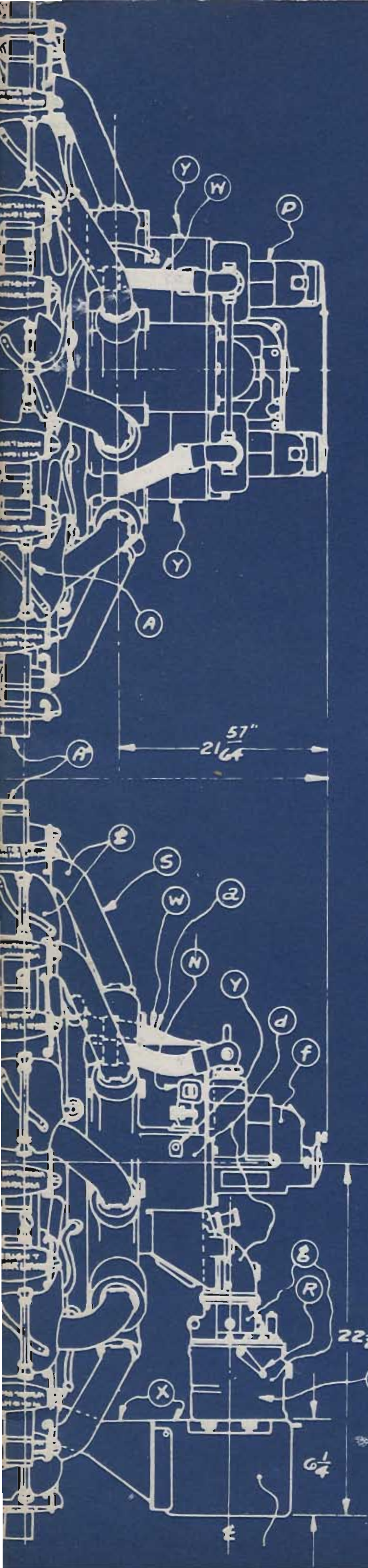
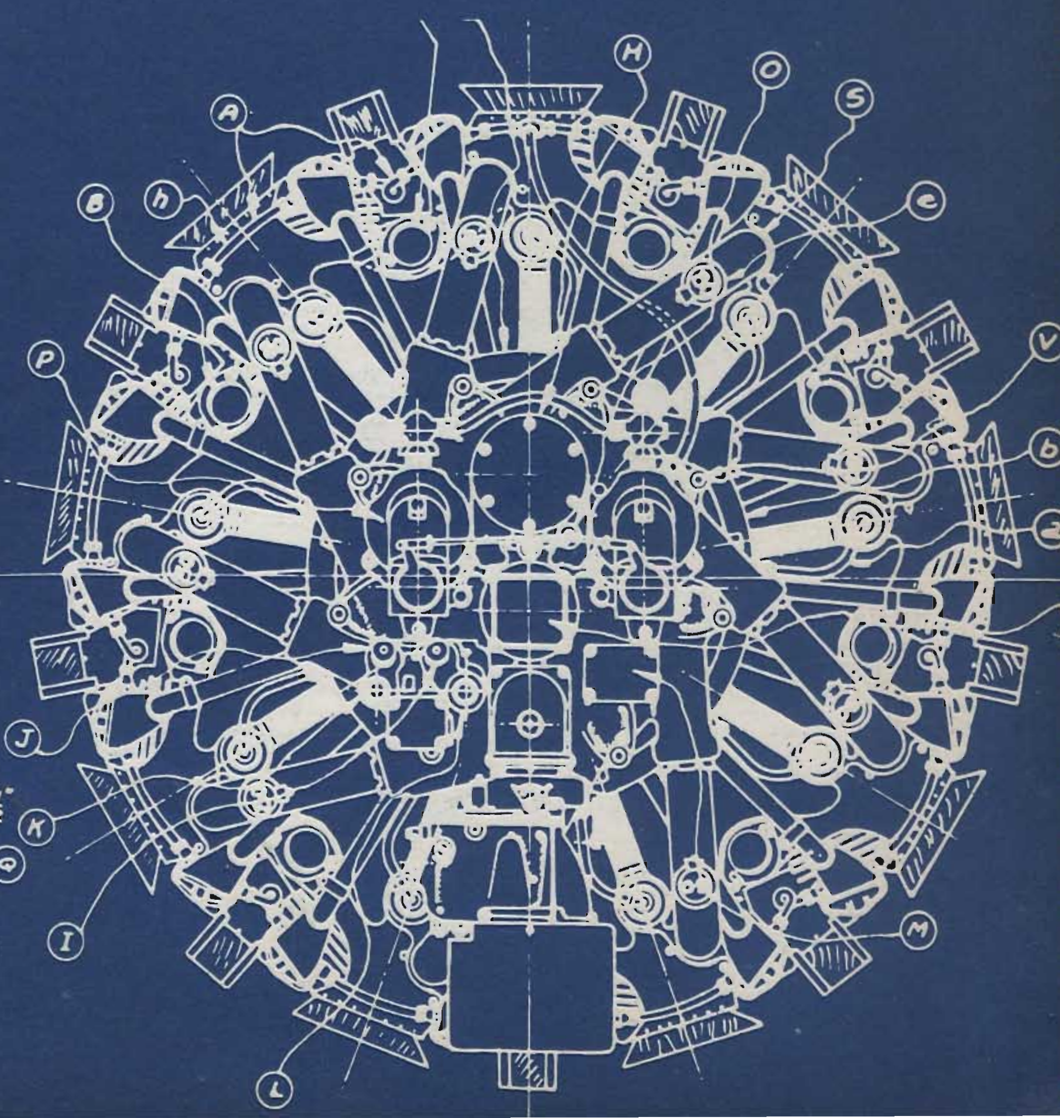
SCALE MODELS by WYLAM





A decade ago the Automobile Age slipped almost imperceptibly into the Air Age . . . But the transition did not go unnoticed by one of America's most brilliant young draftsmen who quickly turned his talents to airplanes and motors. His singular genius for fine detail and plan-layout immediately stamped his work in this field as outstanding . . . and "Drawn by Wylam" soon became a widely recognized trademark of excellence in aeronautic draftsmanship.

"Model Airplane News" magazine is proud to have published William Wylam's works for the past ten years. And in response to numerous requests for a single volume to include all these superb drawings, we offer this distinctive collection to all discriminating aeromodelers.

AIR AGE INC.

Publishers of "Model Airplane News"

Above is the original foreword written some thirty years ago which brought into focus the abilities of William Wylam and his drafting talents. The thirty years since have produced even more Wylam specialties. Actual total count of his efforts is difficult, but it is a safe assumption that this extremely talented and very prolific man has drawn plans for about 100 various planes consisting of over 230 individual plates. For the statistically minded this would approximate a set of plans every four and one-half months for almost 40 years, a seemingly impossible feat when you consider the amount of research Mr. Wylam put into every drawing. As a matter of fact, it has always been his ambition to completely document the fabulous Waco series and although he has devoted more than 12 years to research, he hasn't yet begun to near the end of the road.

This reprint of the first of five books of Wylam plans has been necessitated by the demand of the readers of "Model Airplane News." The amazing popularity of these technically unsurpassed engineering drawings denotes a love affair between our air-minded readers and the incredible William Wylam. It's good to be the go-between and also part of this ever growing club.

Walter L. Schroder

AIR AGE INC. • 1 North Broadway • White Plains, New York 10601

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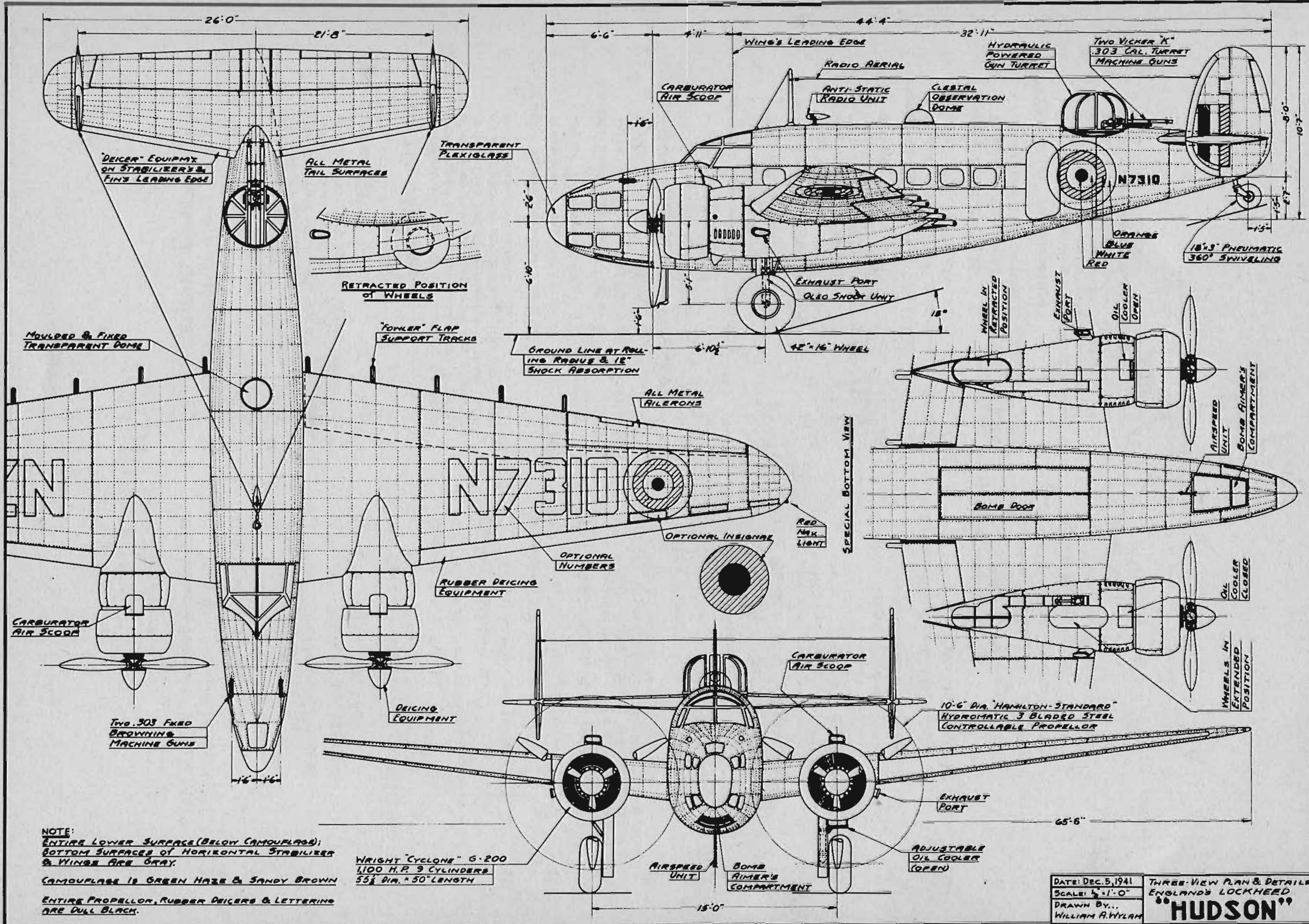
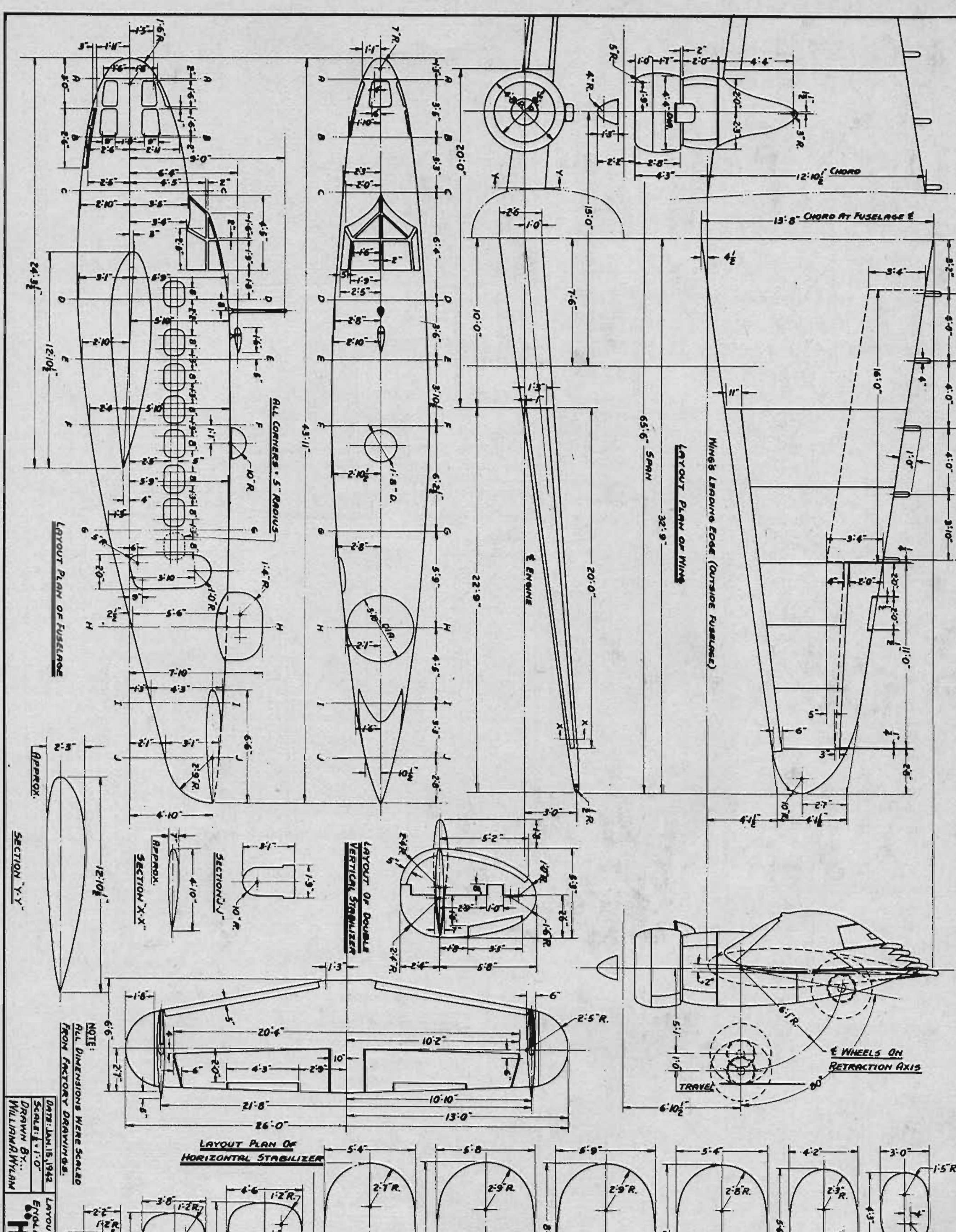

26'0"
21'8"
'Deicer' Equipm't on Stabilizers & Fins Leading Edge
All Metal Tail Surfaces
Retracted Position of Wheels
Moulded & Fixed Transparent Dome
'Fowler' Flap Support Tracks
All Metal Ailerons
N7310
Optional Insignia
Optional Numbers
Red Nav. Light
Rubber Deicing Equipment
Carburator Air Scoop
Deicing Equipment
Two .303 Fixed Browning Machine Guns
1'6" 1'6"
44'4"
6'6"
4'11"
32'11"
Wing's Leading Edge
Radio Aerial
Carburator Air Scoop
Anti-Static Radio Unit
Clestal Observation Dome
Hydraulic Powered Gun Turret
Two Vicker 'K' .303 Cal. Turret Machine Guns
Transparent Plexiglass
8'0"
10'7"
2'6"
6'10"
5'1"
1'6"
6'10½"
18"
Orange
Blue
White
Red
18"x3" Pneumatic 360° Swiveling
Exhaust Port
Oleo Shock Unit
42"x16" Wheel
Ground Line at Rolling Radius & 12" Shock Absorption
Special Bottom View
Wheel in Retracted Position
Exhaust Port
Oil Cooler Open
Airspeed Unit
Bomb Aimer's Compartment
Bomb Door
Oil Cooler Closed
Wheels in Extended Position
Carburator Air Scoop
10'6" Dia. 'Hamilton-Standard' Hydromatic 3 Bladed Steel Controllable Propellor
Exhaust Port
65'6"
Adjustable Oil Cooler (Open)
Wright 'Cyclone' G-200 1,100 H.P. 9 Cylinders 55½ Dia. × 50" Length
Airspeed Unit
Bomb Aimer's Compartment
15'0"
Note:
Entire Lower Surface (Below Camouflage); Bottom Surfaces of Horizontal Stabilizer & Wings Are Gray.
Camouflage Is Green Haze & Sandy Brown
Entire Propellor, Rubber Deicers & Lettering Are Dull Black.
Date: Dec. 5, 1941
Scale: ⅛"=1'-0"
Drawn By... William A. Wylam
Three-View Plan & Details England's Lockheed "Hudson"



