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**PROOF DEPARTMENT
ARMY AIR FORCES PROVING GROUND COMMAND
EGLIN FIELD, FLORIDA**

FINAL REPORT

ON

PRELIMINARY TEST OF XA-26B AIRPLANE

Serial No.: 6-43-2-2 No. of Pages: 9 Date: 13 July 1943.

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1-Flight Section

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1. OBJECT:

To conduct a preliminary test to determine the general operating characteristics of:

a. The 75mm gun installation when fired at ground target at various speeds and at a range of approximately five hundred (500) yards.

b. The G. E. sighting station and the upper and lower remotely controlled twin caliber .50 turrets when operated at various air speeds.

c. The airplane when used in low level attacks against ground targets.

2. INTRODUCTION:

This test was requested in a letter from the Commanding General, Army Air Forces Materiel Command, Wright Field, Dayton, Ohio, dated June 15, 1943, to the Commanding General, Army Air Forces Proving Ground Command, Eglin Field, Florida, subject: "Proof Tests of Douglas IA-26B Airplane with 75mm Cannon."

a. Description.--The armament equipment contained in the IA-26B airplane consists of:

(1) One (1) 75mm M-4 gun experimentally mounted in the forward section of the fuselage and to the right of the pilot. The gun, which is hand-loaded by an operator seated behind the gun, is aimed and fired by the pilot. A magazine of twenty (20) rounds capacity is located above the breech of the gun within easy reach of the loader.

(2) Two (2) twin caliber .50 B&W gun turrets, one (1) upper and one (1) lower located in fore and aft staggered position in the waist section of the airplane. The turrets are remotely controlled from a sighting station equipped with a double-ended periscope.

3. CONCLUSIONS.--It is concluded that:

a. The 75mm gun installation, as tested, is satis-

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factory except for the changes contained in RECOMMENDATIONS, paragraphs 4 a to e inclusive.

b. The rear sighting station has the following unsatisfactory characteristics:

- (1) Inadequate field of view in lower front and rear quarters.
- (2) The location of the lower turret power switch is unsatisfactory.
- (3) The sight reticle is unsatisfactory.
- (4) The headrest is uncomfortable and permits sighting with only the right eye.
- (5) The periscope sighting installation is not waterproof.
- (6) Provisions for rapid dehydration of the lens to prevent fogging is essential.

c. The low level flying characteristics of the airplane, as tested, at speeds up to and including three hundred fifty (350) I.A.S. are satisfactory.

4. RECOMMENDATIONS.--It is recommended that:

a. Every effort be made to substitute a type M-6 sight with a variable reflector mounted independently of the cowling for the present pilot's sight installation.

b. In the event this is impractical, a variable reflector mounted independently of the cowling be installed in place of the fixed reflector with which the subject airplane is now equipped.

c. The reticle be of the ring and dot type instead of the ladder type.

d. A more satisfactory method of retaining the 75mm ammunition in the ammunition holder be developed.

e. More clearance for ejected cases be provided at the point where the ejected cases are deflected downwards after leaving the metal chute.

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f. Increased field of view from rear gunner's compartment be provided to give satisfactory direct scanning in lower front and rear quarters.

g. A study be made to consider the advisability of incorporating additional controlled firepower in the tail of the subject airplane.

h. The periscopes be so constructed as to prevent free water from entering the sighting system during rain storms.

i. The lower turret power switch be located in a position more accessible to the sighting station operator and where visual inspection will be possible from the operating position.

j. The sighting station stowing lock be given a positive action, preferably with detent springs.

k. An adjustable headrest of more comfortable design be incorporated to permit sighting with either eye and that blank eyepieces be provided on either side of the sighting lens to avoid the strain occasioned by the necessity for squinting one (1) eye.

l. The reticle image be such that the outer ring has the greater intensity, and that a slightly more pronounced dot be incorporated in the aiming circle.

m. A study be made to determine whether or not it is practicable to inter-connect the sighting column and gunner's seat and provide power travel.

n. A sighting means be provided for aligning the periscopes during direct scanning so that the target will be positioned within the periscope field of view.

o. Better ventilation be provided for the rear gunner's compartment.

