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ENGINEERING REPORT NO.

FTE #130

SUBJECT:

SUMMARY OF FLIGHT TESTS - XC-120 PACKPLANE

MODEL: XC-120



FAIRCHILD AIRCRAFT

Division of
FAIRCHILD ENGINE & AIRPLANE CORPORATION
FACERSTOWN, MARYLAND

Date: Feb. 12, 1951

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Date	Pages Affected	By	Remarks

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SUMMARY OF FLIGHT TESTS - XC-120 PACKPLANE

I PURPOSE

This report is intended to present a summary of flight test data published earlier in flight reports FT107-1 thru FT107-16. This will provide a single reference, as requested by Air Materiel Command personnel.

All flight test data obtained by the contractor is summarized by this report. The main program of testing was described in the flight test specification for the airplane. See Reference 1. Additional tests, which are reported here, resulted from (1) re-testing after important aircraft modifications, (2) obtaining information requested by the contractor's Engineering Department, or (3) exploring certain new problems, such as aerodynamic roughness and torsional flexibility.

Note: In all cases of small difference between figures reported in the referenced flight reports, and this summary, the figures given here will supersede the flight reports, many of which were made without the benefit of an airspeed calibration.

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FAIRCHILD ENGINE AND AIRPLANE CORP., FAIRCHILD AIRCRAFT DIV.,
HAGERSTOWN, MD. (ENGINEERING REPORT NO. FTE 130)

SUMMARY OF FLIGHT TESTS - XC-120 PACKPLANE

J.A. CLOPPER 12 FEB '51 23PP.

AERODYNAMICS (2)
PERFORMANCE (2)

AIRPLANES, TRANSPORT - PERFORMANCE
AIRPLANES - STABILITY
C-120 - FLIGHT TESTS
C-120

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II CONCLUSIONS

A - Testing Program

1. The contractor has conducted all the tests required by the flight test specification for Phase I evaluation of this airplane.
2. As a result of the tests described in this report, the aircraft is considered safe and airworthy for later phases of evaluation by Air Materiel Command.

B - Aircraft Modifications

1. During the course of the testing, the following important modifications of the aircraft were adopted:
 - a. elimination of auxiliary nacelle doors (small spring-loaded doors at inboard forward corners of main nacelle doors) in order to reduce shaking of the main doors.
 - b. redesign of the auxiliary gear uplocks and emergency lock release system to eliminate unintentional unlocking in flight.
 - c. installation of dorsal fins to improve directional stability.
 - d. installation of aileron hinge gap covers to reduce aileron forces; this modification had previously been adopted on the C-119 airplanes, and was added to this aircraft as a simple and readily available "extra".
 - e. installation of "bob weights" totalling 60 lbs. in the elevator control system, to improve longitudinal stability.

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II CONCLUSIONS:

B - Aircraft Modifications (Cont'd.)

- f. elimination of the steering system as unnecessary for normal ground operation
- g. installation of R4360-20W engines, with water injection system operative, to improve single engine performance
- h. reduction of rudder travel from 16° left, 21° right, to 9° left, 15° right, to eliminate the possibility of rudder force reversals in extreme sideslip conditions

C - Recommendations

- 1. No further improvements should be considered on the present contract for this experimental article.
- 2. In any production development of this configuration, the following improvements should be considered:
 - a. landing gear drag should be reduced by the greatest amount possible, or increased power should be provided for one-engine-out performance
 - b. the rear fairing of the crew nacelle and pack should be revised to reduce turbulence and aerodynamic roughness
 - c. an increase in torsional rigidity of the carrier is desirable, although pilots would probably become accustomed to the flexibility of the aircraft in any rolling maneuver, and during extension of the landing gear

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II CONCLUSIONS:

C - Recommendations (Cont'd.)

- d. moving the main gear aft to reduce the possibility of over-balancing the ship on its tail during reverse pitch backing (if steering is incorporated). This would also reduce the tail-dragging possibility on take-off

In addition to the above, improvements in static stability around all three axis should be considered. The inherent control system friction should be reduced further, if this is feasible. A reduction in friction would provide an appreciable increase in stick-free stability, if nothing else were done.