LAYOUT PLAN OF FUSELAGE
ALL CORNERS: 5" RADIUS
LAYOUT PLAN OF WING
WING'S LEADING EDGE (OUTSIDE FUSELAGE)
65'-6" SPAN
32'-9"
℄ ENGINE
12'-10½" CHORD
13'-8" CHORD AT FUSELAGE ℄
SECTION "Y-Y"
APPROX.
SECTION "X-X"
APPROX.
SECTION "J-J"
LAYOUT OF DOUBLE VERTICAL STABILIZER
LAYOUT PLAN OF HORIZONTAL STABILIZER
℄ WHEELS ON RETRACTION AXIS
TRAVEL
NOTE: ALL DIMENSIONS WERE SCALED FROM FACTORY DRAWINGS.
DATE: JAN. 15, 1942
SCALE: 1/8" = 1'-0"
DRAWN BY: WILLIAM A. WYLAM
LAYOUT PLANS & DETAILS
ENGLAND'S LOCKHEED
"HUDSON"
SECTION "A-A"
SECTION "B-B"
SECTION "C-C"
SECTION "D-D"
SECTION "E-E"
SECTION "F-F"
SECTION "G-G"
SECTION "H-H"
SECTION "I-I"
FUSELAGE CROSS SECTIONS

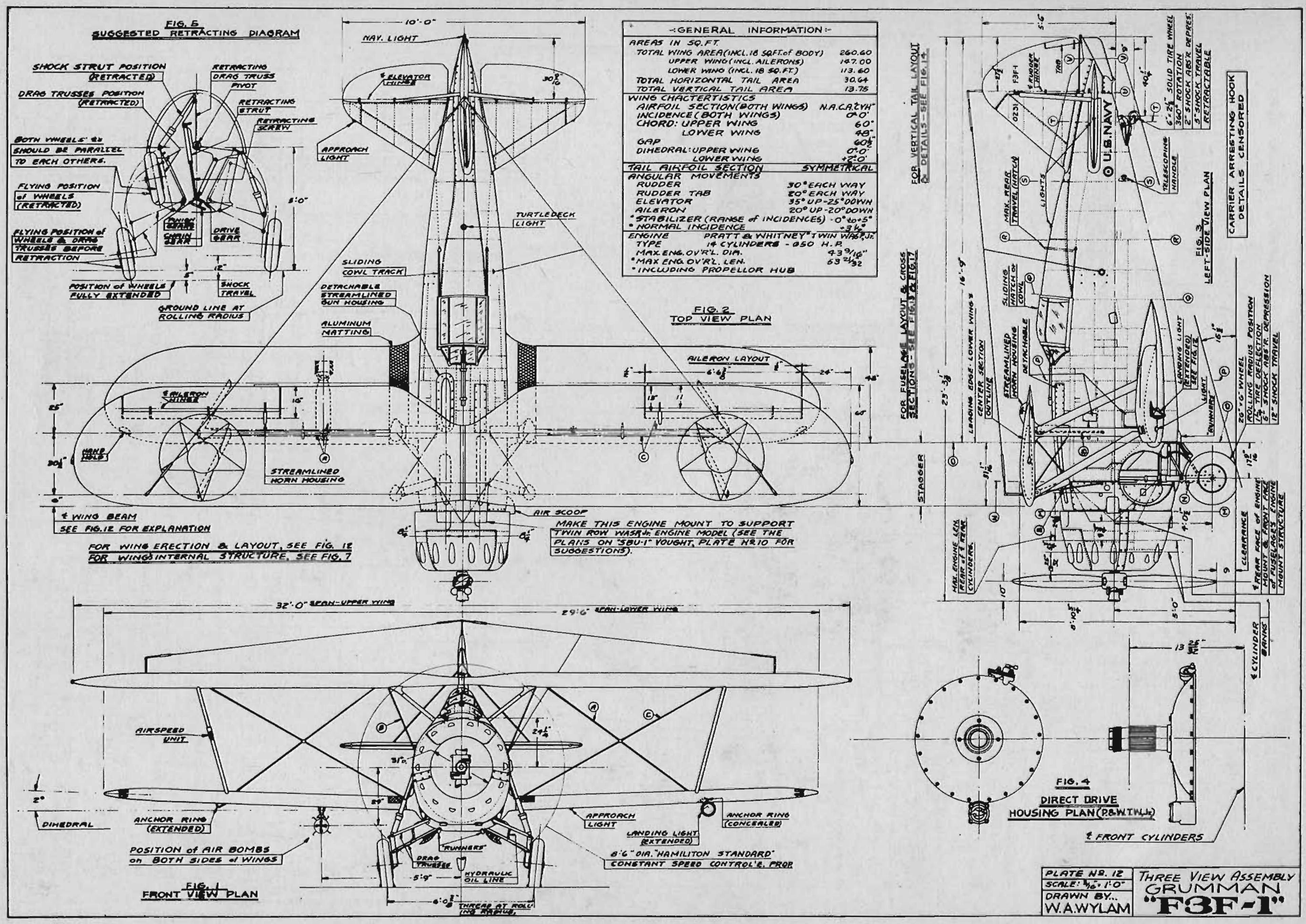
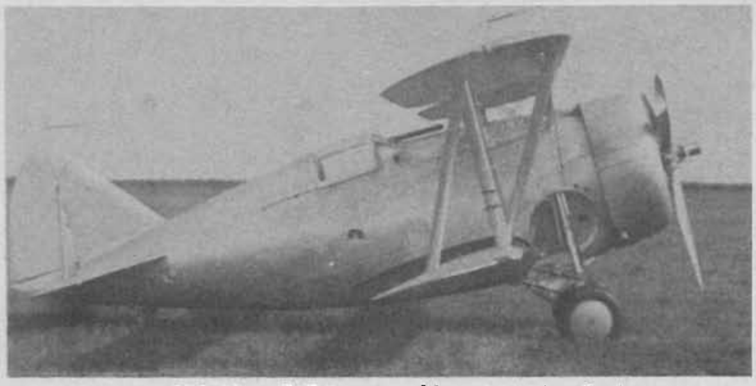


FIG. 5
SUGGESTED RETRACTING DIAGRAM
SHOCK STRUT POSITION (RETRACTED)
DRAG TRUSSES POSITION (RETRACTED)
BOTH WHEELS' ℄s SHOULD BE PARALLEL TO EACH OTHERS.
FLYING POSITION of WHEELS (RETRACTED)
FLYING POSITION of WHEELS & DRAG TRUSSES BEFORE RETRACTION
POSITION of WHEELS FULLY EXTENDED
GROUND LINE AT ROLLING RADIUS
RETRACTING DRAG TRUSS PIVOT
RETRACTING STRUT
RETRACTING SCREW
DRIVE GEAR
SHOCK TRAVEL
NAV. LIGHT
APPROACH LIGHT
TURTLEDECK LIGHT
SLIDING COWL TRACK
DETACHABLE STREAMLINED GUN HOUSING
ALUMINUM MATTING
STREAMLINED HORN HOUSING
AILERON LAYOUT
AIR SCOOP
℄ WING BEAM
SEE FIG. 12 FOR EXPLANATION
FOR WING ERECTION & LAYOUT, SEE FIG. 12
FOR WING INTERNAL STRUCTURE, SEE FIG. 7
MAKE THIS ENGINE MOUNT TO SUPPORT TWIN ROW WASP Jr. ENGINE MODEL (SEE THE PLANS ON "SBU-1" VOUGHT, PLATE NO. 10 FOR SUGGESTIONS).
FIG. 2
TOP VIEW PLAN
-: GENERAL INFORMATION :-
AREAS IN SQ. FT.
TOTAL WING AREA (INCL. 18 SQ. FT. of BODY) 260.60
UPPER WING (INCL. AILERONS) 147.00
LOWER WING (INCL. 18 SQ. FT.) 113.60
TOTAL HORIZONTAL TAIL AREA 30.64
TOTAL VERTICAL TAIL AREA 13.75
WING CHACTERTISTICS
AIRFOIL SECTION (BOTH WINGS) N.A.C.A. "CYH"
INCIDENCE (BOTH WINGS) 0°0'
CHORD: UPPER WING 60"
LOWER WING 48"
GAP 60½"
DIHEDRAL: UPPER WING 0°0'
LOWER WING +2°0'
TAIL AIRFOIL SECTION SYMMETRICAL
ANGULAR MOVEMENTS
RUDDER 30° EACH WAY
RUDDER TAB 20° EACH WAY
ELEVATOR 35° UP - 25° DOWN
AILERON 20° UP - 20° DOWN
*STABILIZER (RANGE of INCIDENCES) -0° to -5°
*NORMAL INCIDENCE -3½°
ENGINE PRATT & WHITNEY "TWIN WASP Jr."
TYPE 14 CYLINDERS - 650 H.P.
MAX. ENG. OV'R'L. DIA. 43 9/16"
*MAX ENG. OV'R'L. LEN. 63 21/32
*INCLUDING PROPELLOR HUB
FOR VERTICAL TAIL LAYOUT & DETAILS - SEE FIG. 14
FOR FUSELAGE LAYOUT & CROSS SECTIONS - SEE FIG. 13 & FIG. 17
STAGGER
23'-3⅜"
16'-9"
MAX. ENGINE LEN. REAR of ℄ REAR CYLINDERS
LEADING EDGE - LOWER WING'S CENTER SECTION OUTLINE
STREAMLINED HORN HOUSING
DETACHABLE
SLIDING HATCH or COWL
MAX. REAR TRAVEL (HATCH)
LIGHTS
F3F-1
0231
℄ RUDDER HINGE
TAB
U.S. NAVY
TELESCOPING HANDLE
6"×2¼" SOLID TIRE WHEEL
360° ROTATION
2" SHOCK ABS'R DEPRES.
5" SHOCK TRAVEL
RETRACTABLE
LANDING LIGHT (EXTENDED) SEE FIG. 12
LIGHT
"RUNNERS"
26"×6" WHEEL
ROLLING RADIUS POSITION
1½" TIRE DEFLECTION
6" SHOCK ABS'R. DEPRESSION
12" SHOCK TRAVEL
CLEARANCE
℄ REAR FACE of ENGINE MOUNT & FRONT FACE of FUSELAGE'S ENGINE MOUNT STRUCTURE
FIG. 3
LEFT-SIDE VIEW PLAN
CARRIER ARRESTING HOOK DETAILS CENSORED
32'-0" SPAN-UPPER WING
29'-6" SPAN-LOWER WING
AIRSPEED UNIT
DIHEDRAL
ANCHOR RING (EXTENDED)
POSITION of AIR BOMBS on BOTH SIDES of WINGS
FIG. 1
FRONT VIEW PLAN
DRAG TRUSSES
HYDRAULIC OIL LINE
THREAD AT ROLLING RADIUS
APPROACH LIGHT
LANDING LIGHT (EXTENDED)
ANCHOR RING (CONCEALED)
8'-6" DIA. "HAMILTON STANDARD" CONSTANT SPEED CONTROL'E. PROP
FIG. 4
DIRECT DRIVE HOUSING PLAN (P.&W.TW.J.)
℄ FRONT CYLINDERS
℄ CYLINDER BANKS
PLATE NO. 12
SCALE: 3/16" = 1'-0"
DRAWN BY.. W.A. WYLAM
THREE VIEW ASSEMBLY
GRUMMAN
"F3F-1"



The Grumman U.S. Navy F3F-2 powered by a 1,000 hp. Cyclone engine

A Grumman Fighter In Miniature

Data Which Will Enable the Most Exacting Model Fan to Build a Detailed Scale Replica of One of the U. S. Navy's Greatest Fighting Planes

By WILLIAM WYLAM

"SHOOTING off" of the aircraft carrier deck into the sky like a bullet, roaring into a steep climb like the anti-aircraft shells and finally leveling off with the greatest of ease, are the main characteristics of these famous Grumman airplanes. They fly beautifully, they maneuver perfectly and they are about the easiest fighter in the United States Navy to land. The first Grumman that successfully passed the competition trials, for new pursuit or combat equipments, created a sensation overnight because of its radical design and better performances.

Grumman airplanes were one of the first airplanes to withstand the terrific new navy power-dives requirements, designed to test out the actual airplane strength in power dives. The first accepted Grumman became very widely acclaimed by the United States Navy and was the cause of the fabulous rise of the manufacturer from a small company to a first-class place in the aeronautical industry. Mr. LeRoy Grumman and his associates originated the clever, and much copied, retracting-wheel system that are found on all of his products. Mr. Grumman's originality is shown by every design that he has created; his airplanes are about the easiest to identify in the sky because of its very plump fuselage, the compact wing arrangements and the folded landing wheels.

The "F3F-1" was a great improvement over its predecessor . . . the "F2F-1." The first "F3F-1" was manufactured in large quantities for the navy and is still in first line services. The "F3F-1" is equipped with the 650 HP. Pratt & Whitney, "Twin Row Wasp Jr.," which pulls the airplane at a pace of some 280 miles per hour! The "F3F-2" was first equipped with the 1,000 HP. Twin Wasp, which made it one of the fastest biplanes in the world. However, the navy ordered the 1,000 HP. Cyclone model of the "F3F-2" in large quantities, which was turned over to the United States Marine Corp squadrons. The "F3F-2" was identified the same as the "F3F-1," with the exception of the changes around the engine section, which were made in order to accommodate the 1,000 horsepower Wright Cyclone, Model "G." It has the same specifications and design characteristics as the "F3F-1" had; the "F3F-2" was rather formidable looking by its new style engine cowl, snappy looking windows and new type rudder. Getting down to facts, the first model of the "F3F-2" looked exactly like the "F3F-1" with the exception of the nose, as the illustrated picture shows.

The Grumman U.S. Navy F3F-1 powered by a 650 hp. Wasp Jr.

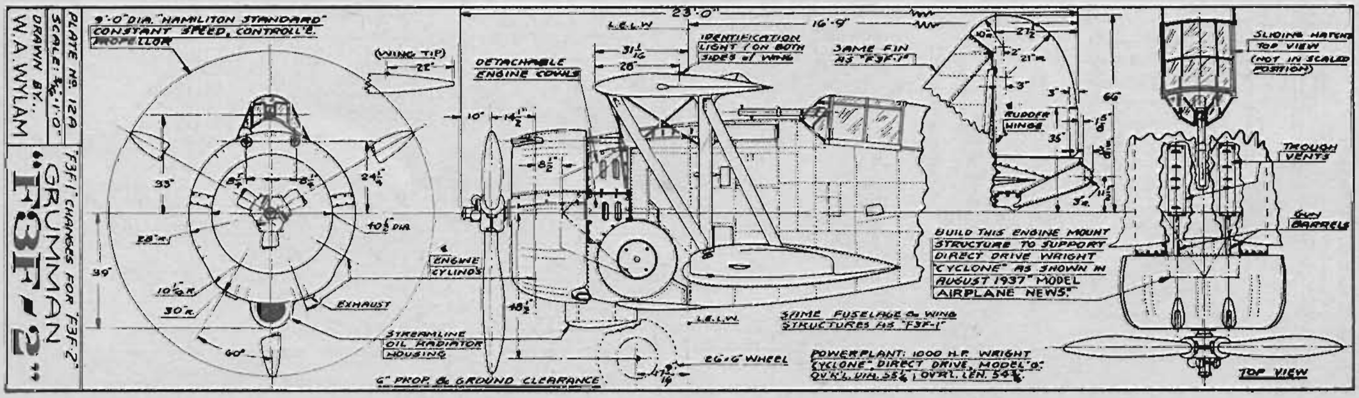
Exact details of the fuselage construction, internal wing structure, fixed equipments, retracting mechanism, cockpit and control arrangements are unobtainable. However, the monocoque type fuselage is constructed of dural bulkhead formers and dural skin covering, both being riveted together. The wings are a compact unit of aluminum alloy ribs, dural beams and dural leading edges; encased in fabric. The composite tail structure is as follows: all fixed or adjustable surfaces are of dural frames with riveted metal (dural) covering; all control surfaces are of dural constructed frames; fabric-covered. The landing gear and tail wheel retract fully into the fuselage, as shown in Figure 10.

Modeling the Grumman Fighter

It is suggested that the reader refer to the super-plans shown on the Vought "V-143" for aid in drawing up the plans on the "F3F-1." After the plans are drawn, it is best that the modeler build the model by the following method, in order to insure realism.

