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Wood, C.R., Jr. 15 Nov 51 13PP Photos, Diagr.

USAF Contr. No. AF-33(038)-9845

Helicopter Rotors, Jet Helicopters - Performance Engines, Ramjet - Performance

H-20
PROGRESS REPORT 62

MONTH OF OCTOBER 1951

RAM JET HELICOPTER DEVELOPMENT

SUBMITTED UNDER Contract AF 33(038)-9845

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7. FIGURES (1) THROUGH (5) 9 - 13
2.2 No. 2, 27-Foot Diameter Rotor

The design of the No. 2, 27-foot diameter rotor has been completed. MAC Drawing J1-2222 for the 27-foot rotor blade assembly is submitted herewith, Figure (5). WADC's approval is requested.
3. RAM JETS

3.1 Overspeed Failure

The modified radial finger type ram jets were repaired; the cracked areas were patched and the flame holder modernized. Figure (3) shows the deformed ram jet No. 33. Modified ram jet No. 32 failed in the over-speed tests of the No. 1, 27-foot rotor. Modified No. 33 was deformed and will not be utilized for subsequent work; see Figures (1) and (2).

3.2 Modified Whirl Stand

The modified whirl stand installation was continued during October. The whirl test stand is scheduled for completion during November 1951. Figure (4) is a drawing of the jet rotor whirl stand.

3.3 Free Air Jet Test Stand

The free air jet test stand was utilized for development of the 8.71-inch diameter ram jets during October. The flame holder design and position was established. A further test program is being directed towards improvement of the design of the fuel injector to ascertain the range of quiet burning. Tests for fuel injector improvement have indicated satisfactory controls of fuel flow and thrust. No trouble is expected in balancing fuel flow on the 27-foot rotor either on the whirl stand or on the helicopter.
4. XH-20, USAF 46-689 and 46-690

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

The XH-20, No. 1, was exhibited at WADC on 5 and 6 October 1951. It is scheduled to be returned in November.

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

The XH-20, No. 2, is standing by for installation of the No. 1, 27-foot diameter rotor blade assembly fitted with new 8.71-inch diameter ram jets, now under construction. This helicopter is to be utilized for the following flight test program which will be submitted for WADC approval in November:

4.2.1 CONTROL FORCE EVALUATION

4.2.1.1 Ground Test at the following conditions:

(a) Three Rates of Movement: .1 Radian/Sec, .5 Radian/Sec, and 1.0 Radian/Sec

(b) 1,000 lbs. Rotor Thrust  
566 RPM - 3.5° Pitch

(c) 800 ft./sec, Tip Speed

(d) Record the following:
Longitudinal Stick Force
Lateral Stick Force
Longitudinal Stick Position
Lateral Stick Position
Rotor RPM

4.2.2 PERFORMANCE

4.2.2.1 Hovering

(a) Maximum hovering ceiling out of ground effect by determination of power required to hover with rotor one diameter above ground.
4.2.2  PERFORMANCE - continued

4.2.2.1  Hovering - continued

(b) Record Blade Stresses as follows:

(1) Steady flapwise bending approximately at Stations 1.75, 30, 82 and 126. At 566 RPM (800 F/S) and 495 RPM (700 F/S)

(2) Steady torsion at pitch link at 566 RPM (800 F/S)

4.2.2.2  Forward Flight

(a) Determine V Max as Limited by power, vibration, stresses or control limitation.

(b) Record Blade Stresses at V Max and ½ V Max as follows:

(1) Steady and oscillating spanwise blade flapping moment at Station 1.75, 30, 82 and 126

(2) Steady and oscillating blade chordwise bending moment at Station 1.75

(3) Steady and oscillating blade pitching moments

4.2.2.3  Autorotation

(a) Determine blade stresses during steady rates of descent and flare outs as follows:

(1) Steady and oscillating spanwise blade flap bending moment at Station 1.75, 30, 82 and 126

(2) Steady and oscillating blade chordwise bending moment at Station 1.75

(3) Steady and oscillating pitching moments

(b) Determine minimum rate of descent and general control characteristics.

4.2.3  RAM JET PERFORMANCE

4.2.3.1  Throttling characteristics during quick stops, minimum power glides, etc.

4.2.3.2  Determine altitude performance within safety limits.
5. **DAILY FLIGHT SHEETS - XH-20 Helicopter Test Data**

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

6. **WORK PROGRAM FOR THE MONTH OF NOVEMBER 1951**

Construction of the new set of 8.71-inch diameter ram jets will be expedited during November for scheduled completion in late November or early in December. The design of the No. 2, 27-foot diameter rotor will be submitted for WADC approval in November.
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