3	77.35
									252.31
R5C001	309	-0201	SS	N/A	N/A	85/07/07	GREEN RUN		9.07
R5C001	309	-0201	SS	N/A	N/A	85/06/07	S.L. ATP		38.12
R5C001	309	-0201	SS	N/A	N/A	85/07/15	S.L. ATP		22.13
R5C001	309	-0201	SS	N/A	N/A	85/07/16	S.L. ATP		36.58
R5C001	309	-0201	SS	N/A	N/A	85/09/26	S.L. ATP		6.82
R5C001	309	-0201	SS	N/A	N/A	85/11/02	S.L. ATP		35.8
R5C001	309	-0201	SS	N/A	N/A	85/12/04	GREEN RUN		34.53
R5C001	309	-0201	099	N/A	3	85/12/10	INSTL		0
R5C001	309	-0201	099-10	51L	3	86/01/28	DESTRUCT		0
R5C001	309	-0201	099-10	51L	3	86/01/28	FLIGHT	1	6
									189.05
R5E001	310	-0201	SS	N/A	N/A	85/10/16	GREEN RUN		13.6
R5E001	310	-0201	SS	N/A	N/A	85/10/16	S.L. ATP		27.5
R5E001	310	-0201	SS	N/A	N/A	85/10/17	S.L. ATP		36.62
R5E001	310	-0201	SS	N/A	N/A	85/10/18	ALT. ATP		26.7
R5E001	310	-0201	SS	N/A	N/A	85/10/25	ALT. ATP		38.38
R5E001	310	-0201	SS	N/A	3	85/12/08	WET		0
R5E001	310	-0201	102	61C	3	85/12/11	C/O RUN	1	7
R5E001	310	-0201	102	61C	3	85/12/19	ABORT	1	6
R5E001	310	-0201	102	61C	3	86/01/06	ABORT	1	11
R5E001	310	-0201	102	61C	3	86/01/12	FLIGHT	1	79
									245.8
RBL002	203	-0011	SS	N/A	N/A	79/03/07	GREEN RUN	3	18.57
RBL002	203	-0011	SS	N/A	N/A	79/03/09	ATP		54.17
RBL002	203	-0011	102	N/A	3	79/11/01	GR. CHECK	6	83.87
RBL002	203	-0061	SS	N/A	N/A	80/04/16	GREEN RUN	4	20.48
RBL002	203	-0061	SS	N/A	N/A	80/04/17	ATP		35.73
RBL002	203	-0061	SS	N/A	N/A	80/04/21	ATP		51.13

