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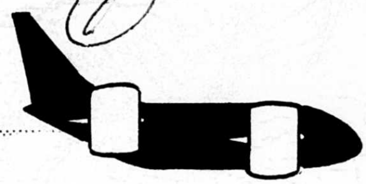
X-22A PROGRESS REPORT NO. 11

OCTOBER 1963



TRI-SERVICE

V/STOL

RESEARCH AIRCRAFT

REPORT NO. 2127-933011

15 NOVEMBER 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.

(6) X-22A TRI-SERVICE V/STOL AIRCRAFT

~~MONTHLY PROGRESS REPORT~~

(14) Report No. 2127-933011

(11) October 1963,

(9) Monthly progress rept. no. 11, 1-31 Oct 63,

This is the eleventh Monthly Progress Report as required in Section F (5) of the contract, and outlines progress for the period 1 October 1963 through 31 October 1963.

(10) by A. J. Marchese,
Project Director
X-22A PROGRAM

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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 out. 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.

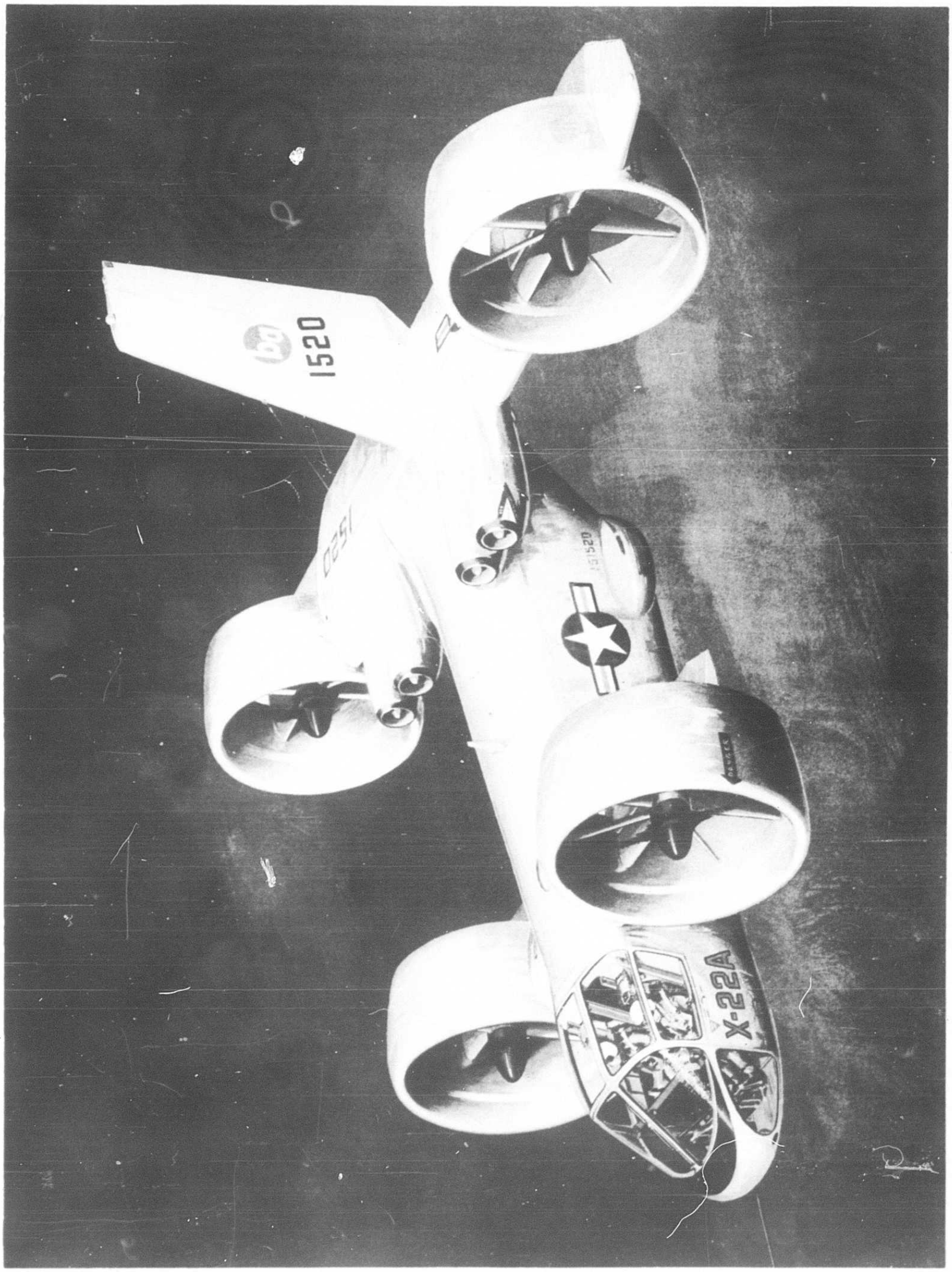

Figure 1. X-22A Tri-Service Research V/STOL Aircraft

II. SUMMARY

Designs and release of drawings to manufacturing for fabrication of parts is ~~gaining momentum~~ progressing. Engineering has released drawings on approximately 39 percent of the Bell controlled X-22A empty weight through the close of this period. The overtime effort in Engineering design is being continued until the effort recovers the period lost through schedule shippage in the initial design phase.

Weight Control effort has been maintained, and changes in the target weight are fluctuating with the release of detail design and due to many adjustments resulting from subcontracted systems and changes authorized by Cockpit Mockup Inspection.

All changes resulting from Cockpit Mockup Inspection are presently being packaged for formal submittal to BuWeps.

Reduction of wind tunnel data from the 1/5 scale, 1/7 scale, and ground effects models progressed. Test preparations for continued wind tunnel model tests were made.

The Acoustic Noise Test of the fuselage test specimen as well as the Salt Spray tests and Low cycle-high stress fatigue tests of maraging steel specimens were all completed.

The first material review meeting with BuWeps was held with satisfactory conclusions.

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

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

Management controls of PERT scheduling and costing continued. The eighth PERT Cost Report, PERT Milestone Computer report and PERT Interim report for the month of September were all submitted to BuWeps as scheduled.

The projected variance against target last reported in the August reports is being analyzed. All PERT program nets (plans) are again being reviewed in detail and all areas of possible reduction in effort are being identified. Bell is planning to meet with BuWeps as soon as the reduction areas and costs estimates are available. All networks are being updated as of 25 October.

The use of PERT and improving familiarization with PERT data by all affected personnel, and the analysis and review of PERT plans is a continuing asset and is improving overall support and control of the program.

Budgets in line with negotiated costs through October 1963 were issued and used by each operational department. Daily reviews of these budgets continued and expenditures through 31 October 1963 remained within the authorized funds for this period.

With concurrence of BuWeps the 30 September quarterly revision submittal of the Weapons System Master Plan was withheld to incorporate the program, as outlined in the 27 September PERT schedule updated data. This therefore negated the NAVEXOS planned for 10 October as the quarterly revision covered the same status period.

Figure 2, the X-22A Milestone Data Requirements Chart for the 4th Quarter of 1963 and Figure 3, Program Schedule, reflect the program and status as of 31 October 1963.

