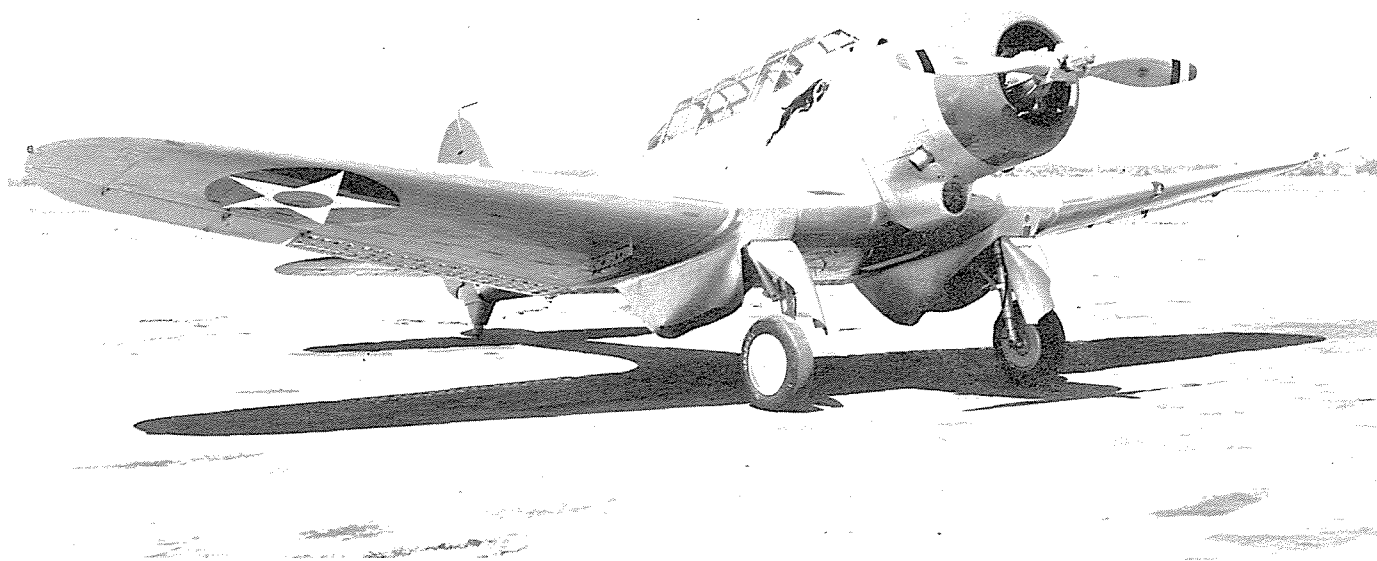




THE NORTHROP BT-1

by Harry Gann, Drawings by Gene Risedorph

(Photos courtesy of Douglas Aircraft Company)

THE U.S. NAVY AND MARINE CORPS have been two of the staunch advocates of dive-bombing as a means of gaining the advantage over an enemy's forces. Until the mid-1930s, this had been accomplished with biplanes, both land- and carrier-based.

By the end of 1934, four U.S. manufacturers were actively engaged in the production of dive-bombers for the U.S. Navy and Marine Corps: Curtiss, Martin, Vought, and Great Lakes.

During 1934, the Bureau of Aeronautics completed type specifications for a completely new dive-bomber of "modern" design incorporating the features which had been developed during the past years. This specification was distributed to the industry with the invitation to submit proposals for the design and construction of experimental airplanes on a competitive basis. Five aircraft manufacturers, Curtiss, Vought, Brewster, Great Lakes, and the Northrop Corporation, submitted design proposals and proceeded with the construction of prototype experimental airplanes. These airplanes were completed and submitted for demonstration and trials during 1935 and 1936.

Two of the competitors, Great Lakes and Curtiss, submitted biplanes for trials. As a result of not being of "modern" design, the Great Lakes entry was soon eliminated

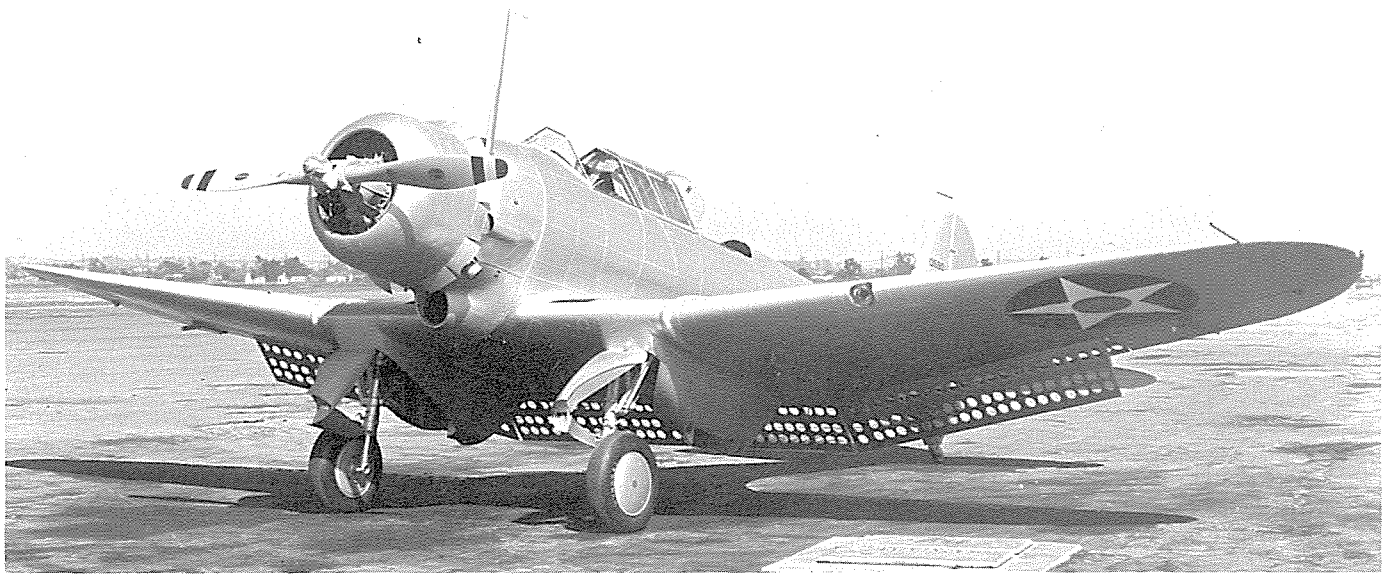
ES3730. BT-1 awaiting delivery to VB-5. Notice the production landing gear doors. (Date of photograph is 24 May 1938.)

from the competition. Having been constructed for a number of years, small quantities of the Curtiss contender variations had been purchased from time to time, but also due to the lack of modern design, Curtiss was also discontinued as a contender.