5. RECORD OF TEST:

The test was conducted in accordance with the test program attached hereto as Inclosure 1.

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6. DISCUSSION:

ARMAMENT

a. Due to a complete absence of data concerning angle of attack of the subject airplane at various speeds and dimensions relative to the position of the gun with respect to the sight, approximate boresighting only was possible. In view of this no precise statement can be made at this time concerning the accuracy of the installation. From the results obtained with the firing accomplished, however, it would appear that a degree of accuracy comparable to that achieved with the 75mm installation in the XB-25G airplane can be expected.

b. Of equal importance with the method of installing the gun in the ship is the accuracy of the sight. In the subject airplane the present sighting arrangement is definitely unsatisfactory and too much emphasis cannot be placed on securing immediate rectification of this defect. The reflector is mounted in a ball socket on the cowl over the instrument panel and is attached to a rib in the plexiglas dome by means of lightweight dural brackets and two (2) adjustable rods. At all of the attaching points thick rubber spacers were inserted, apparently for the purpose of absorbing vibration. A similar approach to the problem of mounting the sight was attempted in the XB-25G airplane until it was established that a stable sight cannot be secured by mounting the instrument on an inherently unstable platform. Under the circumstances then, it is only to be expected that the sight in the YA-26B airplane has excessive vibration and is unable to retain its correct setting with respect to the gun. In addition to the vibration noted, it also is necessary to hunt to initially locate the reticle image in the reflector glass. Further, the reflector installed in the subject airplane is of the fixed type and therefore cannot be adjusted in flight to permit firing at various ranges. As a means of overcoming these deficiencies, it is suggested that a study be made with a view to installing a type N-6 sight independent of the cowling and complete with a variable reflector, similar to that now installed on the XB-25G airplane, photographs of which are attached hereto as Inclosure 2. It is also important that a suitable sun screen be included which can be cut in or out as desired.

c. In the event the installation of the type N-6 sight as shown is impracticable due to space limitations, a variable type reflector assembly complete with sun screen should be installed in such a manner that no vibration occurs and be

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so designed as to provide at least four (4) stops which will permit the pilot to set in the desired range without the necessity for attempting to read a finely graduated scale. At the same time it should be noted that the ladder type reticle is regarded with considerable disfavor, and it is requested that a ring and dot reticle type with short horizontal lines intersecting the circumference of the circle be substituted.

d. From a total of sixty-nine (69) rounds fired during the test the indications are that the gun installation should prove generally satisfactory. It will be appreciated, however, the limited firing accomplished does not provide sufficient evidence to conclude that the nose section on production airplanes will satisfactorily withstand gun blast over an extended period. On the gun with which the subject airplane was equipped it was noticed that there was a fine crack in the welded seam in the mount immediately to the rear of the left hand trunnion. The gun also had what is believed to be excessive play in the trunnion bushes. This play when measured at the muzzle allowed the barrel to be moved by hand a distance of three-eighths ($3/8$) of an inch down and one (1) inch upwards. This play does not seem to have resulted in excessive dispersions or been otherwise harmful, and it is being mentioned merely to draw attention to the existence of the play in the trunnion bushes as well as the cracked weld in the mount.

e. During the test low level attacks were carried out at two hundred fifty (250), three hundred (300) and three hundred fifty (350) I.A.S. against a vertical ground target, size twenty feet by thirty feet (20' X 30') with an eight foot by eight foot (8' X 8') aiming point, and also frontal and beam attacks against an M-4 tank hull. Fifteen (15) shots were fired by each of two (2) pilots against the vertical target from five hundred (500) yards range which resulted in twenty-nine (29) hits, ten (10) of which were in the eight foot by eight foot (8' X 8') bull's eye. All of the twenty-nine (29) hits were contained within a rectangle fifteen feet by eighteen feet (15' X 18'). Against the tank a mission was fired by each of two (2) pilots. On the first mission against the tank some shells with fifty (50) percent charge were fired in error and the results cannot therefore be considered as representative. On the second mission eleven (11) rounds were fired against the front of the tank and six (6) hits were scored. Inasmuch as these scores were achieved without benefit of accurate bore-sighting and that the attacks were carried out at the different speeds mentioned, it is believed that this airplane, due to its excellent low level flying characteristics, will be capable of

