REPORT NUMBER 111A

OCTOBER 1963

PLAN FOR PERFORMANCE

XV-5A

LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM

CONTRACT NUMBER DA44-177-TC-715

GENERAL ELECTRIC

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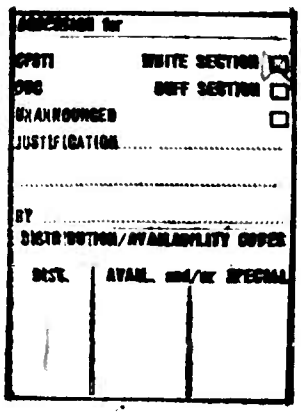
LIFT FAN FLIGHT RESEARCH

AIRCRAFT PROGRAM

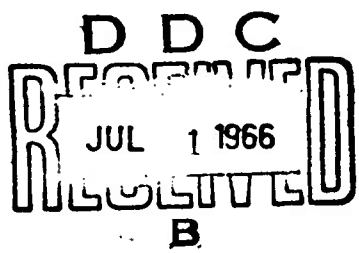
CONTRACT NO. DA44-177-TC-715



PLAN FOR PERFORMANCE

REPORT 111 A

October, 1963



ADVANCED ENGINE AND TECHNOLOGY DEPARTMENT

GENERAL ELECTRIC COMPANY

Cincinnati, Ohio 45315

PLAN FOR PERFORMANCE

Contract No. DA44-177-TC-715

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INTRODUCTION

This revised Plan For Performance is submitted to reflect the latest information concerning the flight research aircraft useage and the planned milestones to complete this program.

PLAN FOR PERFORMANCE (Revision A)

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		January, 1962		
A-I-(3)	6	Complete preliminary design of the pitch fan system		Jan. 5
A-I-(4)	10	Submit Propulsion System Specification		Jan. 15
		February, 1962		
A-I-(4)	10A	Contracting Officer approval of Propulsion System Specification		Feb. 15
A-I-(2)	5	Complete propulsion system design modifications and release 90% of detail design drawings		Feb. 28
A-I-(3)	7	Complete pitch fan system detail design and release 90% of detail design drawings		Feb. 28
A-I-(3)	8	Submit Pitch Fan System Specification for approval		Feb. 28
		March, 1962		
A-I-(4)	11	Submit Propulsion System Flight-worthiness Test Specification		Mar. 5
B-III-(3)	67	Submit the planned Simulator Program for approval		Mar. 15
A-I-(3)	9	Submit Pitch Fan Flightworthiness Test Specification		Mar. 23
A-I-(3)	8A	Contracting Officer approval of Pitch Fan Specification		Mar. 29
		April, 1962		
B-I-(2)	50	Begin flutter model tests		Apr. 5
A-I-(4)	11A	Contracting Officer Approval of Propulsion System Flightworthiness Test Specification		Apr. 6

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
B-I-(2)	48	Start engine induction inlet model tests		Apr. 11
A-II-(1)	14	Submit Propulsion System Acceptance Specification		Apr. 12
B-III-(3)	67A	Government approval of Simulator Program		Apr. 15
A-II-(2)	20	Submit Pitch Fan System Acceptance Test Specification		Apr. 18
A-I-(3)	9A	Contracting Officer approval of Pitch Fan Flightworthiness Test Specification		Apr. 19
		May, 1962		
A-I-(5)	12	Complete propulsion system mock-up		May 10
A-I-(5)	13	Complete pitch fan system mock-up		May 10
A-II-(2)	20A	Contracting Officer approval of Pitch Fan System Acceptance Test Specification		May 28
A-II-(1)	14A	Contracting Officer approval of Propulsion System Acceptance Test Specification		May 29
B-I-(2)	49	Complete tests of engine air flow model		May 29
		June, 1962		
A-II-(4)	25A	Prepare 2 YJ85-5 engines		June 1
	54	Start high speed (conventional flight aerodynamic model tests		June 6
	25B	Prepare 2 YJ85-5 engines		June 15
B-III-(8)	80	Provide estimated list of ground support equipment to be furnished for operation of airplane during ground and flight tests		June 15