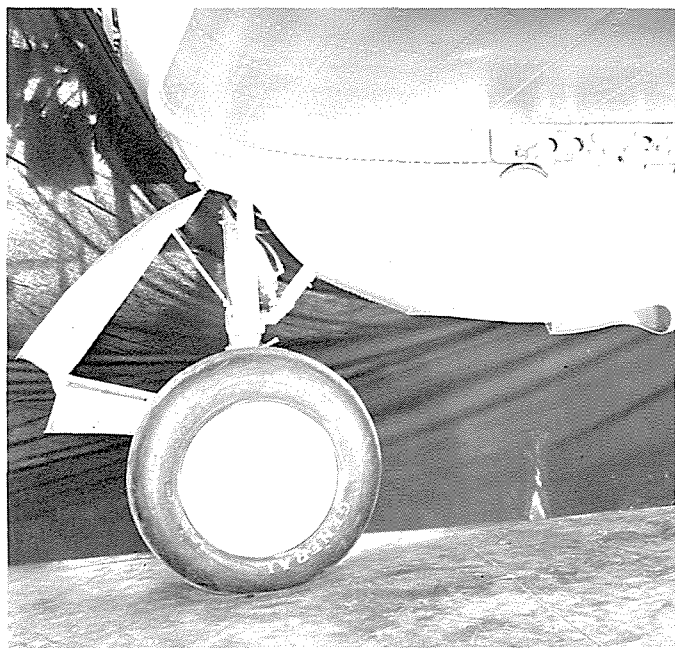
Although one of the highest speed airplanes in the competition, late delivery of the Brewster combined with mechanical difficulties which soon developed resulted in only small quantity procurement of this model.

The best performance was obtained from the entry submitted by the Vought Company. This airplane, however, was seriously handicapped in successfully executing dives as a reversible-pitch propeller was used as a dive brake. This device was a constant source of trouble and while the airplane was produced in quantities, flight operations were hampered by severe restrictions.

Mr. E.H. Heinemann of the Northrop Corporation was selected to serve as project engineer for the development program of the Northrop design under the general supervision of Jack Northrop. Heinemann prepared the initial

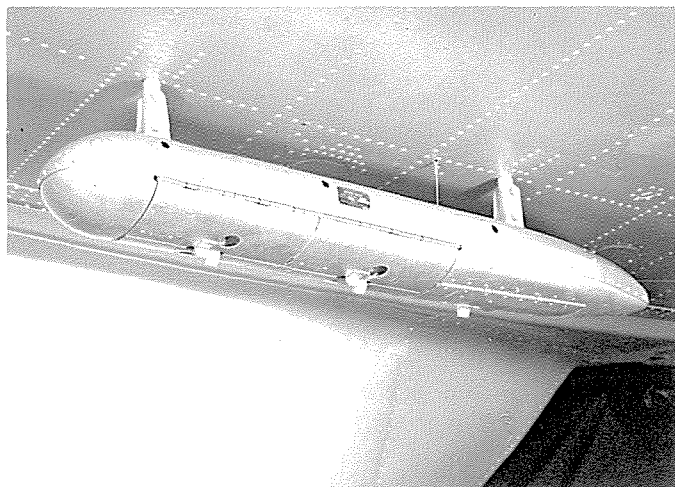
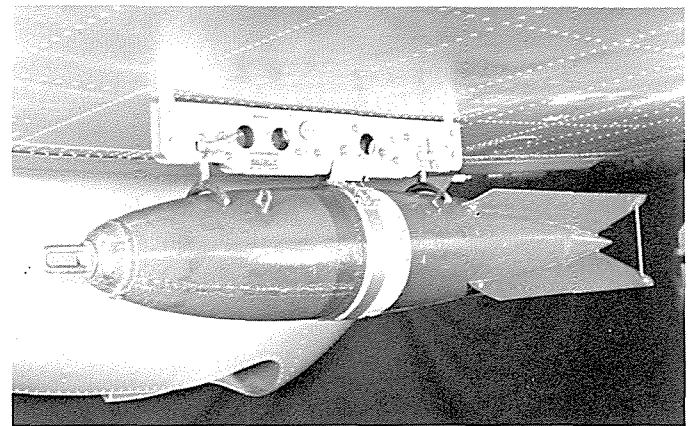


ES3154. BT-1 with dive flaps down and rear canopy open. Notice early version of landing gear doors. Date of photograph is 24 September 1937 prior to delivery and is first aircraft.

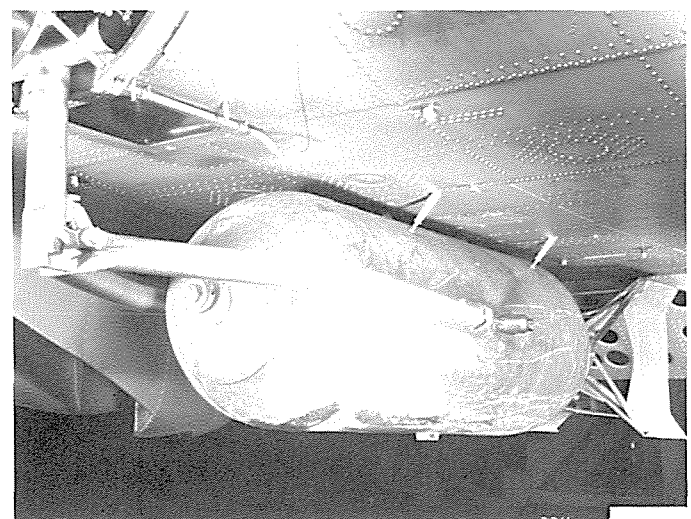


ES3146. Landing gear extended showing preliminary configuration of the door (15 September 1937).