III FACTUAL DATA

A - Stability and Control

The order in which the characteristics are listed below is the same order as shown in the flight test specification upon which the program was based.

1. Elevator effectiveness

a. With pack attached - Ref. FT107-1

Elevator effectiveness is unusually good at take-off and landing, and is satisfactory for stalls in any configuration, with a 20% m.a.c. loading, (gear down) at a gross weight of 60,000 lbs.

b. With pack removed - Ref. FT107-3, -5

Elevator effectiveness is very good in all conditions. For example, 11° of 24° available elevator throw was required for a power-off, flaps down landing at minimum speed. It is easily possible to drag the tail on take-off.

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III FACTUAL DATA

A - Stability and Control (Cont'd.)

2. Elevator control forces

a. With pack attached - Ref. FT107-1

Elevator control forces were considered normal and satisfactory in all conditions before and after the installation of the 60 lb. "bob weight". In tests before the weights were installed, the stick force gradient in diving turns was measured at 41 lbs./g with a 22.0% m.a.c. loading at 58,800 lbs. This was within the allowable limit of reference 3, which is 41.8 lbs./g. The 60 lb. bob weights have increased the forces but not to an undesirable degree.

b. With pack removed - Ref. FT107-5, -14

Stick forces are higher with pack removed than for corresponding conditions with the pack attached, but are not considered objectionable, with the 60 lbs. bob weights installed. Maneuvering stick forces, also not objectionable to the test pilots, exceed the 41.8 lb/g limit of Reference 3. A test gradient of 43 lb./g was measured at a 30.4% m.a.c. loading of 54,300 lbs. gross weight (check for minimum gradient) in the configuration. It is noted that future specification 1815-B allows a maximum gradient of 60 lbs./g, and that moderately high forces are anticipated by the model specification of the airplane.

The bob weight creates an extra inertia effect during rapid motion of the elevator control which is not desirable, but not detrimental to proper control.

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III FACTUAL DATA

A - Stability and Control (Cont'd.)

3. Dynamic longitudinal stability, clean configuration

a. With pack attached - Ref. FT107-1

Dynamic stability is satisfactory in the clean configuration with high power at calibrated airspeeds up to 224 mph V_c , the highest airspeed tested for this characteristic.

b. With pack removed - Ref. FT107-5

Oscillations of the airplane damp completely in 1/2 cycle after disturbance in pitch, at calibrated airspeeds up to 220 mph, the highest airspeed tested for this characteristic.

Both of the above tests were conducted with the loading at approximately 30% m.a.c.

4. Static longitudinal stability

a. With pack attached - Ref. FT107-1, -10, -11

The static longitudinal stability was found to be negative with the airplane in its original configuration. This was improved by adding 60 lbs. elevator control balance weight, and was retested in the clean configuration, with both 100% and 60% of normal rated power. Stability remains neutral at the 30% m.a.c., with either amount of power, although exact determination of neutral stability is greatly hindered by excessive control system friction.

It is noted that the model specification provides for stability when using approximately 60% of normal rated power (reference 2). However, the final results were considered acceptable for an experimental aircraft. Further improvement will be necessary if production is considered.

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FACTUAL DATA

A - Stability and Control

4. Static longitudinal stability (cont'd.)

b. With pack removed - Ref. FT107-14

Static longitudinal stability, with the 60 lb. elevator control balance weight installed, was neutral, within the limits of measurement, in the critical "P" configuration with the normal design gross weight loading, of 55,044 lbs., c.g. at 30% m.a.c., using normal rated power. It was considered acceptable for an experimental article.

5. Changes of longitudinal trim

a. With pack attached - Ref. FT107-1, -10

Longitudinal changes of trim were found to be satisfactory for compliance with the specification, during operation of wing flaps, landing gear, cowl flaps, and application of take-off power in a landing condition. Pilot forces to maintain required airspeeds varied from 18 to 37.5 lbs., with 50 lbs. allowable.

b. With pack removed - Ref. FT107-5

The comments in a, above, apply. Measured forces ranged from 13 to 28 lbs., to maintain constant airspeeds during changes of configuration.

