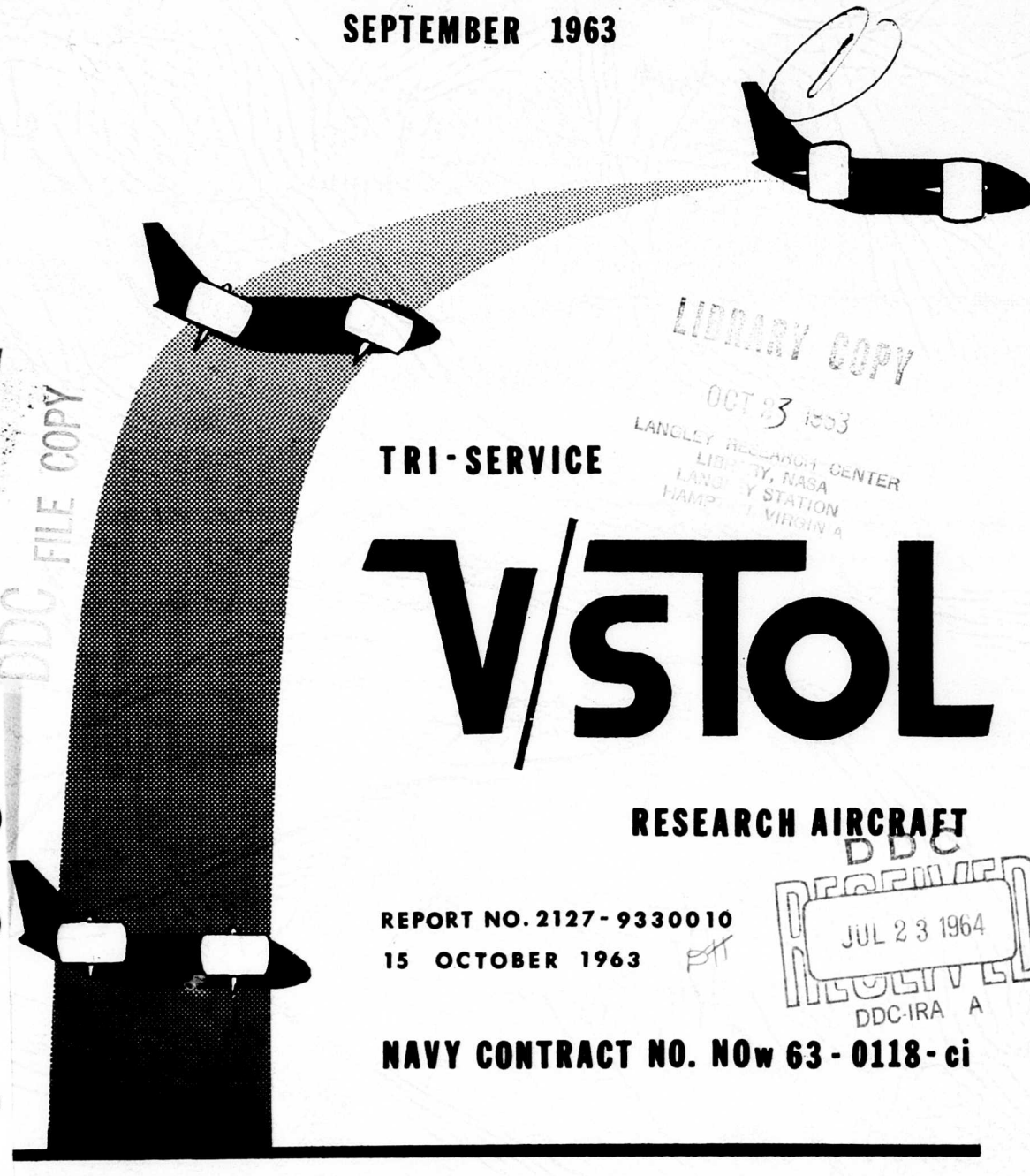
X-22A PROGRESS REPORT NO. 10

SEPTEMBER 1963



TRI-SERVICE

V/STOL

RESEARCH AIRCRAFT

REPORT NO. 2127-9330010
15 OCTOBER 1963

NAVY CONTRACT NO. NOw 63-0118-ci

BELL AEROSYSTEMS COMPANY
DIVISION OF BELL AEROSPACE CORPORATION-A textron COMPANY

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BELL AEROSYSTEMS COMPANY Buffalo, N.Y.

X-22A TRI-SERVICE V/STOL AIRCRAFT

MONTHLY PROGRESS REPORT no. 10, 1-30 Sep 63

Report No. 2127-933010

~~September 1963~~

This is the tenth Monthly Progress Report as required in Section F (5) of the contract, and outlines progress for the period 1 September 1963 through 30 September 1963.

A. J. Marchese
Project Director
X-22A PROGRAM

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CONTENTS (CONT)

ILLUSTRATIONS

I. INTRODUCTION

Bell Aerosystems Company was awarded Contract NOw 63-0118-ci by the Department of the Navy, Bureau of Naval Weapons for two Model X-22A Tri-Service V/STOL Research Aircraft. The official contract was authorized on 30 November 1962.

The X-22A aircraft is a dual tandem ducted propeller research airplane (Figure 1), with a prime mission of exploring the mechanical and aerodynamic problem of an aircraft designed and constructed for both vertical takeoffs and landings as well as conventional type operation. Lift and thrust are provided by four turboshaft engines mounted in dual engine pods, one on each side of the aft fuselage. Four rotatable ducted propeller units, each including a three-blade propeller, are interconnected and driven by the engines through an aircraft transmission system.

This aircraft, with speeds up to 303 knots, carries a flight crew of two, and capable of carrying a 1200 pound payload while maintaining continuous hover . . . with one engine cut. With four engines in operation the payload range will be substantially increased. Provisions are made for the installation of six passenger seats in the cabin area. The aircraft is in the 15,000 pound gross weight category.

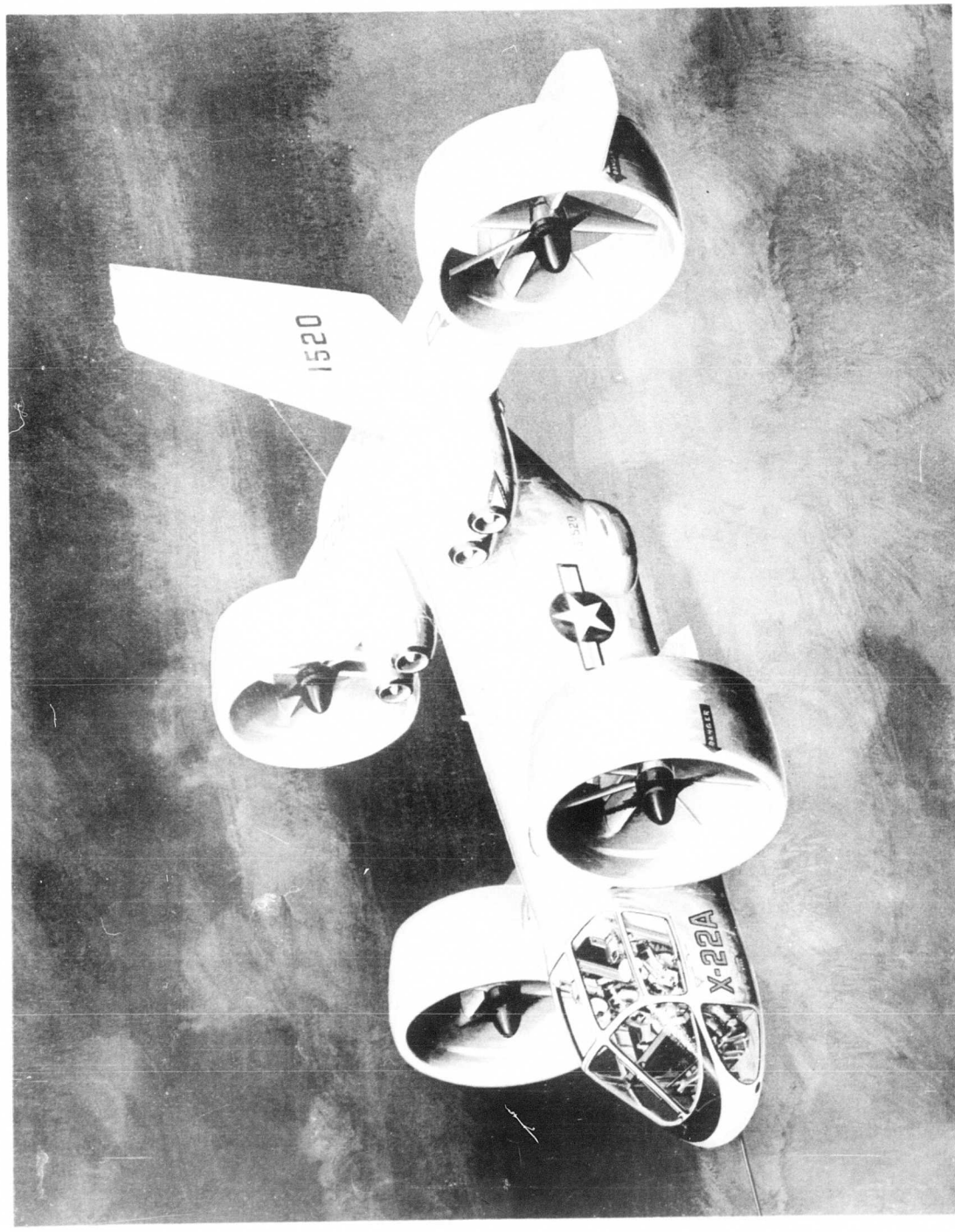

Figure 1. X-22A Tri-Service Research V/STOL Aircraft

II. SUMMARY

Design has progressed in the layout and detailing of systems based on Wind Tunnel Test Results available. Releases have been made for fabrication and extra design effort was continued in the Flight Control System.

Weight Control program effort was continued in the face of slight increases.

Reduction of Wind Tunnel data from the 1/6 scale, 1/7 scale, and others models progressed. Test preparations for continued Wind Tunnel model tests were made. The 1/3 scale test has just entered the initial phase.