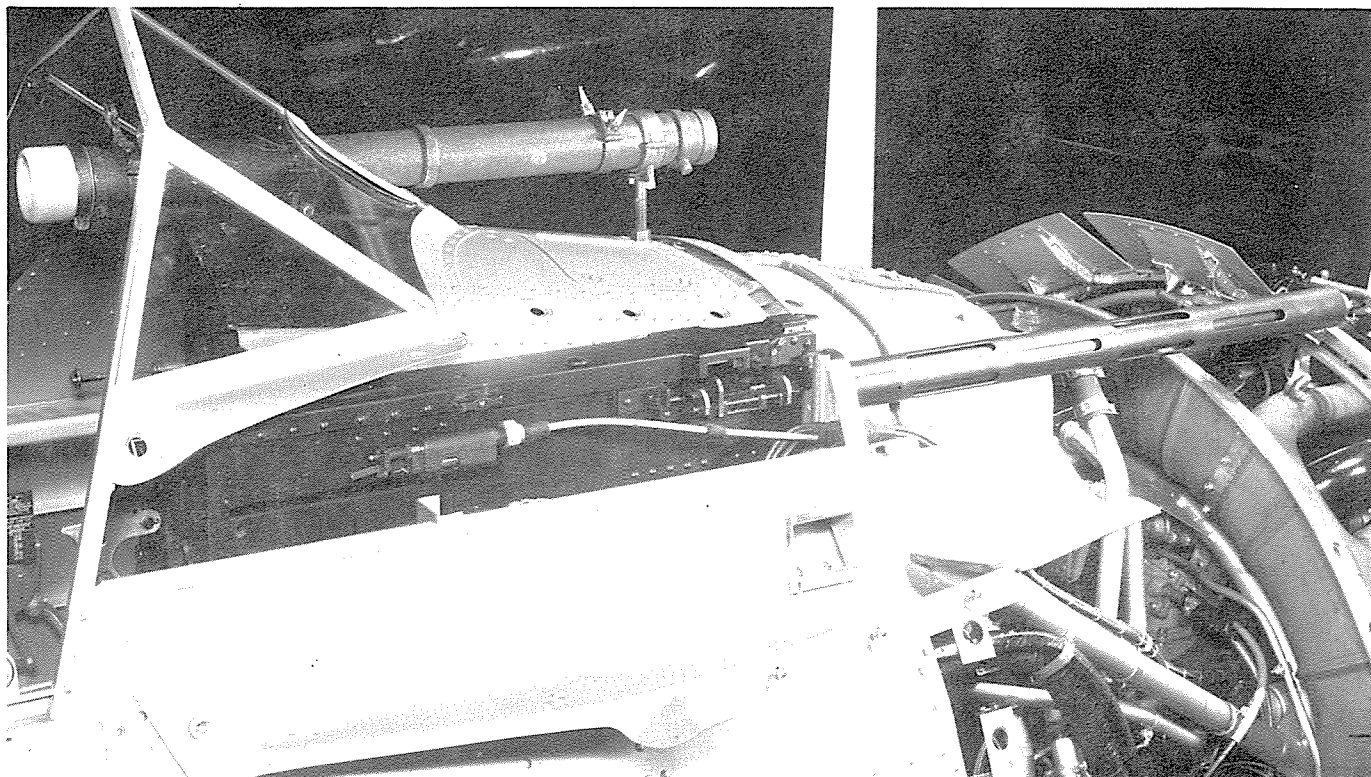
ES3148. 100-pound bomb on the outer wing rack (16 September 1937).



ES3149. Installation of practice bomb rack (16 September 1937).



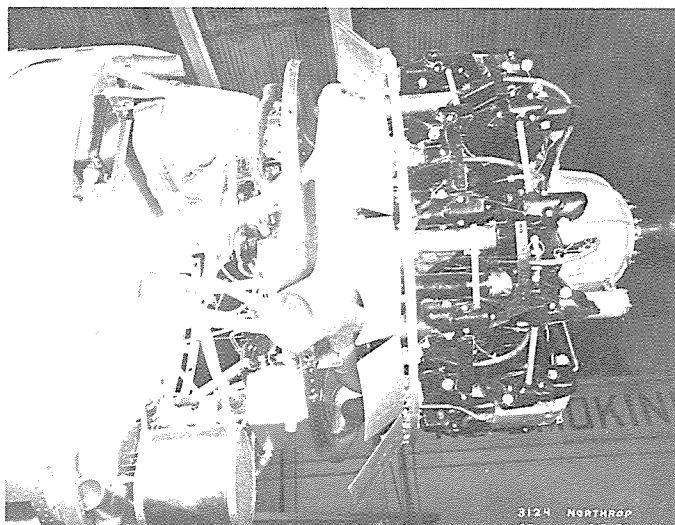
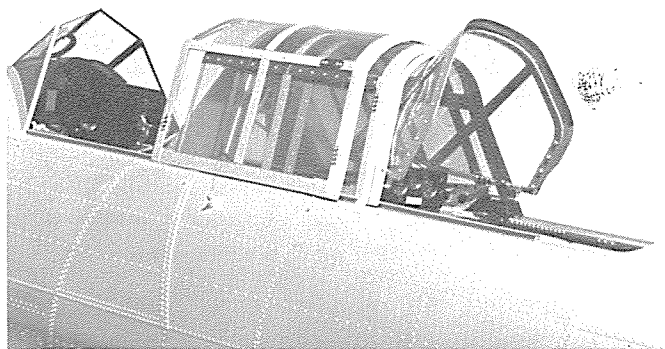
ES3311. 1,000-pound bomb installation (11 November 1937).



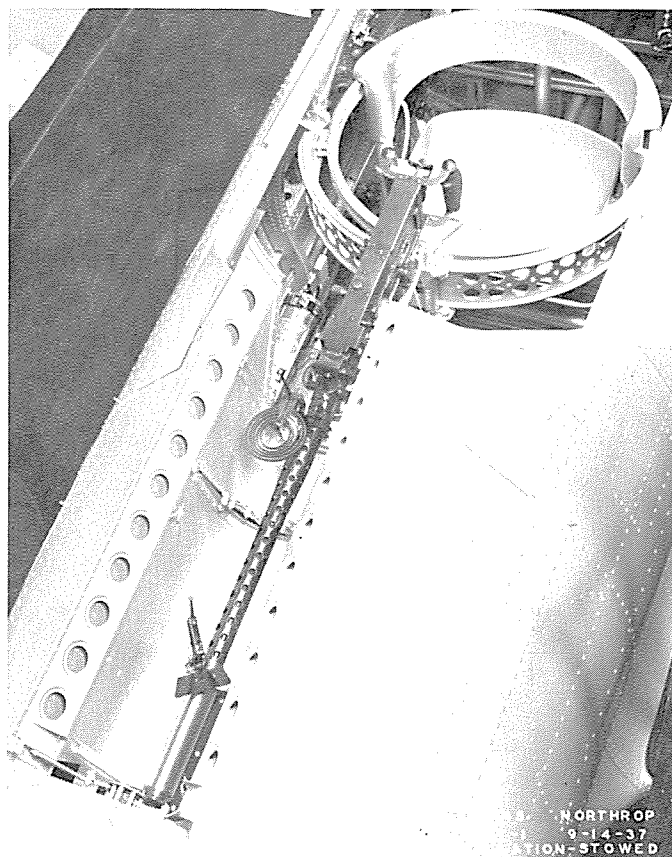
ES3310. Forward gun installation (11 November 1937).

ES3145. Stowed position of the rear flexible gun (14 September 1937).

ES3166. Open canopy of BT-1 (24 September 1937).



ES3124. Engine installation from the right side (2 September 1937).



general arrangement, drawings and design layouts together with the details of the proposal submitted for evaluation. This proposal was accepted by the Navy Department and a contract was awarded for the construction of one experimental dive-bomber designated as the XBT-1.