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delivering a better than acceptable degree of accuracy.

f. The muzzle cover was removed from the gun after thirty-five (35) rounds had been fired. While the gun was operated with the muzzle cover attached, the concentration of smoke and fumes in the pilot's cockpit was most objectionable. After the muzzle cover was removed a definite improvement in this condition resulted. The reason for this is attributed to the fact that when the muzzle cover closed on recoil it trapped a quantity of smoke in the barrel which, due to leaks in the petal assembly, gradually seeped back into the compartment. With the muzzle cover removed the air blast through the open barrel swept the barrel clean carrying the residual fumes with it through the metal loading chute and out of the airplane through the vent provided.

g. At the conclusion of the firing missions, it was noticed that one of the ribs situated under the gunner's seat and at a point immediately to the rear of the metal loading ejection chute was battered and partially torn from its retaining rivets. It is considered that this was occasioned by the force of the ejected cases after the muzzle cover was removed. Inasmuch as it is proposed to remove the muzzle cover from these guns, it will be advisable to investigate a means of preventing this condition occurring in production aircraft.

h. The webbing straps at present employed for retaining the shells in the ammunition holders are not regarded favorably for the reasons that it takes too long to load ammunition into the airplane, occasionally too long to release a shell for loading, and that, unless the strap is positioned across the center of the shell, it has a tendency to vibrate off leaving the shell free to leave the holder during airplane take-off or maneuvers. The location of the ammunition holder is very satisfactory because it allows the round to be withdrawn from the holder and placed in the loading tray without any lost motion. Throughout the test all loading was done with the aid of the wooden ram which also is satisfactory. In connection with this ram, however, it is suggested that a holding bracket be placed at some convenient position to the right of the loading tray so that it will be handy to the loader after the round has been placed in the tray.

i. The direct scanning from the rear gunner's compartment generally is none too good and is definitely unsatisfactory in the lower front and rear quarters. It is appreciated that production airplanes will be equipped with periscopes having a

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seventy (70) degree field of view, but even so it is not considered practical to rely entirely on using the periscopes for locating attacking fighters in the lower front and rear sectors.

j. Due to the limited amount of time available for the preliminary test of this airplane, only one (1) mission was flown for purposes of checking on the rear gunner's station. On this mission five (5) fighter aircraft were detailed to make as many successive attacks as possible with the XA-26B airplane flying straight and level at seven thousand (7,000) feet at two hundred seventy (270) I.A.S. The fighter types employed were P-38J, P-39Q, P-51 and two (2) P-51B's. In the course of a run of approximately fifty (50) miles the P-51 and the two (2) P-51B's were able to make several effective attacks without using maximum throttle. The P-39Q and the P-38J were able to make occasional passes only. On the return run when the XA-26B speed was increased to three hundred thirty-five (335) to three hundred forty-five (345) I.A.S. with the altitude decreasing from seven thousand (7,000) feet to sea level, only the P-51 and the two (2) P-51B's were able to stay with the XA-26B, but could not make passes. The P-39Q and the P-38J were out-distanced and therefore unable to make any attacks. The position assumed by the P-51 and the two (2) P-51B's on the return run varied from immediately behind the vertical stabilizer to immediately behind the left horizontal stabilizer and in this position placed the defensive fire at a decided disadvantage. Due to speed which the XA-26B aircraft is able to maintain, it may be anticipated that all deflection attacks by fighter aircraft will end up behind the tail and therefore hard to shoot at when most vulnerable. For this reason, a study of the possibility of placing additional controlled firepower in the tail position is recommended.

k. During the course of the test one hundred ten (110) rounds of caliber .50 ammunition were fired from the upper turret in all positions except toward the front. The lower turret was not fired. In view of this nothing can be said at this time concerning the functioning of these turrets as installed in this airplane.

l. Many photographs of the armament installations in the XA-26B airplane were taken but the negatives were destroyed during the developing process. Due to the fact the airplane had left the station at the time this occurred, retakes could not be made.