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
B-IV-(2)	84A	Contracting Officer specify flight test site		June 25
B-I-(2)	52	Begin low speed model tests with operating fans		June 28
B-III-(1)	65	Submit basic Ground Test Plan for approval		June 30
		July, 1962		
A-I-(1)	1	Complete preliminary installation study of propulsion system on airplane and release drawing.		July 1
	2	Select main fan inlet and closure configuration		July 1
	3	Select pitch fan inlet and exit configuration		July 1
A-II-(4)	25C	Prepare 2 YJ85-5 engines		July 1
		August, 1962		
A-II-(4)	25F	Prepare 4 diverter valves		Aug. 1
B-I-(2)	55	Complete tests of high speed model		Aug. 3
B-I-(4)	57	Conduct inspection of cockpit and partial airplane mock-up		Aug. 3
B-III-(1)	65A	Government approval of basic Ground Test Program		Aug. 14
B-I-(1)	45	Submit Airplane Specification for approval		Aug. 17
B-I-(1)	46	Freeze analytical design of airplane		Aug. 17
B-I-(4)	51A	Government approval of cockpit mock-up		Aug. 31
B-IV-(1)	82	Prepare a basic Flight Test Program Plan		Aug. 31

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		SEPTEMBER, 1962		
A-II-(1)	15	Fabricate and assemble one lift fan (S003)		Sept. 4
A-II-(4)	25D	Prepare 2 J85-5 engines		Sept. 25
A-II-(2)	21	Fabricate and assemble one pitch fan		Sept. 26
		OCTOBER, 1962		
B-I-(1)	45A	Contracting Officer approval of Airplane Specification		Oct. 4
B-I-(2)	53	Complete tests of low-speed model		Oct. 16
A-II(4)	25G	Prepare 2 diverter valves		Oct. 31
		NOVEMBER, 1962		
A-II-(6)	34	Complete preparation of lift fan ready for official flightworthiness test		Nov. 16
A-II-(7)	36	Complete preparation of pitch fan ready for official flightworthiness test		Nov. 16
	--	Receive second 2 J85 engines		Nov. 23
		DECEMBER, 1962		
A-II-(7)	37	Complete pitch fan flightworthiness test		Dec. 8
A-I-(1)	4	Complete Reliability Failure Analysis		Dec. 15
A-II-(4)	25H	Prepare 2 diverter valves		Dec. 28
		JANUARY, 1963		
A-II-(1)	16	Fabricate, assemble and acceptance test lift fan (C004)		Jan. 28
A-II-(2)	22	Fabricate, assemble and acceptance test pitch fan (PF002)		Jan. 28

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		FEBRUARY, 1963		
A-II-(4)	25E	Prepare 2 J85-5 engines		Feb. 11
A-II-(5)	27	Instrument and prepare for shipment lift fan (C004)		Feb. 15
A-II-(5)	32	Instrument and prepare for shipment pitch fan (PF002)		Feb. 15
B-I-(2)	51	Complete tests of flutter model		Feb. 15
A-II-(1)	16A	Government acceptance of lift fan (C004)		Feb. 18
A-II-(2)	22A	(Movement acceptance of pitch fan (PF002)		Feb. 18
		MARCH, 1963		
A-IV-(4)	42	Deliver Propulsion System O&M Instructions		Mar. 5
A-IV-(5)	43	Deliver Pitch Fan O&M Instructions		Mar. 5
A-II-(3)	24	Preparation of Spare Parts Inventory List		Mar. 8
A-II-(1)	17	Fabricate, assemble and acceptance test lift fan (S005)		Mar. 21
A-II-(2)	23	Fabricate, assemble, and acceptance test pitch fan (PF003)		Mar. 21
A-II-(1)	17A	Government acceptance of lift fan (S005)		Mar. 25
		APRIL, 1963		
A-II-(5)	28	Instrument and prepare for shipment lift fan (S005)		Apr. 3
A-II-(1)	19	Fabricate, assemble and acceptance test lift fan (S007)		Apr. 10

CONTRACT ITEM	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
A-II-(6)	35	Complete lift fan flightworthiness test		Apr. 10
A-III-(2)	40	Complete fabrication of special tools and ground handling equipment required for field maintenance of lift, and pitch fans		Apr. 10
A-II-(1)	18	Fabricate, assemble, and acceptance test lift fan (C006)		Apr. 26
A-II-(6)	35A	Government acceptance of lift fan flightworthiness test		Apr. 26
A-II-(7)	37A	Government acceptance of pitch fan flightworthiness test		Apr. 26
B-I-(3)	56	Complete design of flight test instrumentation system and release 90% of detail design drawings		Apr. 30
		MAY, 1963		
B-II-(1)	58	Complete fabrication of all major airplane tooling		May 3
A-II-(1)	18A	Government acceptance of lift fan (C006)		May 22
A-II-(1)	19A	Government acceptance of lift fan (S007)		May 22
A-II-(2)	23A	Government acceptance of pitch fan (PF003)		May 22
A-II-(5)	30	Instrument and prepare for shipment lift fan (S007)		May 28
		JUNE, 1963		
A-II-(5)	29	Instrument and prepare for shipment lift fan (C006)		June 4
A-II-(5)	33	Instrument and prepare for shipment pitch fan (PF003)		June 4