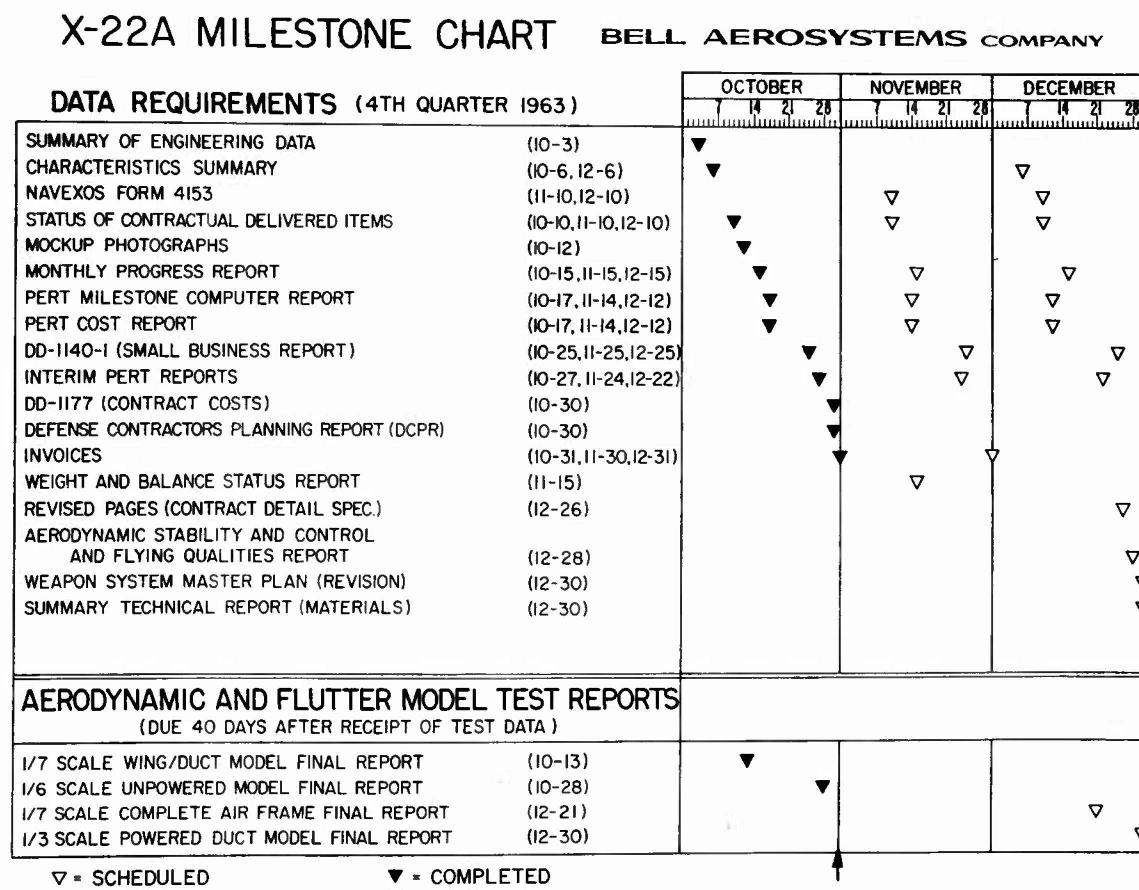

Figure 2. X-22A Milestone Chart - Data Requirements (Fourth Quarter)

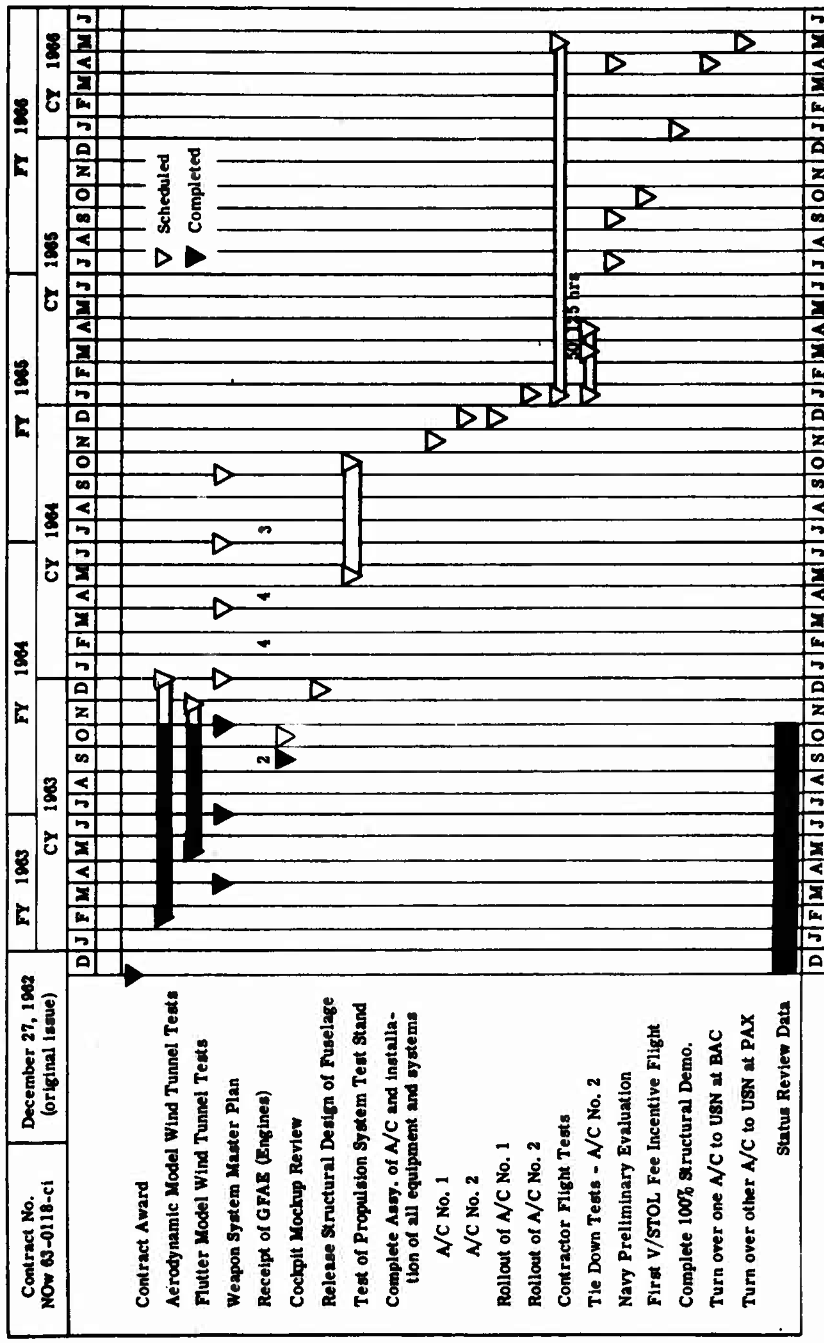

Figure 3. Program Schedule

All operating departments are continuing with necessary planning and interdepartmental coordination as required, spearheaded by a daily 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.

III. DESIGN

A. FLIGHT TECHNOLOGY

1. Performance

The IBM program used to determine most of the X-22A performance is being revised to more easily accommodate changes in propulsion and aerodynamic data.

Several performance characteristics were calculated for use in structural criteria and loads such as best climb speeds at high duct angles and maximum gross weight short takeoff speeds at high duct angles. Following discussions with BuWeps performance personnel, consideration will be given to obtaining further substantiation of the airplane induced drag from the NASA Langley free flight model.

2. Propulsion Analysis

The following topics of technical data were coordinated with HSD:

(a) Propeller thrust at low power for collective pitch authority.

(b) Blade pitch actuation with single hydraulic system at V_L to determine safe operating area.

(c) No propeller flutter or gear box damage is foreseen in normal short duration static operation with military power and maximum control input.

(d) Propeller pitch change rate is the stipulated value only when 7 degree error signal exists; below this error signal, the rate, while not determined, is known to be less due to valve pressure drop.

A summary of propeller blade angle and power absorption as a function of velocity was completed. The collective control at range of 0 to 30 degrees to limit V_{max}, and static low power thrust is recommended.

Informal approval was given to increase the propeller blade angle to 50 degrees maximum for use in high speed control. Blade pitch actuation characteristics and required control level remain to be determined.

Propulsion design support continued in the areas of aft fuselage compartment cooling, nacelle cooling, and engine inlet design.

Available 1/3 scale ducted propeller data was analyzed to determine control parameters for flight control analysis. Previously estimated values are reasonable, but sensitivity to power level is evident. This was not taken into consideration in previous estimates.

3. Stability and Control

Revised component longitudinal and lateral-directional breakdown data for level flight conditions were completed, based upon 1/5 scale powered model data from Langley Research Center and 1/6 scale unpowered model data from David Taylor Model Basin. Sufficient information was available so that loads data for any duct incidence combination within the level flight incidence envelope may be determined.

Isolated duct tests on one of the ducts from the 1/5 scale powered model were completed at Langley Research Center on October 25. The major purposes of these tests were to obtain data useful in the interpretation of the complete model tests, supplementary controls data, and complete model thrust coefficient data. (The thrust coefficients for the complete model tests were estimated using measured propeller thrust.) Analysis of the duct alone tests indicate that the transition thrust coefficients determined from the isolated duct data are sufficiently different from those previously estimated for the complete model, necessitating reevaluation of the transition stability data obtained from the 1/5 scale tests.

Calculations of dimensional lateral-directional static derivatives in equilibrium level flight transition have been completed. The calculations were based on 1/5 scale powered model test data from NASA Langley. Estimated corrections were incorporated to account for the difference in the model vertical tail which differed from that on the present configuration. Estimates were also made of the power effects on these derivatives, i.e., how they vary with changes in thrust. Angle of attack variations are also included.

These derivatives will be used in subsequent analyses at Bell Aerosystems Company and will also be transmitted to Cornell Aeronautical Laboratory for updating their Variable Stability System analyses.