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AIRPLANE

m. Although no operational suitability tests were carried out while the XA-26B airplane was at this station, some general observations concerning the flying and handling characteristics of the airplane were made by the four (4) experienced pilots who flew the gunnery missions. These observations follow:

- (1) The low level flying characteristics of the airplane at speeds up to and including three hundred fifty (350) miles per hour I.A.S. are satisfactory.
- (2) The elevator trim tabs are not sufficiently sensitive, i.e., gear ratio too low.
- (3) The rudder and aileron controls are excellent.
- (4) Flap control which will permit any desired flap setting is suggested.
- (5) Landing gear handle to have positive positioning when landing gear is down.
- (6) Insufficient ventilation in pilot's cockpit.
- (7) The hydraulic lines in rear of pilot's compartment be inclosed so as not to introduce additional heat into the compartment and also to reduce the possibility of being sprayed with hydraulic fluid should they be punctured in combat.

7. INCLOSURES:

Inclosure 1 - Test Program.

Inclosure 2 - Photographs of sight installation in XB-26G Airplane.

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**PROOF DEPARTMENT
ARMY AIR FORCES PROVING GROUND COMMAND
EGLIN FIELD, FLORIDA**

6 July 1943.

SUBJECT: Program for Preliminary Test to Determine General Armament and Flight Characteristics of the XA-26B Airplane. (S.T. No. 6-43-2-2)

TO: Commanding Officer, 1st Proving Ground Group, AAFPGC, Eglin Field, Florida.

1. GENERAL:

a. The equipment to be tested is:

- (1) The experimental installation of a type M-4 75mm gun with a type M-6 mount in the nose section, and**
- (2) The operation of the sighting station and upper and lower caliber .50 turrets in the waist position in a Douglas model XA-26B airplane.**

b. This is a FIRST PRIORITY preliminary experimental service test.

c. The ammunition allowance will be one hundred (100) rounds, 75mm M-48 H.E. inert loaded, and two hundred (200) rounds of caliber .50 ball ammunition.

d. This test was requested by letter from the Commanding General, Army Air Forces Materiel Command, Wright Field, Dayton, Ohio, dated June 15, 1943, to Commanding General, Army Air Forces Proving Ground Command, Eglin Field, Florida, subject: "Proof Tests of Douglas XA-26B Airplane with 75mm Cannon."

e. Major John G. E. Williams is designated as the Machine Gun and Cannon Section Project Officer.

Enclosure 1.

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f. Captain D. T. Gordon is designated as the 1st Proving Ground Group, AAFPGC, Test Officer for this test.

g. At the conclusion of the test, the subject airplane will be returned to Wright Field.

2. OBJECT.—To conduct a preliminary test to determine the general operating characteristics of:

a. The V5mm gun installation when fired at ground target at various speeds and at a range of approximately five hundred (500) yards.

b. The G. E. sighting station and the upper and lower remotely controlled twin caliber .50 turrets when operated at various air speeds.

c. The airplane when used in low level attacks against ground targets.

3. METHOD OF CONDUCTING TEST:

a. Two (2) pilots will fire five (5) rounds each at a speed of two hundred fifty (250), three hundred (300), and three hundred fifty (350) miles per hour at a vertical ground target (30' X 30') with a central aiming point (8' X 8') at a range of approximately five hundred (500) yards.

b. Two (2) pilots will fire ten (10) rounds each at an M48 tank hull, firing five (5) rounds at the front and five (5) rounds at the side of the tank at a range of approximately five hundred (500) yards.

c. A tracking mission will be conducted with several fighter type airplanes making simulated attacks on the subject airplane for the purpose of determining the general characteristics of the sighting station and the upper and lower turrets located in the waist position in the subject airplane.

4. RECORDS:

a. A daily progress report will be kept by the Project Officer.

b. A record of all pertinent events and developments will be kept by the Project Officer.

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c. On completion of the test, there will be a conference of all participating personnel.

5. REPORTS:

A final report on the preliminary test will be submitted to the Chief of the Proof Department, through the Chiefs of the Testing Branch and Machine Gun and Cannon Section, immediately upon completion of the test.

By command of Brigadier General GARDNER:

DUDLEY W. WATKINS,
Colonel, Air Corps,
Chief, Proof Department.

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