CONTRACT NO.	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		JULY, 1963		
B-II-(1)	59	Number 1 airplane ready for static testing		July 15
B-III-(5)	73	Complete fabrication of test fixtures and equipment required for Static Test Program		July 23
B-II-(1)	61	Complete wings, tail and fuselage shell of #2 airplane		July 31
		AUGUST, 1963		
B-III-(6)	75	Complete static structural tests of complete airplane		Aug. 20
		SEPTEMBER, 1963		
B-III-(5)	72	Complete fabrication of major test fixtures and equipment for component test program		Sept. 12
B-II-(2)	63	Complete installation of basic flight test instrumentation in #2 airplane		Sept. 23
		OCTOBER, 1963		
B-IV-(1)	83	Submit detailed flight test plan for approval	Oct. 22	
B-III-(6)	77.0	Complete ground resonance test #2 A/C	Oct. 31	
		NOVEMBER, 1963		
B-III-(2)	66	Complete all component integrity and reliability tests	Nov. 1	
A-II-(2)	21A	Government acceptance of pitch fan (PF001)	Nov. 15	
B-III-(6)	77.1	Start systems functional test #2 A/C	Nov. 26	

CONTRACT NO.	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		NOVEMBER, 1963		
B-IV-(1)	83A	Government approval of detailed flight test plan	Nov. 26	
		Receive approval for revised Plan for Performance	Nov. 26	
		DECEMBER, 1963		
B-III-(6)	76.0	Complete systems function test #1 A/C	Dec. 4	
B-III-(6)	76.1	Complete engine run and modify A/C #1 as result of ground tests	Dec. 11	
A-II-(1)	15A	Government acceptance of lift fan (S003)	Dec. 15	
A-II-(5)	31	Instrument and Prepare for shipment pitch fan (PF001)	Dec. 16	
B-II-(1)	60.0	Completion of No. 1 A/C ready for full scale wind tunnel test	Dec. 19	
B-II-(1)	60.1	Ship No. 1 A/C to NASA Ames	Dec. 19	
B-III-(6)	77.2	Complete system functional test No. 2 A/C	Dec. 19	
A-III-(1)	38	Complete preparation of full scale wind tunnel test plan	Dec. 20	
B-III-(8)	81	Complete fabrication or procurement of all ground support equipment	Dec. 20	
B-II-(2)	64	Install flight test instrumentation in No. 2 A/C	Dec. 27	
	26	Instrument and prepare for shipment lift fan (S003)	Dec. 30	
B-III-(7)	79.0	All flight clearance reports submitted for low speed fan and conventional flight.	Dec. 31	

CONTRACT NO.	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		JANUARY, 1964		
B-III-(6)	77.3	Complete engine run and modify A/C No. 2 as result of ground tests	Jan. 3	
B-II-(1)	62.0	Ship No. 2 A/C to Edwards AFB	Jan. 8	
B-IV-(2)	85	Start Flight Test Program	Jan. 10	
B-II-(1)	62.1	No. 2 A/C ready for ground and taxi tests	Jan. 11	
B-IV-(6)	94	Deliver Instructions for Operation and Maintenance of Airplane and Sub-system.	Jan. 15	
B-III-(6)	77.4	Complete thrust stand and preflight tests on No. 2 A/C	Jan. 17	
B-III-(5)	74	Complete fabrication of test fixtures and equipment required for full scale wind tunnel test program	Jan. 20	
B-III-(7)	79.1	Request clearance for No. 2 A/C for low speed fan and conventional flight	Jan. 20	
B-III-(7)	79A	Government approval and low speed flight clearance of No. 2 A/C	Jan. 27	
		FEBRUARY, 1964		
B-IV-(2)	86	Demonstrate hover	Feb. 2	
B-III-(4)	70	Complete full scale wind tunnel test on No. 1 airplane	Feb. 21	
B-III-(3)	68	Complete a simulation study based on inputs derived from engineering analysis and scale model wind tunnel tests to provide predicted flight characteristics	Feb. 15	

