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MC DONNEL AIRCRAFT CORP., ST. LOUIS, MO. (REPORT 2406)

RAM JET HELICOPTER DEVELOPMENT - MODEL XH-20 - PROGRESS
REPORT 63 - MONTH OF NOV 1951

WOOD, C.R., JR. 15 DEC '51 12PP PHOTOS

USAF CONTR. NO. AF33(038)-9845

HELICOPTERS, JET
ENGINES, RAMJET
H-20

ROTATING WING AIRCRAFT (34)
DESIGN (10)

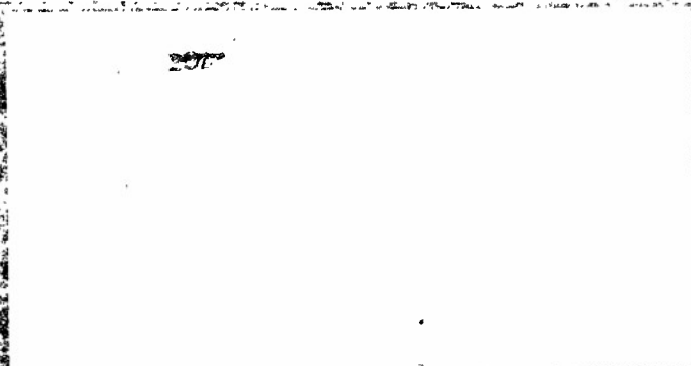
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DATE

15 December 1951

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REVISED

MCDONNELL

Aircraft Corporation

ST. LOUIS 3, MISSOURI

PROGRESS REPORT 63

MONTH OF NOVEMBER 1951

RAM JET HELICOPTER DEVELOPMENT

SUBMITTED UNDER Contract AF 33(038)-9845

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Enclosure 1

Ref: 2143-301-2256

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1. SUMMARY

Fabrication of additional 8.71-inch diameter ram jets was accelerated in preparation for the flight test program proposed in compliance with subject contract. A program has been established to permit compliance with all items of subject contract.

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MODEL XH-20

2. ROTOR DEVELOPMENT

2.1 No. 1, 27-Foot Diameter Rotor Blade

There were no tests of the 27-foot diameter rotor blade assembly scheduled for November after the structural test of 1 November with resultant ram jet failure in the over-speed condition. Evaluation tests of the No. 1, 27-foot rotor fitted with the new 8.71-inch diameter ram jets are scheduled for late in December with measurement of blade stresses in preparation for continuation of the scheduled flight test program.

2.2 No. 2, 27-Foot Diameter Rotor Blade

It is proposed that the fabrication of the No. 2, 27-foot diameter rotor blade, in compliance with Item 6 of subject contract, consist of the construction of two rotor blades only, for the No. 2, XH-20, rather than construction of a complete new rotor. This is recommended inasmuch as the performance of the blade retention system has been satisfactory and since the XH-20 No. 1 is not in flyable condition and therefore unsuitable for flight operations with the 27-foot diameter rotor blade assembly. Completion of Item 6 as proposed above is pending the receipt of WADC approval to proceed accordingly.

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2.3 Initial Test Procedure for the 27-Foot Diameter Ram Jet Propelled Rotor Assembly

- 2.3.1 Inspect ram jets for position of components, high pressure tests for leaks, flow test and check ignition prior to installing on 27-foot diameter rotor blade.
- 2.3.2 Fit ram jets with fuel metering orifice and install ram jets on rotor for fuel flow and ignition check on whirl stand.
- 2.3.3 Determine maximum temperature pattern using temperature indicating paint grid.
- 2.3.4 Test rotor assembly with ram jets operating to provide a maximum of 500 fps; increase tip speed at increments of 100 fps to normal rated speed.
- 2.3.5 Remove and inspect ram jets for defects or distortion.
- 2.3.6 Track rotor.
- 2.3.7 Conduct performance tests.
- 2.3.8 Conduct over-speed tests by increasing speed from normal rated speed in increments of not more than 100 g to over-speed condition for maximum of one minute.
- 2.3.9 Remove and inspect ram jets and measure any deformation of the ram jet shell.

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3.0 RAM JETS

3.1 Ram Jet Over-Speed Failure

As reported in the October Progress Report, the modified radial finger-type flame holder ram jets Modified Nos. 32 and 33, were damaged in over-speed whirl tests. This failure occurred in the routine program to prove the structural integrity of the new experimental ram jet configuration prior to flight tests.

A study of the failure has revealed a fabrication and not a structural failure. Tests in the normal operating speed of 800 fps were satisfactory with failure of one ram jet just below the desired over-speed; the other ram jet indicated evidence of incipient failure and permitted study for modification of the fabrication technique which is expected to prevent recurrences of subject failures.