In July of 1935, the airplane was completed and subjected to a series of flight tests by test pilot Vance Breese to determine the optimum arrangement of a number of its major

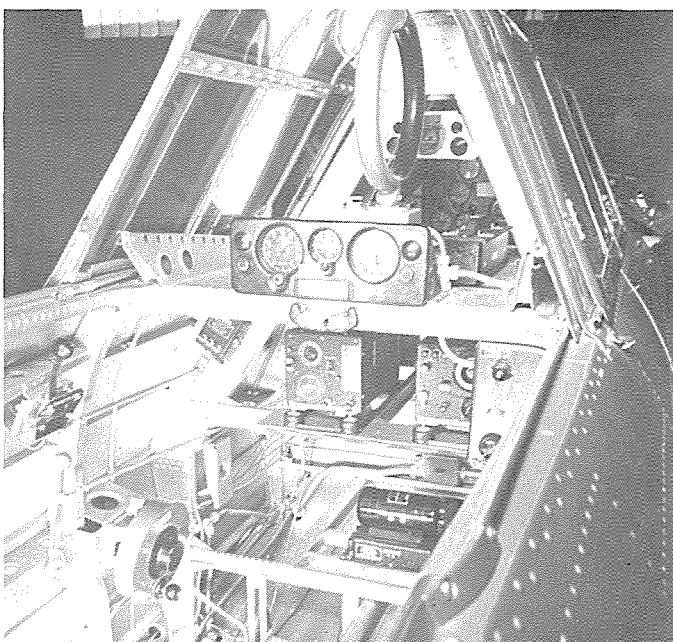
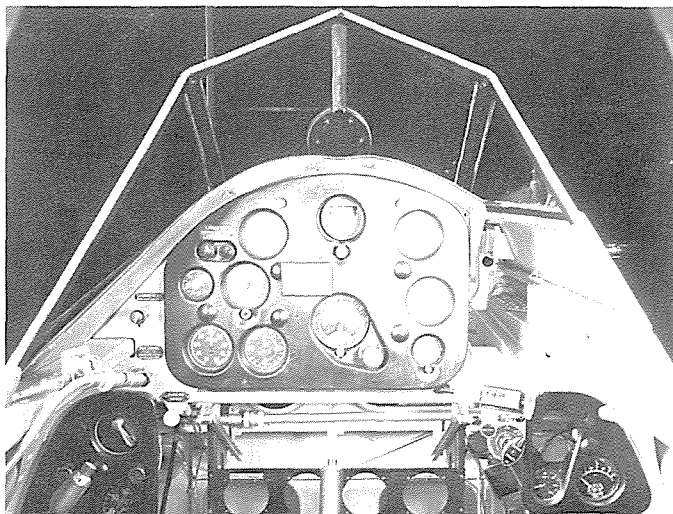
features. During the initial dive test conducted on the XBT-1 using split trailing edge flaps as diving brakes, severe buffeting of the tail surfaces was experienced with the dive brakes in the full open position. It was determined that this buffeting was caused by a wake wave induced by the split flaps in the open position, striking the horizontal tail surfaces. Numerous modifications were tested without success in an endeavor to reduce the magnitude of this disturbance without reducing the effectiveness of the speed-reducing device. The NACA finally advanced the theory that the single wave generated by the open flaps could be broken up into a number of smaller waves or eddies by perforating the surfaces of the flaps. This suggestion was tried on the airplane and it was found that the diving speed of the airplane could be still further reduced by increasing the opening of the dive brakes without reducing tail surface buffeting. Tests also determined that the efficiency of the wing section was not materially affected by the perforations when the flaps were in the closed position.

After successfully completing primary flight and other tests at the factory, the XBT-1 was delivered in December 1935 to the Naval Air Station Anacostia for final demonstrations and acceptance trials by the Navy. Those tests were completed in approximately two months and the airplane accepted as a satisfactory service type. Certain recommended Trial Board changes were incorporated in the airframe and after verification of the effectiveness of these modifications, a contract was awarded in 1936 for the procurement of 54 BT-1 aircraft.

Deliveries began on 21 March 1938 and the last aircraft was delivered on 19 October 1938, the average delivery rate being 7.5 aircraft per month. Fleet squadrons receiving the BT-1s were VB-5 operating aboard the carrier USS *Yorktown* (CV-5) and VB-6 from the USS *Enterprise* (CV-6).

The notable accomplishment of the BT-1 was its subsequent development to the SBD series. The aircraft was redesignated SBD when the Douglas Aircraft Company decided to buy out the remaining 49 percent of the Northrop stock from Northrop and his associates in 1938 and operate the company as the El Segundo plant of Douglas.

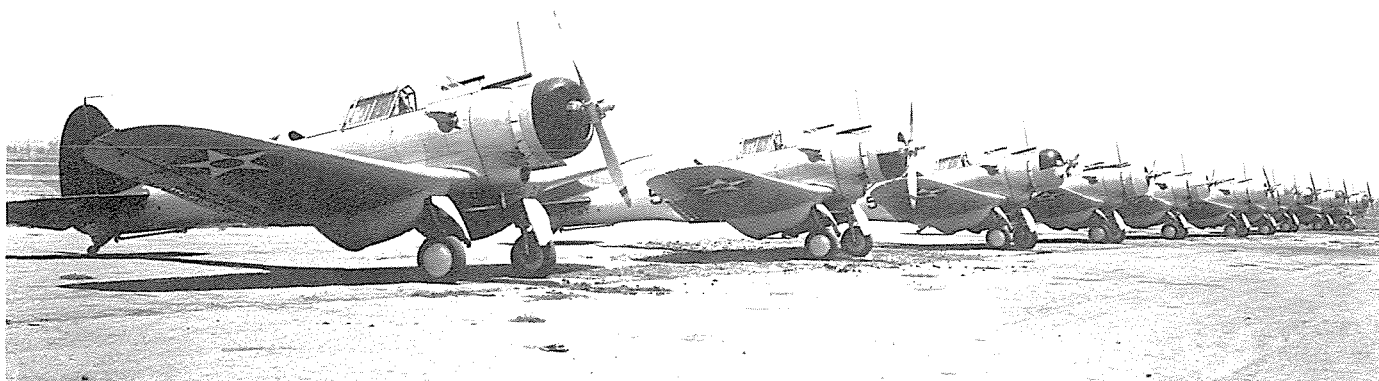
The Battles of the Coral Sea and Midway as well as the subsequent events in the Pacific during the Naval battles against Japan reflected the caliber of the initial development program of the BT-1. □

