



AEROSPACE INFORMATION REPORT

CANCELLED

AIR 912

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N. Y. 10017

Issued 1-1-68
Revised

STARTING SYSTEM INSTALLATION, DESCRIPTION AND GUIDE

TABLE OF CONTENTS

	<u>Page</u>
1. PURPOSE AND SCOPE	i
2. REVISIONS	i
3. DATA SOURCE	i
Table 1 Pneumatic Starting Systems - Turbo-Prop and Turbo-Jet Engines Military Aircraft	1.1
Table 2 Pneumatic Starting Systems - Turbo-Prop and Turbo-Jet Engines Commercial Aircraft	2.1
Table 3 Fuel-Air Starting Systems - Turbo-Prop and Turbo-Jet Engines Commercial Aircraft	3.1
Table 4 Cartridge Starting Systems - Turbo-Prop and Turbo-Jet Engines Military Aircraft	4.1
Table 5 Electrical Starting Systems - Turbo-Prop and Turbo-Jet Engines Military Aircraft	5.1
Table 6 Electrical Starting Systems - Turbo-Prop and Turbo-Jet Engines Commercial Aircraft	6.1

NOTE: Hydraulic Starting Systems to be added at the next revision.

Technical Board rules provide that: "All technical reports, including standards approved practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."



Documents

Document Sharing Hub

1. PURPOSE AND SCOPE

The purpose of this Aerospace Information Report is to provide tabulated technical information describing engine starting systems of various aircraft in operation today.

This information is limited to starting systems of current aircraft of the USA. It is anticipated that data on foreign aircraft will be added by revision.

2. REVISIONS

This document will be reviewed periodically and revised as necessary in order to incorporate additional data as it becomes available. The reader's assistance and cooperation in pointing out errors and providing new information is requested.

3. DATA SOURCE

The data presented herein were collected by SAE Committee AE-6 through surveys of the aircraft, engine, and equipment manufacturers involved.

The values and information herein are for reference purposes only, are subject to change at any time without revision hereof, and should not be used for design or other specific purpose without verification from the applicable manufacturers.

PREPARED BY
SUBCOMMITTEE AE-6A, STARTING SYSTEMS INFORMATION,
OF COMMITTEE AE-6, STARTING SYSTEMS

PNEUMATIC STARTING SYSTEMS
TURBO-PROP AND TURBO-JET ENGINES
MILITARY AIRCRAFT

TABLE 1.1
SHEET 1 of 2

AIRCRAFT	ENGINE	STARTER DRIVE	STARTER	CONTROL VALVE	GSE RECEPTACLE	GROUND EQUIPMENT	OPERATING PARAMETERS			
							NOMINAL CUTOUT RPM	START TIME IN SECONDS	ELEC REQ	
MANUFACTURER AND MODEL	MANUFACTURER AND MODEL	DESIGN SPEC	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	RATING	CUTOUT		
BOEING	B-52A, E	AND 20002 Type XII-S	AND 20002 Type XII-S	Ham. Sid. 84416	Boeing 9-43617	AiResearch GTC85-2-1 USAF MA-1A	90 ppm 45 psia 350 F	30	40	24 v d-c
	B-52F, G	AND 20002 Type XII-S	Ham. Sid. PS400-12	Ham. Sid. 508769	Boeing 9-43617	AiResearch GTC85-2-1 USAF MA-1A	90 ppm 45 psia 350 F	30	40	24 v d-c
	B-52H	AND 20002 Type XII-S	Ham. Sid. PS400-12	Ham. Sid. 508769	Boeing 25-2690-501	AiResearch GTC85-2-1 USAF MA-1A	90 ppm 45 psia 350 F	30	40	24 v d-c
	C-135B	AND 20002 Type XII-S	AiResearch ATS- 100-176A Boeing Doc. D10-60629	Parker F60C023M1 A60A008M1 AiResearch 122594	Bobrick M-913	USAF MA-1A	90 ppm 45 psia 350 F	30	40	28 v d-c
DOUGLAS	KC-135A	AND 20002 Type XII-S	AiResearch ATS140-29 Bendix 36E338-2B Ham. Sid. 501256	AiResearch 105492-300 Ham. Sid. 84416	Bobrick M-913	USAF MA-1A	90 ppm 45 psia 350 F	45	50	28 v d-c
	TA-3B (A3D-1/2T)	AND 20002 Type XII-S	AiResearch ATS40-11 Bendix 36E32-4	None	Roylyn 8160-1	AiResearch GTC85-28	117 ppm 50 psia 375 F	30	50	24 v d-c
	A4A/A4B (A4C/A4D1, 2, 2N)	AND 20007 Type XVII-B AN4182-1	Bendix 36E40 36E28 36E62 36E85	None	Douglas 3815224-1	AiResearch GTC85-15, -24, -28 Western Gear Probe 172 or 130	117 ppm 50 psia 375 F	35	60	24 v d-c
	A4E (A4D-5)	AND 20002 Type XII-F (Special)	AiResearch ATS70-27 Bendix 36E83	None	Douglas 4816101-1	USAF MA-1A BUWEP C-4	110 ppm 50 psia 375 F	40	45	24 v d-c
GENERAL DYNAMICS	B-66	AND 20002 Type XII-S	AiResearch ATS140-29 Ham. Sid.	AiResearch 105492-300	Bobrick M-922	USAF MA-1A	110 ppm 50 psia 375 F	60	60	28 v d-c
	C-133A/B	AND 20002 Type XII-S	Ham. Sid. PS200-15	Ham. Sid. 519896	Bobrick M-935	AiResearch GTU85-3	108 ppm 45 psia 350 F	60	60	24 v d-c
	F-4A (F4D)	AND 20002 Type XII-S	Bendix 36E33-4C Ham. Sid. PS300-31 AiResearch ATS70-22	None	Roylyn 8221	AiResearch GTC85 Series	117 ppm 50 psia 375 F	30	35	24 v d-c
	B-58	AND 20002 Type XII-S	Ham. Sid. PS300-32	Ham. Sid. 515410	General Dynamics USAF 54B9301	AiResearch GTCP105-2 Solar T-300J-2	150 ppm 83 psia 515 F 150 ppm 60 psia 400 F	13	36	28 v d-c