3.2 8.71-Inch Diameter Ram Jets

In conformance with Item 2 of Exhibit B of Item 8 of subject contract, ram jet structural characteristics have been studied and improved. A report covering the development of the 8.71-inch diameter ram jet is being prepared

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3.2 8.71-Inch Diameter Ram Jets - continued

for submittal in full compliance with above mentioned item of the contract. The new 8.71-inch diameter ram jets are scheduled to be ready for installation on the No. 1, 27-foot diameter rotor late in December.

3.3 Modified Improved MAC Whirl Stand

3.3.1 The modified and improved whirl stand will be completed and fully instrumented by the middle of December. Initial whirl tests conducted during November indicated forecast performance. Figures (1), (2), (3), (4) and (5) show the whirl stand in the final stage of assembly. The instrumentation of the whirl stand will include a 12-channel bridge balance box. The 48 slip rings installed will permit the measurement of temperature, stresses, etc., under actual power-on and simulated power-off conditions.

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4.0 XH-20 USAF 46-689 AND 46-690

4.1 XH-20, No. 1, USAF 46-689

No. 1 twin ram jet helicopter was returned from WADC on 20 November. It is standing by in non-flight status.

4.2 XH-20, No. 2, USAF 46-690

No. 2, XH-20 is standing by for the installation of the No. 1, 27-foot diameter rotor blade assembly late in December. Tests are scheduled to be initiated in conformance with the flight test program outlined in the October 1951 Progress Report in full compliance with Items 5 and 8 of subject contract unless WADC advises to the contrary.

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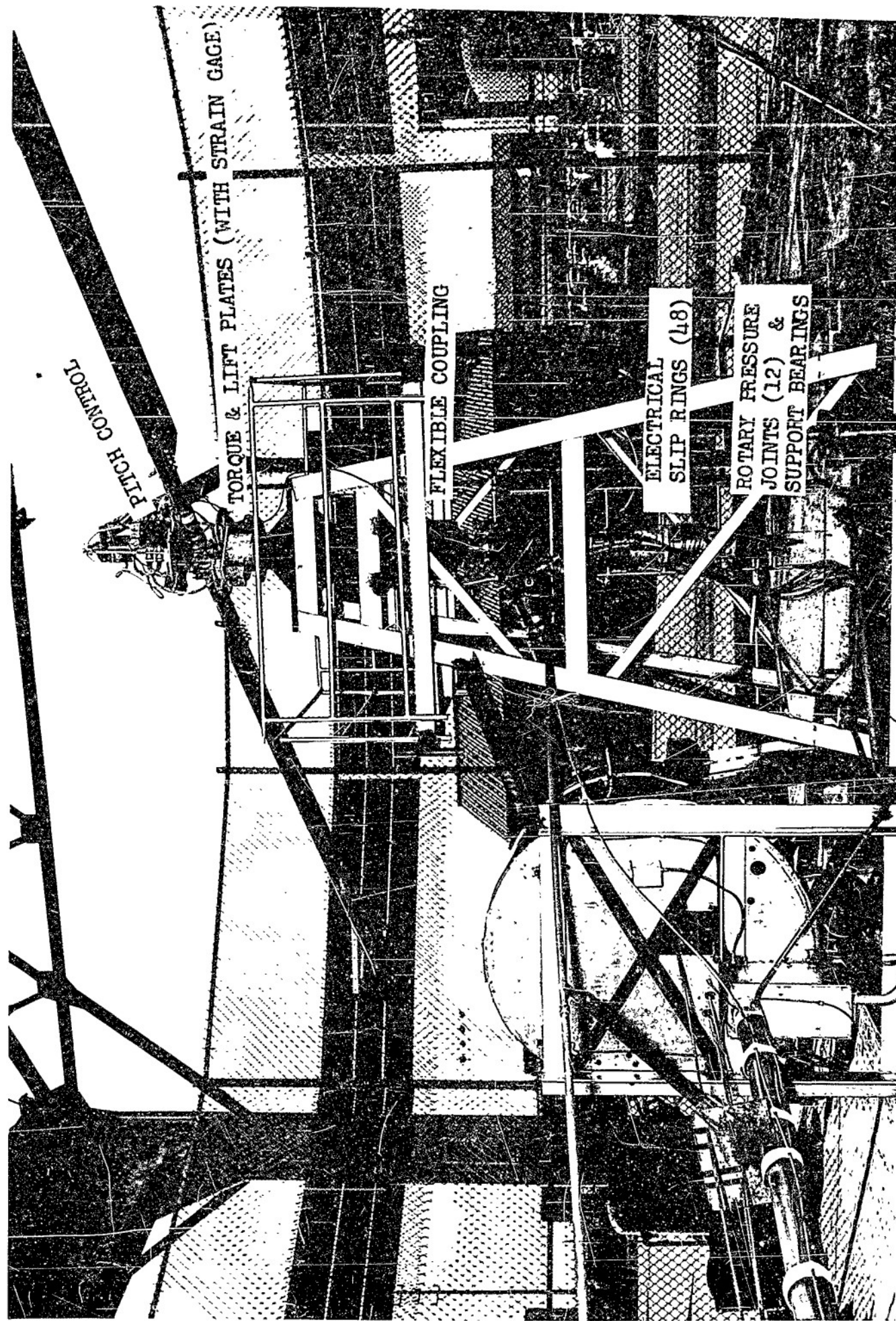
5.0 DAILY FLIGHT SHEETS - XH-20 Helicopter Test Data