A complete component breakdown of the standard elevon loads due to elevon deflection has been completed for the conventional flight configuration based on the control characteristics of the complete airplane. The proportionate loads and centers of pressure acting on the fixed strut, and the inboard and outborad panels of the movable elevons were determined including the effects of thrust coefficient. The load on the wing due to wash from the forward elevons was also obtained.

The elevon effectiveness test program, which was performed to determine the proper amount of aerodynamic balance for the standard elevons, and to determine the aerodynamic parameters of the tri-plane alternate elevon configuration has been completed. As a result of the investigation, the aft elevon overhang balance was reduced to approximately 65 percent of its original area. The reduction in area did not noticeably change the overall effectiveness of the control surface. The effectiveness of the present tri-plane elevon configuration was found to be about twice that of the plain elevon for values of deflection up to 15 degrees. For values of deflection between 15 and 30 degrees, the ratio of effectiveness was found to increase to about three.

Lateral-directional oscillatory stability was reevaluated in conventional flight using latest aerodynamic derivatives for duct incidence settings (+2, -3) and increased moments of inertia. The results showed that for all configurations in conventional flight, the requirements of SD-550-1 were satisfied without damping augmentation.

Rolling pullout maneuvers covering the conventional flight speed range (130K, 280K, 300K, 365K), were investigated using an analog computer, to determine the effects of coupling the differential propeller yaw control to the roll control to give favorable yaw in a rudder pedal fixed rolling maneuver. A value of $\Delta \beta / \delta_r$ of 0.085 was selected to reduce the adverse yaw at low speeds to an acceptable value without excessive favorable yaw at high speeds.

B. VEHICLE STRUCTURES

1. Criteria and Loads

Nacelle loads have been determined for a number of flight loading conditions. Air loads, inertia loads, gyroscopic moments, and engine torques have been combined to establish engine mount shear, bending moment, and torque diagrams. Component loads have been determined for nine duct incidence settings for both V_H and V_L (sea level). This data is being used to establish restrictions of duct incidence at high speed. V-n diagrams have been prepared using available lift curve data for $C_T = 0$. The $C_{N_{max.}}$ and $C_{N_{min}}$ boundaries have been constructed assuming that $\alpha_{max.} = +25$ degree and $\alpha_{min} = 15$ degrees. This has been done since $C_{N_{max.}}$ and $C_{N_{min}}$ data were not determined within the wind tunnel test angle of attack range. These angles of attack are not less than 5 degrees more than the values employed in constructing Operational Flight Envelopes, as previously agreed upon with BuWeps personnel.

2. Structural Analysis

a. Wing and Duct Support Structure

The stress analysis of all elements of the primary wing and engine nacelle structure proceeded along a parallel path with the final drawing design efforts. The fuselage longeron splice to the root rib capstrip was checked and fuselage-wing shear flows between stations 433 and 463 were calculated. Wing shear and bending load summaries were partially completed, together with allowables for each element.

The nacelle structure was revised to the two-door configuration. Determination of stiffening frame sizes and spacing for support of the local air and external pressure loads was completed. Work on the longitudinal firewalls, nose section, aft firewall, and engine support beam continues.

b. Wing

Stress analysis of details and main box bending and shear analyses are continuing. Root section shears have been determined for all conditions except for Rolling Pullout. Beam capstrip loads have been plotted, together with the allowables.

Analysis was continued for the determination of shear and bending loads and the redistribution shear flows around the ejector cutout. Analysis of the engine support beam and aft engine mount support fitting was started.

c. Fin

A detailed digital computer analysis of the root area was completed. Structural analyses and sizing of the front beam and stringers forward of the front beam and stringers forward of the front beam were also completed. An extensive analysis of the aft fuselage-fin root area was prepared for digital computation.

d. Elevons

Final detailing has started on the main elevon. The chordwise and spanwise airload distributions are being revised to account for the new planform and also to account for the swirl of the airflow in the duct.

e. Fuselage

Vertical portion of the main landing gear frames was changed from sheet metal construction to integral machined 7079-T651 fittings. Redesign of canopy structure to provide requirements suggested by mockup review committee has been approved structurally. Seventy-five percent of the fuselage frame drawings have been released to Manufacturing.

f. Flight Control Systems

The study of loads throughout the duct rotation system during all critical operating and holding conditions was completed. Minor changes in system loads from those used in the layout stage necessitated some changes to the parts as they were detailed. An increase to the stop loads during impact required some increase in stop size on the forward and aft duct rotation tube supports. The locking brake assembly and the drive motor gearbox drawings have been completed and released.

Layout work is fairly complete on most of the system in the cockpit area including attitude stick and mount, brake and rudder pedal and mount, and bellcranks and brackets under the floor. The Collective Pitch Stick and mounting arrangement layout is completed.

Studies presently underway are: (a) mixing levers, (b) variable ratio bellcranks, and (c) revised propeller pitch control system.

Bell Helicopter Company furnished test data on both swaged and straight rolled threads in aluminum tubes. Since this data only covered axial load fatigue, other testing may be done to fill in the gaps of information.

g. Centerbody Housing

Design of this centerbody assembly has been completed and the drawings released. The attachment of the horizontal strut to the side of the housing was revised to shorten the length of the lugs on the magnesium casting.

h. Transmission System

Individual fatigue test data points for magnesium casting alloys were received and have been plotted in preparation for statistical analysis. Fatigue allowables for steel shafting were finalized. Vendor analyses were reviewed in efforts to reduce weight. Fuselage bearing hanger loads and structural details were defined. Shafting misalignments were investigated for fuselage and wing deflections due to critical external loading conditions.

i. Landing Gear

The sloped terrain landing conditions and the associated equations of motion were extended to include pitch attitudes: (a) landings with initial impact of main gear on slope and (b) landings with initial impact of nose gear on slope. The pace analog computer was again utilized to provide the solutions for these pitch conditions.

The tail down landing attitude for this secondary horizontal landing has been established as 19 degrees. Verbal approval has been received from BuWeps. A formal request for specification revision is in preparation. The landing loads criteria report is being prepared for submittal to BuWeps and is approximately 90 percent complete.

3. Structural Tests

Modifications intended to increase the fatigue life are being incorporated in the acoustic test specimens. Tests have been started to evaluate the effectiveness of damping material in reducing stress levels and increasing fatigue life of the duct design under acoustic environment. Tests have been started to investigate the torsional fatigue life of welds used in the propulsion system shafting.

4. Aeroelasticity

Effort was concentrated on the rework of the complete airplane flutter model, the installation in the tunnel and with test support.

5. Weights

Significant weight reductions totaling 75 pounds have been achieved this past month so that the current weight empty is now 10,831 pounds. This is 196 pounds over the guaranteed target weight of 10,635 pounds. The major reductions occurred: (1) in the fuselage where drawing releases indicate a weight for cabin floor, cockpit structure and most fuselage frames are about 40 pounds under the estimated weights (to date, 59 percent of the fuselage weight has been released); (2) the incorporation of the guaranteed landing gear weight from the selected subcontractor for the gear; (3) the vertical fin weight has been substantiated by layout analysis; and (4) allowances for hoist fittings and jack pads have been reduced 7 pounds since these requirements are integrated with existing structure. Increases of 7 pounds are scattered throughout the remainder of the weight empty, primarily in the equipment groups. Twenty-two percent of the weight empty has been calculated, to date.

Weight and Balance Status Report No. 5, 2127-942006, now being prepared will present this weight. The center of gravity remains satisfactorily between current aerodynamic design limits.

Summarizing weight data is being prepared for changes recommended by BuWeps through the cockpit mockup inspection. These changes are not included in the current weight data discussed above.

C. DESIGN

1. General

During this reporting period, work has been started on most of the major layouts for Airframe, Propulsion, Landing Gear, Hydraulics, Electrical, and Flight Controls. A considerable portion of the airframe has been released for manufacture, and actual manufacture of hardware has been started.

2. Airframe

a. Wing

Final drawings have been prepared on trailing edge, main spar and capstrips, engine support beam, and engine support fittings. The major rib installation drawings have been completed and are in checking. The final installation drawings of the duct side load gussets are in work. The aft inner and outer duct support fittings drawings have been released for manufacture.

b. Fuselage

(1) Cockpit

With the exception of minor details, the cockpit area is completely released for manufacture. The layout of the new canopy latch and emergency release mechanism has been completed and detail designs are now in work.

(2) Fuselage Center Section

The major bulkheads at STA 190, 210, 340, and 361 are well into the detail stage. The majority of frames in the center section of the fuselage are being detailed. Most of the basic frames are in for final check and many have already been released for manufacture. The fuel tank container installation is in the detail and layout stage. The floor installation is being detailed. The emergency and cargo door structure is in layout stage.