CONTRACT NO.	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		FEBRUARY, 1964		
B-III-(4)	70.1	No. 1 airplane returned for flight test	Feb. 29	
B-III-(7)	79.2	All flight clearance reports submitted for high speed conventional flight	Feb. 29	
		MARCH, 1964		
B-III-(7)	78	Request flight clearance low and high speed for No. 1 A/C	Mar. 9	
B-III-(7)	79.3	Request flight clearance, high speed for No. 2 A/C	Mar. 9	
B-IV-(2)	89	Start flight program on No. 1 A/C	Mar. 13	
B-III-(7)	78A	Government approval and flight clearance, of No. 1 A/C	Mar. 16	
B-III-(7)	79B	Government approval and flight clearance, high speed, No. 2 A/C	Mar. 16	
B-III-(6)	76.2	Complete pre-flight tests on No. 1 A/C	Mar. 23	
		APRIL, 1964		
B-IV-(2)	87	Demonstrate vertical take-off and transition to wing supported flight and from wing supported flight to fan support and vertical landing	Apr. 17	
B-III-(4)	71	Complete analysis of full scale wind tunnel data	Apr. 30	
		MAY, 1964		

NONE

CONTRACT NO.	MILESTONE NO.	MILESTONES	PLANNED DATE	ACTUAL DATE
		JUNE, 1964		
B-IV-(2)	88	Demonstrate aircraft structural integrity throughout approved flight envelope.	June 10	
B-IV-(2)	90	Complete Flight Test Program	June 26	
		JULY, 1964		
B-IV (5)	93	Complete modifications to both A/C to final flight configurations	July 3	
A-IV-(6)	44	Complete any minor modifications in propulsion system and pitch fan system required during flight tests	July 15	
A-IV-(2)	41	Complete engineering and maintenance support of propulsion systems during the flight test program.	July 15	
B-IV-(3)	91	Complete preliminary analysis of flight test data	July 17	
		AUGUST, 1964		
B-I-(2)	47	Complete reliability and failure analysis	Aug. 15	
B-IV-(4)	92	Submit substantiating data to enable Government flightworthiness evaluation for subsequent testing by Government pilots	Aug. 15	

SPECIFICATIONS AND TEST PROGRAMS REQUIRING GOVERNMENT APPROVAL

	SPECIFICATION	SUBMITTED DATE	APPROVAL REQUIRED
1.	Plan for Performance (Report No. 111) (Report No. 111A)		Feb. 13, 1962 Nov. 26, 1963
2.	Propulsion System Specification (Spec. #112)		Feb. 15, 1962
3.	Pitch Fan System Specification (Spec. #113)		Mar. 29, 1962
4.	Propulsion System Flightworthiness Test Specification (Spec. #114)		Apr. 6, 1962
5.	Pitch Fan Flightworthiness Test Specification (Spec. #115)		Apr. 19, 1963
6.	Propulsion System Acceptance Test Specification (Spec. #116)		May 29, 1962
7.	Pitch Fan Acceptance Test Specification (Spec. #117)		May 28, 1962
8.	Airplane Detail Specification (Spec. #118)		Oct. 4, 1962
9.	Ground Test Program (Report 119)		Aug. 14, 1962
10.	Simulator Test Program (Report 120)		Apr. 15, 1962
11.	Flight Test Program (Report #129)	Oct. 22, 1963	Nov. 26, 1963
12.	Request to Clear Aircraft No. 1 for Flight	Mar. 9, 1964	Mar. 16, 1964
13.	Request to Clear Aircraft #2 for First Flight	Jan. 20, 1964	Jan. 27, 1964