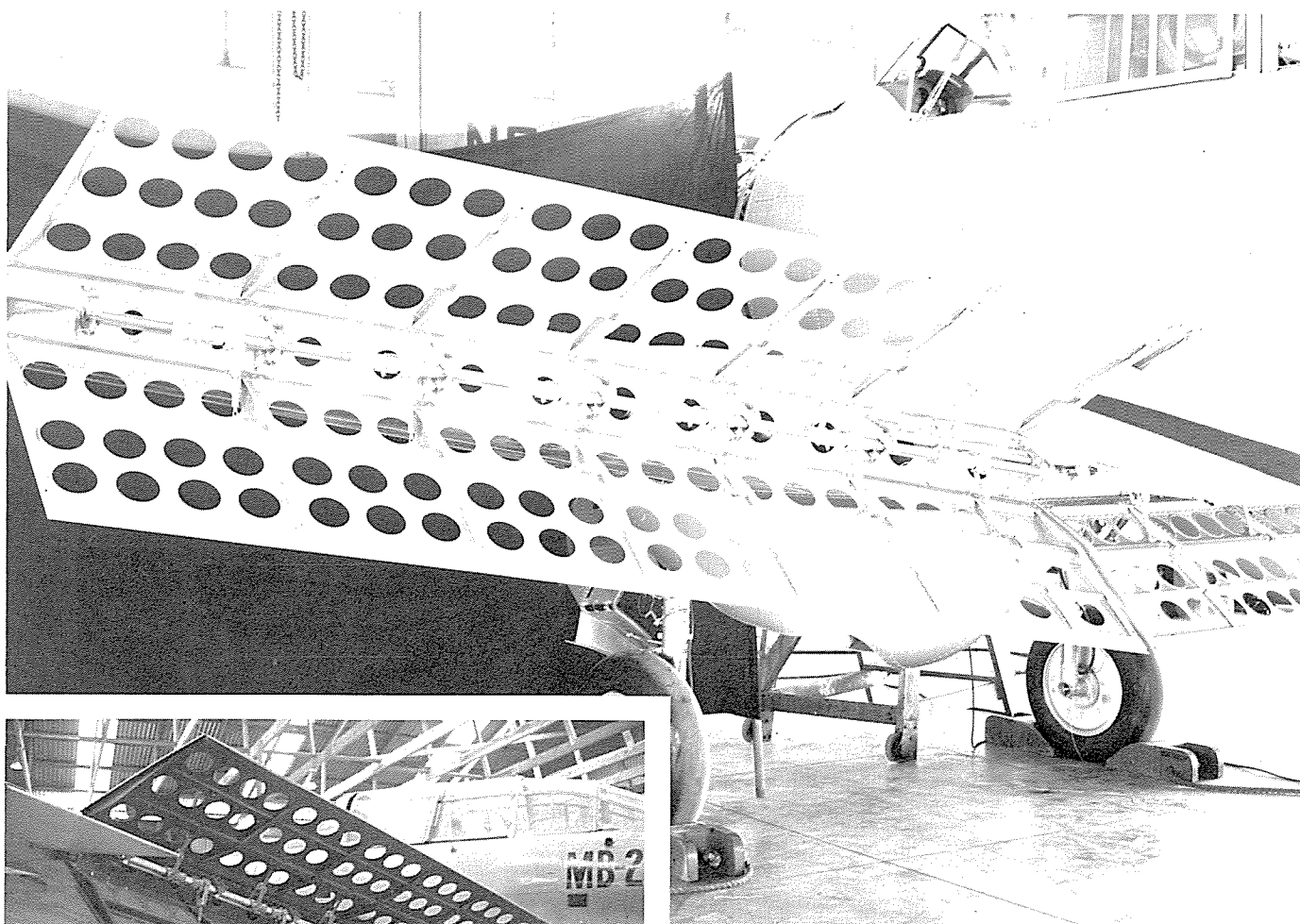
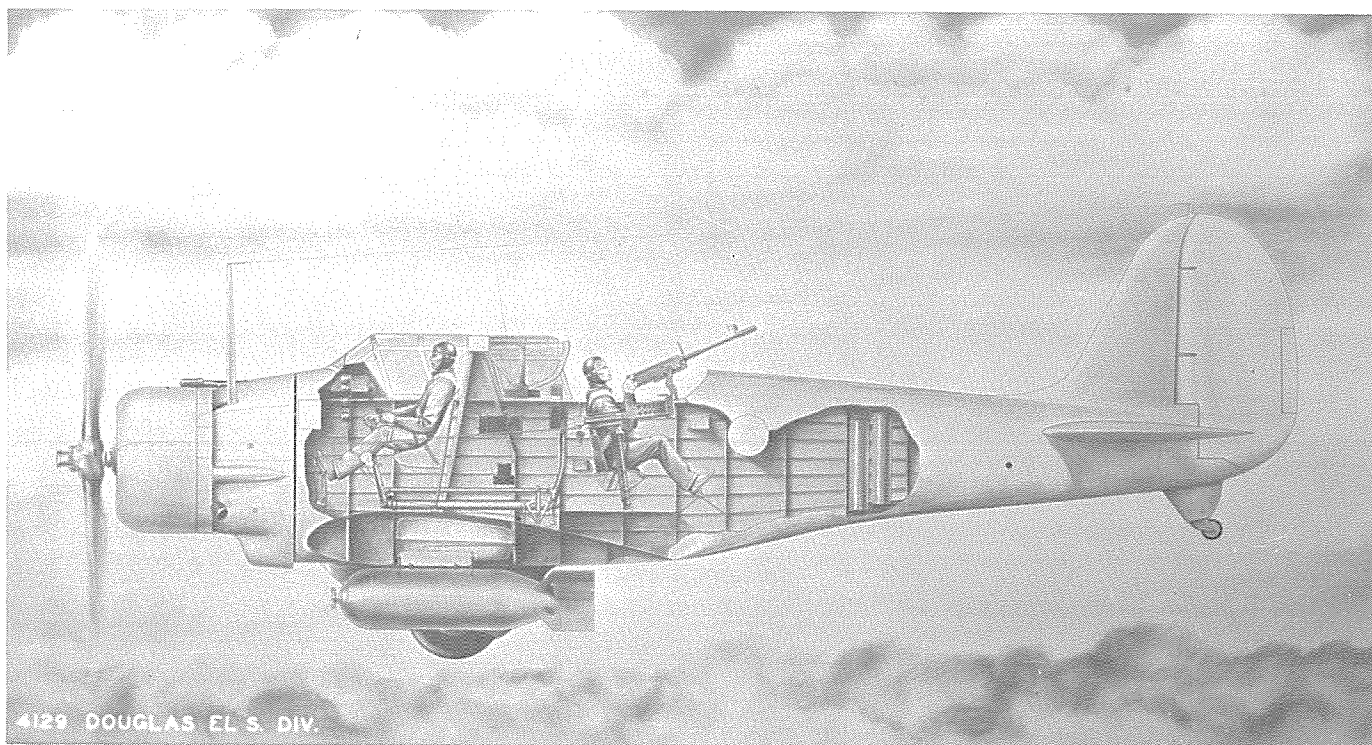


ES3130. Forward cockpit showing the instrument panel (September 1937).

ES3169. Rear cockpit showing instruments and radio installation (September 1937).

ES5063. Lineup of BT-1 aircraft from VB-5. (Photograph taken at Mines Field [LAX] on 1 August 1939.)