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GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
RBL002	203	-0071	SS	N/A	N/A	80/10/24	ATP	1	36
RBL002	203	-0071	102	N/A	1	81/01/23	C/O	1	2
RBL002	203	-0071	102-01	1	1	81/02/20	FRF	1	10.7
RBL002	203	-0071	102-01	1	1	81/04/12	FLIGHT	3	62.63
RBL002	203	-0071	102-02	2	1	81/11/04	RECYCLE	1	7.38
RBL002	203	-0071	102-02	2	2	81/11/12	FLIGHT	2	81.12
RBL002	203	-0071	SS	N/A	N/A	82/01/20	BUBL TEST	1	21.18
RBL002	203	-0071	SS	N/A	N/A	82/01/22	BUBL TEST	1	8
RBL002	203	-0071	SS	N/A	N/A	82/01/26	BUBL TEST	1	10.32
RBL002	203	-0071	SS	N/A	N/A	82/01/28	BUBL TEST	1	11.07
RBL002	203	-0071	SS	N/A	N/A	82/01/29	BUBL TEST	1	9.07
RBL002	203	-0071	SS	N/A	N/A	82/02/01	BUBL TEST	1	10.07
RBL002	203	-0071	SS	N/A	N/A	82/02/02	BUBL TEST	1	7.07
RBL002	203	-0071	SS	N/A	N/A	82/03/03	BUBL TEST	1	20
RBL002	203	-0071	SS	N/A	N/A	82/02/04	BUBL TEST	1	5.07
RBL002	203	-0071	SS	N/A	N/A	82/02/05	BUBL TEST	1	11.07
RBL002	203	-0071	SS	N/A	N/A	82/02/11	BUBL TEST	1	6.6
RBL002	203	-0131	SS	N/A	N/A	83/02/10	GREEN RUN	4	9.53
RBL002	203	-0131	SS	N/A	N/A	83/02/14	FINAL ATP		36.52
RBL002	203	-0131	SS	N/A	N/A	83/02/14	SL TEST		36.27
RBL002	203	-0131	099	N/A	3	83/08/02	GR. CHECK	1	7
RBL002	203	-0131	099-03	8	3	83/08/30	FLIGHT	3	83.7
RBL002	203	-0161	SS	N/A	N/A	84/02/04	LAB	1	36.47
RBL002	203	-0161	099-05	41C	1	84/03/20	FRF	1	7.02
RBL002	203	-0161	099-05	41C	1	84/04/06	FLIGHT	2	103.83
RBL002	203	-0161	099-06	41G	1	84/10/05	FLIGHT	2	73.57
RBL002	203	-0201	SS	N/A	N/A	85/09/14	FINAL ATP		37.11
RBL002	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		2. 3
RBL002	203	-0201	SS	N/A	N/A	85/09/14	GREEN RUN		12.5
RBL002	203	-0201	102	N/A	2	85/12/08	WET		0
RBL002	203	-0201	102	61C	2	85/12/11	C/O RUN	1	7
RBL002	203	-0201	102	61C	2	85/12/19	ABORT	1	6
RBL002	203	-0201	102	61C	2	86/01/06	ABORT	1	11
RBL002	203	-0201	102	61C	2	86/01/12	FLIGHT	1	75
									1128.1
R8M001	205	-0011	SS	N/A	N/A	79/03/16	LAB	3	73.15
R8M001	205	-0061	SS	N/A	N/A	80/01/16	LAB	5	86.06
R8M001	205	-0071	SS	N/A	N/A	80/10/15	LAB	2	76.9
R8M001	205	-0071	SS	N/A	N/A	81/02/02	LAB	1	36.85
R8M001	205	-0071	SS	N/A	N/A	81/02/04	LAB	1	37.02

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GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
R8M001	205	-0071	102-05	5	3	82/09/28	HOTFIRE	1	7
R8M001	205	-0071	102-05	5	3	82/11/11	FLIGHT	2	100.05
R8M001	205	-0071	102-06	9	3	83/10/11	C/O	1	7.15
R8M001	205	-0071	102-06	9	3	83/11/28	FLIGHT	3	78.7
R8M001	205	-0071	SS	N/A	N/A	83/12/27	S.L. ATP	1	37
R8M001	205	-0181	SS	N/A	N/A	84/10/20	GREEN RUN	1	2.15
R8M001	205	-0181	SS	N/A	N/A	84/10/25	S.L. ATP	1	38.45
R8M001	205	-0181	SS	N/A	N/A	84/11/17	S.L. ATP	1	39.95
R8M001	205	-0181	SS	N/A	N/A	84/12/19	S.L. ATP		0.42
R8M001	205	-0181	SS	N/A	N/A	85/01/22	ATP		38.42
R8M001	205	-0181	SS	N/A	N/A	85/01/22	ATP		2.33
R8M001	205	-0181	099-07	N/A	1	85/04/15	HOTFIRE	1	7
R8M001	205	-0181	099-07	51B	1	85/04/29	FLIGHT	2	85.45
R8M001	205	-0181	099-08	51F	1	85/07/12	FLIGHT	2	44.41
R8M001	205	-0181	099-09	61A	1	85/10/30	FLIGHT	3	88.35
R8M001	205	-0181	099-10	51L	1	86/01/28	FLIGHT	1	6
R8M001	205	-0181	099-10	51L	1	86/01/28	DESTRUCT		0
									892.81
R8M002	204	-0011	SS	N/A	N/A	79/03/11	LAB	1	18.03
R8M002	204	-0011	SS	N/A	N/A	79/03/12	LAB	1	27.45
R8M002	204	-0011	SS	N/A	N/A	79/03/13	LAB	1	27.02
R8M002	204	-0011	102	N/A	2	79/11/01	C/O	7	87.77
R8M002	204	-0011	SS	N/A	N/A	81/05/07	LAB	1	0.2
R8M002	204	-0071	SS	N/A	N/A	81/07/15	LAB	1	4.12
R8M002	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	7.6
R8M002	204	-0071	SS	N/A	N/A	81/10/09	LAB	1	1.48
R8M002	204	-0071	SS	N/A	N/A	81/10/12	LAB	1	7.3
R8M002	204	-0071	SS	N/A	N/A	81/10/13	LAB	1	37.18
R8M002	204	-0071	SS	N/A	N/A	81/10/14	LAB	1	35.27
R8M002	204	-0071	102-03	3	1	82/02/26	HOTFIRE	1	7.1
R8M002	204	-0071	102-03	3	1	82/03/22	FLIGHT	2	98
R8M002	204	-0071	102-04	4	1	82/06/27	FLIGHT	3	84.48
R8M002	204	-0071	102-05	5	1	82/11/11	FLIGHT	3	86.4
R8M002	204	-0071	102-06	9	1	83/10/11	C/O	1	6.98
R8M002	204	-0071	102-06	9	1	83/11/28	FLIGHT	2	85.2
									621.58