Acoustic Noise Tests were accomplished during the period, which indicated additional testing was necessary. Test Specimen configuration and Test Requirements are being prepared for these continued tests.

Subcontractor coordination, review meetings, technical visits, and PERT scheduling have continued with all programs on schedule.

During the September period, all contractual reports and data requirements were completed essentially as scheduled.

Management controls of PERT scheduling and costing continued. The seventh PERT Cost Report, PERT Milestone Computer report and PERT Interim report for the month of August were all submitted to BuWeps as scheduled. These reports covered an increase in total required hours which now exceed the negotiated hours by approximately 2 percent.

Progress between 1 September and 30 September 1963 has continued in the detail review of all program efforts. All networks are being updated as of 27 September.

Budgets in line with negotiated costs through September 1963 were issued and were used by each operational department. Daily reviews of these budgets were made and expenditures through 30 September 1963 remained within the authorized funds for this period.

As indicated in previous reporting, an overtime and work effort through vacation shutdown was instituted to minimize engineering schedule slippages. Reviews, which have been extensive in scope, have established a requirement to include premium overtime Engineering personnel. This factor was discussed with BuWeps Representative and instituted without delay.

Use of PERT on this program has identified additional controls and manpower requirements which were not readily recognizable prior to reviews and detail expansion of all PERT nets. The familiarization with PERT data by all affected personnel, and their analysis and review of PERT plans is continuing.

The X-22A Cockpit Mockup Inspection was held at Bell Aerosystems Company 17 and 18 September 1963, better than one month in advance of the contract schedule. All change requests prepared by the Board members and Tri-Service visitors have been formally submitted in summary form to BuWeps for distribution as necessary.

Bell Aerosystems personnel met with BuWeps 26 September 1963 and reviewed all open items which require BuWeps approvals.

Figures 2 and 3, X-22A Milestone Data Requirements Charts for the 3rd and 4th Quarter of 1963 and Figure 4, Program Schedule, reflect the program and status as of September 30, 1963.

All operating departments are continuing with necessary planning and interdepartmental coordination as required, spearheaded by a weekly meeting attended by all members of the X-22A Management Organization.

The Engineering and Manufacturing weekly meetings to discuss and review designs, techniques, specifications, equipment etc., are continuing. Weekly top management program reviews have been held.

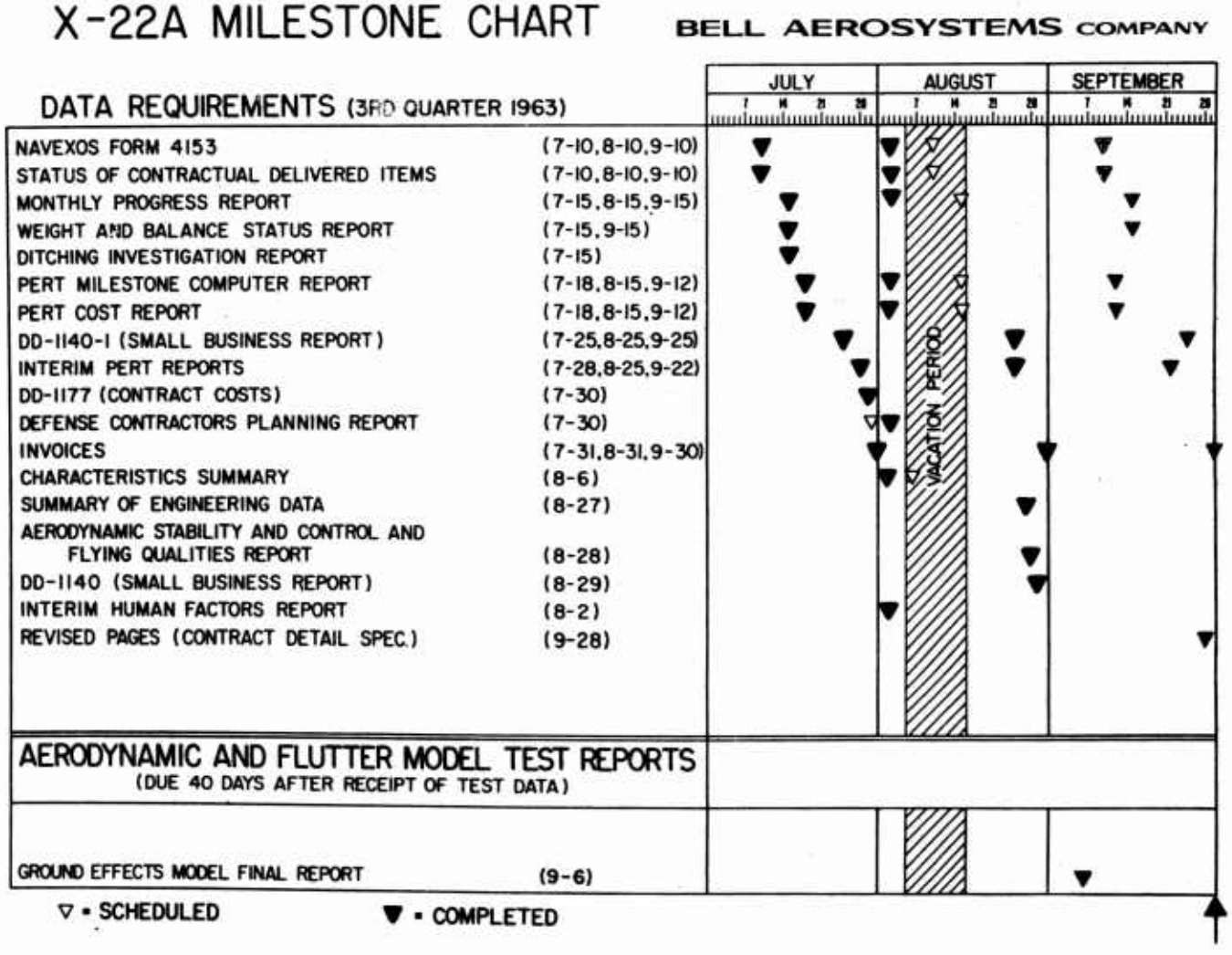

Figure 2. X-22A Milestone Chart - Data Requirements (Third Quarter)

X-22A MILESTONE CHART BELL AEROSYSTEMS COMPANY

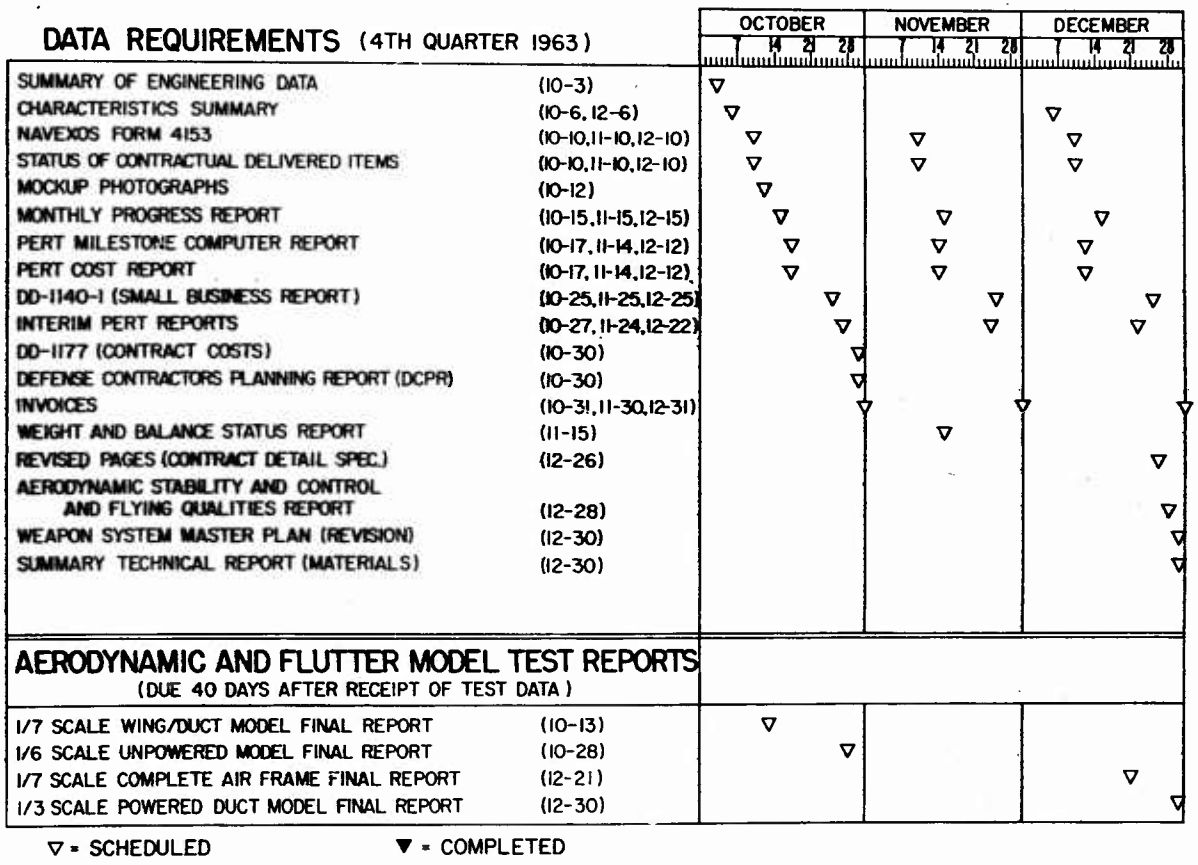

Figure 4. X-22A Milestone Chart - Data Requirements (Fourth Quarter)