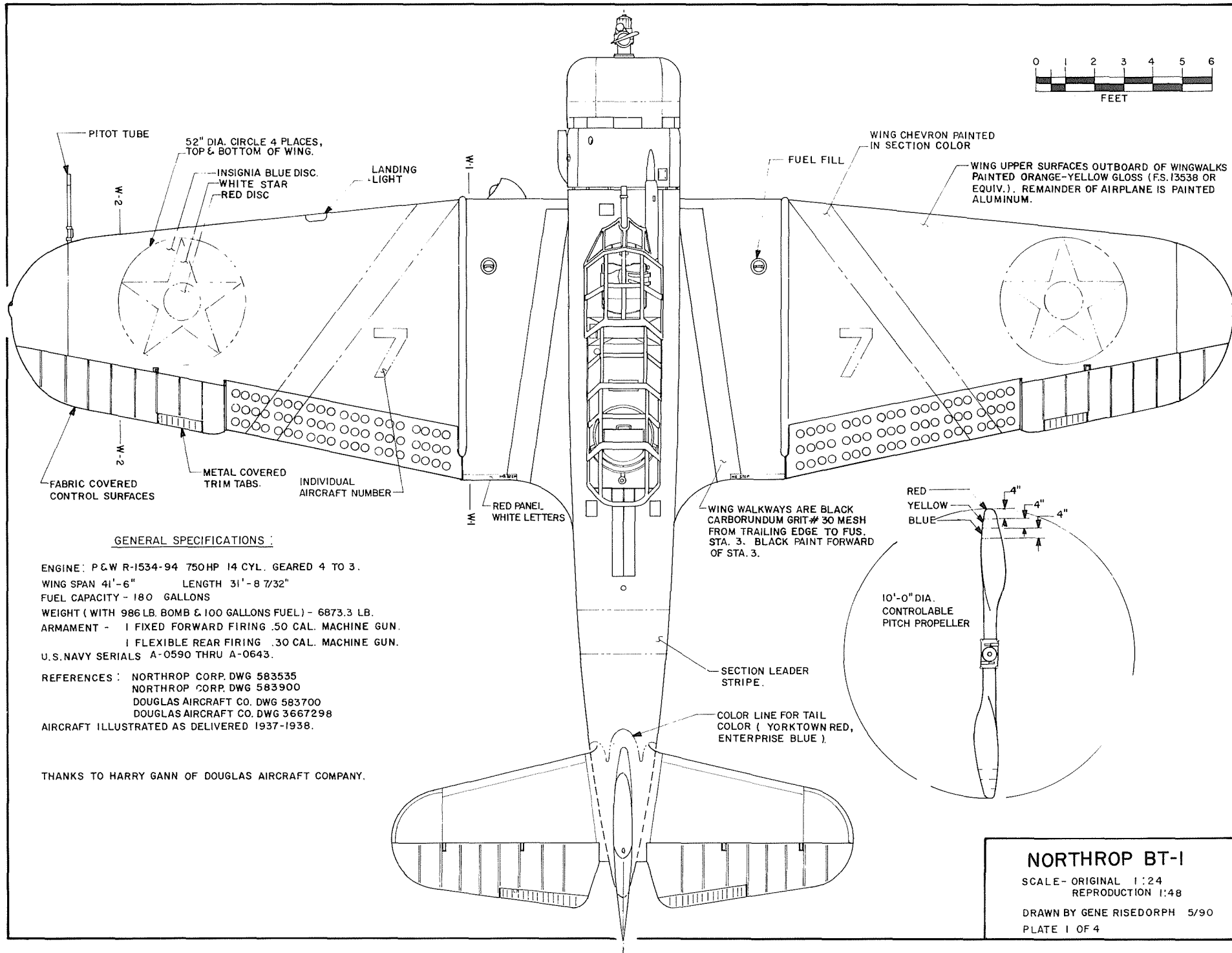


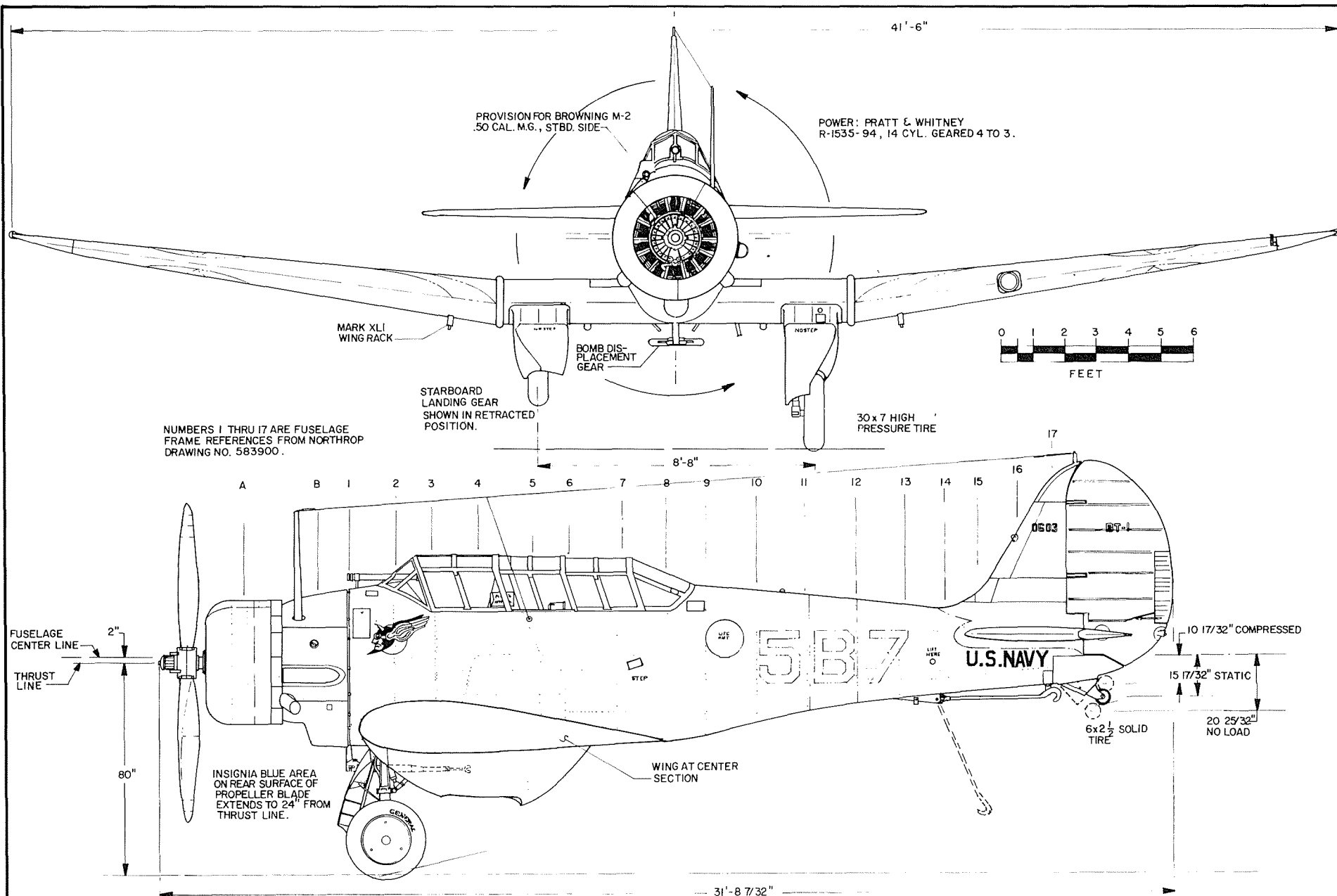


ES4129. Cutaway painting of BT-1.

ES3142. Diving flaps extended (13 September 1937).

The SBD dive flaps remained virtually unchanged from those on the XBT-1. Compare with those on one of the last remaining SBDs at the Nimitz Museum in Fredericksburg, Texas December 1990. (R.E. Williams Photo)





VB-5 (U.S.S. YORKTOWN) WINGED SATAN INSIGNIA.
 RED: FACE, EYE, BACKGROUND BALL, FOREMOST WING & HORN.
 BLACK: BACKGROUND WING & HORN, HELMET, BEARD, MOUSTACHE, FEATHER DETAIL.
 GREY: GOGGLE RIM & STRAP.
 WHITE: TEETH, GOGGLE GLASS.