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III FACTUAL DATA

A - Stability and Control

6. Dynamic directional stability

a. With pack attached - Ref. FT107-1

Dynamic directional stability is satisfactory in the high power clean configuration at airspeeds up to 224 mph V_C , the highest airspeed tested.

b. With pack removed - Ref. FT107-5

Dynamic directional stability is satisfactory, in the clean configuration, with high power, although airplane oscillations can be set up which will require three cycles to damp, with rudder fixed. This occurs only if the rudder pedals are rocked until a natural frequency of the structure of the airplane is excited. A single sharp disturbance of the airplane damps immediately, in one cycle, at speeds up to 220.5 mph V_C , the highest airspeed tested.

7. Static Directional stability

a. Steady sideslip characteristics

(1) With pack attached - Ref. FT107-1, -10, -11

Tests were conducted in configurations "P" and "PA". The former is more critical, and was deficient to an unacceptable degree before installation of the dorsal fins. These along with restriction of rudder throw from 16° left, 21° right, to 9° left, 15° right, improved the stability to a degree considered acceptable for the experimental aircraft, although rudder force reversals still occur at airspeeds below 115 mph V_C in sideslips with full rudder applied while using normal rated power.

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A - Stability and Control

7. Static directional stability

a. Steady sideslip characteristics (cont'd.)

(2) With pack removed - Ref. FT107-5, -14

Static directional stability is much more positive with the pack removed, and was satisfactory for specification compliance before the dorsal fins were installed, or rudder travel decreased. It remained satisfactory when these changes were tested.

b. Adverse yaw in abrupt rolls

(1) With pack attached - Ref. FT107-1, -10, -11

Addition of the dorsal fins was necessary to reduce adverse yaw to values within the limits of specification 1815-A. In the critical configuration (PA), at the critical airspeed $1.4 V_{pa}$, 111 mph V_c , with 30% m.a.c. loading of 60,000 lbs. gross weight, the maximum adverse yaw in abrupt full aileron rolls to the right was 13.2° . The allowable limit is 20° .

(2) With pack removed - Ref. FT107-5

This arrangement was sufficiently stable before adding the dorsal fins, and was not retested following the installation. Stability of the carrier alone with the dorsal fins will be greater than indicated for the pack-attached case immediately above.

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A - Stability and Control

7. Static directional stability (cont'd.)

c. Single engine operating, rudder free stability

(1) With pack attached - Ref. FT107-10

With the dorsal fins, stability was sufficient to permit balancing the airplane directionally in straight flight at 128.5 mph V_0 with the left engine windmilling 1625 RPM, right engine developing normal rated power, flaps and gear up, rudder tab neutral, rudder floating 0.2° right, by sideslipping 6.3° right, banking 9° right. The required minimum airspeed is the maximum cruising range speed, which has not been determined by flight test. However, the 128.5 mph airspeed is probably below maximum range airspeeds.

(2) With pack removed - Ref. FT107-5

Before installation of the dorsal fins, the carrier was sufficiently stable to permit balancing the airplane directionally in straight flight at 128 mph V_0 under the conditions of (1) above, with the rudder floating 1.2° right, by sideslipping 10.8° right, and banking 3° right. It was not considered necessary to re-test it after the modification.

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III FACTUAL DATA

A - Stability and Control

8. Rudder effectiveness

a. Power failure at take-off

(1) With pack attached - Ref. FT107-1, -10, -11

Rudder effectiveness was very good in the original airplane, and after modification. After limiting the rudder travel to 9° left, and 15° right, and installing the dorsal fins, it was possible to hold straight flight at 119 mph V_C with 7.5° left rudder after a simulated right power failure in the take-off configuration, and with 15° of right rudder after a simulated left power failure. The loading in each case was 60,000 lbs., 20% m.a.c. The required minimum control speed for this test condition and loading is 128 mph.