(3) Fuselage Aft Section

The majority of frames in the aft section of the fuselage are in the detailing stage. The upper access door and support structure has been started. The area of the oil cooler outlet and the fin and supporting structure are in the layout stage.

c. Duct

All of the basic duct structure has been released for manufacture. The design of the shroud assembly for the forward duct is approximately 75 percent complete. All supporting struts (vertical, horizontal, and 45 degrees) are in the layout or detail stage. The basic elevon is in various stages of layout and detailing, and the alternate elevon is in the final layout stage. The layout of the stabilizer has been completed and detail drawings have been started.

3. Flight Controls and Equipment

a. Flight Controls

The harmonic drive system, elevon linkage system, variable ratio bellcranks, and mixing lever layouts are in work.

The specification for the SAS system is being finalized, as well as the requirements for the artificial feel system.

Layouts of the component packaging and arrangements aft of the canted bulkhead are progressing.

The servo requirements for the VSS components have been completed.

A preliminary release of the control system test stand and several detail drawings have been made to Manufacturing.

An Advance Bill of Material, releasing materials for bellcranks and other control system components have been made.

b. Equipment

Installation and assembly drawings of the attitude stick have been started. The final drawings of the instrument panel and of the center console cover have been started. The detail of the forward glare shield has been completed. The specification control drawing for the heater has been completed and the layout of final installation has been started.

An inboard profile drawing for interference check and information has been started.

4. Propulsion

The propeller gearbox and associated supports and details are ready for release. The transmission and shafting drawing is in work and a study has been made on the upset shaft and concept.

The details and assembly of the gearbox oil tank and supports are 90 percent complete. The details and assembly of the engine oil tanks are 75 percent complete. The layouts of the transmission and engine oil system have been completed. Fuel system, fire detection system, and fire extinguisher system layouts are complete and detailing has started. Layouts and details of the power controls, jettison valve control, and fuel shutoff valve have been started.

The design of the propulsion system test stand structure, to be used for the 125 hour qualification test of the transmission system, has been completed and fabrication of the structure is in work. Installation of the test pad concrete work has been initiated. (Figures 4 and 5) The installation drawings of the systems to be used on the test stand are in work.

5. Electrical and Electronics

The Sundstrand constant speed drive has been selected and layouts, specification and specification control drawings are being processed for this unit. Final detail drawings of the DC power shield, schematics, electrical test plan, and the power distribution wiring diagram, have been started. The final drawing of the wire routing has been started.

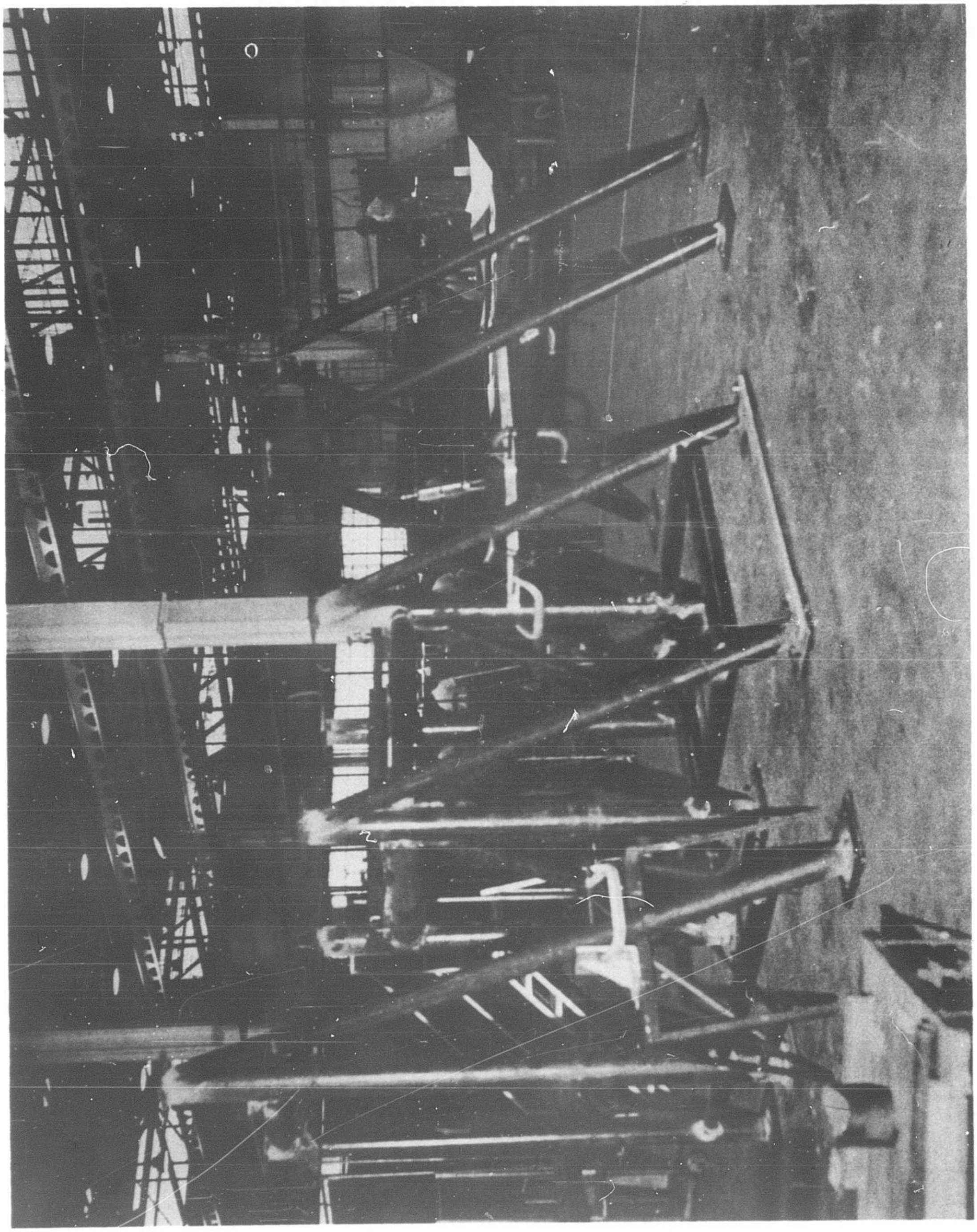

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Figure 4. Propeller System Test Stand Structure