The fuselage should be carved from a solid wood to a shape as shown in Figure 13, and to the cross-sections as shown in

(continued on page 8)



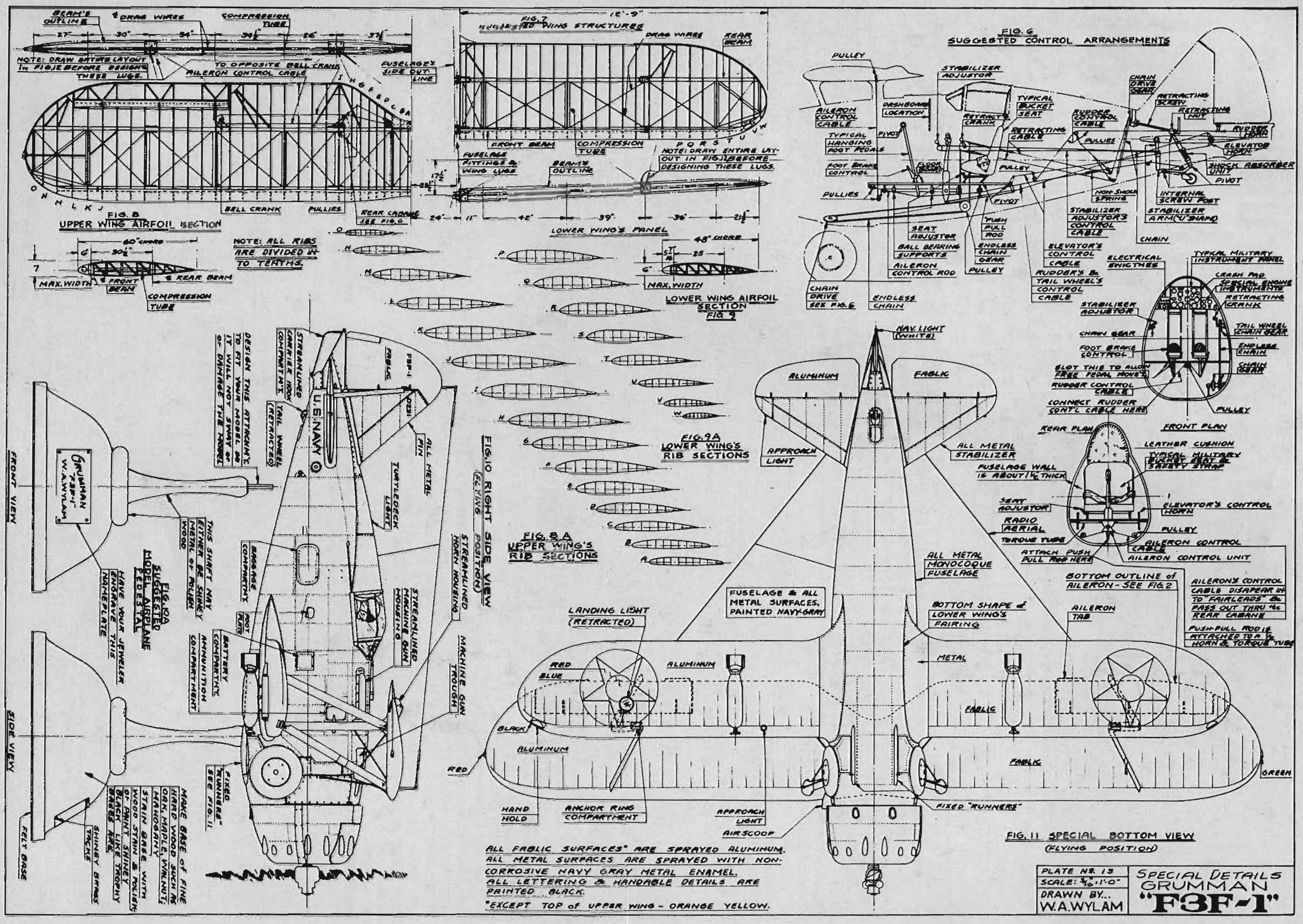


FIG. 6
SUGGESTED CONTROL ARRANGEMENTS
FIG. 7
SUGGESTED WING STRUCTURES
12'-9"
DRAG WIRES
REAR BEAM
FRONT BEAM
COMPRESSION TUBE
BEAM'S OUTLINE
FUSELAGE FITTINGS & WING LUGS
FUSELAGE'S SIDE OUT LINE
NOTE: DRAW ENTIRE LAYOUT IN FIG.13 BEFORE DESIGNING THESE LUGS.
NOTE: DRAW ENTIRE LAYOUT IN FIG.8 BEFORE DESIGNING THESE LUGS.
TO OPPOSITE BELL CRANK
AILERON CONTROL CABLE
BELL CRANK
PULLIES
REAR CRANK SEE FIG. 6
LOWER WING'S PANEL
FIG. 8
UPPER WING AIRFOIL SECTION
60" CHORD
MAX. WIDTH
FRONT BEAM
REAR BEAM
COMPRESSION TUBE
NOTE: ALL RIBS ARE DIVIDED IN TO TENTHS.
48" CHORD
LOWER WING AIRFOIL SECTION FIG. 9
FIG. 9A LOWER WING'S RIB SECTIONS
FIG. 8A UPPER WING'S RIB SECTIONS
PULLEY
STABILIZER ADJUSTOR
DASHBOARD LOCATION
AILERON CONTROL CABLE
TYPICAL HANGING FOOT PEDALS
FOOT BRAKE CONTROL
PIVOT
TYPICAL BUCKET SEAT
RETRACT'G CRANK
RETRACTING CABLE
RUDDER CONTROL CABLE
PULLIES
CHAIN DRIVE GEAR
RETRACTING SCREW
RETRACTING NUT
RUDDER HORN
ELEVATOR HORN
SHOCK ABSORBER UNIT
INTERNAL SCREW POST
STABILIZER ARM ("U" SHAPE)
STABILIZER ADJUSTOR'S CONTROL CABLE
CHAIN
SEAT ADJUSTOR
BALL BEARING SUPPORTS
AILERON CONTROL ROD
PUSH PULL ROD
ENDLESS CHAIN GEAR
ELEVATOR'S CONTROL CABLE
RUDDER'S & TAIL WHEEL'S CONTROL CABLE
CHAIN DRIVE SEE FIG. 6
ENDLESS CHAIN
ELECTRICAL SWITCHES
TYPICAL MILITARY INSTRUMENT PANEL
CRASH PAD
SPECIAL ENGINE INSTRUMENTS
RETRACTING CRANK
TAIL WHEEL CHAIN GEAR
CHAIN GEAR
FOOT BRAKE CONTROL
SLOT THIS TO ALLOW FREE PEDAL MOVE'T
RUDDER CONTROL CABLE
CONNECT RUDDER CONT'L CABLE HERE
FRONT PLAN
REAR PLAN
LEATHER CUSHION
TYPICAL MILITARY SAFETY STRAP
FUSELAGE WALL IS ABOUT 1½" THICK
SEAT ADJUSTOR
RADIO AERIAL
TORQUE TUBE
ELEVATOR'S CONTROL HORN
PULLEY
AILERON CONTROL CABLE
AILERON CONTROL UNIT
ATTACH PUSH PULL ROD HERE
BOTTOM OUTLINE of AILERON - SEE FIG.2
AILERON'S CONTROL CABLE DISAPEAR IN TO "FAIRLEADS" & PASS OUT THRU the REAR CABANE
PUSH-PULL ROD IS ATTACHED TO A ½ HORN & TORQUE TUBE
NAV. LIGHT (WHITE)
ALUMINUM
FABLIC
ALL METAL STABILIZER
APPROACH LIGHT
ALL METAL MONOCOQUE FUSELAGE
FUSELAGE & ALL METAL SURFACES, PAINTED NAVY-GRAY
BOTTOM SHAPE of LOWER WING'S FAIRING
AILERON TAB
LANDING LIGHT (RETRACTED)
METAL
RED
BLUE
BLACK
GREEN
HAND HOLD
ANCHOR RING COMPARTMENT
APPROACH LIGHT
AIRSCOOP
FIXED "RUNNERS"
FIG. 11 SPECIAL BOTTOM VIEW (FLYING POSITION)
ALL FABLIC SURFACES* ARE SPRAYED ALUMINUM.
ALL METAL SURFACES ARE SPRAYED WITH NON-CORROSIVE NAVY GRAY METAL ENAMEL.
ALL LETTERING & HANDABLE DETAILS ARE PAINTED BLACK.
*EXCEPT TOP of UPPER WING - ORANGE YELLOW.
PLATE No. 13
SCALE: 3/16"=1'-0"
DRAWN BY... W.A.WYLAM
SPECIAL DETAILS GRUMMAN "F3F-1"
FIG. 10 RIGHT SIDE VIEW (FLYING POSITION)
STREAMLINED HORN HOUSING
MACHINE GUN TROUGH
ALL METAL FIN
STREAMLINED MACHINE GUN HOUSING
TURTLEDECK LIGHT
F3F-1
0231
U.S. NAVY
STREAMLINED CARRIER HOOK COMPART'M'T.
TAIL WHEEL (RETRACTED)
BAGGAGE COMPART'M'T.
FOOT PLATE
BATTERY COMPART'M'T.
AMMUNITION COMPARTMENT
FIXED "RUNNERS" SEE FIG. 11
DESIGN THIS ATTACHM'T. TO FIT YOUR MODEL SO IT WILL NOT SWAY or or DAMAGE THE MODEL
THIS SHAFT MAY EITHER BE SHINEY METAL or POLISH WOOD
FIG. 10A SUGGESTED MODEL AIRPLANE PEDESTAL
HAVE YOUR JEWELER ENGRAVE THIS NAMEPLATE
GRUMMAN "F3F-1" W.A.WYLAM
MAKE BASE of FINE HARD WOOD SUCH AS OAK, MAPLE, WALNUT, MAHOGANY
STAIN BASE WITH WOOD STAIN & POLISH, or PAINT SHINEY BLACK LIKE TROPHY BASES ARE.
SHINEY BRASS TACKS
FELT BASE
FRONT VIEW
SIDE VIEW

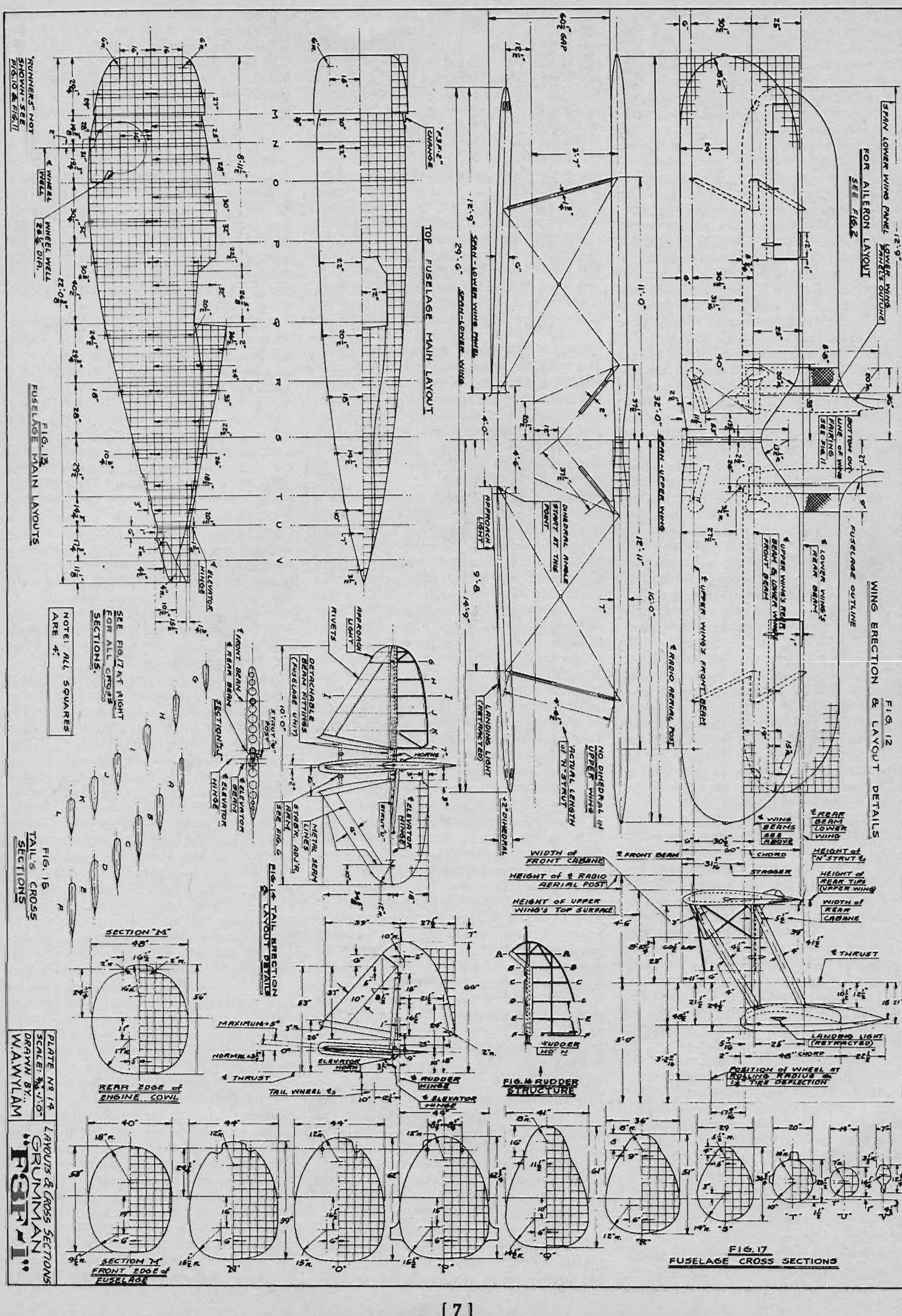


PLATE Nº 14
LAYOUTS & CROSS SECTIONS
GRUMMAN
"F3F-1"
DRAWN BY... W.A.WYLAM
FIG. 12 WING ERECTION & LAYOUT DETAILS
FIG. 13 FUSELAGE MAIN LAYOUTS
TOP FUSELAGE MAIN LAYOUT
FIG. 14 TAIL ERECTION & LAYOUT DETAILS
FIG. 15 TAIL'S CROSS SECTIONS
FIG. 16 RUDDER STRUCTURE
FIG. 17 FUSELAGE CROSS SECTIONS
NOTE: ALL SQUARES ARE 4"
SEE FIG. 17 AT RIGHT FOR ALL CROSS SECTIONS.
FOR AILERON LAYOUT SEE FIG. 2
SECTION "M"
REAR EDGE of ENGINE COWL
SECTION "M" FRONT EDGE of FUSELAGE

(continued from page 5)

Figure 17. Before you come to the outside shape figure out a method on how you are going to hollow out the inside shell. The best method is the common "two split blocks" construction, which is two flat blocks attached together by means of screws at the front fuselage and tail ends; each block is 1/2 the fuselage . . . say the vertical half. The outside shape should be carved to the fuselage lines first, then finally to the cross section shapes. Before you lay out the fuselage lines on the blocks, it is best to leave out the engine cowl so that you can have a much easier access to the fuselage internal shell. After the two blocks are screwed together very snugly, begin to lay out the fuselage lines as shown in Figure 13. Cut away the surplus on the outside of the fuselage outlines and begin to carve the cross sections at each station to the exact shape as shown in Figure 17.

When the entire shape of the fuselage has been carved, use sandpaper to smooth out the rough edges then shellac the entire form to close up the wood pores. When the shellac is dry, use a very fine sandpaper to smooth out the shellac to a finish that feels like glass to the touch. After the form is all smoothed off, lay out the wheel well and dig out the surplus as carefully as you can. Refer to Figure 5 for an idea on how deep the well should be and how the landing gear drag trusses should be centered. After the wheel wells are hollowed out according to the way you plan to construct the undercarriage, smooth out the shape to give it a neat appearance.

Another way of making the wheel wells is to cut a hole the size of the wheels right through the wheel well on the right side, to the wheel well on the left side. That is, drill a way through the fuselage to the other side. Now unscrew the two screws and begin to hollow out the inside space. Use care in your "digging operations" and when you come near to the walls hold the form up to a light so that you will not go through the walls. Hollow out the shell to the approximate 1-1/2" scale, which is the thickness of the real fuselage shell.

After the fuselage is all hollowed out sand out the rough spots to give the insides a neat appearance. Now refer to Figure 6 and try to plan out your control and retracting unit, if you are going to install these in the model. The retracting unit is very difficult and it should not be attempted by the less experienced builder as you may ruin your model. It is suggested that the wheels should be made to fold up by hand, instead of being operated from the cockpit. Refer to Figure 5 and try to plan out some way that you would have to drag trusses centered on a pivot so that they can go, in and out, without any interferences.

Before you build the inside details start at the tail end and build the supports for the rudder and elevator torque rods. These torque rods are mounted on pivots inside of the fuselage; the torque rods stick outside of the shell like the telescoping handles do. The movable control surface beams are slid into the torque rods, then are hinged at all hinge locations. The control surfaces are lifted at a certain angle where the bolt holes of the beams meet the bolt holes of the torque rods.

At this point bolts are inserted to attach the torque rods to the movable control surface beams. After you have doped out your methods of making the rudder and elevator works, install the supports the best way that you can. Refer to Figure 11 and try to cut the tail wheel hole out of the fuselage. When completed refer to Figure 6 and try to make your tail wheel chassis as shown in that drawing. The tail wheel retracts by the turning of the retracting screw, which in turn, lowers or raises the retracting nut. The retracting crank turns the gear, which pulls the chain and cable; and the chain at the other end of the cable turns the gear on the retracting screw. After the tail wheel is fully retracted, the chain gear at the retracting crank automatically disintegrates itself so that the pilot can finish bringing up the front wheels. If you want to give the tail wheel some shock absorber travel you will have to have the unit mounted on pivots as shown in Figure 6. After the tail wheel unit is finally completed, if you decide to make the stabilizer adjuster screw post, make it so that when you turn the adjuster in the cockpit this adjuster turns a chain gear that pulls the cable in the direction the adjuster turns; this cable pulling the chain around a chain gear on the screw post. This chain gear is threaded with fine threads that raises or lowers the stabilizer.