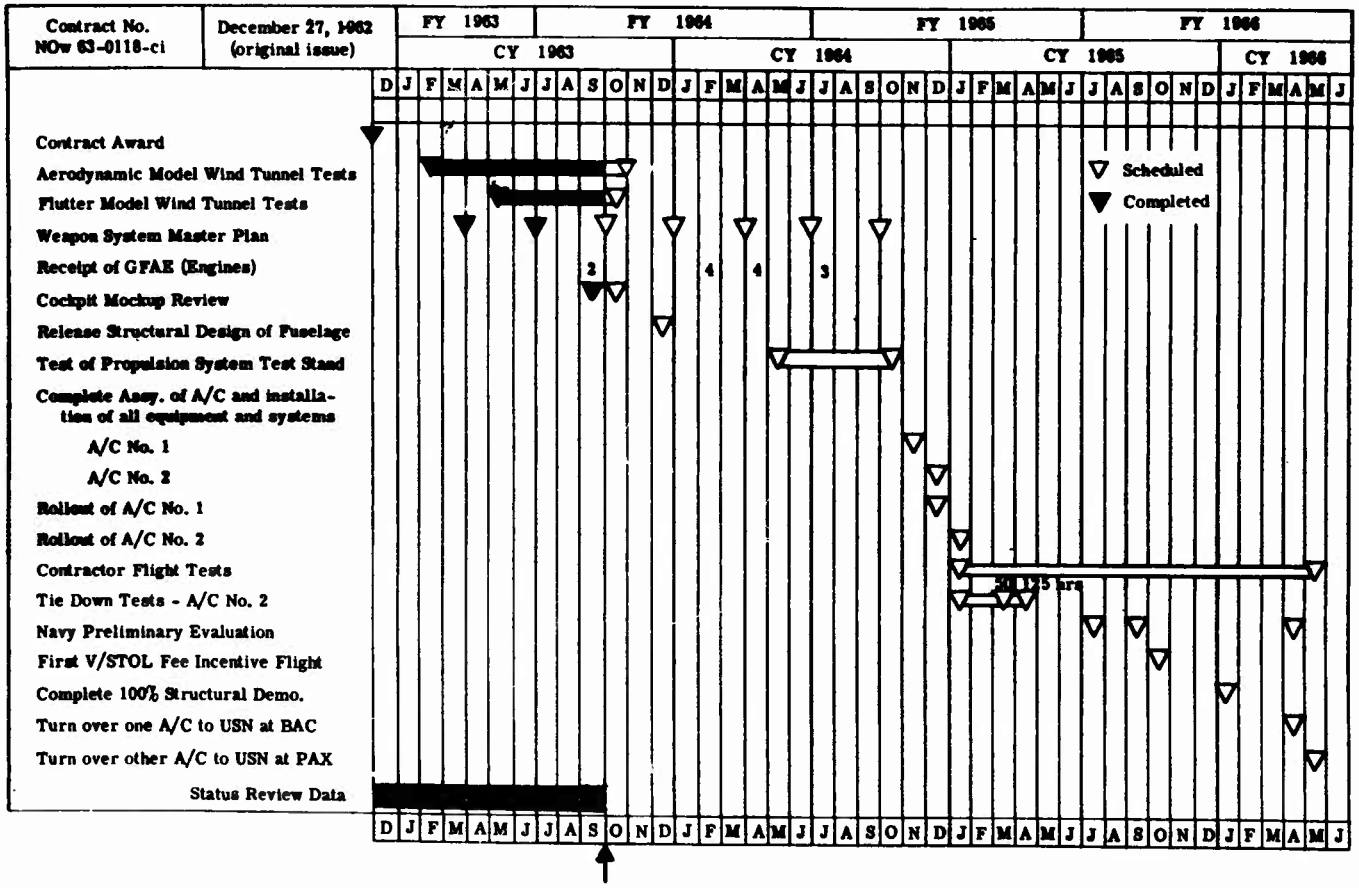

Figure 4. Program Schedule

III. PRELIMINARY DESIGN

A. FLIGHT TECHNOLOGY

1. Performance

A scheduled revision to the Characteristics Summary has been made. Since the wind tunnel data are still being analyzed, the drag data will not change. Changes in this revision are due to weight changes. Several flight paths were calculated for loads and criteria analysis.

2. Propulsion Analysis

The propeller tip clearance study is not completed but working graphs are available. A summary of the heating and cooling investigations for the fuselage compartment and cockpit areas has been prepared.

Calculated duct pressure distributions have been prepared for use in structural loads determinations. Duct internal drag at $V_{max.}$ was estimated and is undergoing review.

Engine power limiting approaches are being investigated with General Electric. Fuel control limiting does not give the necessary tolerance. A method of matching cooling air inlet and ejector flows to prevent pressurizing the engine compartment is under study.

3. Stability and Control

Lift, drag, and pitching moment coefficient data for transition as functions of angle of attack and C_T were developed based on the 1/5 scale Langley Phase I powered model wind tunnel tests.

Level flight control moment coefficient data for the standard elevons, based on free-stream dynamic pressure, have been prepared as functions of control deflection, angle of attack, and C_T from the 1/5 scale powered model control effectiveness tests. Transition elevon control data have also been prepared as functions of control deflection, duct angle, and angle of attack based on the dynamic pressure in the duct exit.

The level flight roll and yaw control systems design was simplified to employ both forward and aft propellers instead of the aft pair only. Control inputs to blade pitch are being incorporated into the rotary drive of the governor-collective blade pitch control system. This modification eliminates 3 ratio changers, portions of the summing network, and 4 push rods (one per duct).

The elevon-blade pitch phasing schedule in transition for the standard airplane was changed to give optimum control performance based on revised transition longitudinal elevon effectiveness data.

Because of excessive elevon loads in rolling maneuvers at maximum load factor for V_L, "q" stops were incorporated into the lateral control system to restrict the elevon deflection to 7 degrees at V_L and increasing linearly with decreasing q to 20 degrees at approximately 140 knots. These design values meet the required specification roll rates and trims the rolling moment due to sideslip angle in a 35 knot cross wind at 1.15 vs with a 25 percent margin of roll control.

B. VEHICLE STRUCTURES

1. Criteria and Loads

Component loads have been determined for light gust and four transition loading conditions using the latest available component lift

and center of pressure data. The effects of structural flexibility have been included in the gust loading cases. Large wing negative bending moments have been found due to the maximum aft duct incidence adjustment setting of -5 degrees. Elevon loads required to trim 1.0 g flight have also been found to be relatively large for extreme duct ground incidence adjustments. As a result of these findings, revision to allowable duct incidence settings are being investigated.

A six degree of freedom vehicle response program is currently being checked out. This IBM 7090 program will provide an accurate numerical solution of vehicle response to MIL-A-8861(ASG) maneuvers.

2. Structural Analysis

a. Front and Rear Ducts

Stress checking of the strut support ribs in the duct shroud was completed for both the 45 degree struts and the vertical struts. The stress checking of the vertical strut fitting (shroud side) has been completed, and work is nearing completion on the 45 degree strut fitting (shroud side). The analysis of the vertical strut itself is well under way, and work has begun on the analysis of the 45 degree strut and its end fittings. Investigations have been made concerning hoist points for handling the duct during manufacture and appropriate modifications to the 45 degree and vertical strut ribs are being considered.

The front ring beam (Dwg 2127-103003) was checked and revised to provide the stiffness to satisfy propeller clearance requirements. At the same time, the rear beam root segment (Dwg 2127-103051) was revised to include a smoother transition at the attachment between the beam caps and the duct support structure. Reduced web thicknesses

were incorporated in this segment. The top, outboard, and bottom rear beam segments (Dwg 2127-103050) have been revised at the splices joining each segment to reduce stress concentration and eccentricities. The rear beam outboard fitting and associated ribs have also been revised to include a separate, rather than an integral, outboard elevon bracket. This will facilitate location of elevon hinge points during manufacturing.

An access door, approximately 8 inches square, has been installed at the inner trailing edge surface of the duct at the outboard elevon hinge bracket, for purposes of adjusting the elevon.

b. Wing and Duct Support Structure

Detail stress analyses are continuing on major elements of the main wing box. These include the major rib at the fuselage attachment, the front and rear beams and the trailing edge. The duct support fittings, the major ribs supporting the duct and the leading edge structure forward of the duct support fittings between the duct and engine cowling have been completed.

Detailed analysis of the aft centerbody housing is almost complete. However, an increase in the diameter at the rear face required for accessibility of the parts inside requires further study. The assembly consists of an AZ92A-T6 magnesium casting with aluminum sheet used for the structural access door in the side.

Because of engine maintenance and removal requirements, the structural arrangement of the cowling and forward engine mount support off the engine support beam has been revised. The support frame for the cowling has been moved forward of the oil tank while the presently located frame is lowered below the cowl to support only the engine. Design air

load distributions for the individual stiffening rings have been determined and the ring spacing and sizing are in work. Completed items of the engine installation include the structural approval of the final drawings of the forward and aft engine mount links and the aft engine mounting face extension.

c. Fin

A skin stringer combination (0.025 in. - 2024-T3 skins and 0.025 in. - 7075-T6 stringer) has been selected for the structural box portion of the new 68.5 square foot fin and a corresponding structural test panel was designed. A detailed analysis of the fin root area was prepared for digital computation.

d. Fuselage

Static tests were completed on the fuselage shear test specimen. Mode of failure for this 0.025 skin and 0.040 frame combination (2024-T3 alclad) was forced, crippling of the frame flange adjacent to the skin, Figure 5 and 6. Failure occurred at a shear load of 19100 pound or a corresponding shear flow of 310 pounds per inch.