PNEUMATIC STARTING SYSTEM
TURBO-PROP AND TURBO-JET ENGINES
MILITARY AIRCRAFT

TABLE 1.1
SHEET 2 of 2

AIRCRAFT		OPERATING PARAMETERS (CONT'D)										LUBRICATION		REFERENCES AND REMARKS
MANUFACTURER AND MODEL	AMB TEMP, F		DUTY CYCLE	AIR FLOW PPM	PRESSURE, PSIA			TEMPERATURE, F			LUBRICANT	SERVICE PERIOD		
	OPER	NON-OPER			RTD	MAX	MIN	RTD	MIN	MAX				
BOEING	B-52A/E	-65 to 160	-65 to 250	2' on, 3' off, 2' on, 10' off	110	45	210	30	550	-65	700	MIL-L-7808	200 hr	MIL-S-5866, USAF Drawing S53D9599, USAF Drawing S53D9524, AF Type MB-3
	B-52F/G	-65 to 160	-65 to 250	2' on, 3' off, 2' on, 10' off	110	45	210	30	550	-65	700	MIL-L-7808	200 hr	AF Type MB-10
	B-52H	-65 to 160	-65 to 250	2' on, 3' off, 2' on, 10' off	110	45	210	30	550	-65	700	MIL-L-7808	200 hr	Engines 1, 2, 3, 5, 7 and 8 only. AF Type MB-10
	C-135B	-65 to 160	-65 to 250	30'' on, 1' off		45	74	30			240	MIL-L-7808	500 starts or 150 hr	
	KC-135A	-65 to 160	-65 to 250	1' on, 3' off, 1' on, 10' off	90	45	62	30	550	100	700	MIL-L-7808	150 hr	USAF T.O. 1C-135 (K) A-2-4. Not used on Engine 4 AF Type MB-3
DOUGLAS														
	TA-3B (A3D-1/2T)	-65 to 160	-65 to 275	3' on, 15' off 3 starts in 5'	60	50	70	45	345	250	650	MIL-L-7808	600 starts or 500 hr	MIL-S-19557A (AER), BuWeps Type A-21
	A4A/A4B (A4C/A4D1, 2, 2N)	-65 to 160		45'' on, 1' off Repeat 5 times	60	50	70	45	350	250	450	MIL-L-6880	600 starts or 500 hr	MIL-S-19557A (AER). Lubrication period 1200 starts or 1500 hr for 36E85 mod
	A4E (A4D-5)	-65 to 160	-65 to 200	5 starts, one hr rest	90	50	70	45	350	250	450	MIL-L-6880	500 hr or 600 starts	MIL-S-19557A (AER) BuWeps A19-1. Lubrication period 1200 starts or 1500 hr for 36E83.
	B-66				110	45			500			MIL-L-7808	200 hr or 100 starts	USAF T.O. 1B-66B-2-4. AF Type MB-3
	C-133A/B			2' on, 30'' off	56	45	60	31	550	245	650	MIL-O-6081	100 starts	T.O. 1C-133A-2-4, MIL-S-5866A, AF Type STU-2/A
GENERAL DYNAMICS	F6A (F4D)	-65 to 160	-65 to 165	3 starts in 15'	90	50	70		350		350	MIL-L-7808	600 starts or 500 hr	MIL-S-19557A (AER) BuWeps Type A-19
	B-58	-65 to 160	-65 to 250	1' on, 3' off, 1' on, 10' off	71	70	70		500		600	MIL-L-7808	600 hr	T.O. 1B58A-1 T.O. 1B58A-2-6, AF Type M-5
 Documents Document Sharing Hub														