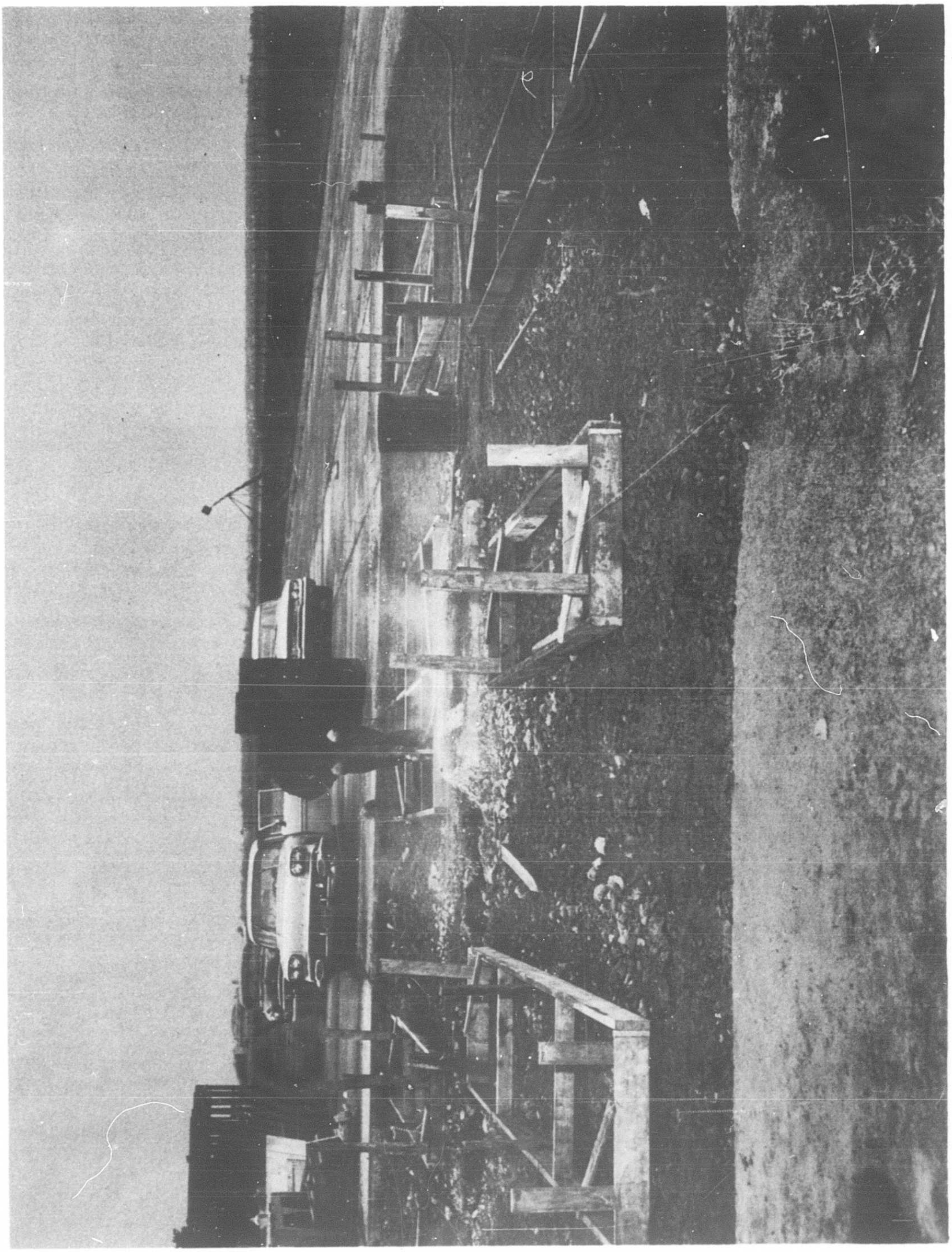

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Figure 5. Propeller System Test Stand - Test Pad (Looking West)

The layout for the radar altimeter has been completed. The layout of the supporting structure for the electronic compartment has been made and is being checked by Stress Group. The antenna installation layout is in work.

6. Landing Gear and Hydraulics

A new layout and mockup has been made of the aft duct center-body to check the installation and serviceing of equipment in this area.

The subcontract for the landing gear has been let and vendor coordination is underway. All main structural points are being coordinated and layouts of these areas are in work. Layouts and details of the landing gear (both main and nose gear) are in work. Layouts of retraction system for them has also been made.

Layouts of major areas of the hydraulic system have been started. Specification Control Drawings for the elevon actuator have been made and issued for quotes. Quotes on the proposed SAS actuator have been received and are being reviewed. The duct rotation cam mechanism layout has been completed and details have been started.

D. SYSTEMS SUPPORT

1. Human Factors

Frequent coordination reviews have been made to insure satisfactory progress on the building of the cockpit simulator.

Analyses have been completed and recommendations to design have been made in the areas of: (1) control feel and trim system, (2) cockpit lighting and markings, (3) annunciator panel arrangement and nomenclature, and (4) hover control tasks using height control.

Additional studies covering height control tasks are planned using the cockpit simulator.

2. Maintainability and AGE

Work is continuing on inspection requirements as equipment becomes firm and location is established. An analysis and decision rendered on the type of fasteners for the engine cowls was made. Access areas on the T58 engine installation are under study.

The relocation of the canopy latch handles and the addition of an emergency canopy release handle are being coordinated with Human Factors.

3. Environmental Factors

Work concentrated on a revision of the analytical method used to calculate the sound pressure distribution along the duct wall. Inclusion of the higher harmonics resulted in an increase of the overall value to 159 db near the propeller plane. A comparison between calculated and measured values of the Hydroskimmer duct showed an appreciable difference. The measurements indicated much higher values aft of the propeller plane. For validation, the sound pressure distribution along the 1/3 scale powered duct of the X-22A shall be recorded at DTMB.

A test procedure for the testing of the effectiveness of vibration damping materials (to be bonded to the duct structure) was proposed and tests of treated skin panels are being conducted.

A fuselage panel was subjected to a simulated X-22A noise environment and the panel vibration was recorded at three different points. Photographs of the test installation are shown in Figures 6 and 7.

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Figure 6. Arrangement for the Measurement of Sound Induced Vibrations - Fuselage Specimen on Left

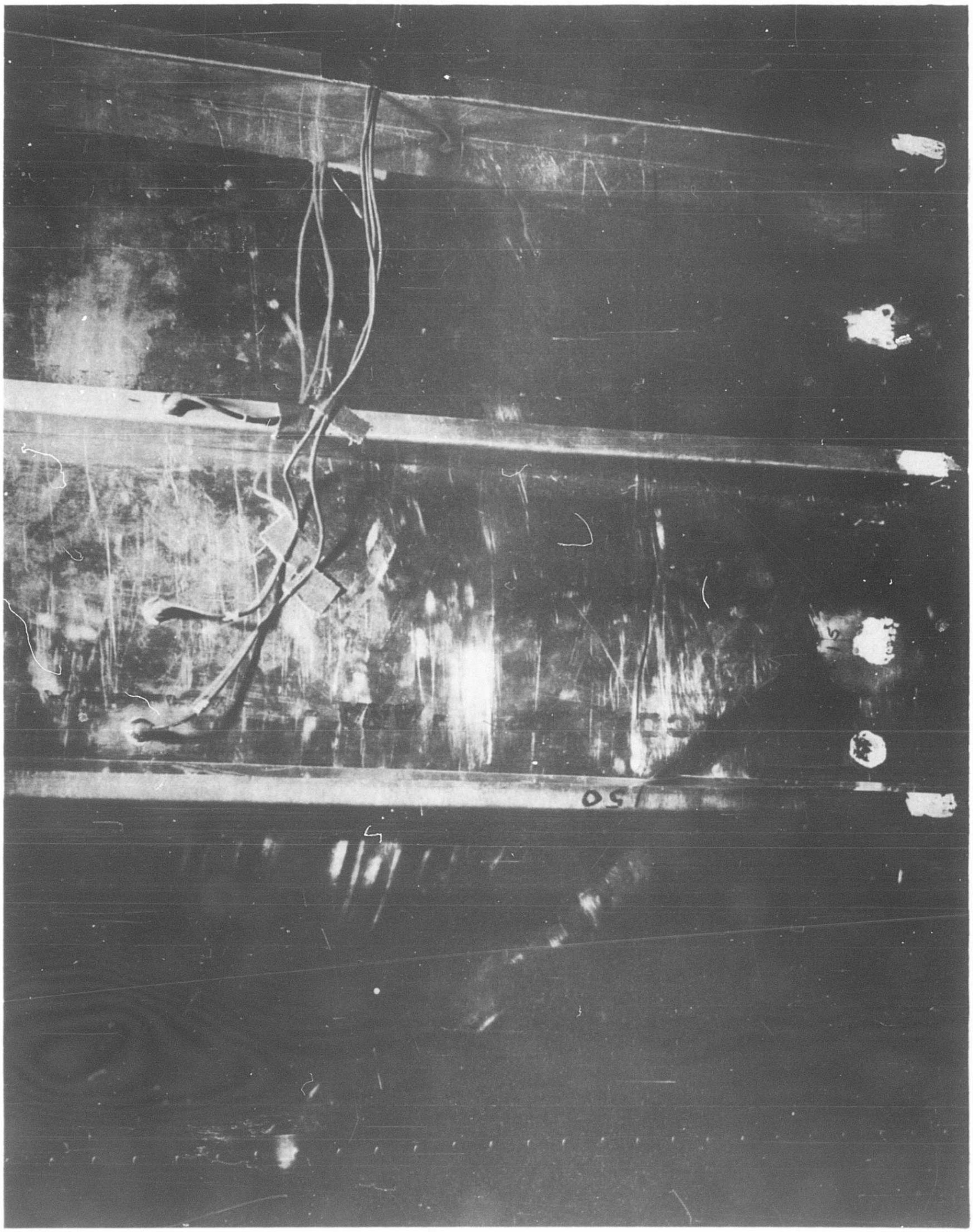

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Figure 7. Arrangement for the Measurement of Sound Induced Vibrations - Accelerometer Mounting

The measured overall vibration levels confirmed the values predicted in the analysis. At a sound pressure level of 130 db, the overall acceleration was approximately 10 g for the skin and 5 g for the frames. The same fuselage panel was also subjected to sinusoidal sound excitation for the determination of the number and the location of vibration modes. The data will be utilized in the prediction of the expected vibration environment for components, and the crews.

E. SYSTEMS ANALYSIS AND INTEGRATION

A preliminary dynamic analysis of the elevon servo actuator was completed and documented. Preliminary test plans for the stability augmentation system test on the control system test stand were issued. The electronic design of several variable stability system modules has been completed by the VSS subcontractor. Temperature test procedures are now being reviewed.

IV. SUBCONTRACTS

1. Propellers - Hamilton Standard Division of United Aircraft Corporation

   There was considerable exchange of technical information during this month, plus two visits by Hamilton Standard personnel for the purpose of discussing cost and schedules.