Structural analyses of the forward duct support frames STA 190.5 and 210, maraging steel fittings BL 14 and 34.5, horizontal duct support beam W.L. 132, ejection seat track supports, canopy assembly including latches and hinges, and numerous skin-stiffening frames were completed and released to Manufacturing.

e. Control System

Analysis of the loads in the duct rotation system for critical operating conditions is progressing. Particular attention is being given to the stopping conditions, both during mid-transition when the motors stop

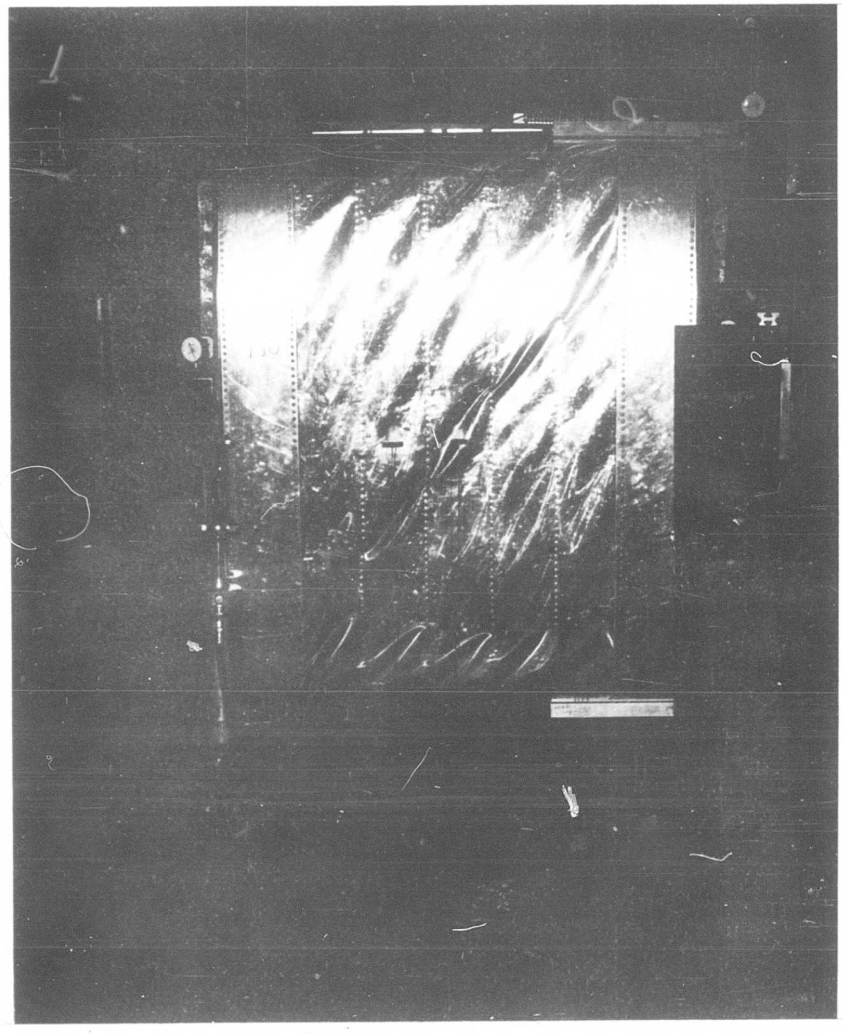

Figure 5. Fuselage Shear Test Specimen

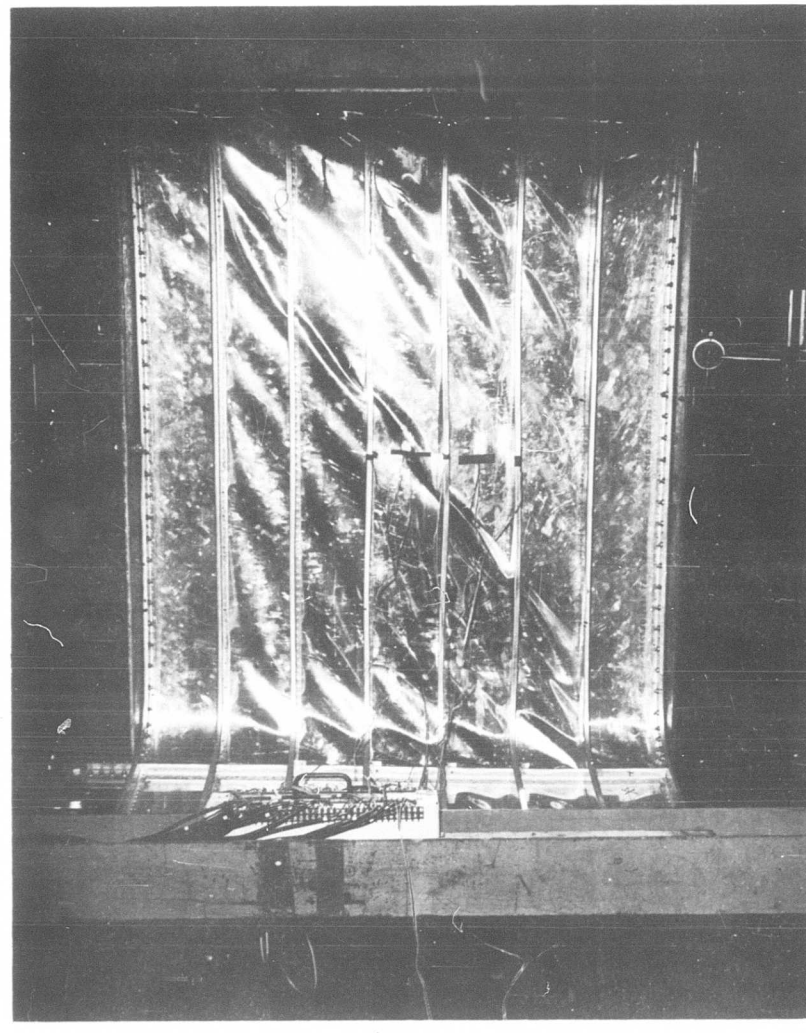

Figure 6. Fuselage Shear Test Specimen

the rotation and at full travel when the ducts are restrained against the fixed stops.

f. Landing Gear

The aircraft specifications include a slope terrain landing condition. To perform a rational evaluation of the loads imposed on the airframe due to landings on a sloped terrain, theoretical equations of motion involving three degrees of freedom were derived.

The initial condition investigated was the roll attitude (rotation of the aircraft about the X axis). The equations establish the motion of the airplane and the main gear loads only. The nose gear was assumed not to contact the ground.

In the evaluation of the main gear forces during the impact, the oleo strut loads including hydraulic, pneumatic, and friction forces have been considered. In addition, the effects of the load-displacement characteristics of the main gear tire were also utilized.

The analog simulator was employed to solve the non-linear equations of motion. The slope of the terrain was varied from 0 to 15 degrees and the assumption of small angles was used to simplify the calculations and setup.

3. Aeroelasticity

Work is in progress to correlate flutter model test data with X-22A flutter analyses. Results to date indicate that our equations of motion provide a good representation of the geometry, mass, and elastic characteristics of the system.

Accelerated acoustic tests of the test specimens representing original duct skin and rib construction in the vicinity of the propeller have shown marginal fatigue capability, based on initial propeller noise level theoretical predictions. Work is in progress to verify ducted propeller noise predictions and to prepare additional panel test specimens of improved fatigue capability and accuracy of prototype representation.

Accelerated life testing will be continued to establish design adequacy. The use of panel damping materials in critical areas will be studied as a backup solution to provide additional fatigue safety factors if required.

4. Weights

Weight changes incorporated during this reporting period have added 12.4 pounds to the X-22A weight empty. These changes are essentially due to detail analysis of data for the harmonic drive component in the duct rotation system and for engine starter covers previously considered part of engine weight. The current weight empty is 10,906.1 pounds. This is 271.1 pounds over the guarantee target.

Efforts to reduce the weight of the harmonic drive unit are underway, primarily by combining elements to eliminate fastener requirements. This could produce a 7.8 pound reduction per airplane. Cockpit mockup inspection changes are being summarized.

Hardware drawings for the ducts and fuselage are being processed. To date, approximately 5 percent of the weight empty has been released. The ducts, especially in the machined part components, such as beams and supports are indicating over weights. These are being reviewed.

The center of gravity location remains satisfactorily located between current design aerodynamic limits.

C. DESIGN

1. General

During this reporting period, major work was concentrated on layouts and detailing in the airframe group, and in the propulsion system. Finalization of electrical circuitry and diagram is in process. The control system is undergoing extensive redesign for simplification and improved operation.

2. Airframe

a. Wing

Investigations and layouts progressed in the areas of the rear wing spar, main wing spar, main box root bulkhead and fuselage longeron attachment, engine and cowl support points, leading edge ribs, duct tube, and supporting structure. Detailing of the main spar, STA 89 rib, rear spar, gearbox support, front beam, outboard bearing support and duct support fittings is underway.

b. Fuselage, Cockpit, and Aft Fuselage

Layouts are in work of the revised fin and its attachment, the fuselage from STA 463.16 aft, the floor installation, and the fuselage from STA 396 to 463.16. The canopy and many of the frames, bulkheads, and supporting structure in the cockpit area have been released for Manufacturing. However, a layout of the canopy control handles and the jettison system as requested by the mockup board is now in process. Certain areas of the canopy will be affected. Hold orders have been issued on affected component already released for manufacture.

c. Fuselage Center Section

The fuel tank and fuel tank area, cargo door area, landing gear area, upper longeron, typical frames, bulkheads and frames and duct support areas are in work. Several major bulkheads and frames have been released for Manufacturing.

d. Duct

The front and rear spars are having structural and checking changes incorporated. The leading and trailing edge assemblies have been completed and are being reviewed by the Airframe Group. The lay-outs of the vertical support strut and the details of attachment are in work. The layout of the beam to beam bulkhead (at the vertical strut attachment) has been completed and is being detailed. The detailing of the elevon hinges is in process. The layout of the alternate elevon has been started.

3. Flight Controls and Equipment

a. Flight Controls

Further revisions to the control system have been found necessary due to packaging requirements and mechanical difficulties. They include packaging of the variable ratio bellcranks, SAS system and the mixing levers into one preassembled unit which may be bench tested; and also the elimination of the push-pull propeller pitch control and the substitution of a differential rotary operation of the Beta pitch control.

The preliminary specification for the SAS is being formulated. Conceptual layouts of the system have been initiated.

Layouts are in work of the control stick and collective stick, the pitch control basic differential gearbox, the duct interconnecting system and gearboxes, the longitudinal firewall installation and the air induction system.

b. Equipment

The cockpit mockup was reviewed by BuWeps and the comments are being investigated for incorporation into the flight article. Investigation of a modified heater arrangement is being made with accompanying layouts.

The main circuit breaker panel is 80 percent detailed. The left console is in the final layout and detailing stage. The instrument panel including approved changes by the mockup board are in work. The specification control drawing for the duct rotation indicator has been released.

4. Propulsion

The specification control drawings for the propeller gearbox are being checked. The SCD for the transmission is 85 percent complete. Layouts have been prepared for all of the transmission bearing hangars. The layout of the transmission gearbox system is nearing completion.