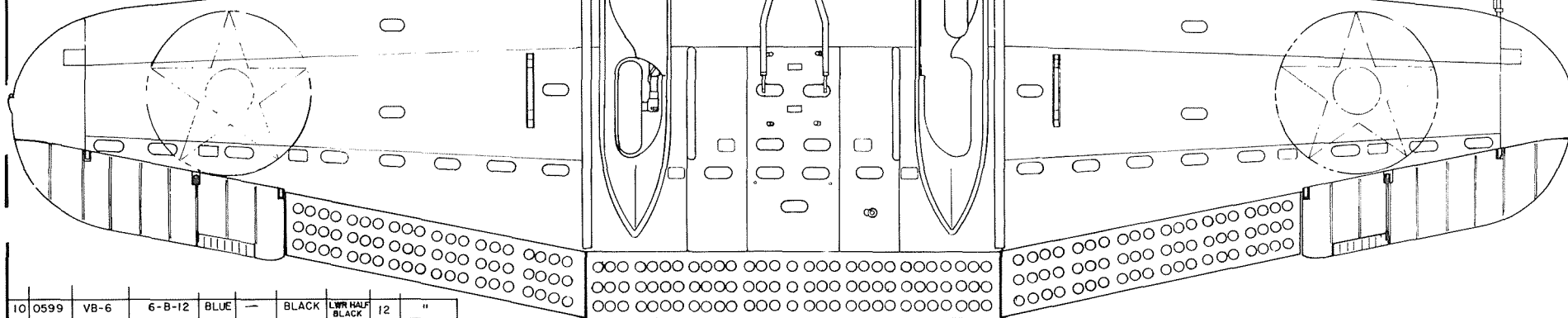
NORTHROP BT-1

SCALE- ORIGINAL 1:24
 REPRODUCTION 1:48

DRAWN BY GENE RISEDORPH 5/90
 PLATE 2 OF 4

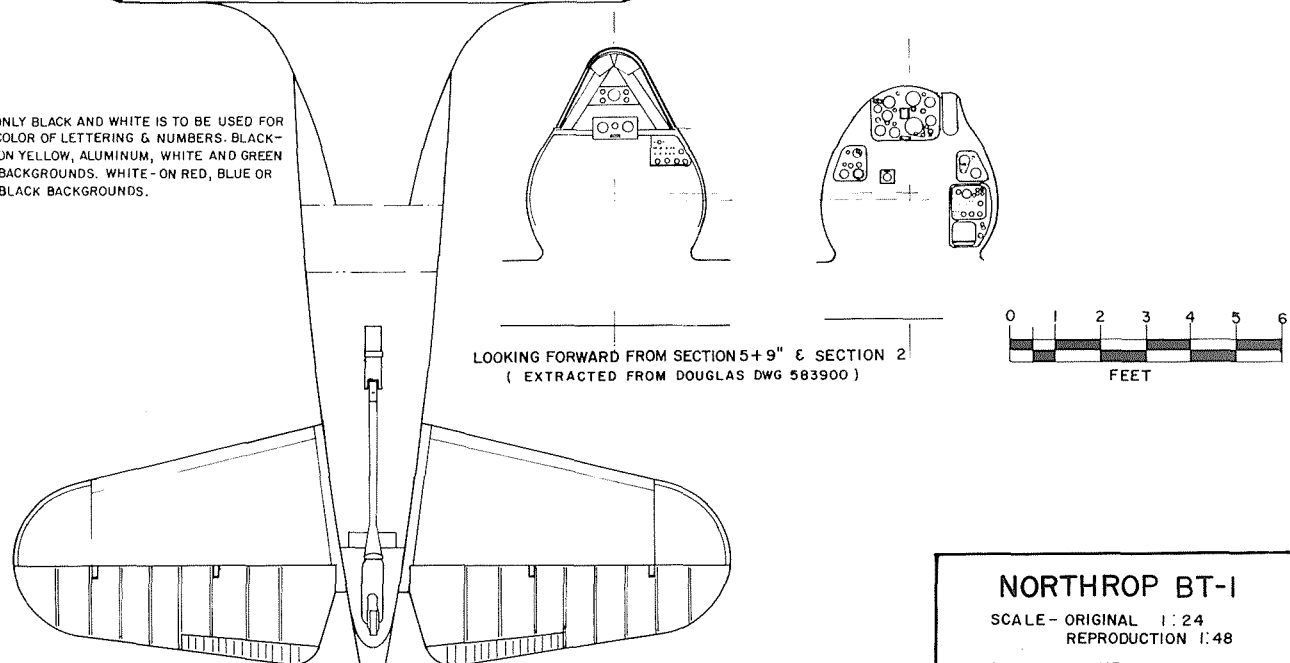
BT-1 COLOR SCHEDULE
FROM DOUGLAS DWG. 583700

N2	NAVY SERIAL NUMBER	SQUADRON	SQUADRON DESIGNATION AND NO.	TAIL COLOR	SECTION LEADER BAND	CHEVRON	COWLING BAND	WING NO.	SQUADRON INSIGNIA
1	0590	TEST	TEST	ALUM	—	—	—	—	—
2	0591	VB-5	5-B-1	RED	RED	RED	RED	1	DEVIL'S HEAD
3	0592	VB-5	5-B-2	RED	—	RED	UPPER HALF RED	2	"
4	0593	VB-5	5-B-3	RED	—	RED	LOWER HALF RED	3	"
5	0594	VB-5	5-B-4	RED	WHITE	WHITE	WHITE	4	"
6	0595	VB-5	5-B-5	RED	—	WHITE	UPPER HALF WHT	5	"
7	0596	VB-5	5-B-6	RED	—	WHITE	LOWER HALF WHT	6	"
8	0597	VB-6	6-B-18	BLUE	—	LEMON YELLOW	LWR HALF L. YELLOW	18	RAM
9	0598	VB-6	6-B-15	BLUE	—	WILLOW GREEN	LWR HALF W. GREEN	15	"