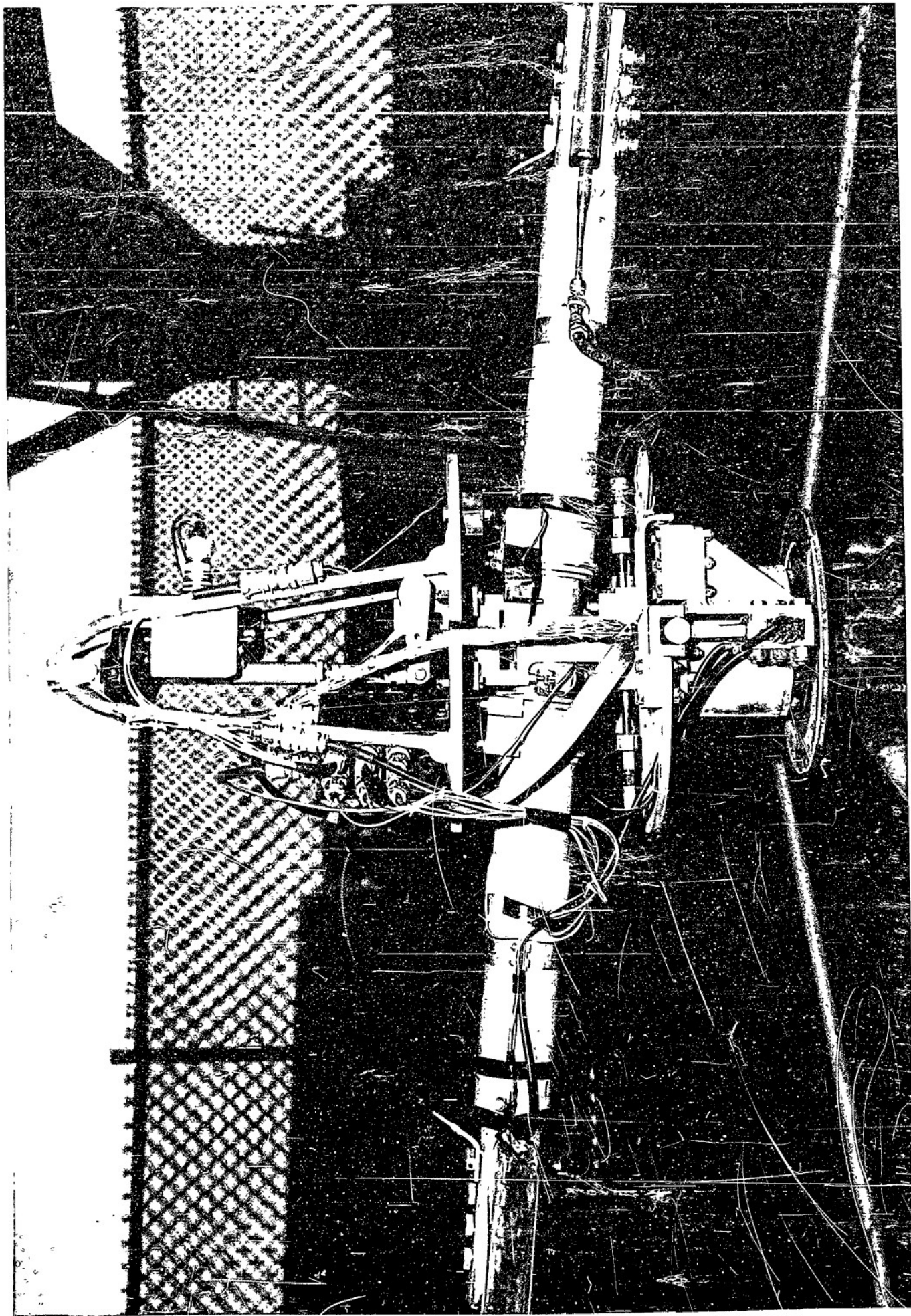
There were no operations scheduled for the XH-20 during November.