PNEUMATIC STARTING SYSTEMS
TURBO-PROP AND TURBO-JET ENGINES
MILITARY AIRCRAFT

TABLE 1.2
SHEET 1 of 2

AIRCRAFT		ENGINE	STARTER DRIVE		STARTER	CONTROL VALVE	GSE RECEPTACLE	GROUND EQUIPMENT		OPERATING PARAMETERS			
MANUFACTURER AND MODEL	MANUFACTURER AND MODEL	DESIGN SPEC	RATIO N-dr N-eng	MANUFACTURER AND MODEL	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	RATING	NOMINAL CUTOUT RPM	START TIME IN SECONDS		ELEC REQ
											CUTOUT	IDLE	
GRUMMAN	A6A (A2F) & EA6A	P&WA J52-P-6 J52-P-6A	AND 20002 Type XII-F	0.577	AiResearch CSDS100-10	Integral with Unit	Roylyn 8907	AiResearch GTC85-90	117 ppm 50 psia 375 F	3100	25	30	28 v d-c
	F11A (F11F-1)	Curtiss Wright J65-W-18	AND 20007 Type XVII-B	1.000	AiResearch ATS40-8 ATS70-24 Bendix 36E39	AiResearch 10S104		AiResearch GTC85-90	117 ppm 50 psia 375 F	2550	30	60	24 v d-c
	E2A (W2F-1) & C2A	Allison T56-A-8	AND 20002 Type XII-S	1.030	AiResearch ATS100-169 Ham. Sid. PS200-17 Bendix 36E80		Roylyn 8907	AiResearch GTC85-90	117 ppm 50 psia 375 F	8300	32	40	28 v d-c
	C-130	Allison T56-A-7, -9, -11	AND 20002 Type XII-S	1.030	AiResearch ATS100-14 ATS100-160 ATS100-203 Ham. Sid. PS200-16	AiResearch 108240 392122-1 Ham. Sid. 553875	Lockheed 353034	AiResearch GTC85-71 USAF MA-1A	125 ppm 50 psia 360 F 90 ppm 45 psia 350 F	8250	30	35	28 v d-c
LOCKHEED	C-141A	P&WA TF33-P-7	AND 20002 Type XII-S	0.700	AiResearch ATS100-138	AiResearch 392284-3-1	Speedway S-62	AiResearch GTC85-106 USAF MA-1A	130 ppm 53 psia 400 F 90 ppm 45 psia 350 F	3000	20	25	28 v d-c
	F-104	G.E. J79	AND 20002 Type XII-S	1.000	AiResearch ATS100-18 ATS100-148 Ham. Sid. PS400-14		Lockheed 773165-1	USAF MA-1A USAF MA-2	90 ppm 45 psia 350 F 150 ppm 60 psia 400 F	3300	40	45	28 v d-c
	P3A	Allison T56	AND 20002 Type XII-S	1.030	AiResearch ATS100-167 Ham. Sid. PS200-18 Bendix 36E89	AiResearch 392200-1 Ham. Sid. 554062 Bendix 38E45				8350	30		28 v d-c
	T2V T-1A	Allison J73-A-24			Allison		Lockheed 462454-1	AiResearch GTC85-28	122 ppm 52 psia 400 F		20	20	
LTV	F8U	P&WA J57	AND 20002 Type XII-S		Bendix 36E33								28 v d-c
	F8U-2A	P&WA J57	AND 20002 Type XII-S		Bendix 36E59					3300			28 v d-c