You see, when a pilot takes off with a heavy load, say of gasoline, this makes the airplane tail or nose heavy and the stabilizer must be adjusted to place the airplane on an even keel. Toward the end of the flight the airplane may become nose- or tail-heavy because of the empty load so the pilot sets the stabilizer back to the normal incidence. If you wish to make up all this fine mechanism perhaps a jeweler can tell you where to get some gears, screws and nuts fine enough for your work. Some concerns that manufacture model railroad trains have these fine gears in stock which you might be able to use with great satisfaction in your model. After you have made the screw post be sure that you make the stabilizer arm into a "U" shape so it will give clearance to the tail wheel's shock absorber when it is in retracted position.

When you have all the mechanisms finished in the rear section, begin to make the cockpit arrangements. Make the floorboard first and install the various fixed equipments such as the joy-stick unit, the pilot seat, the various pulley and pivot systems as shown in Figure 6. It is possible to place all these mechanisms on one-half the fuselage shell . . . that is, attach all control mechanisms on one side, with the exception of controls that belong on the opposite side, and when the entire unit is completed carefully attach the other half of the fuselage onto the half that has the floorboard and mechanism mounted.

After you have completed the cockpit details, refer to the plans on the Type "III-C" Hawk, page 11, for additional details that you may wish to add into the cockpit which will give your model the impression of realism. The engine control units, the instruments, dashboards and various controls as shown in the Type "III-C" are practically standard in nearly every military airplane.

After the cockpit is completed it is suggested that you make the landing gear chassis. This is very difficult but if you use patience, are very careful and use good judgment by trying to make the landing gear work as shown in Figure 5, you should have a very wonderfully built model. The two drag trusses on each side of the fuselage should be hinged on pivots and should move freely in and out of the wheel well, in order to insure the operation of the retracting mechanism.

For the less experienced builder it is suggested that he make no attempt to make this unit. He should make the drag trusses to operate on the pivots so that they should be folded and extended by hand. That is, if you want to retract the wheels, you squeeze the wheels up into its wheel well; if you want to extend the wheels, pick the wheels out with the tip of your fingers and attach the shock absorber struts so that your airplane won't do a "belly flop."

After the fuselage is all completed begin to make the dummy engine and engine cowling. The engine cowling, because of its odd shape, cannot be turned down on a lathe but must be slowly carved to shape. Make the engine cowl so that it will add grace to the detailed engine, if you are going to build a detailed engine. Choose some method on how you are going to build the engine by referring to plans on the "Twin Row Wasp Jr.", page 11, or the Cyclone "F-50", page 49. You see, on the "Twin-Row Wasp Jr." engine plans, you can remove the geared gear housing and add the direct gear housing as shown on Plate 12. The plans on the "Twin-Row Wasp Jr." are for the 850 HP. model while the "F3F-1" are equipped with the 650 HP. models. The 650 HP. model is slightly different in bore and stroke, having about 1/2" smaller over-all diameter and about 10" smaller overall length.

The engine looks just like the 850 HP. model with the exception of a small change in the wiring diagram and accessories. The same is true about the 1,000 HP Cyclone "G" and the 820 HP Cyclone "F." The Cyclones have practically the same over-all diameter, with the exception of a change in the bore and stroke and a change in the wiring diagram and the accessories. If you made your engine model of the Cyclone and use the direct drive hydro gear housing in place of the 16:11 gear housing, the engine would look just like the 1,000 HP. model. Whatever Grumman model you choose to make, try to make the engine look lifelike as this will go a long way to improve the model's appearance . . . a bum-looking engine would spoil the whole appearance of a beautifully-made airplane!

After the engine is completed, plan on how you are going to attach the engine to the fuselage. Refer to the drawings on the side-views of each model on Plate No. 12 and 15 for help on the motor-mount structure, and refer to the drawings on the "SBU-1" Vought Corsair plans on Plate No. 32 for additional help in building the motor mount. On the Grumman airplanes the motor mounts are attached to special fittings that are bolted to the fuselage shell. All points of attachments are reinforced to give the motor mount strength. After the motor is mounted onto the fuselage carefully place the engine cowling over the motor. When the motor is rigidly attached, refer to the plans on the "Twin Wasp Jr." for some fine details on the propeller hub. Build this but do not attach permanently to the engine until you have completed the entire airplane.

The next unit to be built is the tail structure. First attach the fin in its proper off center position, then mount the stabilizer so that it can change the incidence angle, if you wish to do this. After all stabilizer surfaces are permanently attached to the fuselage attach your style hinge in all its locations. Then build up your movable surfaces as shown in Figure 14, attaching the completed covered frames onto the torque tubes and finally the hinges.

The wings should be made as shown in Figure 7. After all ribs are made choose your own methods of making the beams, and your own methods of making all fittings and lugs. Make the center cabane into a complete unit onto the fuselage shell. (Be sure the rear cabane is hollowed out to permit the passage of the aileron's control cable.) After the top wing panel is permanently attached to the fuselage or cabane

(continued on page 36)

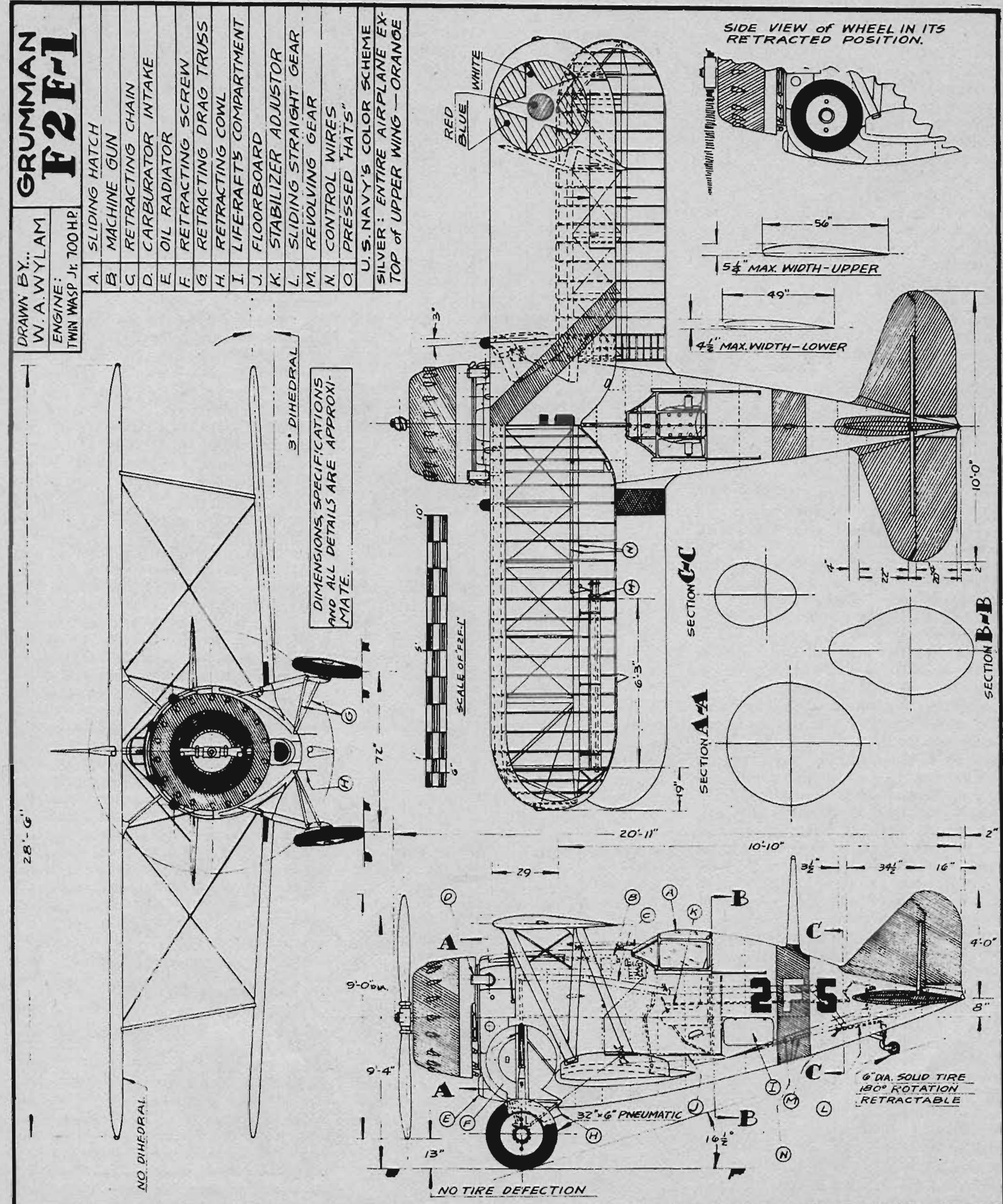


PLATE No. 4 SCALE: 3/4"=1'-0" DRAWN BY... W.A.WYLAM	PRATT & WHITNEY TWIN ROW-14 CLY'S "WASP, Jr."
A	℄ FRONT CYLINDERS
B	℄ REAR CYLINDERS
C	CONTROLLABLE PROP. VALVE
D	GENERATOR MOUNTING FLANGE
E	MAGNETO
F	CARBURATOR HEATER
G	CARBURATOR UNIT
H	FUEL PUMP
I	OIL SUMP
J	RETURN OIL LINE
K	AUXILIARY OIL SUMP
L	#40 PROP. SHAFT & SPLINES
M	OIL STRAINER UNIT
N	COWL MOUNTING BOSSES
O	INNER-EAR OIL DRAIN
P	INNER-CAP OIL DRAIN
Q	OIL BREATHER UNIT LINE
R	OIL BREATHER UNIT
S	CYLINDER HEAD BAFFLE
T	FRONT CYLINDER BAFFLE
U	FRONT & REAR CYLIND'R. BAFFLES
V	INTAKE PIPE
W	EXHAUST PORTS
X	MACHINE GUN SYNCHRONIZER