The SCD for the fuel tank has been completed and incorporates comments of BuWeps. Layout of the fuel jettison line is well underway. The final details of the engine oil tanks are in work. Final details of the engine mount installation have been completed. Drawings of the propulsion system test stand and the fuel system installation have been released.

Layouts are in work of the fuel shutoff valve controls, the fuel jettison valve control, the power controls, the power boost control system and the nacelle structure.

5. Electrical and Electronics

Layouts of the forward equipment area continue with close coordination of BAC equipment and VSS equipment installations. The landing light installation has been completed. Layout work on the installation of the transformer-rectifier and current transformer continues.

6. Landing Gear and Hydraulics

The mockup of the aft centerbody section has shown that a larger area is required to house the controls and elevon actuators. As a result, new layouts have been started to provide the needed space. Specifications and SCD's for the elevon servo valve and actuators are in work.

The landing gear work statement and specification are being revised to final requirements. Layouts on the main gear supporting structure are in work. Layouts and detailing are nearing completion on the nose gear door and actuation. The main gear doors and actuators are in layout and detailing stage. A layout of an unboosted hydraulic brake system is being investigated.

D. SYSTEMS SUPPORT

1. Human Factors

Much of this sections' activity during the report period was concentrated in preparation for and participation in the mockup review. Where possible, comments by Tri-Service personnel were noted for consideration in analysis of any future cockpit changes.

A cockpit simulator, which includes a variable control feel system is being procured for use in analog simulation studies. Delivery is scheduled for 9 December 1963.

2. Maintainability and AGE

The latest Service Instructions Handbook and Overhaul Handbook on the T58 engine are under study for applicable items of inspection requirements and coordination of access areas. Propeller, gearbox, aft centerbody, struts, and duct installation are also being studied.

3. Environmental Factors

The calculation of acoustically excited mechanical vibrations of the fuselage in terms of overall and spectral values was completed. The results, if compared with noise and vibration levels, measured in other aircraft, indicate that the fuselage vibrations in areas close to the propeller plane might be marginal to the tolerable MIL specification values. A final conclusion will depend on vibration acceleration measurements to be conducted with a fuselage panel subjected to a simulated noise field inside a test chamber.

The probability of fatigue life and also the required test time for one or more test panels was calculated using test data obtained from reference material. The results will be used to determine the test factor for the future tests being planned.

During ground tests of the Hydroskimmer, the sound pressure at certain points along the inner wall of the propeller duct was measured. Results will be used as backup information for the pressure distribution calculated for the X-22A.

E. SYSTEMS ANALYSIS AND INTEGRATION

An engineer from the Systems Analysis Section has been assigned to regularly spend one day a week at the Cornell Aeronautical Laboratory to follow the development of the Variable Stability System. The primary purpose is to review the analytical and electronic design programs. This liaison facilitates coordination of all Variable Stability System and X-22A interfaces.

IV. SUBCONTRACTS

A. SUBCONTRACTS

1. Propellers - Hamilton Standard Division of United Aircraft Corporation

A Monthly Review Meeting was held and there has been a considerable exchange of technical information. The program is progressing on schedule. The definitized subcontract is in the final stage.

2. Variable Stability System - Cornell Aeronautical Laboratories

This program has been moving ahead and there has been no special problems. Review meetings and exchange of information has taken place. The fully executed contract has been completed.

3. Transmission and Gearbox System - Steel Products Engineering Company

A review meeting and PERT have revealed a schedule and weights problem in one of the critical boxes. Steps were immediately taken and progress made toward resolution. The contract has been signed by SPECO and returned with comments.

4. Cockpit Simulator

The formal purchase order was placed with the Trainer Corp. of America. The specifications have been reviewed and designs prepared. A project review meeting was held on September 24, 1963. The scheduled delivery date is December 9, 1963.

5. Landing Gear

Engineering proposal reviews and facility surveys have been conducted during this past month. Award is scheduled for October 4, 1963.

6. Ames Test Gearbox - York Gears Ltd.

Proceeding satisfactorily; delivery scheduled for 18 October 1963.

7. Duct Support Tube

Proposals have been received from H. W. Loud, Cleveland Pneumatic and Engineering Enterprises Companies.

8. Harmonic Drive Gearboxes

Quotations have been received from York Gears, Western Gear, United Shoe, Michigan Tool and Lear-Siegler Companies.

9. Harmonic Drive

The proposal request has been forwarded to the United Shoe Machinery Corp. Due October 18, 1963.

10. Constant Speed Drive

The proposal from Lycoming has been received and a review meeting schedule with them for October 9, 1963. Sundstrand made an Engineering presentation at Bell and they have been invited to make a proposal.

V. MODELS

A. WIND TUNNEL TEST PROGRAM

1. 1/6 Scale Unpowered Airplane Model

Final tabulated data were received from DTMB for the Phase II tests. Phase I data have been plotted for the data report and the Phase II data are being processed.

2. 1/5 Scale Powered Airplane Model

Phase II tests of the complete model were rescheduled by NASA to approximately November 11, 1963, and duct-alone tests will be conducted for one week starting October 14, 1963.

3. 1/3 Scale Powered Duct Model

This model went into the wind tunnel September 26, 1963, and testing is in progress. No data are available as yet.

4. Full-Scale Powered Duct Model

Design of this model has been completed and fabrication is progressing. Photographs of the model appear in Figures 7 through 11.

5. Elevon Effectiveness Model

The alternate elevon configuration for VSS maximum yaw control was tested. Preliminary results indicate the hinge moment to be within the actuator design capability and the control effectiveness at full deflection to be about three times the effectiveness of the standard elevon.