(2) With pack removed - Ref. FT107-5, -14

Rudder control is more than adequate for this condition. The modified airplane was controllable in straight flight at 108 mph V_C under the specified test conditions, with a loading of 54,000 lbs., c.g. at 27.3% m.a.c, with 15° or right rudder applied, and 5° of right bank. The required minimum control speed for this loading is 117 mph.

b. Control of adverse yaw

(1) With pack attached - Ref. FT107-11

The airplane as delivered has sufficient rudder control power to overcome adverse yaw, in abrupt full aileron rolls in either direction, in configurations "G" and "FA". In the "G" configuration, at 143 mph V_C it is relatively easy to coordinate such rolls, while in the "FA" configuration, at 111 mph V_C the maximum rudder power is required to do so.

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A - Stability and Control

b. Control of adverse yaw (cont'd.)

(2) With pack removed - Ref. FT107-5

Before modification, rudder power to control adverse yaw in the abrupt full aileron roll to the right in the power-approach configuration was slightly deficient, although it was relatively better than with the pack attached. In view of the improvement of a worse condition relating to the pack-attached case described in the above and the limited flight program, the carrier alone was not tested after modification.

9. Rudder pedal forces - Ref. FT107-5

The rudder control forces were observed incidentally in conjunction with some of the tests described above, and are not objectionable, although in control of adverse yaw, they may approach the 180 lb. limit of the specification.

10. Dynamic lateral stability

a. With pack attached - Ref. FT107-1

Dynamic lateral stability is satisfactory in the high power clean configuration, at airspeeds up to 224 mph V_0 , the highest airspeed tested.

b. With pack removed - Ref. FT107-5

Dynamic lateral stability is satisfactory, in the clean configuration, with high power, at airspeeds up to 220.5 mph V_0 , the highest airspeed tested.

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III FACTUAL DATA

A. Stability and Control (Cont'd.)

11. Static lateral stability

a. With pack attached - Ref. FT107-1

Static lateral stability is marginal neutrally in the approach condition. In maximum side-slips with flaps and gear down, cowl flaps closed and engines developing 50% normal rated power, the ailerons did not return to neutral when released. In maximum right sideslip the ailerons showed no tendency to return to neutral, and in left sideslips, returned only to about 45° from trimmed position. A deviation has been provided (Reference 2) for this condition.

b. With pack removed - Ref. FT107-5

Static lateral stability is marginal in the approach configuration at 107 mph V_0 , with the wings remaining in any banked position, due to aileron system friction. Rudder-only turns can be made at this airspeed, but improved aileron returning characteristics are desirable. A deviation from specification requirements noted above applied to this case also.

12. Aileron control effectiveness

a. With pack attached

Lateral control is weak and should be improved on a production article. This is very noticeable in the "L" configuration. It was investigated, according to program, only in normal flying.

b. With pack removed - Ref. FT107-5

Aileron effectiveness appears to be somewhat better with the pack off, and lateral control characteristics are basically better.

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A. Stability and Control (Cont'd.)

13. Aileron control forces

a. With pack attached - Ref. FT107-1

Aileron forces are very similar to those of the C-119B.

b. With pack removed - Ref. FT107-5

Qualitatively, aileron forces seem reduced with the pack removed, although this impression may be created by apparently greater responsiveness of the aircraft in this configuration.

14. Stalling characteristics

a. With pack attached - Ref. FT107-1

Stalling characteristics are generally acceptable. The only undesirable stall is the PA condition, in which the specified power is higher than usual due to the higher drag of landing gear on this airplane. In the PA configuration, with approximately normal rated power required for level flight, flaps and gear extended, cowl flaps open, the ship tended to roll with longitudinal instability, indicated by slight upward pitch in the stall, necessitating almost full forward elevator for immediate recovery. The improvement in longitudinal stability brought about by installation of the 60 lb. "bob-weight" may have improved this tendency, but the limitations of the program did not permit repeating all tests.

Detailed data on stalling speeds, warning, and behavior at the stall is given in the referenced flight report.

b. With pack removed - Ref. FT107-3, -5

Stalling characteristics are generally acceptable, with the exception of the tendency to settle tail-low in the powered stalls with flaps down (configurations A and PA). The PA stall was not

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III FACTUAL DATA

A. Stability and Control

14. Stalling characteristics

b. With pack removed (Cont'd.)

carried below 73 mph IAS due to this tendency, which was accompanied by lack of elevator effectiveness at this airspeed. Tabulated stall data is given in FT107-5 report.