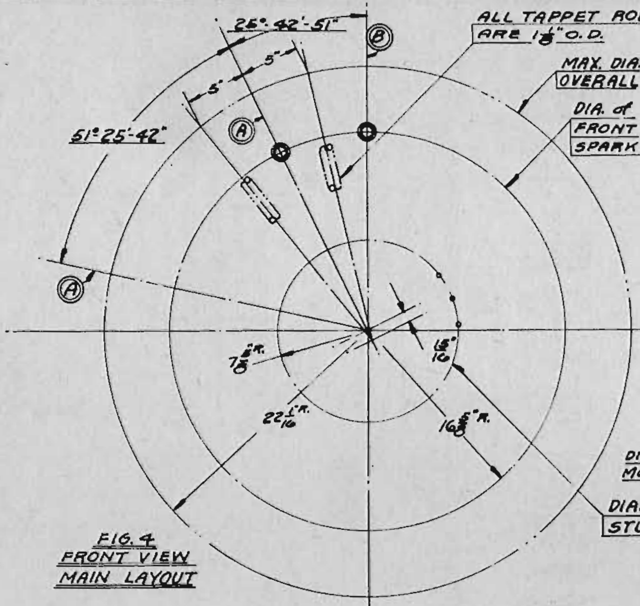


FIG. 4 FRONT VIEW MAIN LAYOUT

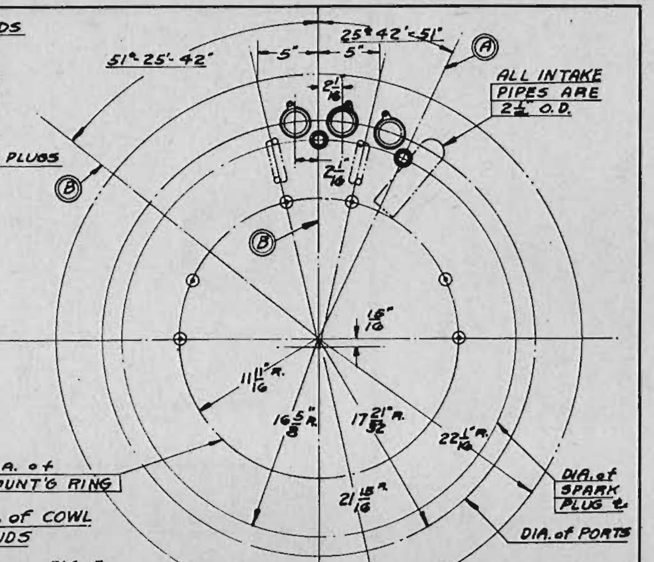


FIG. 5 REAR VIEW MAIN LAYOUT

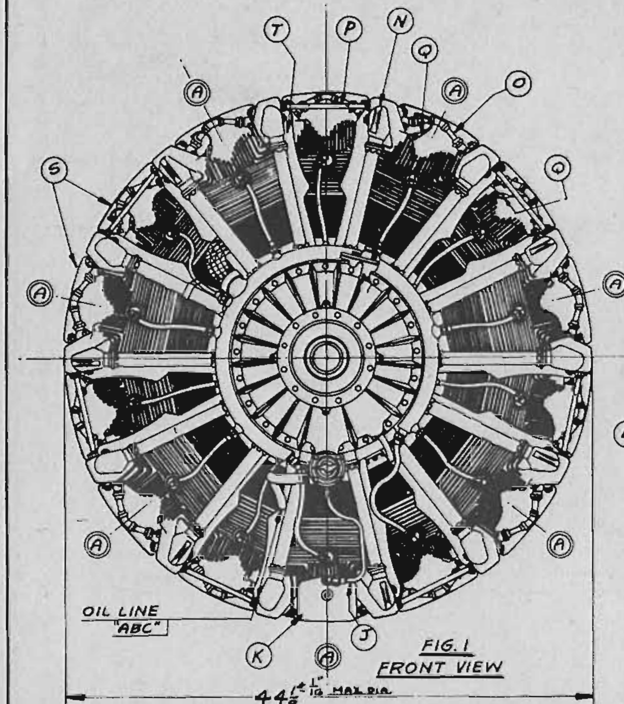


FIG. 1 FRONT VIEW

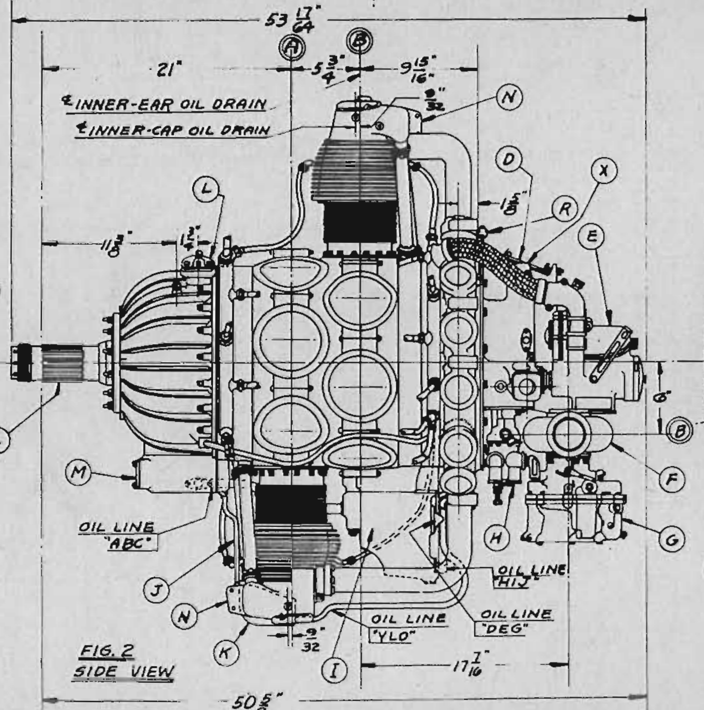


FIG. 2 SIDE VIEW

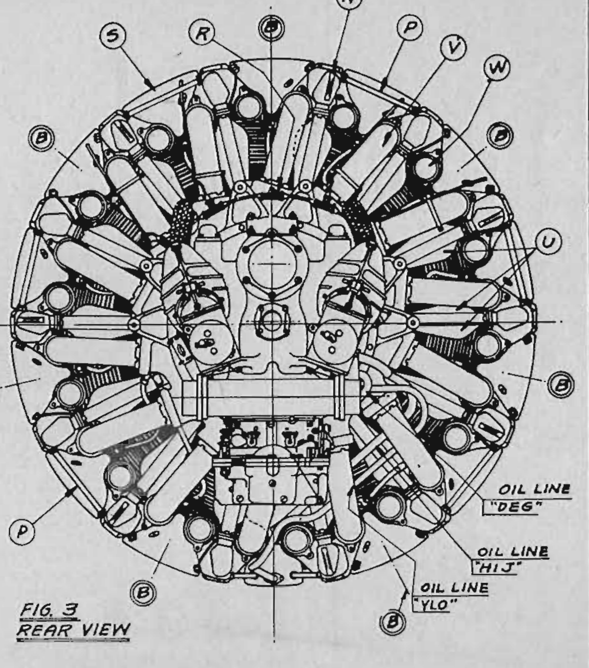
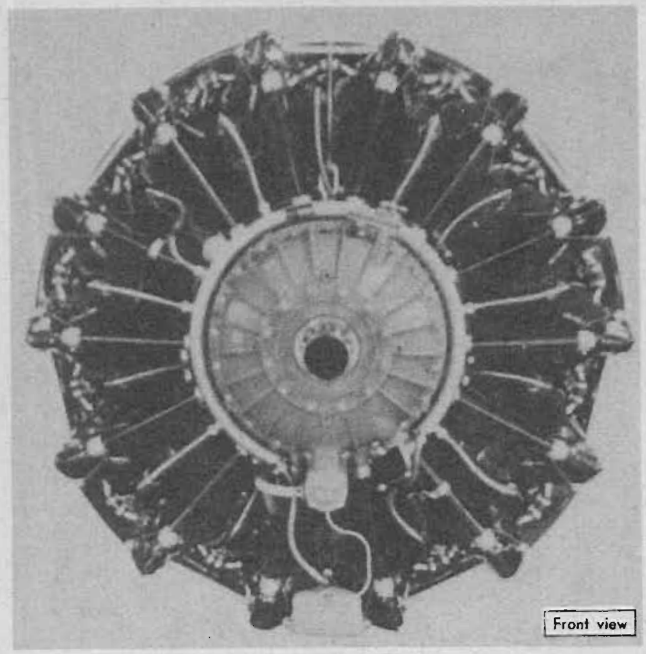
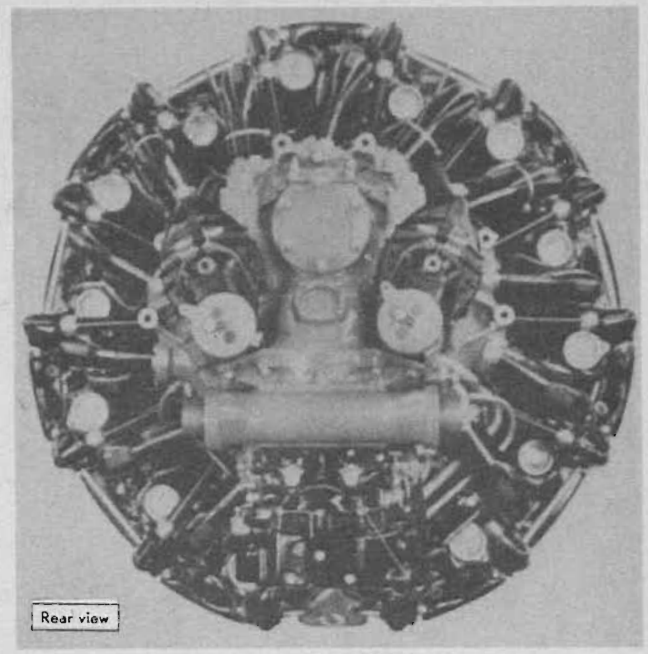


FIG. 3 REAR VIEW





MODEL THIS TWIN WASP JR.

Plans with complete instructions to build a model of a famous engine in exact detail

by WILLIAM WYLAM

THE Twin Wasp and the Twin Wasp Jr. are not new type engines as Pratt & Whitney engineers designed the basic engine of this type over ten years ago.

It was known then that the Aeronautical Industry's demand for more and more horsepower would overtax the capacity of their famous single row engines, the Wasp and Hornet, so the double or twin row engines were designed. Single row engines of the same horsepower ratings as the twin row, per weight, would have such a large frontal area that the advantages of more hp. would be lost by the excessive amount of hp. needed to push the front engine cowl through the air. The small frontal area of the twin row engine models also provides greater visibility for the pilot. The more frequent power impulses of the 14 cylinders provide smoother operation and longer life for the engine.

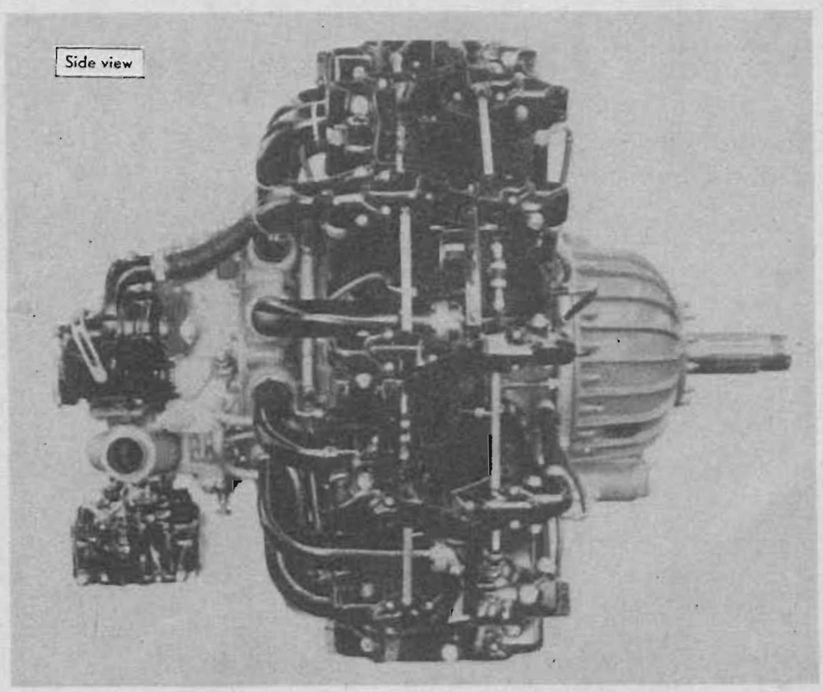
The ingenious features such as automatic valve lubrication, automatic mixture and power control, thermostatic oil system combined with other distinctive Pratt and Whitney features produced a high powered engine with no sacrifice in qualities and reliabilities created by the reputation of the Wasp and Hornet engines. This is why there are now over 5,000 engines already in commerical and military service since the first model was produced in 1933.

These plans on the twin row Wasp Jr. were drawn so the model builder can build an exact duplicate of the real engine. Plans have been and will be drawn on popular military and commercial airplanes that use this type engine and will be published in super-sets by MODEL AIRPLANE NEWS only.

Modelers of this era are now getting out of the "hunk of wood model" class and are building great realism into their models, as shown by the rapid strides made in gas models and the recently built scale models. If the builder prefers, he can make just a dummy motor for a desk piece; or a dummy motor that looks almost real inside an engine cowl but still not build the entire motor as shown in the assembly drawing on Plate No. 1. He also can build the entire engine and mount it on the airplane model just like the mount for real motors. But before we start to build the motor, let us learn something about the mechanism of the real motor.

GEAR HOUSING SECTION: The

(continued on page 14)



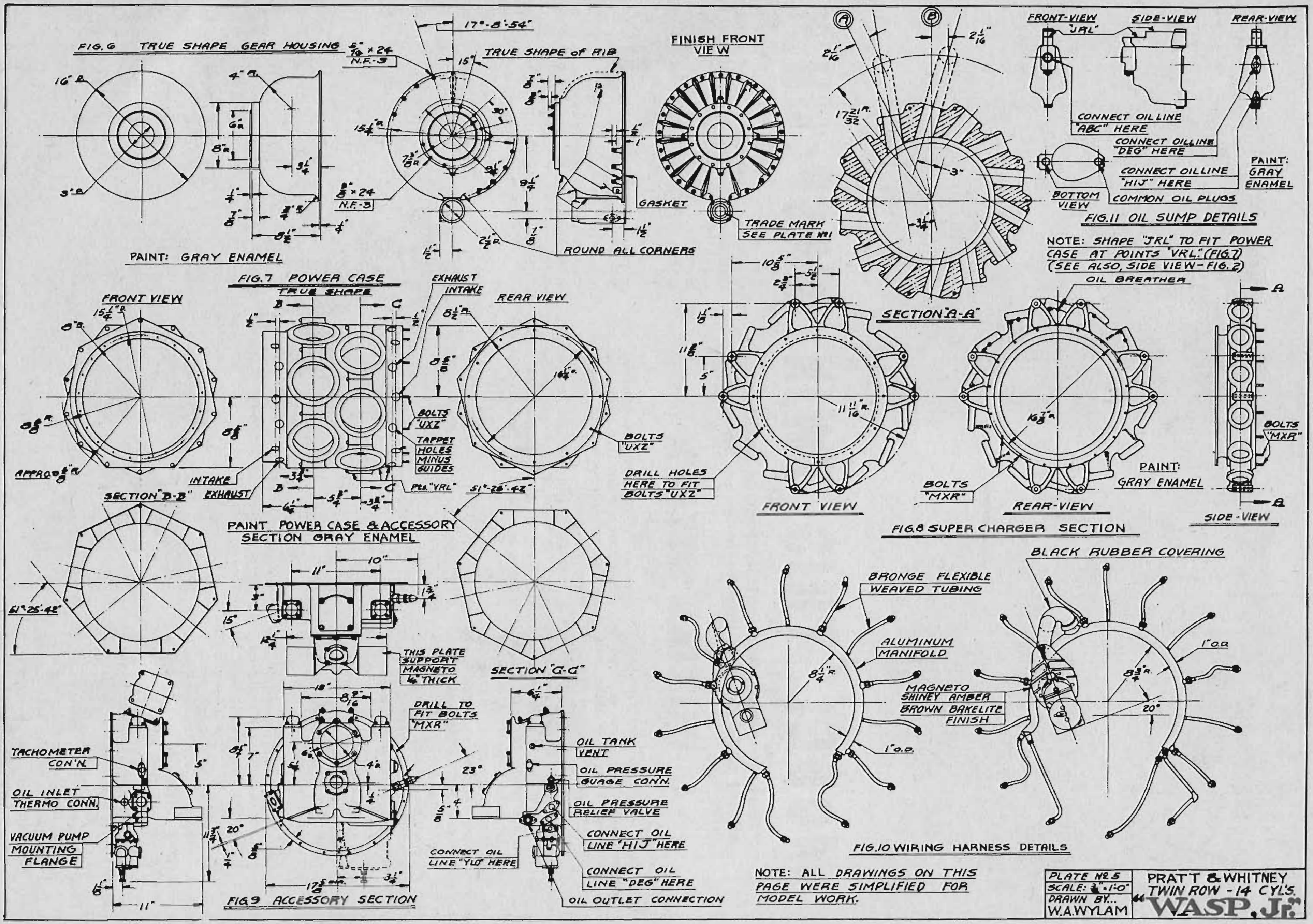


FIG. 6 TRUE SHAPE GEAR HOUSING
PAINT: GRAY ENAMEL
TRUE SHAPE of RIB
GASKET
ROUND ALL CORNERS
FINISH FRONT VIEW
TRADE MARK SEE PLATE No 1
FRONT-VIEW "JRL"
SIDE-VIEW
REAR-VIEW
CONNECT OILLINE "ABC" HERE
CONNECT OILLINE "DEG" HERE
CONNECT OILLINE "HIJ" HERE
COMMON OIL PLUGS
BOTTOM VIEW
PAINT: GRAY ENAMEL
FIG.11 OIL SUMP DETAILS
NOTE: SHAPE "JRL" TO FIT POWER CASE AT POINTS "VRL" (FIG.7) (SEE ALSO, SIDE VIEW - FIG. 2)
OIL BREATHER
FIG.7 POWER CASE
TRUE SHAPE
FRONT VIEW
REAR VIEW
EXHAUST
INTAKE
BOLTS "UXZ"
TAPPET HOLES MINUS GUIDES
INTAKE
EXHAUST
SECTION "B-B"
PAINT POWER CASE & ACCESSORY SECTION GRAY ENAMEL
SECTION "G-G"
SECTION "A-A"
DRILL HOLES HERE TO FIT BOLTS "UXZ"
BOLTS "MXR"
FRONT VIEW
REAR-VIEW
SIDE-VIEW
PAINT: GRAY ENAMEL
FIG.8 SUPER CHARGER SECTION
THIS PLATE SUPPORT MAGNETO 1/4" THICK
DRILL TO FIT BOLTS "MXR"
TACHOMETER CON'N.
OIL INLET THERMO CONN.
VACUUM PUMP MOUNTING FLANGE
CONNECT OIL LINE "YLO" HERE
OIL TANK VENT
OIL PRESSURE GUAGE CONN.
OIL PRESSURE RELIEF VALVE
CONNECT OIL LINE "HIJ" HERE
CONNECT OIL LINE "DEG" HERE
OIL OUTLET CONNECTION
FIG.9 ACCESSORY SECTION
BLACK RUBBER COVERING
BRONGE FLEXIBLE WEAVED TUBING
ALUMINUM MANIFOLD
MAGNETO SHINEY AMBER BROWN BAKELITE FINISH
FIG.10 WIRING HARNESS DETAILS
NOTE: ALL DRAWINGS ON THIS PAGE WERE SIMPLIFIED FOR MODEL WORK.
PLATE No 5
DRAWN BY... W.A.WYLAM
PRATT & WHITNEY TWIN ROW - 14 CYL'S.
"WASP, Jr."

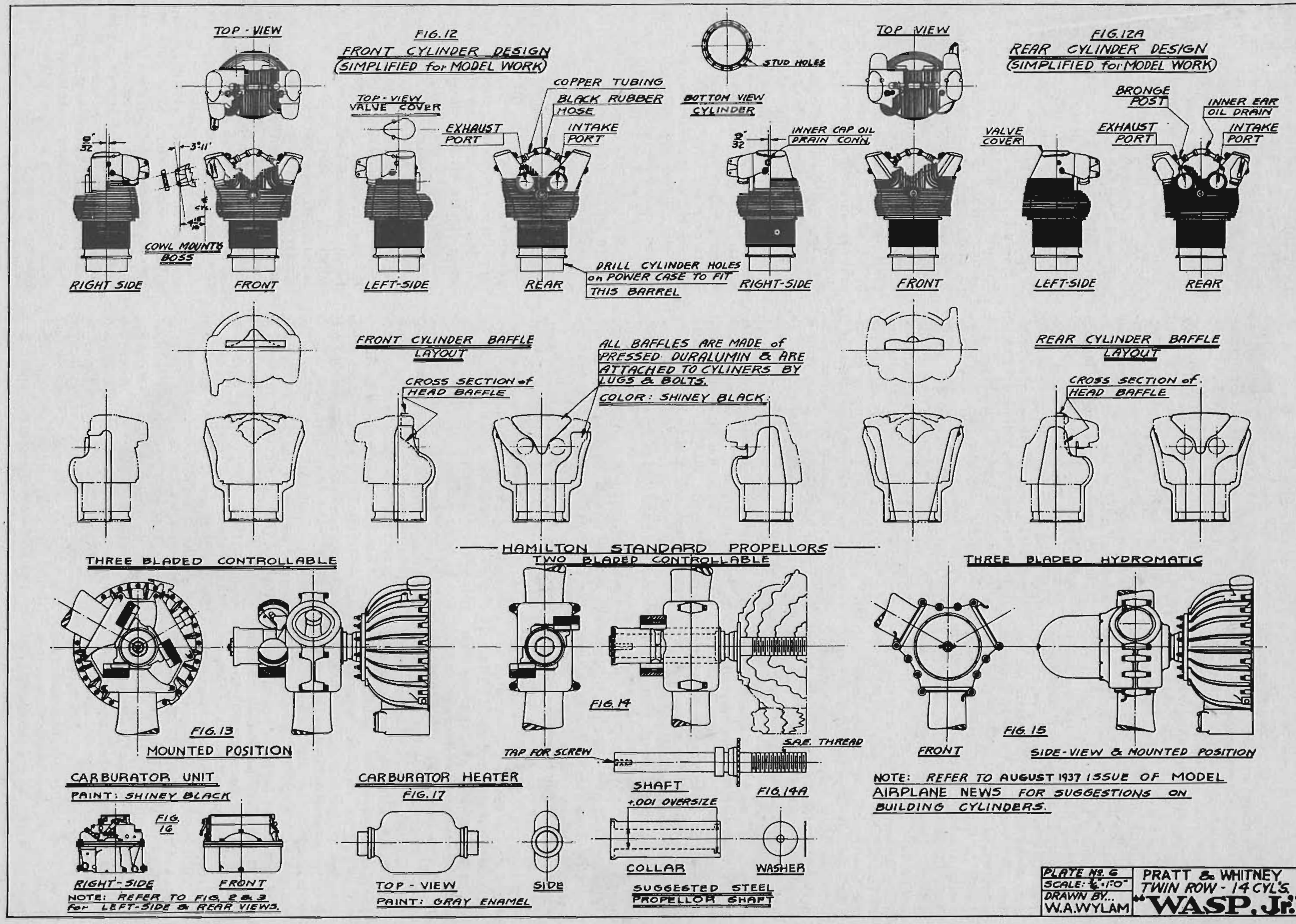


FIG. 12
FRONT CYLINDER DESIGN
(SIMPLIFIED for MODEL WORK)
TOP - VIEW
TOP - VIEW VALVE COVER
EXHAUST PORT
COPPER TUBING
BLACK RUBBER HOSE
INTAKE PORT
COWL MOUNTG BOSS
RIGHT SIDE
FRONT
LEFT-SIDE
REAR
DRILL CYLINDER HOLES on POWER CASE TO FIT THIS BARREL
STUD HOLES
BOTTON VIEW CYLINDER
INNER CAP OIL DRAIN CONN.
RIGHT-SIDE
FIG. 12A
REAR CYLINDER DESIGN
(SIMPLIFIED for MODEL WORK)
TOP VIEW
BRONGE POST
INNER EAR OIL DRAIN
VALVE COVER
EXHAUST PORT
INTAKE PORT
FRONT
LEFT-SIDE
REAR
FRONT CYLINDER BAFFLE LAYOUT
CROSS SECTION of HEAD BAFFLE
ALL BAFFLES ARE MADE of PRESSED DURALUMIN & ARE ATTACHED TO CYLINERS BY LUGS & BOLTS.
COLOR: SHINEY BLACK.
REAR CYLINDER BAFFLE LAYOUT
CROSS SECTION of HEAD BAFFLE
HAMILTON STANDARD PROPELLORS
THREE BLADED CONTROLLABLE
TWO BLADED CONTROLLABLE
THREE BLADED HYDROMATIC
FIG. 13
MOUNTED POSITION
FIG. 14
TAP FOR SCREW
S.A.E. THREAD
FIG. 14A
FIG. 15
FRONT
SIDE-VIEW & MOUNTED POSITION
CARBURATOR UNIT
PAINT: SHINEY BLACK
FIG. 16
RIGHT-SIDE
FRONT
NOTE: REFER TO FIG. 2 & 3 for LEFT-SIDE & REAR VIEWS.
CARBURATOR HEATER
FIG. 17
TOP - VIEW
SIDE
PAINT: GRAY ENAMEL
SHAFT
+.001 OVERSIZE
COLLAR
WASHER
SUGGESTED STEEL PROPELLOR SHAFT
NOTE: REFER TO AUGUST 1937 ISSUE OF MODEL AIRPLANE NEWS FOR SUGGESTIONS ON BUILDING CYLINDERS.
PLATE No. 6
DRAWN BY... W.A.WYLAM
PRATT & WHITNEY TWIN ROW - 14 CYL'S.
"WASP, Jr."