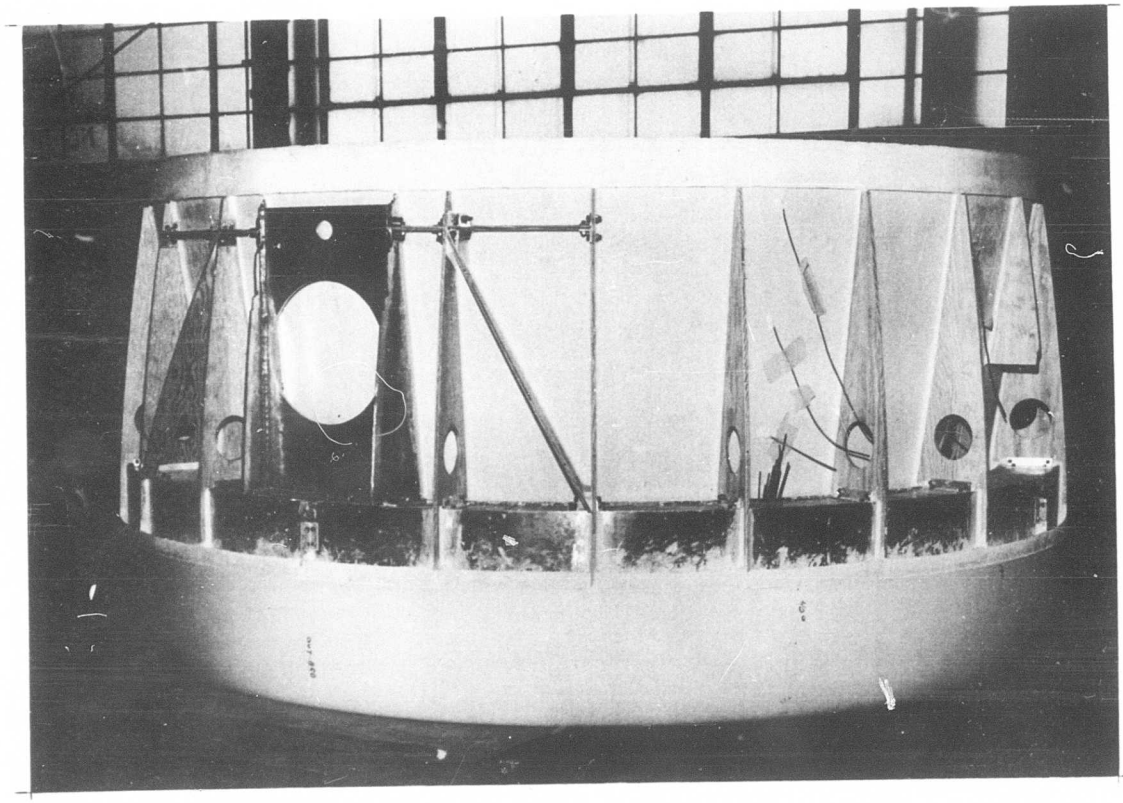

Figure 7. Full Scale Ducted Propeller Model - Duct Assembly

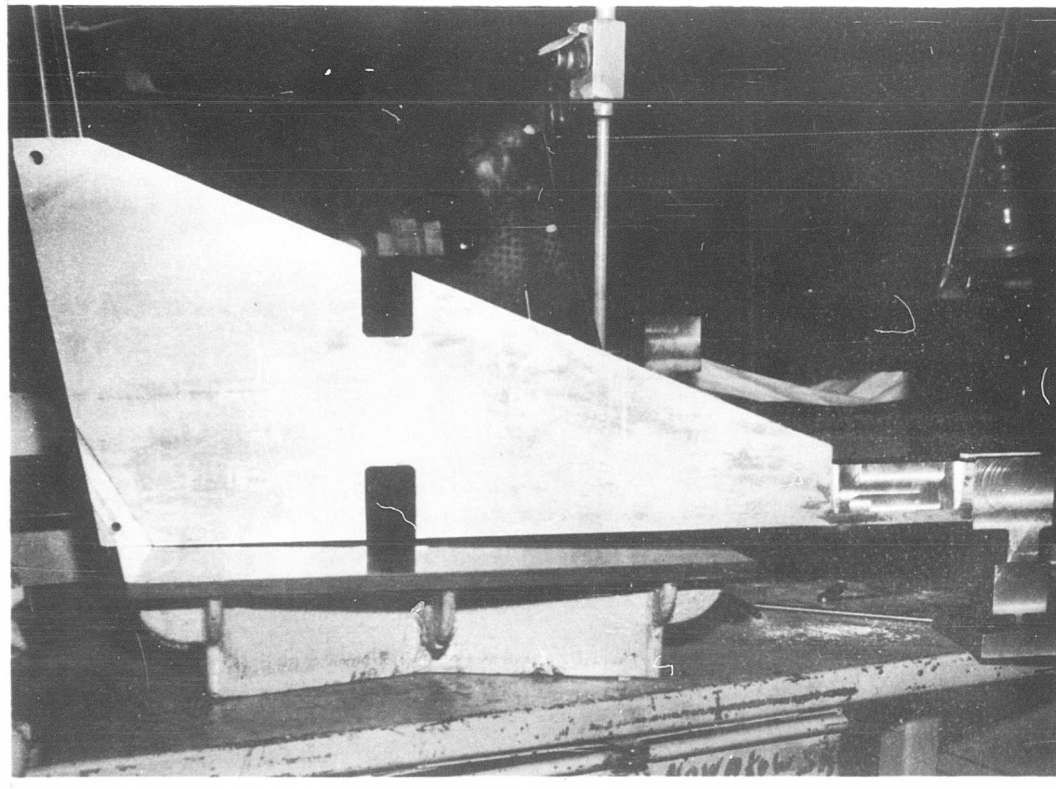

Figure 8. Full Scale Ducted Propeller Model - Vertical Strut Strain Gage Beam

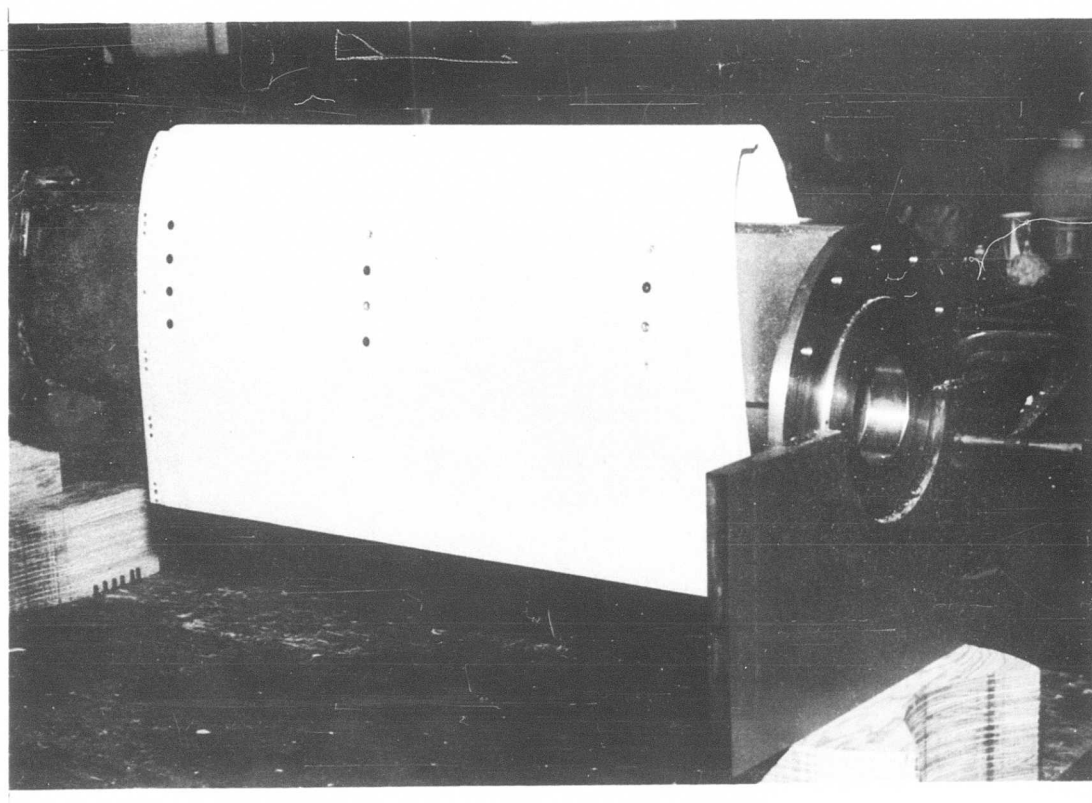

Figure 9. Full Scale Ducted Propeller Model - Power Strut and Fairing

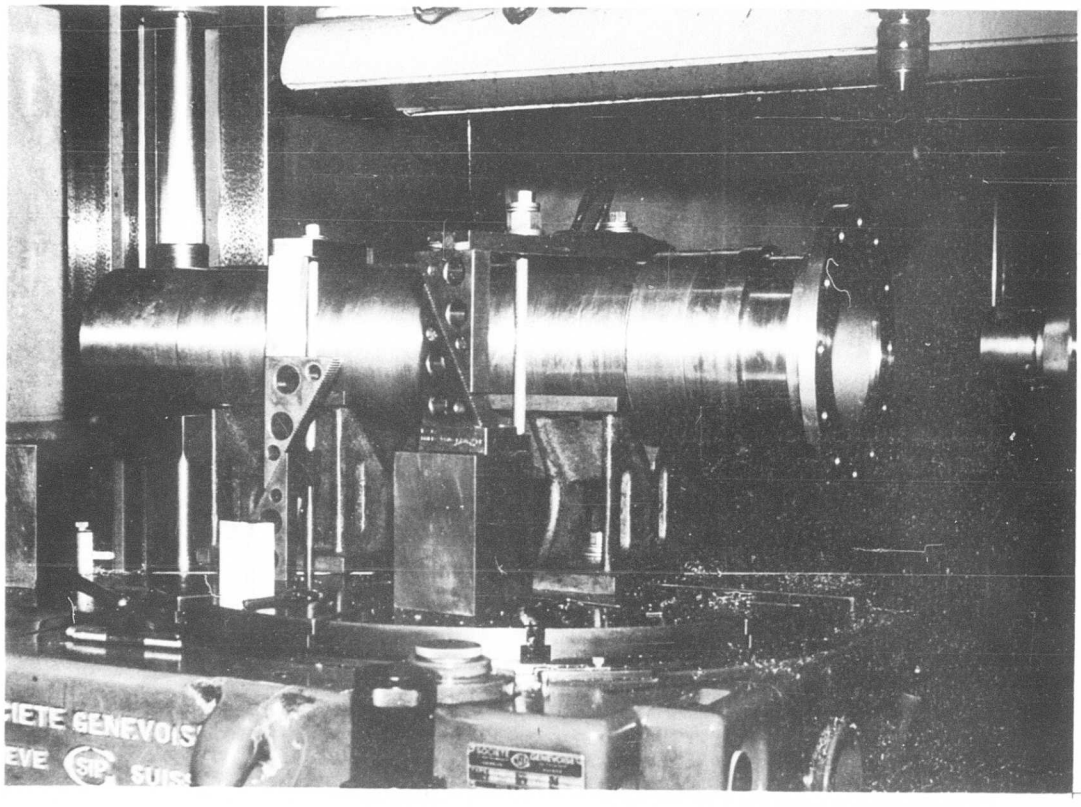

Figure 10. Full Scale Ducted Propeller Model - Trunnion

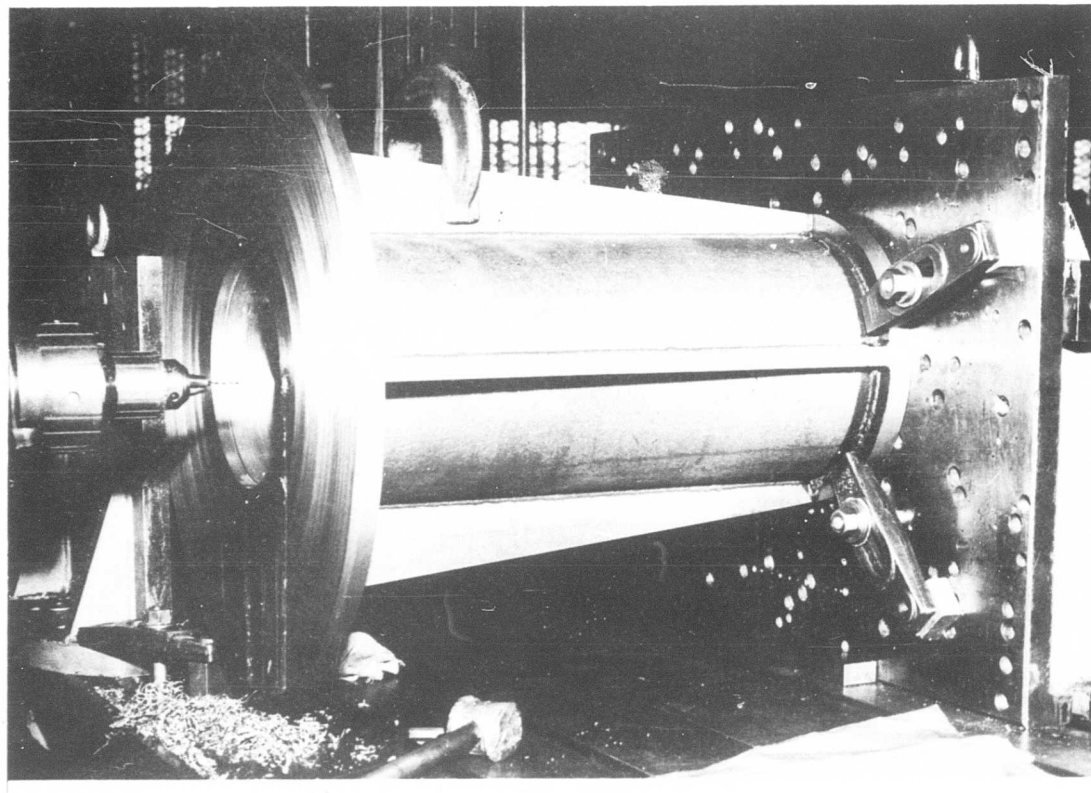

Figure 11. Full Scale Ducted Propeller Model - Trunnion Base Mount

6. Free-Flight Model

NASA has indicated this model will be completed for test in November 1963.

7. 1/20 Scale Spin Models

The spin models and current weight and inertia data have been delivered to the Spin Tunnel at Langley Field. Following examination of the models, NASA will advise Bell Aerosystems of the test schedule.

