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HEADQUARTERS

TSEPE/REB/ks/2-6275

AIR ~~TECHNICAL SERVICE~~ COMMAND

WRIGHT FIELD, DAYTON, OHIO

MEMORANDUM REPORT ON

Date 3 December 1946

SUBJECT: Effect of Modified Nose and Clipped
Wing Tip Panels on the Level Flight
Performance of the P-80A-1.

OFFICE TSEPE

Contract or Order No.

SERIAL No. TSEPE-2042

Expenditure Order No.

A. Purpose

To report the results of flight tests conducted to determine the comparative level flight performance of a P-80A-1 airplane in each of the following configurations:

- a. With a modified nose section and clipped wing tip panels.
- b. With a modified nose section and standard wing tip panels.
- c. With a standard nose section and standard wing tip panels.

B. Factual Data

1. The airplane tested was the P-80A-1, AAF No. 44-85123 which was used in winning first place in the jet propelled Thompson Trophy Race at the National Air Races at Cleveland in September 1946. This aircraft had been modified to the extent of replacing the standard wing tip panels (and tank racks) with clipped wing tip panels, modifying the fuselage nose section, removing the dive flaps and stripping as much weight as possible. These tests were conducted to determine the effect of those modifications on the level flight performance of the P-80A type aircraft. Fourteen hours and forty-five minutes were flown in seventeen flights to complete the tests which were run at Wright Field from 11 September 1946 to 14 November 1946.

2. Before the tests were started a new engine was installed and the airplane was thoroughly checked. The first series of flight tests were made with the airplane as it was flown in the air race. The clipped wing tip panels were then removed and the standard wing tip panels (and tank racks) were reinstalled for the second series of tests. Upon completion of the second series of tests the modified nose section was replaced by the standard nose section (six .50 caliber dummy guns installed) and the

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dive flaps and miscellaneous equipment were reinstalled. Photographs of the airplane showing the modified nose section, the clipped wing tip panels and the standard wing tip panels are included in Appendix III.

3. Instrumentation of the aircraft was standard except that calibrated sensitive airspeed, altimeter, tachometer and free air temperature indicators were installed in lieu of the standard aircraft instruments. A shielded free air temperature pick-up was installed on the nose wheel door. All instrument readings were recorded by the pilot.

4. The loading consisted of full fuel, pilot, and parachute for all flights.

The take-off gross weights for each series of tests were:

a. With modified nose section, clipped wing tips, (no tank racks) miscellaneous equipment removed and 820 pounds of ballast in the nose - 11,483 pounds.

b. With modified nose section, miscellaneous equipment removed, 820 pounds of ballast in the nose, but with standard wing tips (and tank racks) - 11,563 pounds.

c. The standard airplane with standard fuselage nose, standard wing tips, and all equipment reinstalled but with only 500 pounds of ballast in the nose - 11,750 pounds.

5. The engine installed was a J-33-11, Serial No. 006130 and the diameter of the tail pipe nozzle was 18.5 inches. A new tail cone was installed just before the third series of flights were made in the standard configuration. This tail cone then had to be rotated to stay within the permissible clearance limits before the last flight in the third series was made.

6. No test airspeed system was installed for the test flights. The aircraft was calibrated against a P-80A pacer airplane during each series of tests as the standard flush static system would be affected by the change from the modified to the standard nose configurations. This change in position error amounted to an increase in indicated airspeed reading from eight to nine miles per hour at high speed. The airspeed calibrations obtained are plotted in Figures 3 and 4 in Appendix I.

7. Stabilized speed versus rpm points were obtained in level flight at altitudes of 2700, 7600, 12,000 and 34,700 feet in the first and third series of flights. However, in the second series of flights these points were only obtained at 2700, 7600 and 12,000 feet. Power settings were

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selected so that a complete speed range of the P-80A-1 airplanes would be covered at the altitudes flown. The rpm's were corrected for the effect of weight and temperature. Curves of rpm versus Speed (indicated airspeed corrected for instrument error, position error and compressibility effect = true speed X the square root of the density ratio) were plotted in Figure 2 and Curves of Speed versus Altitude are plotted in Figure 1. The effect of the modified nose and clipped wing tips on the level flight performance of this aircraft have been summarized in the following table:

	Altitude	Mod. Nose & Clipped Wing Tips Gr. Wt. 11,480 Lbs.	Mod. Nose & Std. Wing Tips Gr. Wt. 11,560 Lbs.	Std. Nose & Wing Tips Gr. Wt. 11,750 Lbs.
	Ft.			
Maximum	2700	562	556	548
True Airspeed	7600	561	554	546
At	12000	557	550	542
11,500 RPM	34700	505	---	501
Cruising	2700	445	439	435
True Airspeed	7600	452	445	439
At	12000	457	450	444
10,300 RPM	34700	464	---	451