   The monthly Program Review Meeting was held at Hamilton Standard.

2. Variable Stability System - Cornell Aeronautical Laboratories

   The program is on schedule. Review Meeting held during the month, and discussions were held on the Trim Feel System. Interface checking of Cornell and Bell PERT networks is continuing.

3. Transmission and Gearbox System - Steel Products Engineering Company

   Program Review Meeting scheduled for November 1st. SPECO are attempting to comply with the guaranteed weight. However, as the current design is over target, weight remains a major problem. The program is progressing on schedule.

4. Ames Test Gearbox - York Gears Ltd.

   Gearbox delivered 15 October as scheduled.

5. Cockpit Simulator - Trainer Corporation of America

   This program has been proceeding on schedule.

6. Landing Gear - H.W. Loud Machine Works, Inc.

   The program go-ahead was given on October 21st, and the design phase is underway. Bell Engineering visited H.W. Loud Machine Works to coordinate technical information.

7. Duct Support Tube

Material for the tubing has been ordered.

Negotiations with proposed vendors conducted. Survey of facilities has been made and we are currently in the final stages of negotiations.

8. Duct Support Plates

A survey of vendor facilities was conducted. Negotiations are continuing in cost areas.

9. Constant Speed Drive

Negotiations were conducted with two vendors. Procurement is pending release of final Engineering specifications.

10. Harmonic Drive

Formal proposals have been received from United Shoe Machinery Company, and a negotiating meeting was held on October 29th.

Efforts being made to reduce complexities and to reduce costs.

11. Cockpit Enclosure

Proposals are being solicited.

V. MODELS

A. WIND TUNNEL TEST PROGRAM

1. 1/6 Scale Unpowered Airplane Model

The data report for Phases I and II tests of this model was completed and submitted to BuWeps.

2. 1/5 Scale Powered Airplane Model

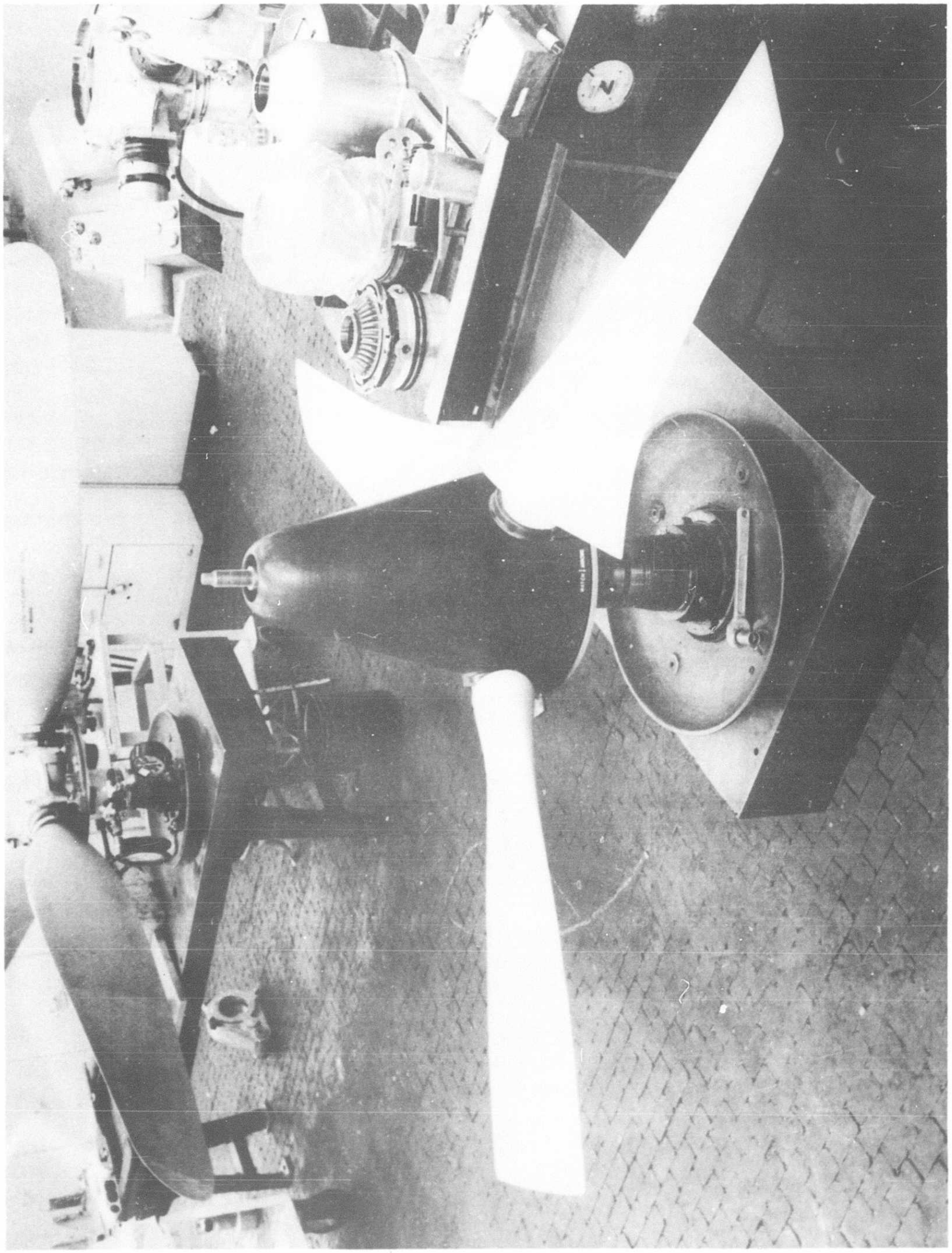
The duct-alone tests of this model were completed. The Phase II tests of the complete model are currently scheduled by NASA to start the week of November 18, 1963 and to run for six weeks.

3. 1/3 Scale Powered Duct Model

Tests with propeller removed and with instrumented blades for blade stress data were completed. Approximately 23 performance runs were completed in the high speed section of the tunnel. (While not during the period of this report it should be noted that on 1 November during tests, a propeller blade failed from fatigue and caused extensive damage to the model. The model which was built at DTMB is being disassembled and examined to determine the effect of the extent of damage and if it is feasible to make repairs and continue the test program.)

4. Full-Scale Powered Duct Model

The gearbox and propeller for this model have been received and final assembly is underway. (See Figures 8, 9, 10, and 11) NASA Ames has indicated the wind tunnel tests will not start until the latter part of January 1964.



G24508

Figure 8. Propeller Manufactured for Full-Scale Wind Tunnel Testing at NASA - Ames