8. Ground Effect Model

The data report for this model was completed and submitted to BuWeps.

9. 1/7 Scale Complete Airframe Flutter Model

This model is presently scheduled for testing in the DTMB 8 x 10 foot subsonic wind tunnel during a 2 week period starting about October 28, 1963. The model is being furnished with a vertical pad type mount with rod rollers for vertical translation and gimbals for angular degrees of freedom. The model also has a new vertical fin to reflect latest prototype design and a set of alternate elevons to check out this special prototype configuration. In addition to flutter checks, it is expected that this model will yield useful component loads data and stability derivatives for the fuselage rotational degrees of freedom.

10. 1/7 Scale Aft Wing-Duct Flutter Model

The final report on this model test program is near completion. Submittal is scheduled for October 15, 1963.

11. Wind Tunnel Facilities

This contractor is reviewing the test delays, slippage and rescheduling of the Wind Tunnel Model Test programs and will formally submit effects on program schedules and costs.

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VI. MOCKUP

A. COCKPIT MOCKUP (Figures 12-16)

This contractor was successful in advancing the inspection/acceptance of this contractual item to 17 and 18 September, over one month ahead of schedule. Over 30 interested Tri-Service personnel participated in the inspection. A Review Committee, headed by Cdr. F. Highsmith, processed and approved 36 change requests which have now been formally submitted to BuWeps.

In summary, seven of the 36 changes required contract change. We are now preparing proposals covering these changes for submittal. Action on all requests as recommended is being taken by this contractor as coordinated and concurred in by BuWeps.

The Mockup has been essentially accepted by BuWeps, paperwork confirming action is pending.

B. HUMAN FACTORS MOCKUP

This unit was completed in the instrument panel layout area to assist in the formal Mockup Review. In this category it was of great value to members in evaluation of display and grouping arrangements.

Following the Mockup Inspection, this 3-D layout was utilized to aid in the integration and location of variable stability and Electronic equipment. This work is proceeding now.