PNEUMATIC STARTING SYSTEMS
TURBO-PROP AND TURBO-JET ENGINES
MILITARY AIRCRAFT

TABLE 1.2
SHEET 2 of 2

AIRCRAFT		OPERATING PARAMETERS (CONT'D)											LUBRICATION		REFERENCES AND REMARKS
MANUFACTURER AND MODEL	AMB TEMP, F		DUTY CYCLE	AIR FLOW PPM	PRESSURE, PSIA			TEMPERATURE, F			LUBRICANT	SERVICE PERIOD			
	OPER	NON-OPER			RTD	MAX	MIN	RTD	MIN	MAX					
GRUMMAN	A6A (A2F) & EA6A	-65 to 200	-65 to 200	5 cycles, 1/2 hr cooling	95	50	265	35	350	-65	870	MIL-L-7808	240 hr	Unit is a constant speed drive and engine starter combination.	
	F11A (F11F-1)	-65 to 160	-65 to 160	1' on, 1' off 5 cycles max	60	50	70	45	350	230	445	MIL-L-7808 MIL-L-6880	600 starts	MIL-S-19557A (AER), BUWEPS Type A-16	
	E2A (W2F-1) & C2A	-65 to 160	-65 to 250	1' on, 5' off 1' on, 3' off 1' on, 10' off	105	50	70	45	350	260	450	MIL-L-7808 MIL-L-6880	600 starts or 500 hr	MIL-S-19557A (AER), BUWEPS Type A-24	
	C-130	-65 to 160	-65 to 200	1' on, 30" off 3 cycles	100	54		40	600	-65	600	MIL-L-7808	100 starts	T.O. IC-130B-2-4, T.O. 2JA3-4-56, MIL-S-5866A, WCL-842, AF Type STU-1/A	
LOCKHEED	C-141A	-65 to 350	-65 to 350	1' on, 30" off 1' on, 30" off 1' on, 30" off	115	53	195	40	400	-65	900	MIL-L-7808	75 hr	MIL-S-38043, AF Type STU-16/A	
	F-104	-65 to 250		2' on, 3' off 2' on, 23' off	90	45	70		350				150 ± 50 hr	T.O. 1F-104-6, LAC ER 421004, AF Type MB-6	
	P3A	-65 to 160	-100 to 275	1' on, 5' off 1' on, 15' off	110	50	70	45	350	760	450	MIL-L-6880	600 starts		
	T2V T-1A	-20 min			122	52			400			None		BUWEPS/NAVER 03-105BC-508/509/510 Direct Impingement, BUWEPS Type A-24	
LTV	F8U	-65 to 160	-65 to 275	3 starts in 15 min.	90	50	70	45	350	260	450	MIL-L-6880	600 starts	MIL-S-19557A (AER), BUWEPS Type A-19	
	F8U-2N	-65 to 160	-100 to 275	1' on, 5' off 1' on, 15' off	110	50	70	45	350	260	450	MIL-L-6880 MIL-L-7808	600 starts or 500 hr	MIL-S-22518, BUWEPS Type ATS/AO	

Documents

TABLE 1.3
SHEET 1 of 2PNEUMATIC STARTING SYSTEMS
TURBO-PROP AND TURBO-JET ENGINES
MILITARY AIRCRAFT

AIRCRAFT	ENGINE	STARTER DRIVE	STARTER	CONTROL VALVE	GSE RECEPTACLE	GROUND EQUIPMENT	RATING	OPERATING PARAMETERS		
								NOMINAL CUTOFF RPM	START TIME IN SECONDS	ELEC REQ
MANUFACTURER AND MODEL	MANUFACTURER AND MODEL	DESIGN SPEC	RATIO $\frac{N_{dr}}{N_{eng}}$	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	MANUFACTURER AND MODEL OR PART NO.	117 ppm 50 psia 375 F	2350	CUTOFF	IDLE
									25	60
F3B/C (F3H-2)	Allison J71-A-2E	AND 20002 Type X11-T	1.000	Ham. Srd. PS500-11	Roylyn 8386	AiResearch GTC85	117 ppm 50 psia 375 F	2350	25	60
F4B (F4H-1)	GE J79-GE-8									
F-101A C	P&W J57-P-13, -53	AND 20002 Type X11-S	0.700	Ham. Srd. PS500-13	Dunbar-Kopple Hamilton Wilson USAF Dwg. 54B9301	USAF MA-1A	182 ppm 77 psia 520 F	3300	40	43
							90 ppm 45 psia 375 F		25	40
A5A (A3J-1)	GE J79-GE-8				North American USAF 54B9301	AiResearch RCPP105-1	180 ppm 81 psia 550 F	3400	30	35
F-100 Unmod.	P&W J57	AND 20002 Type X11-S	0.700	Ham. Srd.	Roylyn 8396	USAF MA-1A	90 ppm 45 psia 350 F	4750 3300		
T2J-1 (T-2A)	Westinghouse J34-WE-48				Aireterra 8396		110 ppm 50 psia 350 F		30	

McDONNELL

NORTH AMERICAN

Documents



Document Sharing Hub