B. Engine Cooling - Ref. FT107-2, -12, -13

Power plant cooling is generally satisfactory. The critical element is cylinder head cooling, and all other items were found satisfactory in the tests. Cylinder head cooling is inadequate only in normal rated power climb with pack removed, chiefly because of the low airspeeds which are estimated as best climbing speeds - ranging from 131 mph V_C at sea level to 116 mph V_C at 22,000 ft. altitude. A maximum of 8° C. correction above the 249° C. limit was reported, for the hottest cylinder head. With the pack attached, normal rated power climb cooling was marginal on the hottest cylinder head, correcting 3° C. over the 249° C. limit. The airspeed range for this test was from 134 mph V_C at sea level to 127 mph V_C at 20,000 ft., which is an indication of the minimum airspeed at which hot day cooling can be expected for the pack-removed case discussed above.

Level flight cooling at normal rated power at 2000 ft. will require a very slight increase in the "closed" gap of the cowl flaps, to overcome an 8° C. overheating with cowl flaps fully closed. In cruising flight at altitude, as in the case of the C-119 airplanes, fairly large cowl flap openings will be required for 38° C day cooling. For example, 5.3 inches of gap was required to limit corrected head temperatures to the 232° C. cruising limit, using 70% of normal rated power with normal mixture, at 8750 ft. pressure altitude.

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G. Airplane Performance - Ref. FT107-2, -12, -13, -16

The Phase I program provided for airplane performance as a secondary consideration, and the data must therefore be considered preliminary in nature. The following values were determined, usually concurrently with other tests.

- Normal Climb Performance - Ref. FT107-2, -13**

Good agreement was found between the service ceilings estimated in the model specification, and the flight values. With pack attached, service ceiling with take-off design gross weight of 64,000 lbs. was 23,300 ft. under standard conditions; estimated service ceiling was 23,900 ft. With pack removed, and take-off design gross weight of 55,000 lbs., service ceiling under standard conditions was 28,900 ft. and corresponding estimate was 27,500 ft.
- Level Flight Performance - Ref. FT107-13, -16**

A 10 mph difference in high speed at 6000 ft. density altitude, was found between pack-on and pack-off configurations, at normal rated power. The true airspeed with pack attached was 250.5 with pack removed 260.5 mph. In each case the tests were conducted with approximately 2000 lbs. less than design gross weight. Speed-power curves for drag determination are presented in the referenced flight reports.

A speed-power point was obtained with the left propeller feathered, right engine developing dry military power available at 5000 ft. density altitude. With a gross load of 52,900 lbs., a level flight speed of 198.5 mph (true airspeed) was maintained.
- Single Engine Climb Performance - Ref. FT107-12**

In ten minutes of right engine operation at dry military power with the pack attached a net gain from 1600 ft. density altitude to 2900 ft. density altitude was observed, with a take-off gross load of 64,000 lbs. Corrected steady rates of climb are not presented because of unstable air conditions. The tabulated data appears in the referenced flight report.

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D. Airspeed Calibration - Ref. FT107-3. -11

The ship's original production airspeed system was found entirely unacceptable. Excessive airspeed errors were observed of the order of 35 mph high at 200 mph with the pack attached, and 10 mph high with pack removed. Altimeter pulsations also occurred with the pack attached. This system used a combination pitot-static head on a side mounting below the triangular side window at the forward end of the cabin. It was abandoned, in favor of a boom mounting forward of the wing tip, using the combination type of head. The latter system has not been calibrated, because it will not be completed until the booms for yaw vane and swivelling test airspeed system are no longer needed.

The test airspeed system, using a swivelling static source and a fixed total head source, both mounted on a single boom on the right wing tip, has small negative errors, less than 5 mph, and within the limits of specification AE-1-4.