Figure 12. X-22A Cockpit Mockup - Side View - One Canopy Open

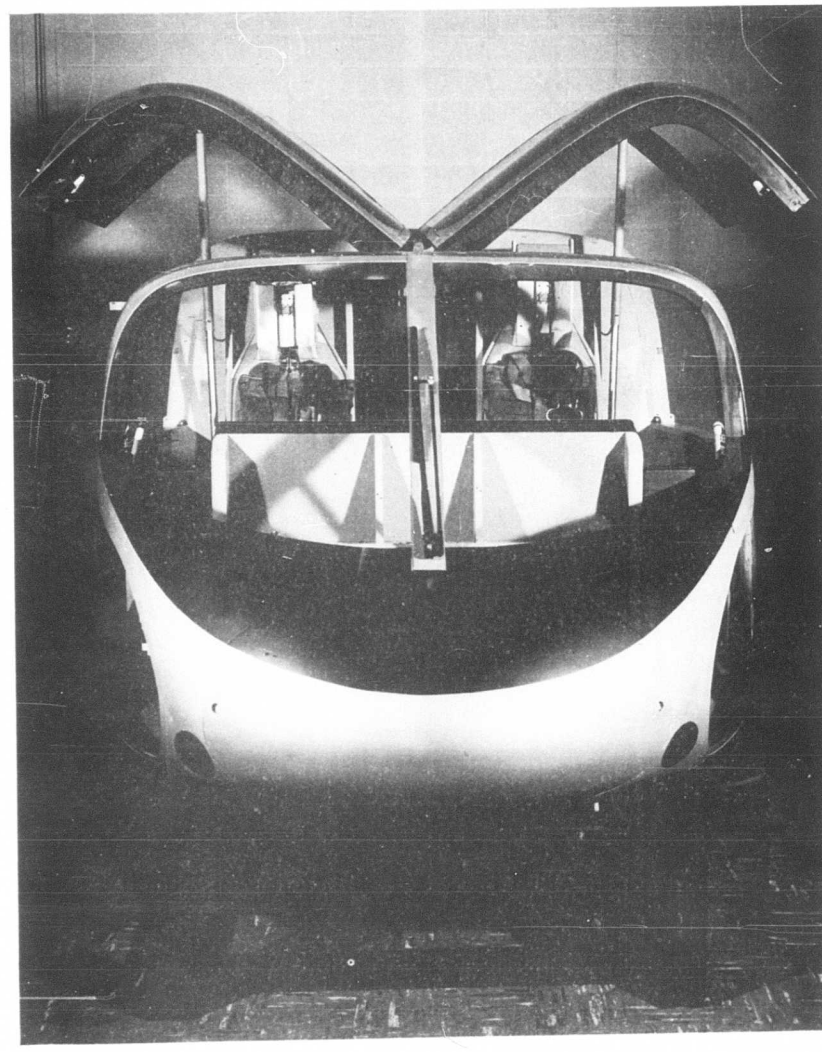

Figure 13. Front View - X-22A Cockpit Mockup - Canopies Open

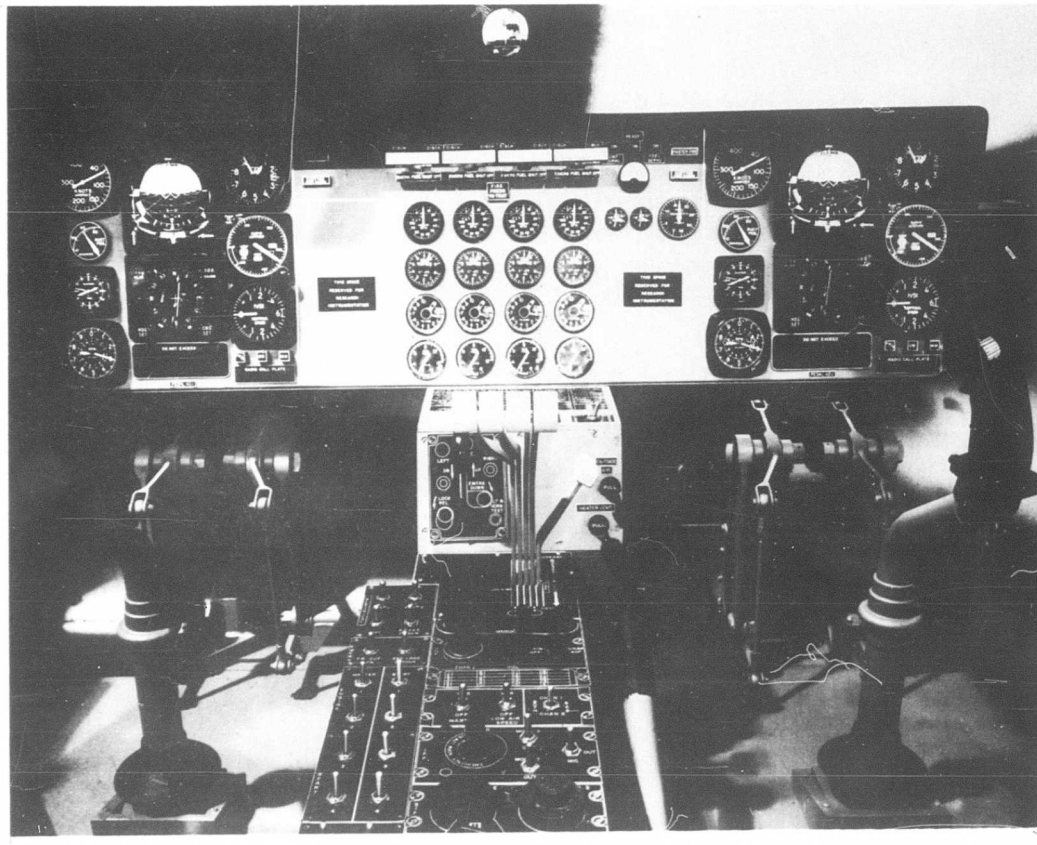

Figure 14. Instrument Panel - X-22A Cockpit Mockup

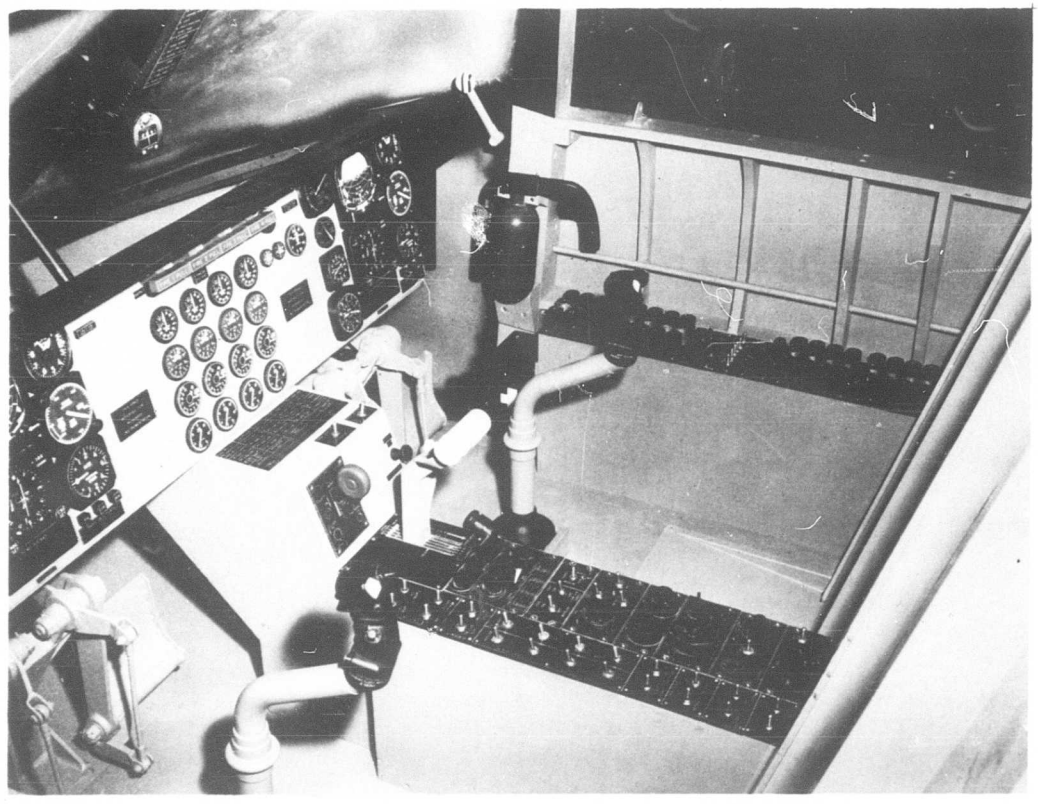

Figure 15. Cockpit Interior - X-22A Cockpit Mockup

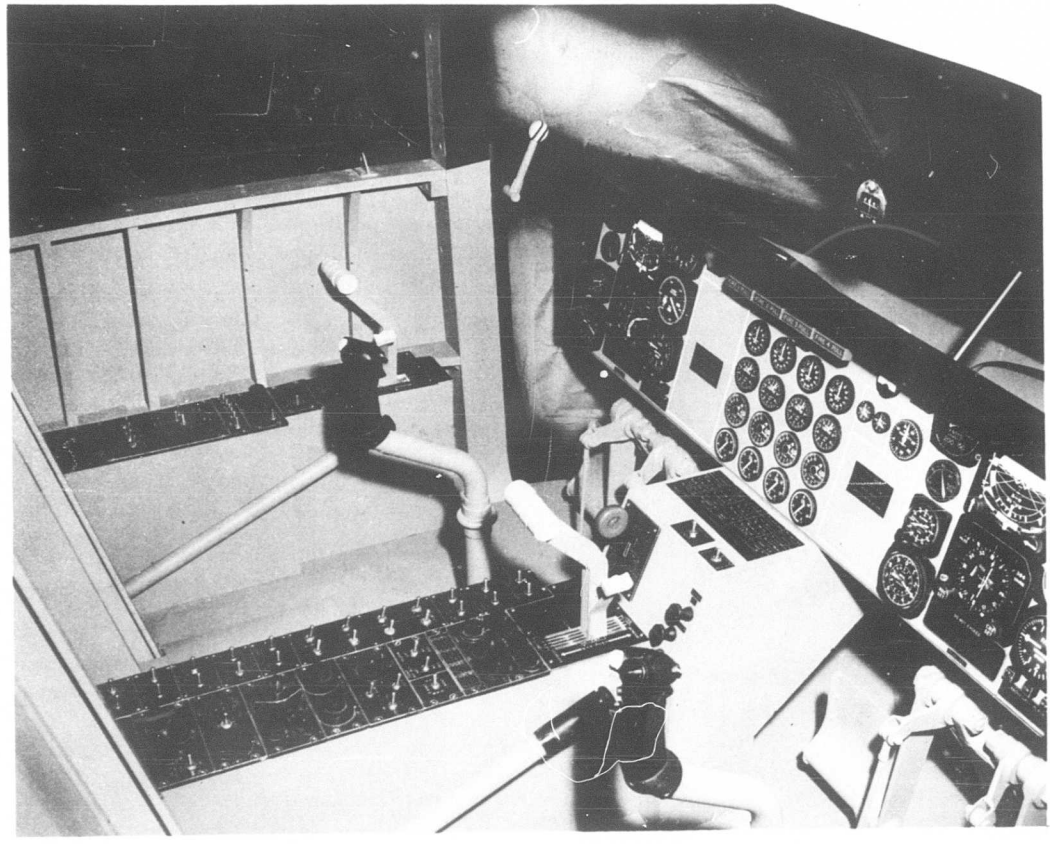

Figure 16. Cockpit Interior - X-22A Cockpit Mockup

VII. GENERAL

A. TRIPS AND VISITS

1. Trips

Date	Destination	Purpose
9/10-11	BuWeps	Ground Impingement Tests and Fuel and Oil Tanks.
9/19-20	H.W. Loud Machine Wks. Inc.	Facility Survey
9/25	DTMB	1/3 Scale Model Duct Tests
9/30-10/4	DTMB	1/3 Scale Model Duct Tests
9/26	BuWeps	X-22A Systems Design
9/30-10/1	Steel Products	Program Review

2. Visitors

Date	Company	Purpose
9/19	United Shoe Machinery	Harmonic Drive Stress Analysis
9/20	Cuno	Filters
9/20	Pacific Scientific	Power Controls
9/20	Sundstrand	Constant Speed Drive
9/24	Russell Assor Gamale Corp.	Fuel Line Couplings

Date	Company	Purpose
9/25	Bendix Corp.	Program on Landing Conditions
9/25	Hamilton-Standard	Program Review

B. CORRESPONDENCE AND REPORTS SUBMITTED DURING THE PERIOD OF SEPTEMBER 1 - SEPTEMBER 30, 1963

BAC Letter No.	Date Submitted	To	Subject	Reason
390	9-4-63	BuWeps - RA-443	Cockpit Mockup Inspection Brochure	Info
391	9-4-63	ASD - WPAFB, Ohio - ASZTV	Propeller Test Facility Requirements	Action
392	9-5-63	BuWeps-Cdr. Braun	Cockpit Mockup Inspection Brochure	Info
393	9-9-63	GE - Dean Teece	September T-58 Coordination Meeting	Info
394	9-9-63	BuWeps - RA-443	Propulsion System - Fire Extinguishing System Schematic	Release
395	9-11-63	BuWeps - NPAF-35	Revision to SD-550-1 (Areas and Dimensions)	Approval
396	9-11-63	BuWeps NPAF-35	Schedules for Deliverable Items	Info
397	9-12-63	BuWeps - RA-443	PERT Reports	Info
398	9-13-63	BuWeps - RA-443	Monthly Progress Report No. 9	Info

BAC Letter No.	Date Submitted	To	Subject	Reason
399	9-13-63	BuWeps - RA-443	Weight and Balance Status Report No. 4	Info
400	9-17-63	BuWeps Rep	Overtime and Second Shift Premiums	Info
401	9-17-63	BuWeps Rep	Request for Overtime Approval	Approval
402	9-17-63	BuWeps - RA-443	Weapon System Master Plan - Monthly Status	Info
403	9-18-63	BuWeps - RA-443	Propulsion System Drawing - Lubrication System Schematic	Release
404	9-18-63	David Taylor Model Basin	Contr. No. 63-0118- ci - 1/7 Scale Complete Airframe Model Test Planning Report	Approval
405	9-19-63	BuWeps - RA-443	Landing Gear Drawing	Info
406	9-19-63	BuWeps - RA-443	Ground Effect Model-Final Report	Info
407	9-23-63	BuWeps - RA-443	PERT Interim Report	Info
408	9-23-63	BuWeps - RA-443	Engine Exhaust Position	Info
409	9-24-63	BuWeps - RA-443	Contract Item Exhibit B	Action

BAC Letter No.	Date Submitted	To	Subject	Reason
410	9-27-63	BuWeps - RA-443	Revised Pages (SD-550-1)	Info
411	9-27-63	AF Quality Control BAC - E. Stocker	Specifications	Info
412	9-27-63	BuWeps - RA-443	Ejection Seat Proposal, Request for	Action
413	9-30-63	BuWeps - RA-443	Aircraft Mockup Summary Board Report	Info
414	9-30-63	BuWeps - RA-443	Performance Calibration Curves	Action

C. OPEN ITEMS (Submitted at least 30 days prior to September 30, 1963

1. BuWeps and BuWeps Rep

BAC Letter No.	Subject	Date Submitted	Required Approval Date
28	Basic Aerodynamic Data Report-Revision (2127-917002)	1-24-63	*
31	Human Factors Data Report (2127-919001)	1-29-63	*
75	Vibration Program Report (2127-932001)	2-27-63	*
122	Revised Pages - SD-550-1 (R-1)	3-29-63	*

*BAC has scheduled a 30 day interval for approval by BuWeps of each of these submittals after BuWeps Rep. endorsement.

BAC Letter No.	Subject	Date Submitted	Required Approval Date
174	Revision to Addendum No. 162 (Test Program)	5-1-63	*
178	Aerodynamic Stability and Control and Flying Qualities Report	5-2-63	*
179	Performance Data (revision)	5-3-63	*
181	Fatigue Criteria Report	5-6-63	*
215	Engine Delivery Requirements	5-23-63	*
216	Revision to SD-550-1 (Electrical Equipment)	5-23-63	*
257	Revision to SD-550-1 (Propeller Brake System)	5-31-63	*
299	Revision to SD-550-1 (Ground Clearances)	6-13-63	*
316	Revision to SD-550-1 (Elevon Balancing)	6-27-63	*
318	Weapon System Master Plan - Revision No. 1	6-28-63	*
326	Revision to SD-550-1 (Fuel Tank Capacity)	7-23-63	*
328	Engine Accessory Delivery Requirements	7-15-63	*
334	Revision to SD-550-1 (Longitudinal Stability and Control Requirements)	7-16-63	*
340	Propeller Group Drawing	7-18-63	*

*BAC has scheduled a 30 day interval for approval by BuWeps of each of these submittals after BuWeps Rep. endorsement.

BAC Letter No.	Subject	Date Submitted	Required Approval Date
344	Revision to SD-550-1 (Fuel System Description)	7-23-63	*
351	Revision to Addendum No. 162 (Static Test Requirements)	7-29-63	*
356	Human Factors Data - Interim Report	7-31-63	*
359	Flight Control System Drawings	7-31-63	*
371	Fuel and Oil Lines MIL-1-18802 (Aer)	8-20-63	*
373	Transmission System Test Plan	8-22-63	*
375	Revision to Addendum No. 162 (Rev. to Engineering Data)	8-23-63	*
379	Summary of Engineering Data	8-27-63	*
381	Aerodynamic Stability and Control and Flying Qualities Report	8-28-63	*
382	Revision to Addendum No. 162 (Drawing Submittal)	8-28-63	*

BuWeps Project Officer verbally advised BAC on April 30, 1963 that a letter is forthcoming which will describe method of requesting changes.

*BAC has scheduled a 30 day interval for approval by BuWeps of each of these submittals after BuWeps Rep. endorsement.

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