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GEAR BOX S/N	COMPRT APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STARTS	RUN TIME (MIN)
R9A002	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	19.93
R9A002	206	-0011	SS	N/A	N/A	79/05/05	LAB	1	28.2
R9A002	206	-0011	SS	N/A	N/A	79/05/07	LAB	1	27.27
R9A002	206	-0011	SS	N/A	N/A	79/09/19	LAB	3	73.73
R9A002	206	-0011	102	N/A	1	79/11/01	C/O	7	89.33
R9A002	206	-0011	SS	N/A	N/A	80/04/28	LAB	1	0.43
R9A002	206	-0011	SS	N/A	N/A	80/07/09	LAB	1	18.07
R9A002	206	-0071	SS	N/A	N/A	80/10/00	LAB		0
R9A002	206	-0071	SS	N/A	N/A	80/11/18	LAB	3	94.22
R9A002	206	-0071	102-02	2	2	81/09/15	HOTFIRE	1	7.77
R9A002	206	-0071	102-02	2	2	81/11/04	RECYCLE	1	7.38
R9A002	206	-0071	102-02	2	2	81/11/12	FLIGHT	3	85.25
R9A002	206	-0071	102-03	3	2	82/03/22	FLIGHT	2	82.03
R9A002	206	-0071	102-04	4	2	82/06/27	FLIGHT	2	98.25
R9A002	206	-0011	102-05	5	2	82/11/11	FLIGHT	2	81.37
R9A002	206	-0071	102-06	9	2	83/10/11	C/O	1	7.1
R9A002	206	-0071	102-06	9	2	83/11/28	FLIGHT	2	74.13
									794.46
R9C001	207	-0011	SS	N/A	N/A	79/11/07	LAB	3	75.8
R9C001	207	-0011	SS	N/A	N/A	80/01/11	LAB	5	88.32
R9C001	207	-0071	SS	N/A	N/A	80/10/23	LAB	1	36.5
R9C001	207	-0071	102-01	1	2	81/01/23	C/O	1	2
R9C001	207	-0071	102-01	1	2	81/02/20	FRF	1	10.08
R9C001	207	-0071	102-01	1	2	81/04/12	FLIGHT	2	83.95
R9C001	207	-0071	SS	N/A	N/A	81/07/00	ENG. VIB		10.37
R9C001	207	-0071	SS	N/A	N/A	81/07/25	S.L. ATP	6	30.27
R9C001	207	-0071	SS	N/A	N/A	81/07/27	ALT. ATP		49.1
R9C001	207	-0131	SS	N/A	N/A	82/11/09	GREEN RUN	4	10.95
R9C001	207	-0131	SS	N/A	N/A	82/11/10	S.L. ATP		38.1
R9C001	207	-0131	SS	N/A	N/A	82/11/11	ATP		36.38
R9C001	207	-0131	SS	N/A	N/A	84/06/00	N/A		0
R9C001	207	-0171	SS	N/A	N/A	84/08/08	S.L. ATP		37.3
R9C001	207	-0171	SS	N/A	N/A	84/08/08	S.L. ATP	2	7.52
R9C001	207	-0171	099	N/A	3	84/09/13	C/O	1	7
R9C001	207	-0171	099-06	41G	3	84/10/05	FLIGHT	3	76.78
R9C001	207	-0171	099-07	51B	3	85/04/05	FLIGHT	2	74.8
R9C001	207	-0171	099-08	51F	3	85/07/12	FLIGHT	2	100.17
R9C001	207	-0171	099-09	61A	3	85/10/30	FLIGHT	2	84.98
									869.37