The airspeed calibration of the test system was determined by means of a trailing airspeed bomb, with the pack attached. Since the system error is assumed to be dependent only upon angle of attack, the same calibration is applied to the pack-off configuration.

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III FACTUAL DATA

E. Structural Demonstration - Ref. FT107-15

A preliminary structural demonstration was conducted as required by specification 1803-11. The load factors and airspeeds were recorded by a type A-1 flight analyzer, and the demonstration was witnessed by Mr. Henry Jarrett, of the Structures Group, Air Materiel Command.

The following loads were demonstrated:

Type of Maneuver	Maximum Load Factor	Airspeed at Max. Load Factor
High Speed Pull-Up	2.69 g	240 mph
Rolling Pull-Up	2.85 g	159 mph
Low Speed Pull-Up	2.46 g	165 mph

The above structural demonstration represents in all cases over 80% of the design load factor of the aircraft and is in excess of the original values set up in the flight program. Flight analyzer records of the three maneuvers appear in the referenced flight report.

F. Miscellaneous Tests

1. Torsional Vibration, Pack Removed - Ref. FT107-3, -4

On the initial flight with pack removed, considerable flexing of the airplane was visible when the ailerons were rocked at any indicated speed. The motion appeared to be engine vertical movement and out-of-phase wing bending.

The ship was instrumented to study the vibrational modes and the magnitude of the accelerations involved. Vertical bouncing of the engines was confirmed, and the frequency was identified as approximately the torsional natural frequency of the wing center section. This motion occurs only if the ailerons are "rocked" to set it up, and damps immediately after the aileron motion ceases. The measured accelerations were of the order of .5 g, and it was not considered necessary to investigate further, or to take any corrective action.

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III FACTUAL DATA

P. Miscellaneous Tests

2. Elevator "Feather" Tabs - Ref. FT107-6

A set of spring steel tabs were added to the trailing edge of the elevator, to impose a constant download at a given airspeed in order to improve the stick-free longitudinal stability at speeds below the trim speed. A rather violent vibration developed, and these tabs were abandoned. The vibration consisted of a "buzz" along a triangular section of the elevator right trailing edge, extending approximately 4 feet inboard from the end of the elevator. No damage resulted, but other means were adopted to improve stability.

3. VHF Antenna Location - Ref. FT107-8

In compliance with a Safety Inspection Work List, the VHF antenna was tested for transmission and reception in all directions. It was found that the strength of the transmitted or received signal is reduced to a slight degree in some directions. It was not considered necessary to make changes in the antenna location for the experimental article.

4. Flight Loads on Forward Doors - Ref. FT107-8

Two problems were presented to the Flight Test Department by Fairchild Engineering; (1) what was the magnitude and direction of load on each of the front clamshell door latches in flight, and (2) would the front entrance door latch vibrate open, and if so, would the door be forced open, or remain closed.

It was determined that the loads on the clamshell door latches in the cruising speed range are quite low, tending mainly to close the doors. It was also determined that the front entrance door latch did not show any tendency to vibrate open during 20 hours of flying. It was evident from an examination of the latch that the airloads tend to keep the front entrance door closed.

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III FACTUAL DATA

F. Miscellaneous Tests

5. Strength of the Auxiliary Landing Gear - Ref. FT107-8

A separate contract was incorporated into the flight program to cover this investigation, which is described in Fairchild Test Request F-15. A total of seven landings were made, including symmetrical, unsymmetrical and side-drift landings, at various impact loadings ranging from soft to severe. A separate report will be issued from the Fairchild Engineering Structures Section upon completion of the oscillograph record analysis.

6. Relief Tube Spray Pattern - Ref. FT107-9

The area to be covered by acid-resistant finish was determined by releasing a water-paint solution from the relief tube during flight.

7. Anti-Icing and Heating System Operation - Ref. FT107-9, -16

The anti-icing system for wing and tail surfaces was operated at the design airspeed, with only anti-icing in use, and the following was observed;

- a) satisfactory functioning of the combustion heaters
- b) satisfactory heater compartment temperatures in the aft carrier deck
- c) excessive anti-icing airflows across the heaters, resulting in reduced temperature rise of the heaters (268°F. rise instead of 350°F. rise available at 32°F. ambient temperature).