CONTRACT REQUIRED REPORTS

FINAL TECHNICAL REPORTS	SUBMISSION DATE
Propulsion & Pitch Fan Sub-Program Design & Engineering	Apr. 30, 1964
Flightworthiness Test	Nov. 15, 1963
Full Scale Wind Tunnel Test Report	Apr. 30, 1964
Detail Flight Test Procedure	Oct. 22, 1963
Installed Systems Test Procedure	Nov. 4, 1963
Conventional Model Wind Tunnel Test Report	Nov. 14, 1963
Fan Powered Model Wind Tunnel Test Report	Nov. 4, 1963
Wing Basic Structure	Oct. 29, 1963
Empenage Structural Analysis	Nov. 29, 1963
Fuselage Structural Analysis & Sub Systems	Dec. 16, 1963
Wing Flap, Aileron, Fittings Structure	Dec. 16, 1963
Main Landing Gear Structural Analysis	Nov. 29, 1963
Heat Transfer & Cooling Analysis	Dec. 31, 1963
Installed Systems Functional Test	Jan. 25, 1964
Predicted Performance Characteristics	Dec. 16, 1963
Inlet Model Wind Tunnel Test Report	Dec. 21, 1963
Ground Vibration Test Procedures and Results	Dec. 31, 1963
Predicted Noise and Vibration Characteristics	Dec. 31, 1963
Load Analysis	Dec. 25, 1963
Calculated Weights, Balance, and Moments of Intertia	Dec. 28, 1963
Estimated Static Stability Characteristics	Dec. 31, 1963
Calculated Installed Engine Performance	Dec. 31, 1963
Control System Structural Analysis	Dec. 31, 1963
Structural Test Procedures & Results	Dec. 31, 1963
Flutter Model Wind Tunnel Test Report	Jan. 17, 1962
Preliminary Calculated Flutter Analysis	Feb. 15, 1964
Calculated Dynamic Stability Characteristics	Feb. 28, 1964
Predicted Flying Qualities	Feb. 28, 1963
Aircraft Operating Instructions Manual	Jan. 29, 1964
Final Systems Analysis & Simulation	Feb. 28, 1964

CONTRACT REQUIRED REPORTS

FINAL TECHNICAL REPORTS	SUBMISSION DATE
Aircraft Fabrication, Assembly, and Inspection	Mar. 29, 1964
Final Calculated Flutter Analysis	Apr. 15, 1964
Final Weight and Balance	Aug. 15, 1964
Final Flightworthiness Summary & Reliability Report	Aug. 29, 1964
Final Flight Test Report	Aug. 29, 1964
Final A/C Detail Specification	Sept. 15, 1964

QUARTERLY TECHNICAL PROGRESS REPORTS

		SUBMITTAL DATE
No.	1	Mar. 31, 1962
	2	June 30, 1962
	3	Sept. 30, 1962
	4	Dec. 31, 1962
	5	Mar. 31, 1963
	6	June 30, 1963
	7	Sept. 30, 1963
	8	Dec. 31, 1963
	9	Mar. 30, 1964
(Summary)	10	July 31, 1964

MONTHLY LETTER REPORTS

No.	1	Dec. 20, 1961	No.	12	Nov. 20, 1962	No. 23	Oct. 20, 1963
	2	Jan. 20, 1962		13	Dec. 20, 1962	24	Nov. 20, 1963
	3	Feb. 20, 1962		14	Jan. 20, 1963	25	Dec. 20, 1963
	4	Mar. 20, 1962		15	Feb. 20, 1963	26	Jan. 20, 1964
	5	Apr. 20, 1962		16	Mar. 20, 1963	27	Feb. 20, 1964
	6	May 20, 1962		17	Apr. 20, 1963	28	Mar. 20 1964
	7	June 20, 1962		18	May 20, 1963	29	April 20, 1964
	8	July 20, 1962		19	June 20, 1963	30	May 20, 1964
	9	Aug. 20, 1962		20	July 20, 1963	31	June 20, 1964
	10	Sept. 20, 1962		21	Aug. 20, 1963	32	July 20, 1964
	11	Oct. 20, 1962		22	Sept. 20, 1963		

MOTION PICTURE REPORTS

		SUBMITTAL DATE
No.	1	June 30, 1962
	2	Sept. 30, 1962
	3	Dec. 31, 1962
	4	Mar. 31, 1963
	5	June 30, 1963
	6	Sept. 30, 1963
	7	Dec. 31, 1963
	8	Mar. 30, 1964
(Final Summary)	9	July 31, 1964

DRAWINGS

All required propulsion system, pitch fan system, and airplane drawings will be submitted on July 17, 1964.

OPERATION AND MAINTENANCE INSTRUCTIONS

	SUBMITTAL DATE
Propulsion System	Mar. 5, 1963
Pitch Fan System	Mar. 5, 1963
Airplane	Jan. 31, 1964

PERCENTAGE BREAKDOWN OF WORK BY TASK

Task	A-I	13%
	A-II	33
	A-III	4
	A-IV	2
	B-I	20
	B-II	22
	B-III	3
	B-IV	3
		100%

Monthly letters will report progress against the above Task percentages