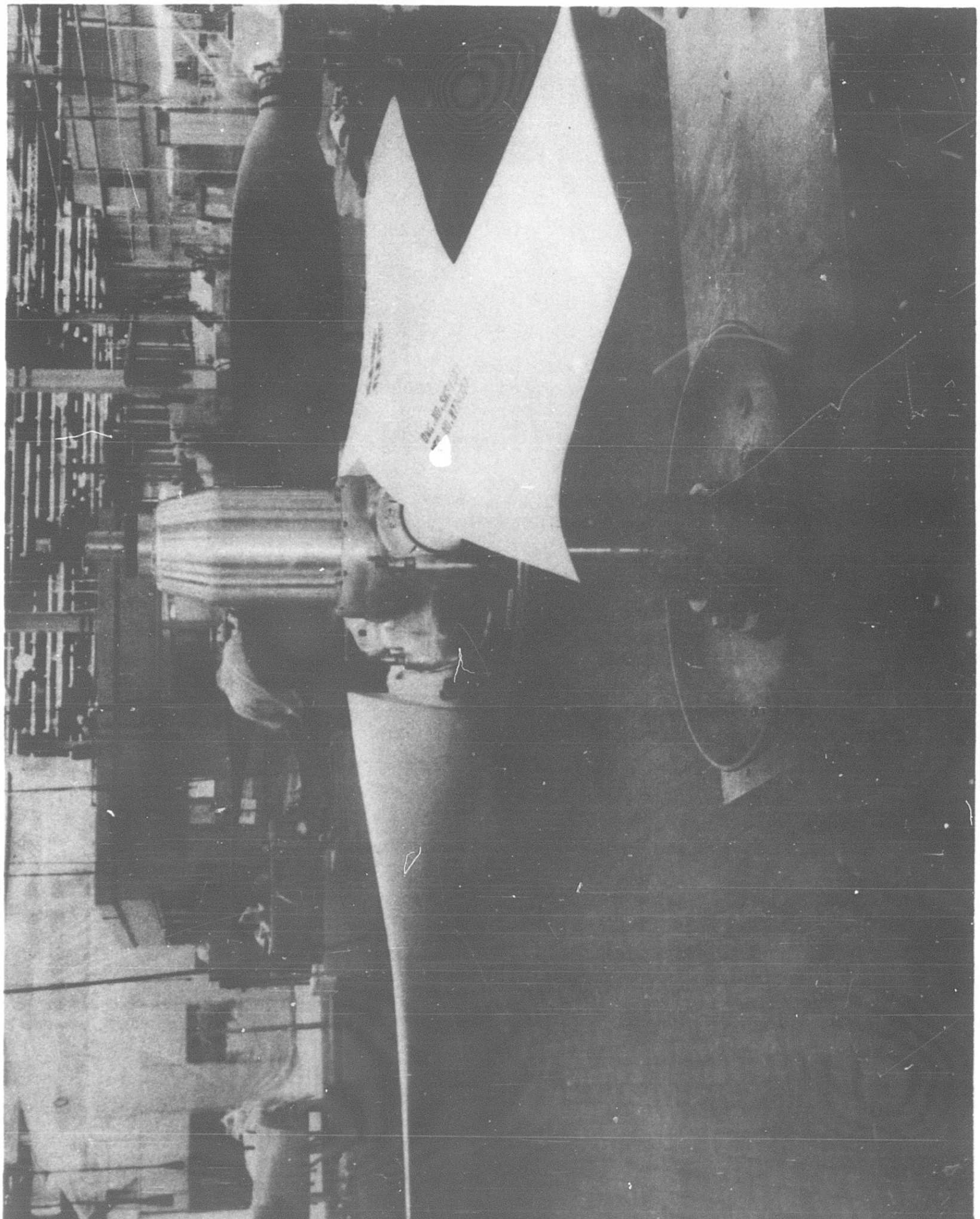


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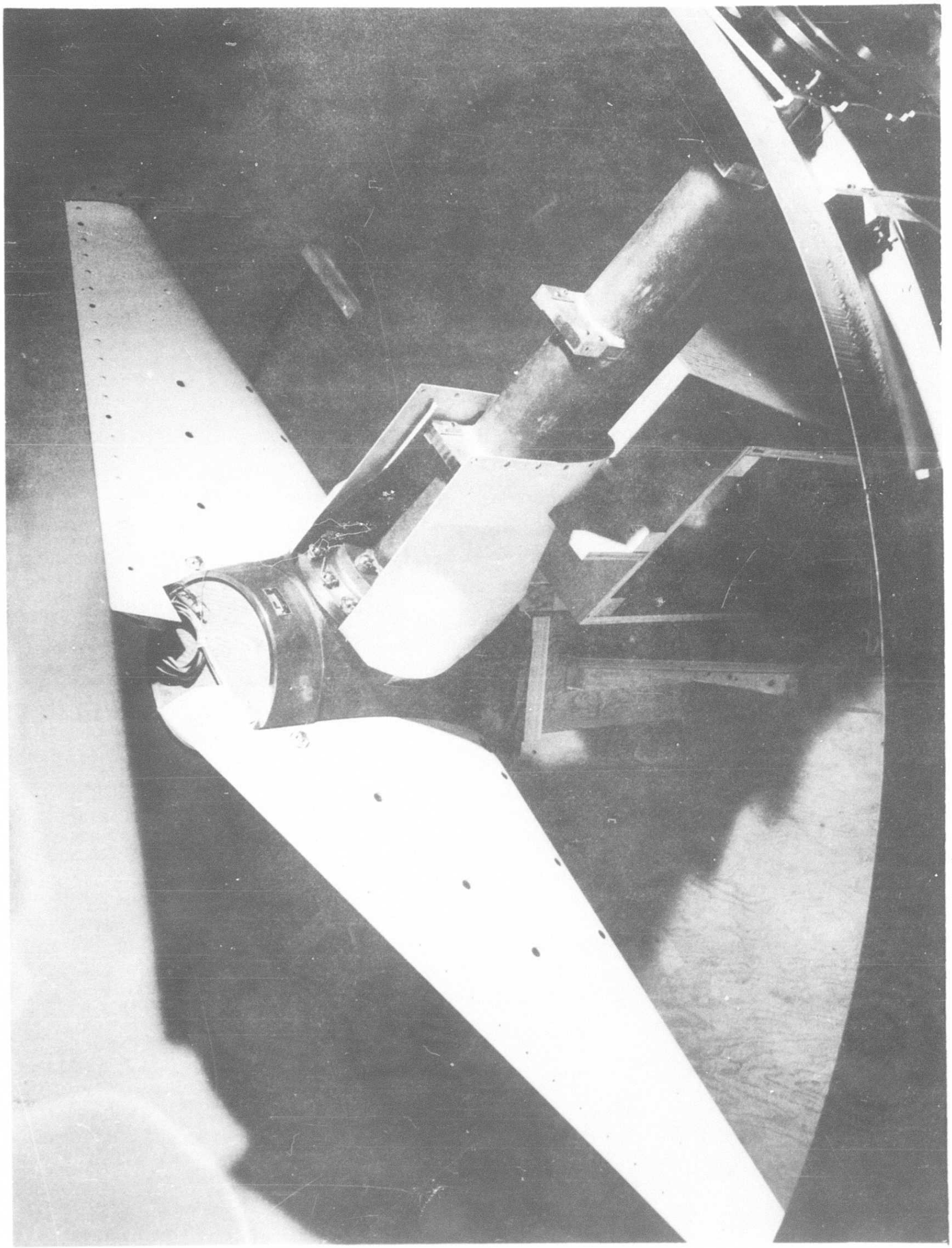
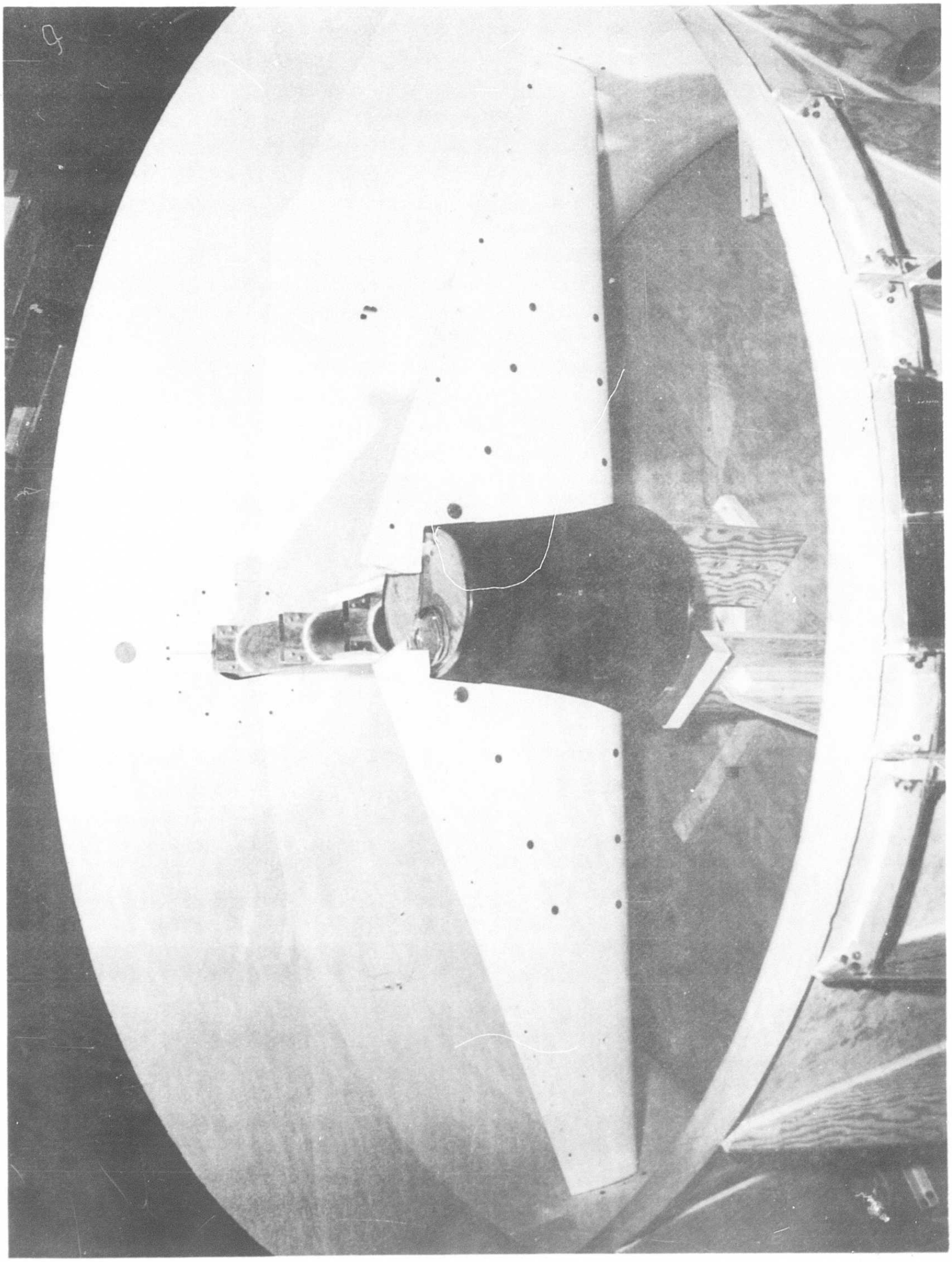
Figure 9. Propeller Manufactured for Full-Scale Wind Tunnel Testing at NASA - Ames