(Continued from page 11)
gear housing or nose Section (Fig. 6) is constructed from an aluminum casting and assembled into one whole unit before being installed on to the power case. This unit supports the engine thrust ball bearings, which absorb the axial and radial thrust loads of the propeller shaft. The bearings are housed in a flanged steel bearing, liner shrunk and forced into the housing. Provisions are made inside this housing to permit installation of reduction gears and built-in drives for the constant speed propeller governor or a manually operated valve for the controllable pitch propeller. This inside section also contains oil lines, which operate the devices for the controllable pitch propeller Valve. (C in Fig. 2).

POWER CASE SECTION: The power case or crankcase section of every Twin Wasp and Wasp Jr. is made up of three sections. (The front third is the section looking forward from B-B, middle section is the section from B-B to C-C; and the rear third is from section C-C to the rear as shown in Fig. 7, side view.)

This case is machined from a forged aluminum alloy, jointed together by 14 machine bolts or screws. Tappet guides are rigidly inserted in tappet holes for perfect alignments with the cams. Cams are located in both ends of the case; these operate the opening and closing of intake and exhaust valves at the proper times. They are supported by annular shelves mounted in the case. The connecting rods of I crossection and the master rods are machined from steel forgings. All shafts and rods before assembly are highly polished and magna-fluxed to prevent magnetism.

SUPERCHARGER SECTION: The supercharger section is a machined cast magnesium alloy case. This section houses a centrifugal supercharger and is mounted on the axis of the crankshaft. The impeller of this unit provides a steady precompressed mixture of gasoline and air in correct proportions at all altitudes, by transferring kinetic energy of gas from the impeller tips into pressure in the annulas and feeding the intake pipes by means of an interposed diffuser.

ACCESSORY SECTION: The accessory section is a compact unit cased in a light magnesium housing. This case contains drives for the following: starter, generator, two magnetos, fuel pump, oil pump, two tachometer connections and a vacuum pump. The carburetor unit consists of the carburetor section (G on Fig. 2), the carburetor heater or better known as the "hotspot" (F on Fig. 2) and are attached together by machine bolts to a horizontal flange on the rear of the section. (See Fig. 9 for better idea of this unit.)

CYLINDERS OF THE TWIN ROW WASP JR.: Twin Row cylinders are very much smaller than cylinders of single row engines of the same displacement. This twin row system permits higher engine speed without excessive engine wear and cylinder pressure. The cylinder barrels (Fig. 12) are of hardened steel and the fins are machined to shapes, then the barrel is screwed and shrunk into cast aluminum heads. These aluminum heads have whole casted rocker boxes and the valve sections are machined before barrels are attached to the heads. Provisions are made on each cylinder to permit the connection of engine cowl by means of bosses, and for attachments of baffles.

CYLINDER BAFFLE SYSTEM: All baffles installed on the Twin Row Pratt & Whitney engines are of patented pressures type. These baffles increase the engine's cooling efficiency by forcing air around all spots on the front cylinders to all places on the rear cylinders in such a way that uniform cooling is accomplished. This prevents localized "hotspots" and uneven cylinder temperatures. These baffles are of pressed duralumin sheets, attached to the cylinders by small bolts and spring lugs. Figure 12 and 12A give you the idea how they should look on each cylinder.

BUILDING THE DUMMY TWIN ROW MOTOR: Before we start to build the motor we should study the entire engine drawings. After you feel quite sure you understand the drawings and the motor features, choose your purpose for constructing the model and how you want it built. If you want it for a desk piece, make your plans for this; if you want to make the motor appear real inside of an installed engine cowl, and not build any detail behind the rear cylinders, then make your plans on how you are going to attach it to your airplane; and if you are going to build the entire motor and mount it exactly like the real airplane motor is mounted, then make your plans to indiacte how your motor is going to be built and attached to the motor mounting ring.

Choose the scale you prefer to build the model and follow this throughout the entire construction when scaling down all dimensions shown on the drawings.

The power case should be built first, then the other details added onto this case. We are suggesting a method of constructing the power case which is rather difficult to build, but exact form can be obtained by following these instructions and by being patient.

First make a template out of stiff drawing (heavy) paper or stiff thin metal sheets of Section B-B and C-C as shown in Fig. 7. (Both sections, B-B and C-C are of equal angles and shapes but of opposite directions.) On this sheet to be made into templates scribe a circle equal to 8-5/8" radius (see front view, Fig. 7) and then divide this circle into 7 equal parts or sectors. (One part or sector is equal to 1/7th circle or 51 degrees, 25 minutes and 42 seconds.) At each point on the circle draw the cylinder centerlines toward the engine center as shown in Section B-B and C-C. At each point where the cylinder centerlines cross the scribed circle (8-5/8" R.) draw 7 lines at right angle to each 7 cylinder centerlines, to form the shape as shown in the two crossections B-B and C-C. After this template is made study the entire plans on the power case. Note how the cylinders' bases are of opposite angles in front and rear rows or banks . . . note how they should appear in the front and rear views.

The best way to make this entire unit is get a block of wood and turn it down on a lathe to the approximate diameter of 1/16" to 1/8", 9-5/8" R. (See side view, Fig. 7.) While it is still between the lathe centers mark the cylinder rows or banks centerlines all the way around the entire cylinder wooden form. Then scribe a centerline lengthwise across the form to give the top cylinder centerline; turn the cylinder block halfway around and scribe another centerline, which is exactly on the other side of the top centerline, which will be the bottom front cylinder centerline. Take a caliper and measure the outside diameter (O.D.) of the wooden cylinder from and draw a circle on drawing paper to the exact diameter of the caliper or wooden form.

Now divide this circle into 7 equal parts just like you divided your template of Section B-B and C-C. Spread your dividers to the width of the new circle and test it out on all 7 points on the circle for exact division; then test it out for exact division on the cylinder banks centerline. If it divides each two centerlines into 7 equal parts on each bank line then begin to lay off the cylinder centers on each bank by carefully following these instructions:

On the top horizontal centerline that crossed the rear cylinder bank centerlines place a plain point at the intersection of these two lines. Now turn the block halfway around and place a point where the bottom centerline crosses the front cylinder bank centerlines. Check these two points over and over to make sure you have marked off the exact location of the rear top cylinder and the front bottom cylinder. (Compare with Fig. 2 and 7.) After you are positive that each bottom and top, front and rear cylinders are marked off correctly take your dividers and start from the top cylinder center and begin to divide the rear cylinder banks centerlines into 7 equal parts for the location of each cylinder's center. Repeat the same process by turning the block halfway around and begin to lay off the centers of front cylinders on the front banks centerlines, from the center of the bottom front cylinder, dividing the circle (banks centerline) into 7 equal parts.

Now take the block and examine the layout to make sure you have centered the 14 cylinders accurately on both cylinders banks by comparing your results with the plan as shown in Fig. 7. See if all front cylinder centers are exactly in the middle of the space on the rear banks centerline between the two rear cylinder centers . . . just to be doubly sure, turn the block around and look at it from the rear and see if the centers of the rear cylinders are exactly in the middle of the space between the two front cylinder centers on the front cylinder banks centerline.

After you are reasonably sure the centers are exactly located begin to drill each cylinder centers with a pilot drill. After you are finished using the pilot drill start to drill the cylinder barrel holes, about right through to the center of the base. (Consult drawings of cylinders, Fig. 12 and 12A, to determine the size drill to use.) When drilling make sure you are drilling the holes at right angles to the absolute center.

After the entire 14 cylinders are drilled begin to turn out the front and rear shapes of the power case where the tappet holes are located. Use the same procedure to lay out the tappet holes but make your layout drawing by referring to Fig. 4 and 5, also using the data as shown in Fig. 7, side view.

After all tappet holes are exactly located drill holes in each tappet location. For exhaust and intake location on the front and rear cylinders consult the side-view, which shows where each tappet rod is located, and compare them with the location of the rocker boxes which houses the intake or exhaust valves or outlets as shown in Fig. 3, 12 and 12A. The front view location of both tappet rods are directly the opposite of the rear view, in regards to intake and exhaust rods. After all tappet holes are laid out and drilled begin to shape the cylinder bases to the shape of the template of B-B and C-C.

Before you start to shave away the surplus make a solid plug gauge to exact shape of the cylinder barrel as shown in Fig. 12. Make sure the gauge barrel diameter is the same size as the cylinder holes you have drilled on the case; also be sure you make the cylinder base on the plug gauge at 90 degrees or right angle to the barrel so the plug gauge can be inserted into the cylinder holes to check the trueness of the flat cylinder base while you are planing it down. After you have done a little planing, stick the plug gauge in the hole and see if all sides are 90 degrees to the cylinder holes. Also check the section with your template to insure that it is being shaped as it should be, Fig. 7, side view. Carefully shave away the surplus until you have obtained the exact form. Then begin to trim away the odd corners to make it appear like the drawing of the power case show. You are now ready for the nose or gear housing section.

GEAR HOUSING OR NOSE SECTION: It is best to turn the gear housing to the true shape, shown in Fig. 6, on a lathe. Making a template of this section will insure accuracy. You may make this unit with or without the propeller shaft. (Consult Fig. 14-A also.) After it is shaped begin to attach all rear cowl studs and round off all rear corners as noted on the drawing. Next add the controllable propeller valve mechanism, then the oil strainer unit; then round off all corners. Now add nose ribs by gluing strips of narrow balsa in each rib position as shown in the finished drawing. After all strips are glued begin to "finish up" the rough strips or ribs by trimming with a knife and fine sandpaper, ending up the completion of the nose section by rounding off all corners as noted; and by painting the unit gray, with exception of all metal parts.

SUPERCHARGER SECTION: If you are going to build the entire motor this section, besides the power case, is very difficult to build. There are no sharp corners, except bolt holes, and the entire section is practically one unit. It can be built-up with striking realism, or carved to shape by long painstaking work. It is best to turn the center disc on the lathe and add intake pipe outlets on later, by gluing each outlet separately until all outlets are attached firmly. Then round off all corners by the use of filling compounds such as bees-wax, putty or plastic wood. To insure accurately the attaching of mounting holes it is suggested that a jig form be built before bolt holes are drilled. A simple jig can be made by the following method: First, draw up the plan of the supercharger front or rear view, that will give you the exact location of each bolt hole. Second, drive small nails, the size of the bolt hole's diameter, into each eight bolt holes; make sure the nails are in straight and that the nails' height are over the thickness of the side-view of the supercharger section as shown in Fig. 8. After the nail-heads are snipped off sharpen each nail-tip into a pointed cone so that when you lay the supercharger section on top of these nails they will make impressions in the supercharger unit. This will give you the exact location of each bolt hole, if you are careful in lining the unit up with both horizontal and vertical center-lines. After you have drilled the holes set this jig aside for further reference when you build the motor mount for your airplane. This entire unit is painted gray.

ACCESSORY SECTION: The Accessory Case, as shown in Fig. 9, is about the easiest part to build of the entire motor. This case consists of square and round forms on a disc background or support, which is bolted to the rear of the supercharger section. Shape the middle section before you add the outer section, as shown in all views. When this is completed paint it all gray with the exception of any exposed metal parts such as the bolt nuts.

Now start to carve the fuel pump to the sections as shown and finish it up by painting all gray and attaching it to the bottom of the case. After the fuel pump is attached firmly add some metal part underneath the pump to give the motor a business-like appearance.

Now start to carve the carburetor heater and entire unit. When it is all shaped finish it up as noted on the drawings of each unit: The heater or "hotspot" should be painted a shiny metal gray and attached to the motor case first. The carburetor unit is painted shiny black and attached underneath the heater as shown in Fig. 2 and 3. After the two sections are attached, for realism purposes, add all shiny metal fixtures such as bolt nuts, tie wires and control horns, into their respectful place. Consult all drawings on these two units.

MISCELLANEOUS: The wiring harness, as shown in Fig. 10, can be made up by the following means:

Use aluminum tubing for the manifold and shape it carefully to required form; watch out for kinking when you are bending it. All spark plug wires can be made from plain small-gauge copper wire. Some models of this Twin Row Wasp Jr. have different colored wires for the spark plugs; such as red, orange, green, and are used for easy identification of different models of this motor. All attachment nuts can be either cut from wood or metal to their shapes.

All oil lines with the exception of oil-line ABC, which is of aluminum, can be twisted to shape from common copper wire. Intake pipes also can be made of wire twisted to shape, painted shiny black for striking effect. It is best to shine up all exposed copper oil lines, for appearance before installing on the motor.

The cylinders, as shown in Fig. 12 and 12-A, can be made to almost-realism by following these suggestions. The section from the lowest part of the barrel to the top fin above the spark-plug hole can be turned out on the lathe to almost exact shape. The barrel section could be threaded with fine cotton or silk threads as shown on the "Cyclone F-2" plans.

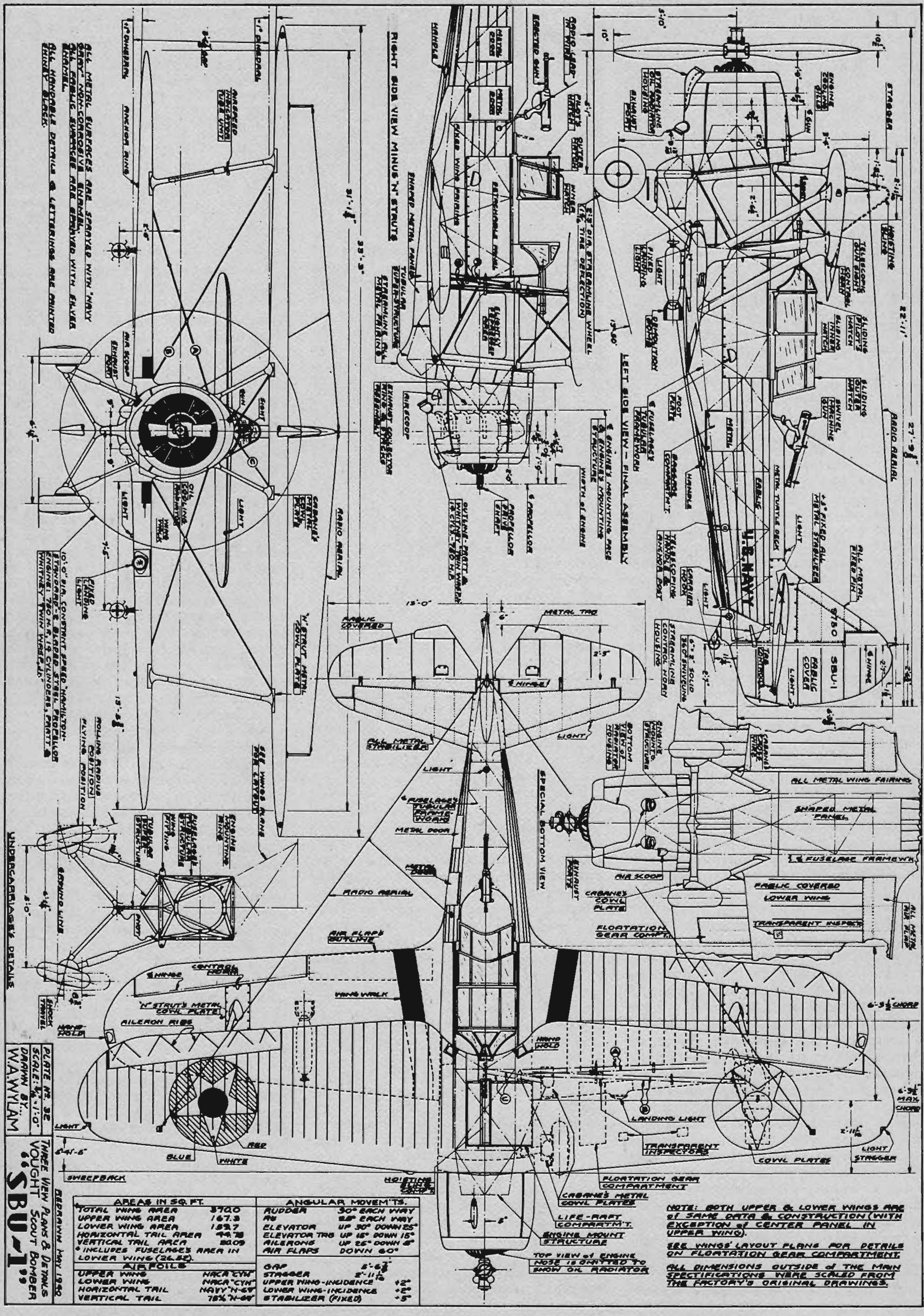
The main fins can either be built up or shaped on the lathe. The cylinder head, which houses the rocker or valve units, will have to be carved to shape in the Cyclone plans.