COM PRT

01-30-86

GEAR BOX OPERATING HISTORY

GEAR BOX S/N	APU S/N	MC DASH NO.	ORBITER	STS NO.	APU POS	DATE	EVENT	NO. STA RTS	RUN TIME (MIN)
R9E001	208	-0061	SS	N/A	N/A	80/01/13	LAB	3	82.53
R9E001	208	-0071	SS	N/A	N/A	80/10/21	LAB	5	112.85
R9E001	208	-0071	SS	N/A	N/A	80/10/30	LAB	1	36.47
R9E001	208	-0071	102	N/A	3	81/01/23	C/O	1	2
R9E001	208	-0071	102-01	1	3	81/02/20	FRF	1	10.05
R9E001	208	-0071	102-01	1	3	81/04/12	FLIGHT	2	83.75
R9E001	208	-0071	102-02	2	3	81/11/04	RECYCLE	1	7.38
R9E001	208	-0071	102-02	2	3	81/11/12	FLIGHT	2	98.82
R9E001	208	-0071	102-03	3	3	82/03/22	FLIGHT	3	85.25
R9E001	208	-0071	102-04	4	3	82/06/27	FLIGHT	2	79.25
R9E001	208	-0071	JSC	N/A	N/A	82/09/24	JSC	4	71.6
R9E001	208	-0131	SS	N/A	N/A	83/04/13	GREEN RUN	9	12.68
R9E001	208	-0131	SS	N/A	N/A	83/04/21	ACC[TES		76.65
R9E001	208	-0131	SS	N/A	N/A	83/06/15	GREEN RUN		8.37
R9E001	208	-0131	SS	N/A	N/A	83/06/16	ACCEP TES		71.23
R9E001	208	-0161	SS	N/A	N/A	84/02/19	FINAL ATP	1	35.57
R9E001	208	-0161	099-05	41C	3	84/03/20	FRF	1	7.18
R9E001	208	-0161	099-05	41C	3	84/04/06	FLIGHT	2	73.33
R9E001	208	-0161	SS	N/A	N/A	84/07/26	LAB	1	36.58
R9E001	208	-0161	SS	N/A	N/A	84/07/27	LAB	1	36.68
R9E001	208	-0161	JSC	N/A	N/A	84/12/13	TTA	2	20.2
R9E001	208	-0161	JSC	N/A	N/A	84/12/14	TTA	1	20.03
R9E001	208	-0161	JSC	N/A	N/A	85/01/10	TTA	1	44
R9E001	208	-0161	SS	N/A	N/A	85/10/08	LAB	1	45.2
R9E001	208	-0161	SS	N/A	N/A	85/03/15	LAB	1	42.77
									1200.4