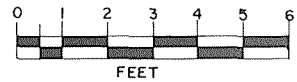


10	0599	VB-6	6-B-12	BLUE	—	BLACK	LWR HALF BLACK	12	"
11	0600	VB-6	6-B-9	BLUE	—	BLUE	LWR HALF BLUE	9	"
12	0601	VB-6	6-B-6	BLUE	—	WHITE	LWR HALF WHITE	6	"
13	0602	VB-6	6-B-3	BLUE	—	RED	LWR HALF RED	3	"
14	0603	VB-5	5-B-7	RED	BLUE	BLUE	BLUE	7	DEVIL'S HEAD
15	0604	VB-5	5-B-8	RED	—	BLUE	UPPER HALF BLU	8	"
16	0605	VB-5	5-B-9	RED	—	BLUE	LWR HALF BLUE	9	"
17	0606	VB-5	5-B-10	RED	BLACK	BLACK	BLACK	10	"
18	0607	VB-5	5-B-11	RED	—	BLACK	UPPER HALF BLK	11	"
19	0608	VB-5	5-B-12	RED	—	BLACK	LWR HALF BLACK	12	"
20	0609	VB-5	5-B-13	RED	WILLOW GREEN	WILLOW GREEN	WILLOW GREEN	13	"
21	0610	VB-5	5-B-14	RED	—	WILLOW GREEN	UPPER HALF WGRN	14	"
22	0611	VB-5	5-B-15	RED	—	WILLOW GREEN	LWR HALF W. GREEN	15	"
23	0612	VB-5	5-B-16	RED	LEMON YELLOW	LEMON YELLOW	LEMON YELLOW	16	"
24	0613	VB-5	5-B-17	RED	—	LEMON YELLOW	UPPER HALF LYL	17	"
25	0614	VB-5	5-B-18	RED	—	LEMON YELLOW	LWR HALF L. YELLOW	18	"
26	0615	VB-6	6-B-1	BLUE	RED	RED	RED	1	RAM
27	0616	VB-6	6-B-2	BLUE	—	RED	UPPER HALF RED	2	"
28	0617	VB-6	6-B-4	BLUE	WHITE	WHITE	WHITE	4	"
29	0618	VB-6	6-B-5	BLUE	—	WHITE	UPPER HALF WHT	5	"
30	0619	VB-6	6-B-7	BLUE	BLUE	BLUE	BLUE	7	"
31	0620	VB-6	6-B-8	BLUE	—	BLUE	UPPER HALF BLUE	8	"
32	0621	VB-6	6-B-10	BLUE	BLACK	BLACK	BLACK	10	"
33	0622	VB-6	6-B-11	BLUE	—	BLACK	UPPER HALF BLK	11	"
34	0623	VB-6	6-B-13	BLUE	WILLOW GREEN	WILLOW GREEN	WILLOW GREEN	13	"
35	0624	VB-6	6-B-14	BLUE	—	WILLOW GREEN	UPPER HALF WGRN	14	"
36	0625	VB-6	6-B-16	BLUE	LEMON YELLOW	LEMON YELLOW	LEMON YELLOW	16	"
37	0626	VB-6	6-B-17	BLUE	—	LEMON YELLOW	UPPER HALF LYL	17	"
38	0627	TEST	TEST	ALUM	—	—	—	—	—
39	0628	SPARE	SPARE	ALUM	—	—	—	—	—

ONLY BLACK AND WHITE IS TO BE USED FOR
COLOR OF LETTERING & NUMBERS. BLACK-
ON YELLOW, ALUMINUM, WHITE AND GREEN
BACKGROUNDS. WHITE- ON RED, BLUE OR
BLACK BACKGROUNDS.



LOOKING FORWARD FROM SECTION 5+9" & SECTION 2
(EXTRACTED FROM DOUGLAS DWG 583900)



NORTHROP BT-1

SCALE- ORIGINAL 1:24
REPRODUCTION 1:48

DRAWN BY GENE RISEDORPH 5/90
PLATE 3 OF 4

0629 TO 0643 INC. SAME AS 0628 REF. DWG # 5050151

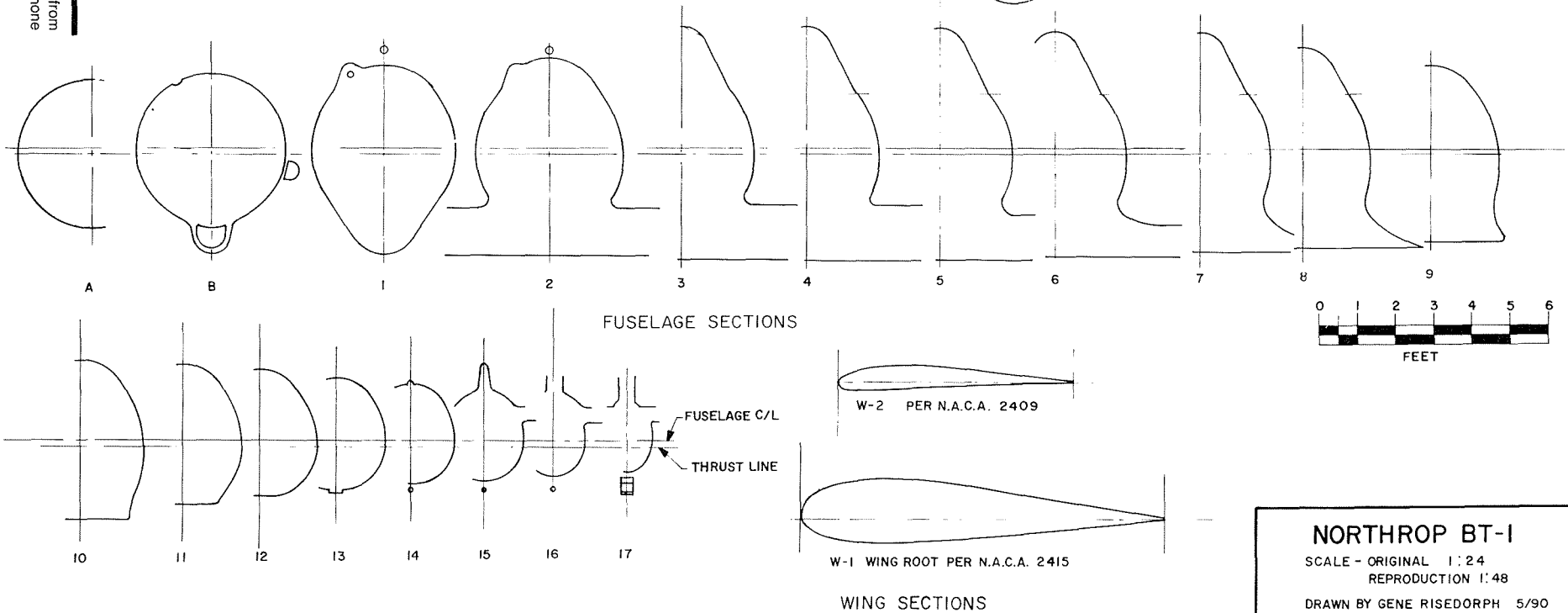
The full-size drawings of the Northrop BT-1 in a set of four plates are available from the artist Gene Risedorph, 402 Washington Drive, Arlington, Texas 76011, phone (817) 277-8829.

VB-6 (U.S.S. ENTERPRISE) CHARGING RAM INSIGNIA.
BLACK AND WHITE.

FRONT & REAR CANOPIES SHOWN
IN FULL OPEN POSITION.

TAIL WHEEL ASSEMBLY
SHOWN IN FLIGHT POSITION

RIVET PATTERNS ILLUSTRATED ARE THOSE
DISCERNIBLE IN AVAILABLE PHOTOGRAPHS.



NORTHROP BT-1

SCALE - ORIGINAL 1:24
REPRODUCTION 1:48

DRAWN BY GENE RISEDORPH 5/90
PLATE 4 OF 4