The baffles were made of stiff paper, glued and wrapped around the cylinders and on the heads as shown in the baffle layouts in Fig. 12 and 12A. This should be varnished (the paper baffles) after it is attached to give the paper stiffness, and the varnish should be dry before you paint it shiny black. Cloth can be used instead of stiff paper, varnished to give it stiffness after the cloth has been glued to the cylinders; then later painted shiny black.

The Hamilton Standard Propeller hubs were drawn so that you can build the hub in correct proportions to the motor. The shaft, as shown in Fig. 14A, was suggested for the following reasons: it will add realism to the motor and entire centersection; it will give your propeller a true and better support; and if mounted right, it will not warp the propeller out of alignment or it will not run off-center like nailed propellers do. This shaft can be turned out in your own machine shop, your high school machine shop or it can be made very reasonably (should not exceed $1 for labor and materials). When it is installed on your motor you'll be surprised at the snappy appearance it will give your propeller and motor.

When making the propeller shaft unit, first make the shaft, then the collar to fit (with about .001" clearance to allow free-wheeling) the shaft. It is suggested that the shaft should be threaded with fine S.A.E. thread; and before you attach the shaft to the gear housing, ask or consult the tap drill size chart to find out what size hole you should drill in the gear housing to fit your size thread on the shaft. The machine screw may be obtained from your local watchmaker; if he does not have any in stock that is nearest to the size you want, ask him where you could obtain it, as he most likely has a catalog on these fine screws, bolts and nuts that can be used with beautiful effect on other parts of your motor, besides the propeller hub unit.

If the entire motor is carefully and neatly made it will add greatly to your model airplane's appearance. We have seen plenty of. beautifully built models of airplanes but which had a faulty looking motor that marred or ruined the whole appearance of the model airplane. For this reason the motor plans were drawn to aid model builders in putting more "life" into their airplane models.

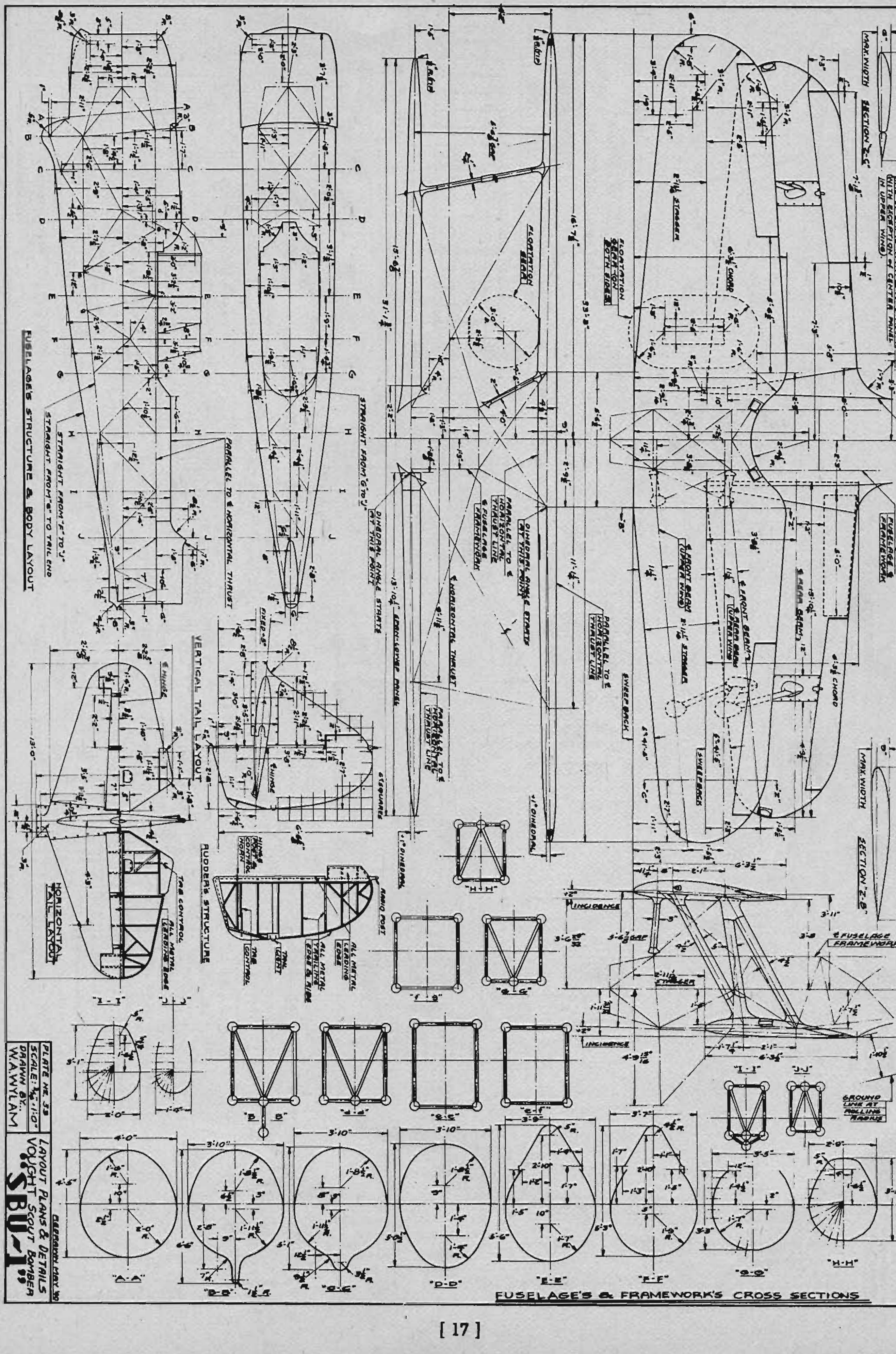


AREAS IN SQ. FT.	
TOTAL WING AREA	370.0
UPPER WING AREA	167.3
LOWER WING AREA	152.7
HORIZONTAL TAIL AREA	44.78
VERTICAL TAIL AREA	20.09
* INCLUDES FUSELAGES AREA IN LOWER WING (26.32).	

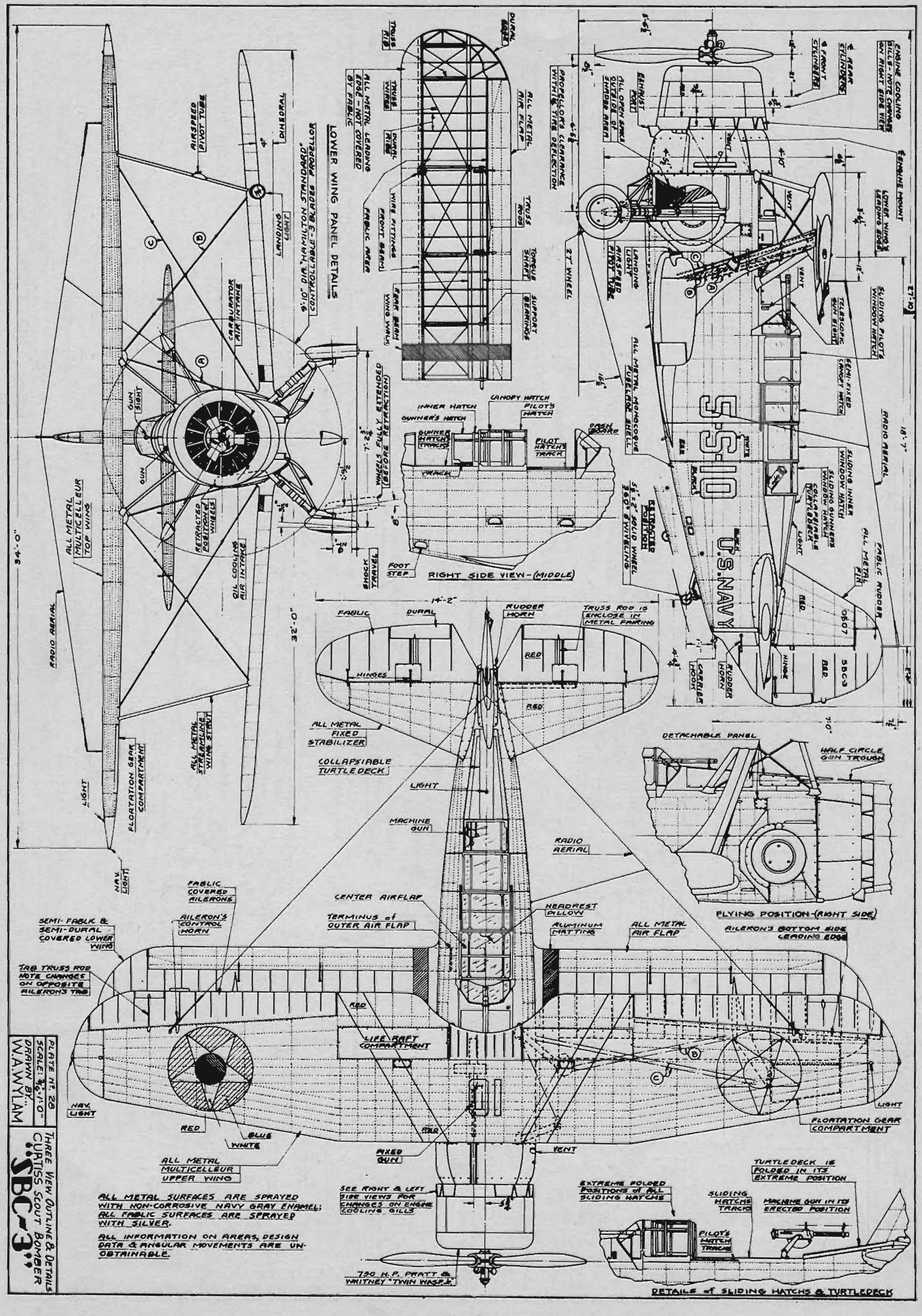
AIRFOILS	
UPPER WING	NACA "CYH"
LOWER WING	NACA "CYH"
HORIZONTAL TAIL	NAVY "N-67"
VERTICAL TAIL	75% "N-67"

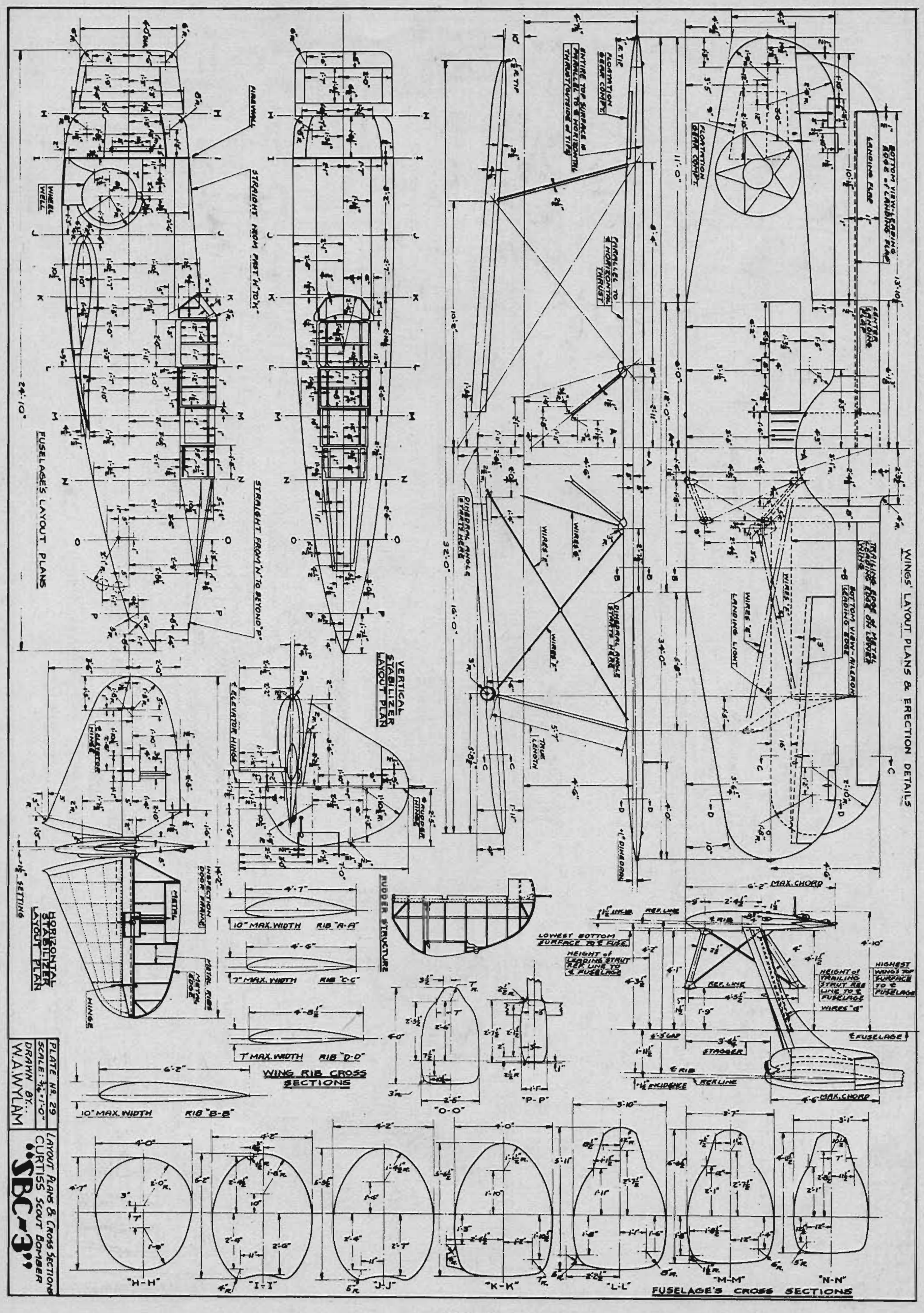
ANGULAR MOVEM'TS.	
RUDDER	30° EACH WAY
AS	25° EACH WAY
ELEVATOR	UP 30° DOWN 25°
ELEVATOR TAB	UP 15° DOWN 15°
AILERONS	UP 25° DOWN 8°
AIR FLAPS	DOWN 60°