195021

Figure 10. Full Scale Duct for NASA Ames



195022

5. Elevon Effectiveness Model

While the tests of the alternate (tri-plane) elevon were being run, additional tests of the basic elevons were also conducted to establish the required amount of aerodynamic balance. These tests have been completed, an interim letter report submitted and a supplement to the data report is being prepared.

6. Free-Flight Model

The model, being built by NASA-Langley is being readied for assembly; instrumentation and ballasting will follow. Tunnel facility has scheduled tests in January 1964.

7. 1/20 Scale Spin Models

NASA Langley Spin Tunnel personnel have indicated that it will probably be early in Decembly 1963 before the spin models will be ready to test.

8. 1/7 Scale Complete Airframe Flutter Model

The complete airplane configuration was reworked and returned to DTMB for the second series of tests. The model has been installed in the tunnel and tests begun late in October.

9. Wind Tunnel Facilities

Schedule and cost effects relating to the delays and slippages caused by the Wind Tunnel Test facilities have been prepared and are being packaged for formal submittal to BuWeps.

VI. GENERAL

A. TRIPS AND VISITORS

1. Trips

Date	Destination	Purpose
10/1/63	David Taylor Model Basin	Model Test Program
10/1/63	Hamilton-Standard	Propeller Coordination
10/9/63	BuWeps	Flight Controls System
10/14/63	NASA-Langley	1/3 Scale Model Tests
10/15/63	Bell Helicopter	Transmission Shafting
10/18/63	BuWeps	Harmonic Drive
10/17/63	Hamilton-Standard	Propeller Coordination
10/20/63	Hamilton-Standard	Program Review Meeting
10/25/63	David Taylor Model Basin	1/3 Scale Ducted Prop. Model
10/28/63	David Taylor Model Basin	1/3 Scale Ducted Prop. Model
10/30/63	BuWeps	Review Open Items
10/30/63	H. W. Loud Co.	Landing Gear Design
10/30/63	Cleveland Pneumatic	Facilities Survey
10/30/63	Engineering Enterprises Inc.	Facilities Survey

Date	Destination	Purpose
10/30/63	Aerospace Crew Equipment Laboratory (ACEL)	Ejection Seat Testing

2. Visitors

Date	Company	Purpose
10/3/63	Pesco Products	Fuel Boost Pump
10/3/63	Steel Products Engineering Co.	Transmission System
10/8/63	Cornell Aeronautical Laboratory	Variable Stability System
10/8/63	Avionics Product Eng. Corp.	Fuel Shut Off Valves
10/8/63	H. W. Loud Machine Works, Inc.	Landing Gears
10/9/63	Hamilton Standard	Propeller Program
10/9/63	Lycoming Mfg.	Constant Speed Drive
10/15/63	McDowell & Co.	Controls
10/21/63	Sundstrand Aviation	Constant Speed Drive
10/21/63	Goodyear Aerospace	Cockpit Closure
10/21/63	Aeroequip Company	Brazed Fittings
10/23/63	Cleveland Pneumatic	Duct Support
10/24/63	Adams Rite Mfg. Co.	Power Controls
10/25/63	Hamilton Standard	Propeller Program
10/25/63	H. W. Loud Machine Works Inc.	Landing Gears
10/28/63	Gleason Manufacturing	Gearing
10/28/63	Engineering Enterprises Inc.	Duct Support

Date	Company	Purpose
10/28/63	United Shoe Machinery Co.	Harmonic Drive
10/31/63	Cornell Aeronautical Labs.	VSS Trim-Feel System

B. CORRESPONDENCE AND REPORTS SUBMITTED DURING THE PERIOD OF OCTOBER 1 - OCTOBER 31, 1963

BAC Letter No.	Date Submitted	To	Subject	Reason
415	10/1/63	BuWeps - RA-443	1/5 Scale Model - Test Data	Info
416	10/2/63	NASA-Ames Res. Ctr. Mountain View, Cal. Mr. Kenneth Mort	Full Scale Duct/ Prop. Wind Tunnel Model	Approval
417	10/3/63	BuWeps - RA-443	Drag Data - Transmittal	Info
418	10/3/63	BuWeps Rep.	Summary of Engineering Data	Approval
419	10/3/63	BuWeps - RA-443	Characteristics Summary (Revision No. 2)	Info
420	10/3/63	NASA-Scientific and Tech. Info Fac. Bethesda, Md.	Reports and Data	Info
421	10/4/63	GE - Dean Teece	XT-58-8 Spare Parts Quotation	Info
422	10/4/63	DTMB - Mr. Schultz	1/6 Scale Model - Engr. Chgs.	Info
423	10/4/63	BuWeps Rep. - E. Longwell	Premium Overtime	Approval

BAC Letter No.	Date Submitted	To	Subject	Reason
424	10/7/63	BuWeps - RA-443	Aluminum Alloy Blind Rivets	Approval
425	10/11/63	BuWeps - RA-443	Specific SD-550-1, MIL-D-8706A Addendum No. 162 (Revision 2)	Action
426	10/11/63	BuWeps - RA-443	Cockpit Mockup Photographs	Info
427	10/17/63	BuWeps - NPAF-35	Request for Deviation from SD-550-1 (Antifriction Bearings)	Approval
428	10/14/63	BuWeps - RA-443	1/7 Scale Wing/ Duct Model - Final Report	Info
429	10/15/63	BuWeps - NPAF-35	Schedules for Deliverable Items	Info
430	10/17/63	BuWeps - RA-443	Close Tolerance Bolts	Approval
431	10/16/63	BuWeps - RA-443	Monthly Progress Report No. 10	Info
432	10/17/63	BuWeps - RA-443	Body Group Drawing	Info
433	10/17/63	BuWeps - RA-443	Program Evaluation Review Technique (PERT) Reports	Info
434	10/18/63	BuWeps - NPAF-35	Funding Requirement (P. Leon)	Action
435	10/23/63	Bell-Dayton Office Attn: W. Ungerer	Request by Lt. Col. E. Callaghan for X-22A Material (Your letter of 23 Sept. 1963)	Info

BAC Letter No.	Date Submitted	To	Subject	Reason
436		BuWeps - NPAF-35	Proposed Revision to SD-550-1 (Fuel Jettisoning)	Approval
437	10/23/63	BuWeps Rep. - E. Longwell	Premium Overtime	Approval
438	10/24/63	BuWeps - RA-443	Operational Flight Envelopes	Info
439	10/28/63	BuWeps - RA-443	Elevon Effectiveness Model - Interim Report (Extended Tests)	Info
440	10/28/63	BuWeps - RA-443	Cockpit Mockup Inspection (Wheel Warning Light)	Info
441	10/28/63	BuWeps - RA-443	Cockpit Mockup Inspection (Canopy Clearnace)	Info
442	10/29/63	BuWeps - RA-443	Program Evaluation Review Technique (PERT) Report	Info
443	10/31/63	BuWeps, Attn. RA-443	1/6 Scale Model - Final Rpt.	Info
444	10/31/63	BuWeps, Attn. RA-443	Propulsion System Drawing - Proposed Revision	Info
445	10/31/63	BuWeps, Attn. RA-443	Heaters for Test Stand and Tie Down Tests	Action

C. OPEN ITEMS (Submitted at least 30 days prior to October 31, 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	*
174	Revision to Addendum No. 162 (Test Program)	5-1-63	*
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	*

*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
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	*
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-L-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	*

*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
395	Revision to SD-550-1 (Areas and Dimensions)	9-11-63	*
409	Contract Item - Exhibit B - (GFE)	9-24-63	*
412	Request for Ejection Seat Proposal	9-27-63	*
414	Performance Calibration Curves	9-30-63	*

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