The "Electrapane" windshield was operated satisfactorily in flight, under non-icing conditions. A few minutes elapse before a temperature rise can be detected by touching the inner surface of the glass after "low" heat is turned on, but this is considered normal.

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III FACTUEL DATA

F. Miscellaneous Tests

8. Shimmy Damping Characteristics - Ref. FT107-9

Very violent shimmy occurred during a landing reported in flight report FT107-7. The auxiliary gear oleo struts had been inflated before take-off, to carry a 60,000 lb., 20% m.a.c. loading with their 3.75" normal extension. The landing was made with a loading of 52,300 lbs., at 25.2% m.a.c., and it was established that the oleo strut fully extended under this condition. This provided a more unstable nose gear trail angle. In addition, the by-pass valve on the shimmy damper was found improperly installed, which prevented proper dampening. The combination of trail angle and improper damping led to unusually violent shimmy.

Following correction of the above installations, a series of runs were made at speeds from 13 to 75 mph over a two-inch obstacle placed at a 45° angle to the runway axis with various oleo strut extentions. Shimmy damping during these tests, and subsequently in service, prior to delivery, was very satisfactory.

9. Fuselage Inclination in Level Flight - Ref. FT107-12

At the request of Fairchild Engineering, the inclination of the fuselage floor was determined during level flight runs, as follows:

V _C mph	Fuselage Floor Inclination Degree
177	0.0
199.5	1.0 nose down
205	1.5 " "
227	2.0 " "

The airplane was loaded to 64,000 lbs. gross weight. For reference, the wing center section incidence is 7° 4' greater than in the C-119.

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III Factual Data

P. Miscellaneous Tests (cont'd.)

10. Aerodynamic Roughness - Ref. FT107-1, -3, -5, -6, -7, -11, -12

Beginning with the first flights, repeated reference was made to aerodynamic roughness. It was never considered dangerous, but was investigated with the pack removed by means of tufts and an observer in another airplane. It was determined that the air flow over the blunt rear section of the carrier was spoiled. Refairing of the fuselage rear lines should be done on any future model. At various times, it was also noted that (1) the roughness was decreased by closing the cowl flaps (2) the roughness was not affected by power changes (3) opening the paratroop door definitely increased the "bumping" felt in the cabin. On one occasion it was reported that the roughness increased when the ship was banked 30° into a turn, with no other change.

11. Nacelle Door Loads - Ref. FT107-9

Lateral oscillation of the landing gear doors was noted. Removal of the small spring-loaded auxiliary doors reduced the oscillation, but it was not completely eliminated. Strain measurements were taken in the door control rods, in straight flight and in sideslips. The average oscillating loads varied from maximum values of approximately 50 lbs. to 820 lbs., at a frequency of 13 cycles per second. The steady load in the rod with gear retracted, at 130 mph, for comparison, is 1060 lbs. No corrective action was considered necessary.

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IV REFERENCES 1. Fairchild Engineering Report No. R107-009, <u>XC-120 Flight Test Specification, Phase I</u>, revised December 1950. 2. Fairchild Engineering Report No. R107-000B, <u>Model Specification for M-107 Airplane</u>, dated 12 January, 1950 3. Air Force Specification No. 1815-A, amended 29 March, 1946, <u>Stability and Control Characteristics of Airplanes</u> 4. Fairchild Flight Test Reports FT107-1 to FT107-16 inclusive.					

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FAIRCHILD ENGINE AND AIRPLANE CORP., FAIRCHILD AIRCRAFT DIV.,
HAGERSTOWN, MD. (ENGINEERING REPORT NO. FTE 130)

SUMMARY OF FLIGHT TESTS - XC-120 PACKPLANE

J.A. CLOPPER 12 FEB '51 23PP.

AERODYNAMICS (2)
PERFORMANCE (2)

AIRPLANES, TRANSPORT - PERFORMANCE
AIRPLANES - STABILITY
C-120 - FLIGHT TESTS
C-120 - PACKPLANE

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