6.0 WORK PROGRAM FOR THE MONTH OF DECEMBER 1951

Another set of 8.71-inch diameter ram jets is scheduled to be completed and ready for installation on the No. 1, 27-foot diameter rotor late in December. After initial ground evaluation tests, the flight test program submitted for WADC approval in the October Progress Report will be initiated.



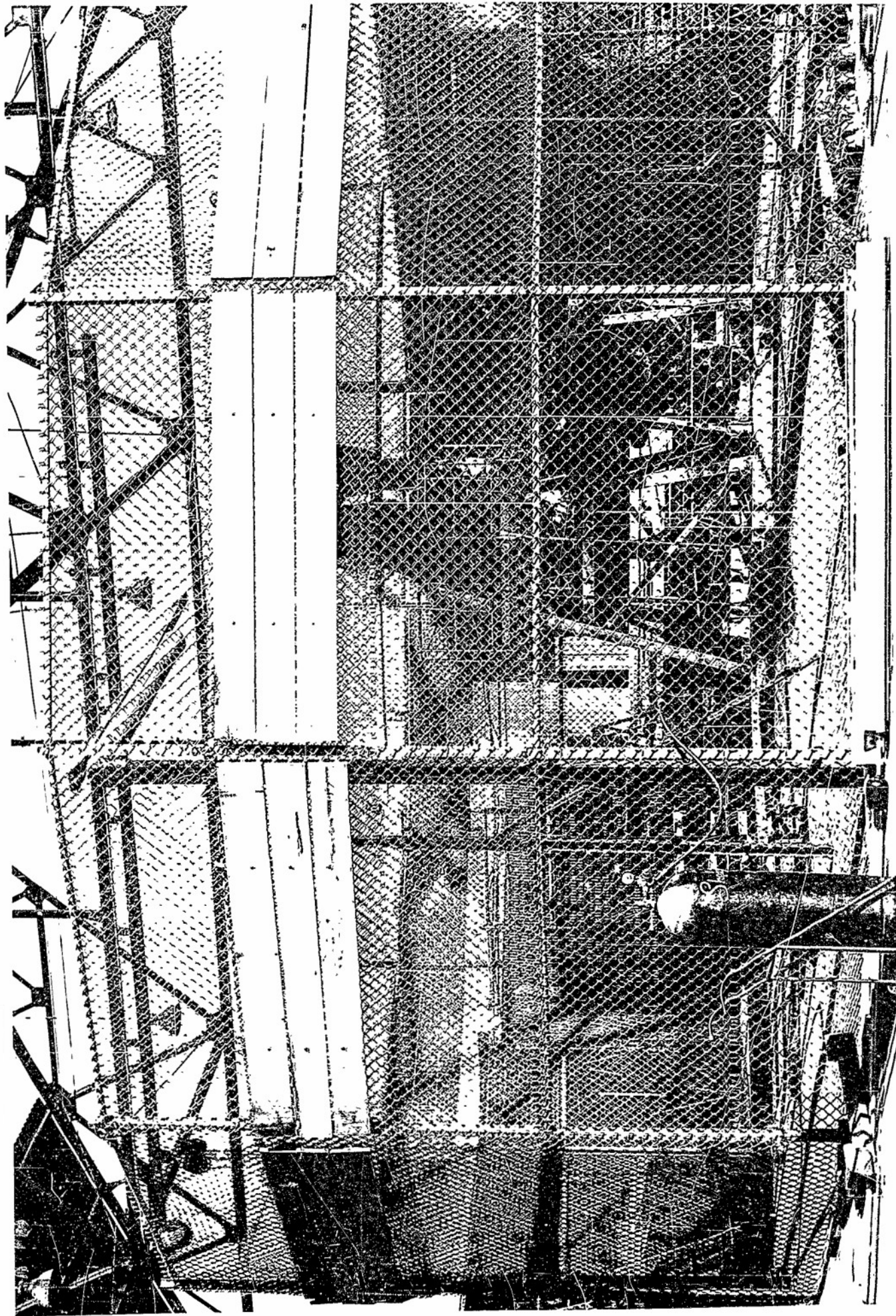




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P & W POWERED WHIRLSTAND
PITCH CONTROL, TORQUE, LIFT MECHANISM

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FIGURE 3



PAGE 11
FIGURE 1

& W POWERED WHIRLSTAND

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