C. Conclusions

1. The effect of the modified nose section and clipped wing tip panels (no tank racks) on the high speed of this aircraft amounted to approximately 15 mph true airspeed at low altitude and approximately 4 mph true airspeed above 30,000 feet.
2. The effect of the modified nose section and clipped wing tip panels on the cruising speed amounted to approximately 12 mph true airspeed at all altitudes.
3. The gain in speed resulting from the installation of the clipped wing tips (no tank racks) was approximately the same as the effect of stripping the airplane and modifying the fuselage nose.
4. The flying characteristics were not changed by these modifications.
5. The P-80A airplane flown in these tests in the standard configuration was approximately 15 mph faster at low altitude than the average of the P-80A's that have been tested at Wright Field. This difference in speed is believed

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due to the variation in thrust output of the J-33-11 type engines which are installed in this type aircraft.

6. Development of a thrust measuring device comparable in accuracy and reliability to the torque meters used on reciprocating type engines is a necessity for the intelligent interpretation and comparison of performance flight test results obtained on jet aircraft.

D. Recommendations

None.

Prepared by:

Robert E. Brandenburg
ROBERT E. BRANDENBURG
Engineer, Performance Engineering Section

flown by:

Walter J. McAuley
WALTER J. MCAULEY, 1st Lt., A. C.
Test Pilot, Fighter Operations Section

Approved by:

Kenneth O. Chilstrom
KENNETH O. CHILSTROM, Major, A. C.
Chief, Fighter Operations Section

Approved by:

Louis H. Siebelsky
LOUIS H. SIEBILSKY
Chief, Performance Engineering Section

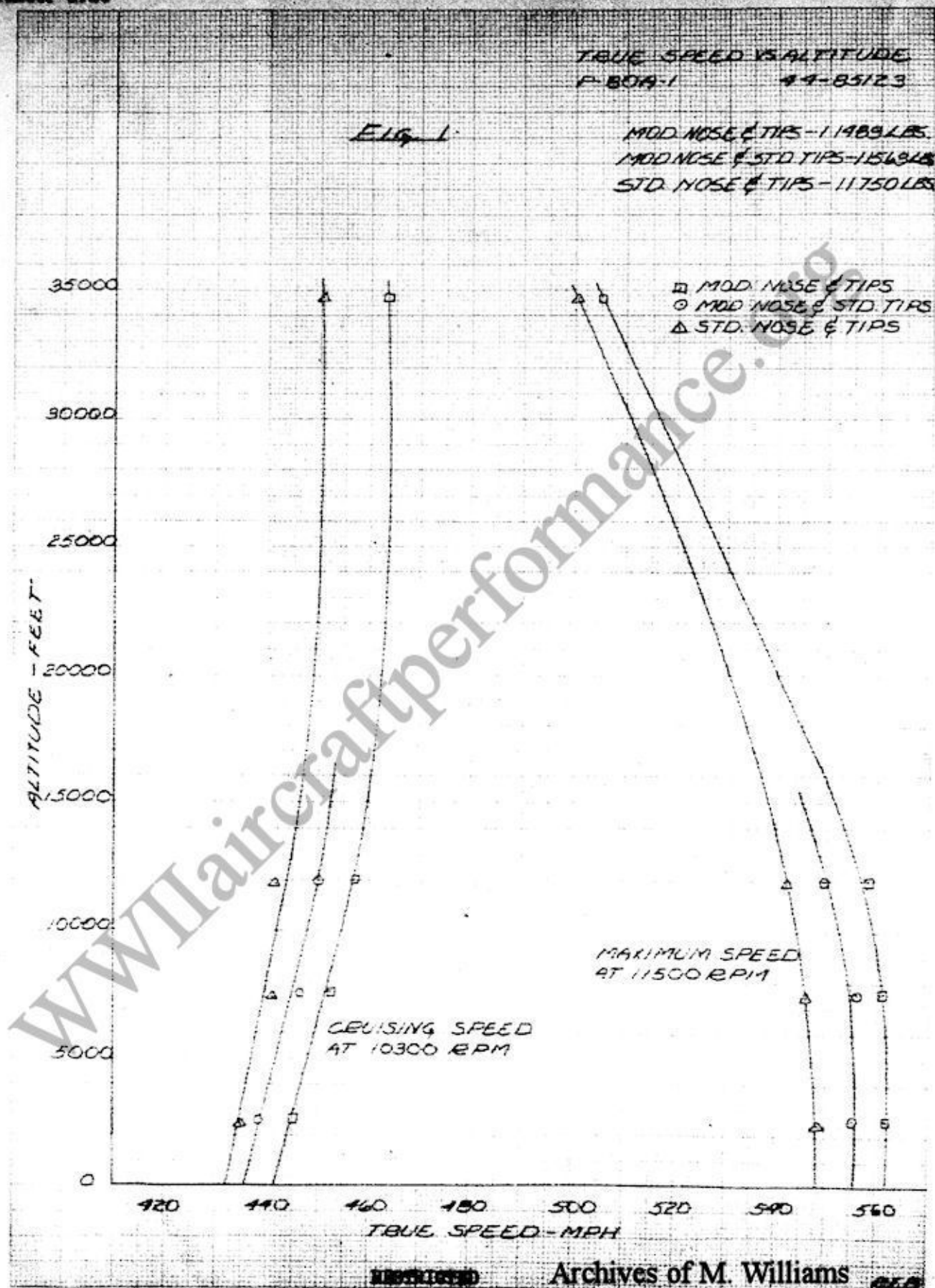
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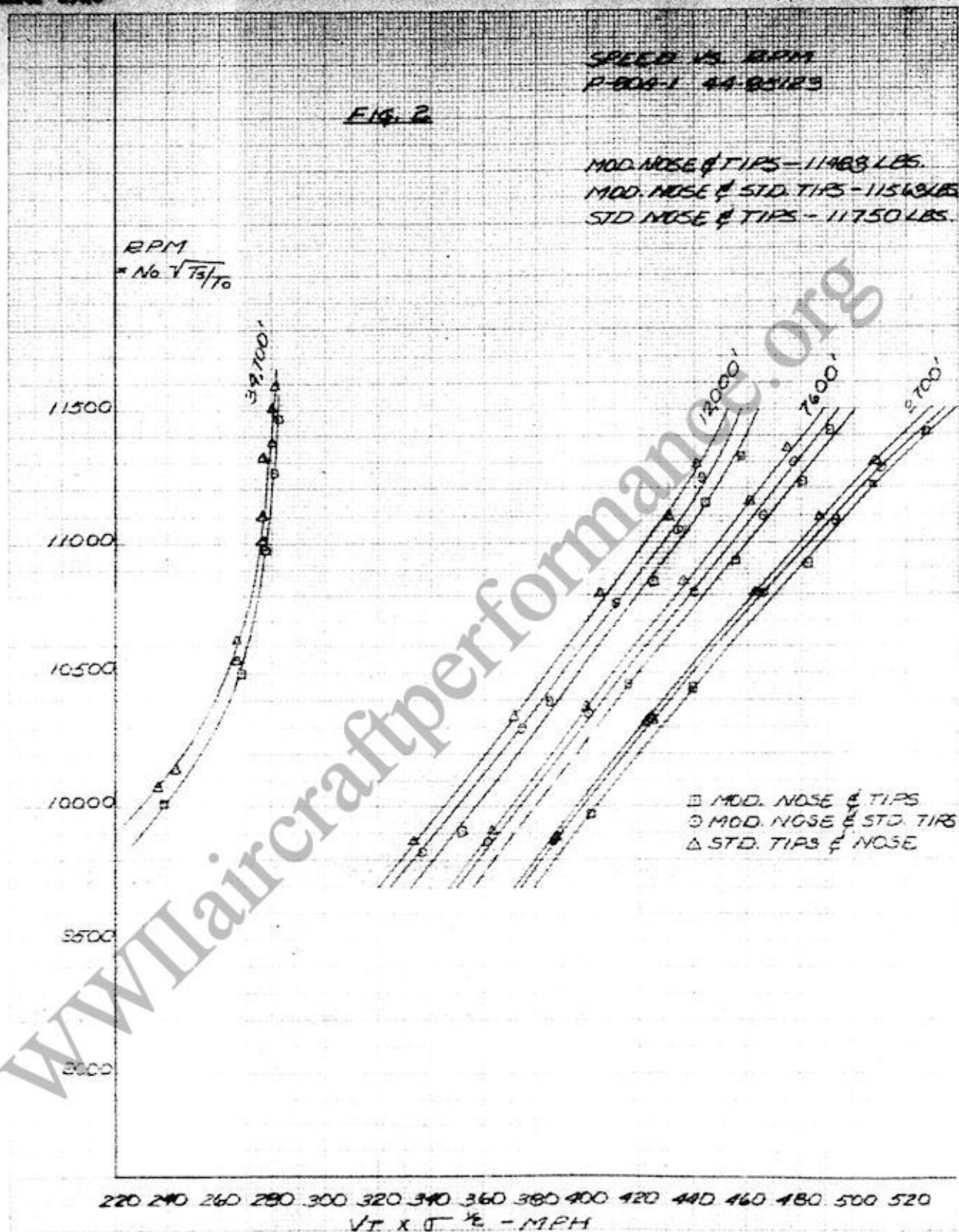
Charles M. McCorkle
CHARLES M. MCCORKLE, Colonel, A. C.
Chief, Test Engineering Sub-Division

Approved by:

Albert Boyd
ALBERT BOYD, Colonel, A. C.
Chief, Flight Test Division

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