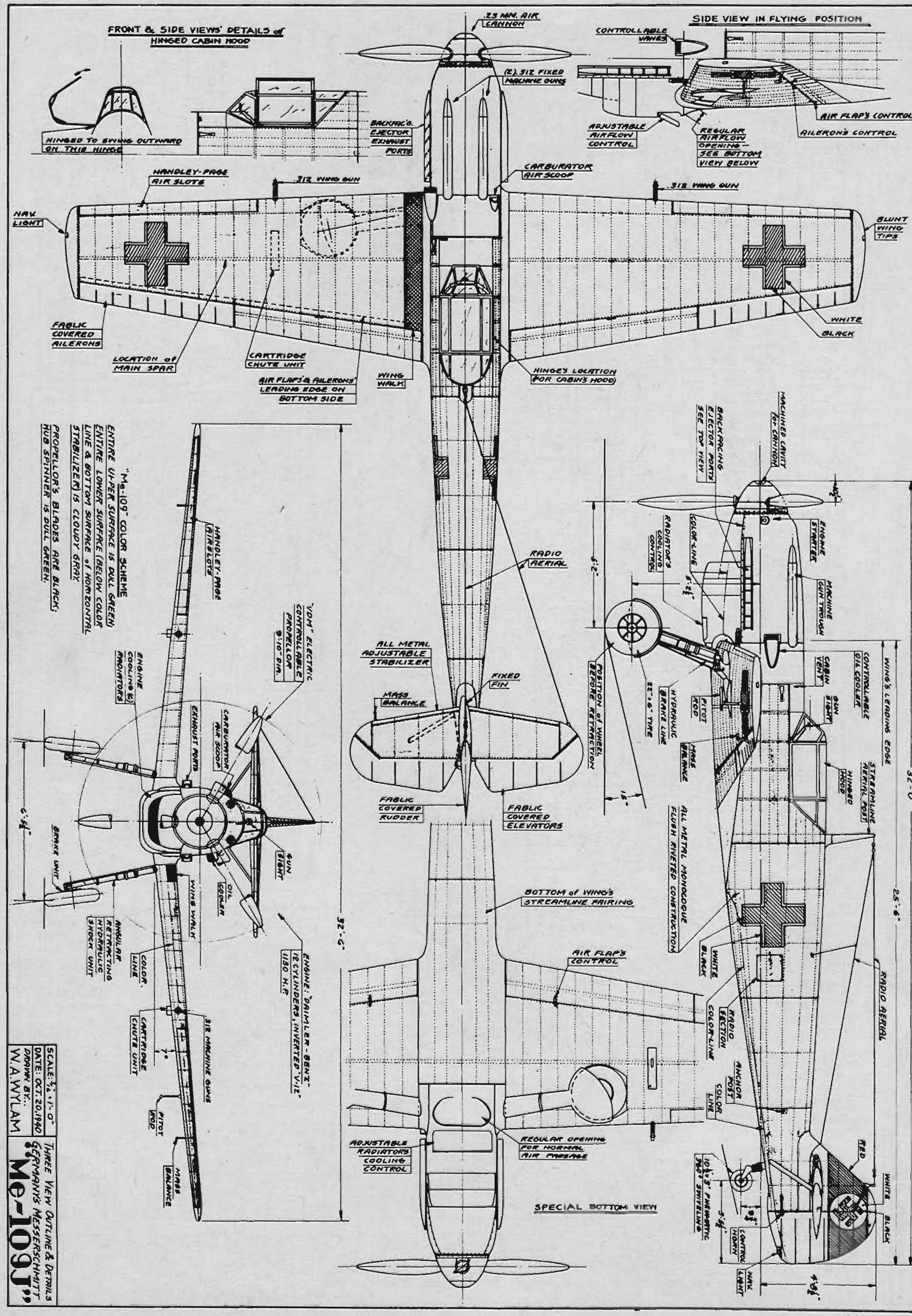
GAP	5'-6 7/8"
STAGGER	2'-11 1/16"
UPPER WING-INCIDENCE	+2°
LOWER WING-INCIDENCE	+2°
STABILIZER (FIXED)	+5°

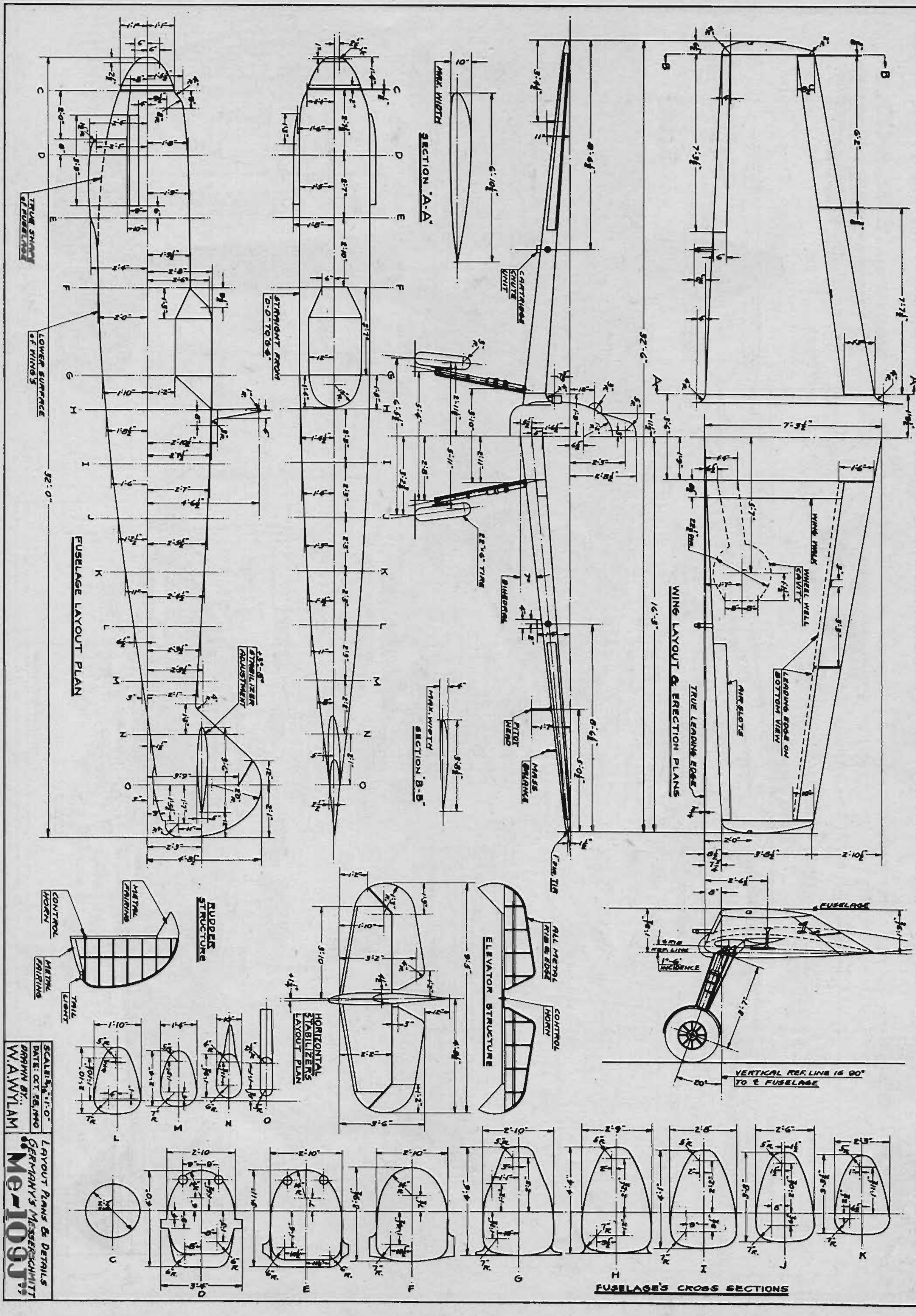


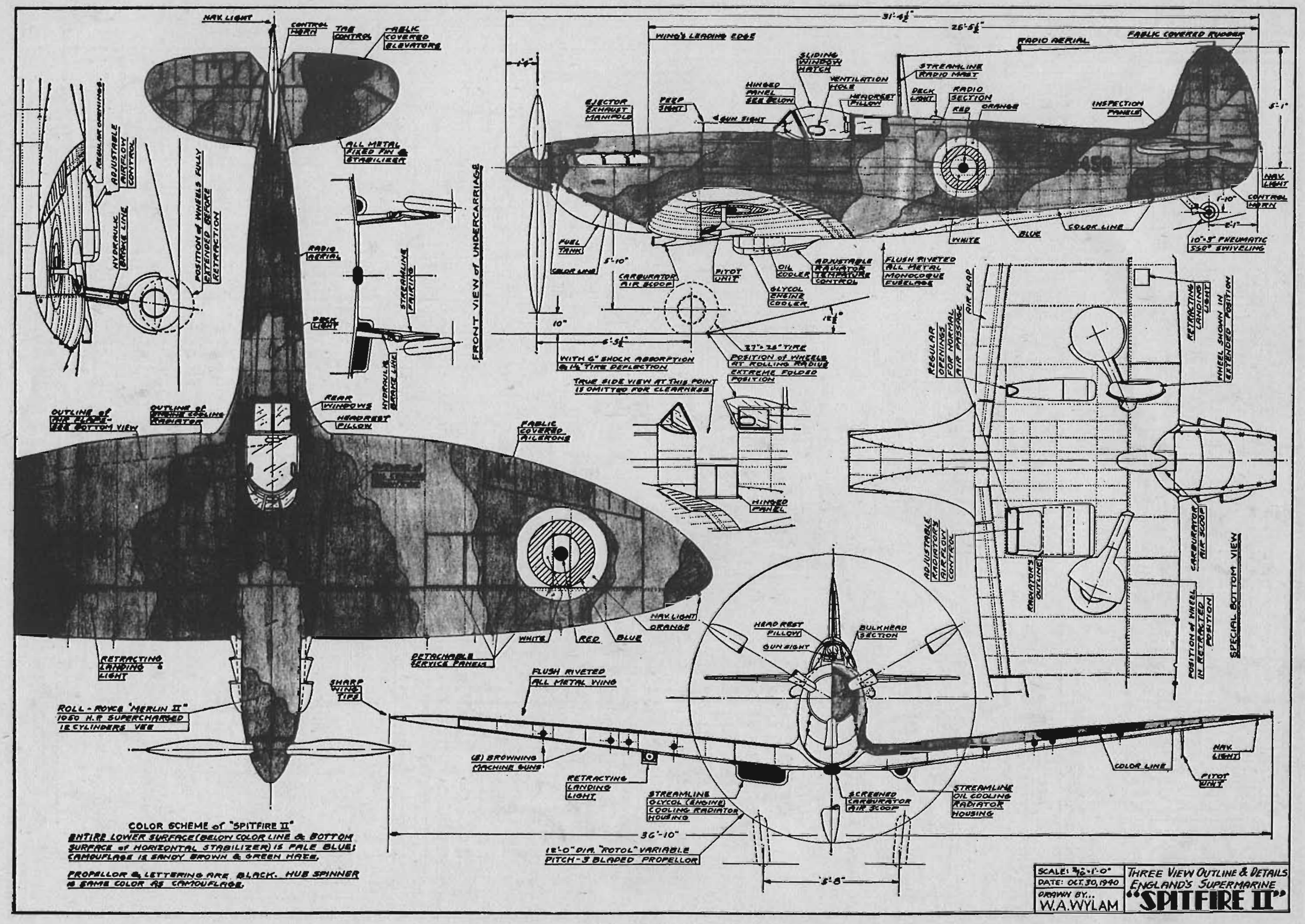
LAYOUT PLANS & DETAILS
VOUGHT SCOUT BOMBER
"SBU-1"
PLATE NO. 39
SCALE: 1/8"=1'-0"
DRAWN BY: W. A. WYLAM
FUSELAGE'S STRUCTURE & BODY LAYOUT
VERTICAL TAIL LAYOUT
RUDDER'S STRUCTURE
HORIZONTAL TAIL LAYOUT
TOP VIEW of FUSELAGE & FRAMEWORK
FUSELAGE'S & FRAMEWORK'S CROSS SECTIONS
MAX. WIDTH
SECTION "Z-C"
SECTION "Z-B"

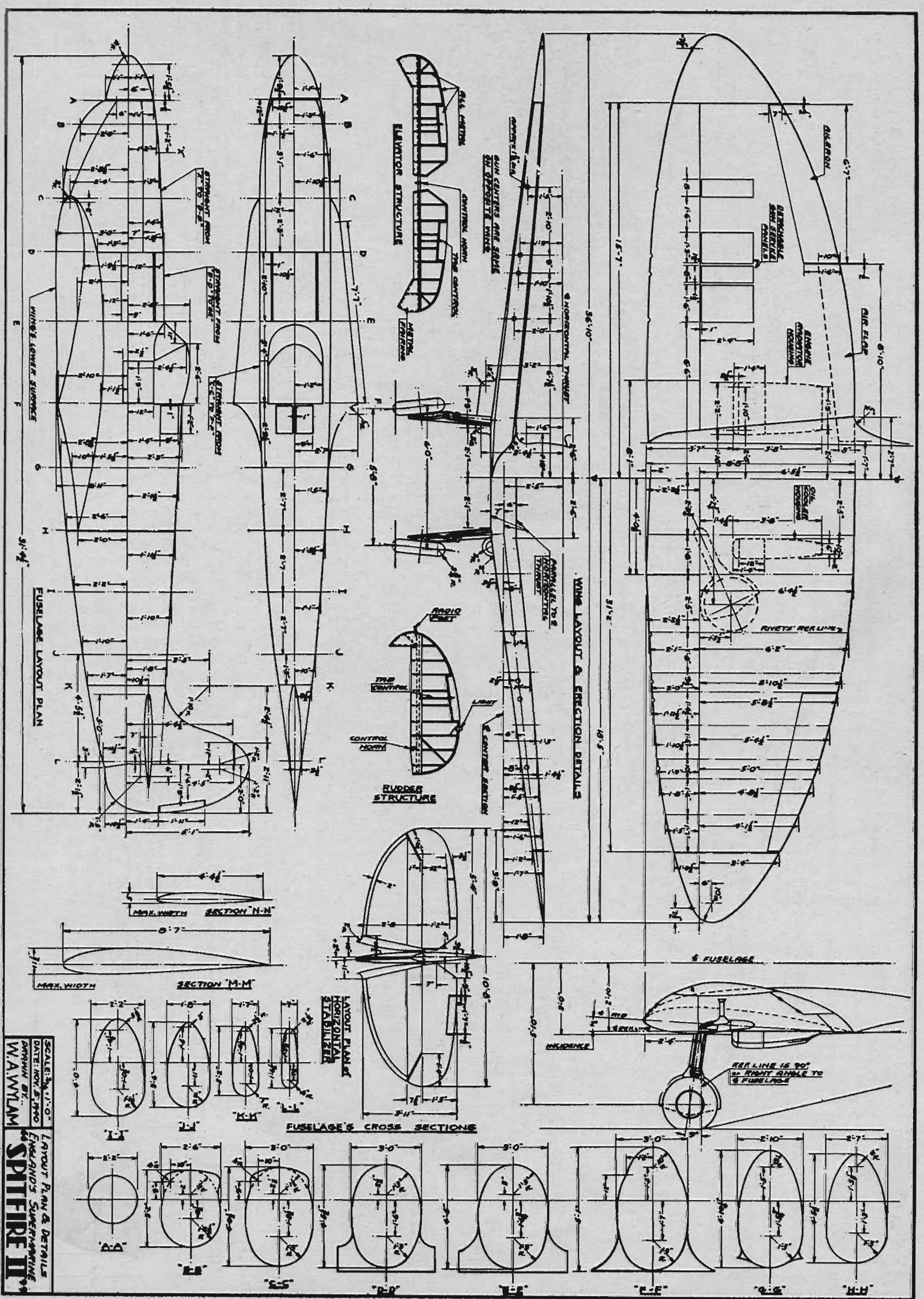

THREE VIEW OUTLINE & DETAILS
CURTISS SCOUT BOMBER
"SBC-3"
PLATE No. 28
DRAWN BY W.A. WYLAM
LOWER WING PANEL DETAILS
RIGHT SIDE VIEW-(MIDDLE)
FLYING POSITION-(RIGHT SIDE)
DETAILS of SLIDING HATCHS & TURTLEDECK
INNER HATCH
CANOPY HATCH
GUNNER'S HATCH
PILOT'S HATCH
PILOT HATCH TRACK
DASH BOARD
FOOT STEP
SHOCK TRAVEL
FABRIC
DURAL
RUDDER HORN
TRUSS ROD IS ENCLOSE IN METAL FAIRING
HINGES
RED
ALL METAL FIXED STABILIZER
COLLAPSIABLE TURTLE DECK
LIGHT
MACHINE GUN
RADIO AERIAL
CENTER AIRFLAP
TERMINUS of OUTER AIR FLAP
HEADREST PILLOW
ALUMINUM MATTING
ALL METAL AIR FLAP
AILERON'S BOTTOM SIDE LEADING EDGE
FABRIC COVERED AILERONS
AILERON'S CONTROL HORN
SEMI-FABRIC & SEMI-DURAL COVERED LOWER WING
TAB TRUSS ROD NOTE CHANGES ON OPPOSITE AILERON'S TAB
LIFE RAFT COMPARTMENT
NAV. LIGHT
FLOATATION GEAR COMPARTMENT
BLUE
WHITE
ALL METAL MULTICELLEUR UPPER WING
FIXED GUN
VENT
DETACHABLE PANEL
HALF CIRCLE GUN TROUGH
ALL METAL SURFACES ARE SPRAYED WITH NON-CORROSIVE NAVY GRAY ENAMEL; ALL FABRIC SURFACES ARE SPRAYED WITH SILVER.
ALL INFORMATION ON AREAS, DESIGN DATA & ANGULAR MOVEMENTS ARE UNOBTAINABLE.
SEE RIGHT & LEFT SIDE VIEWS FOR CHANGES ON ENGINE COOLING GILLS
750 H.P. PRATT & WHITNEY "TWIN WASP Jr."
EXTREME FOLDED POSITIONS of ALL SLIDING HATCHS
SLIDING HATCHS TRACK
PILOT'S HATCH TRACK
MACHINE GUN IN ITS ERECTED POSITION
TURTLEDECK IS FOLDED IN ITS EXTREME POSITION
14'-2"
U.S. NAVY
S-S-10

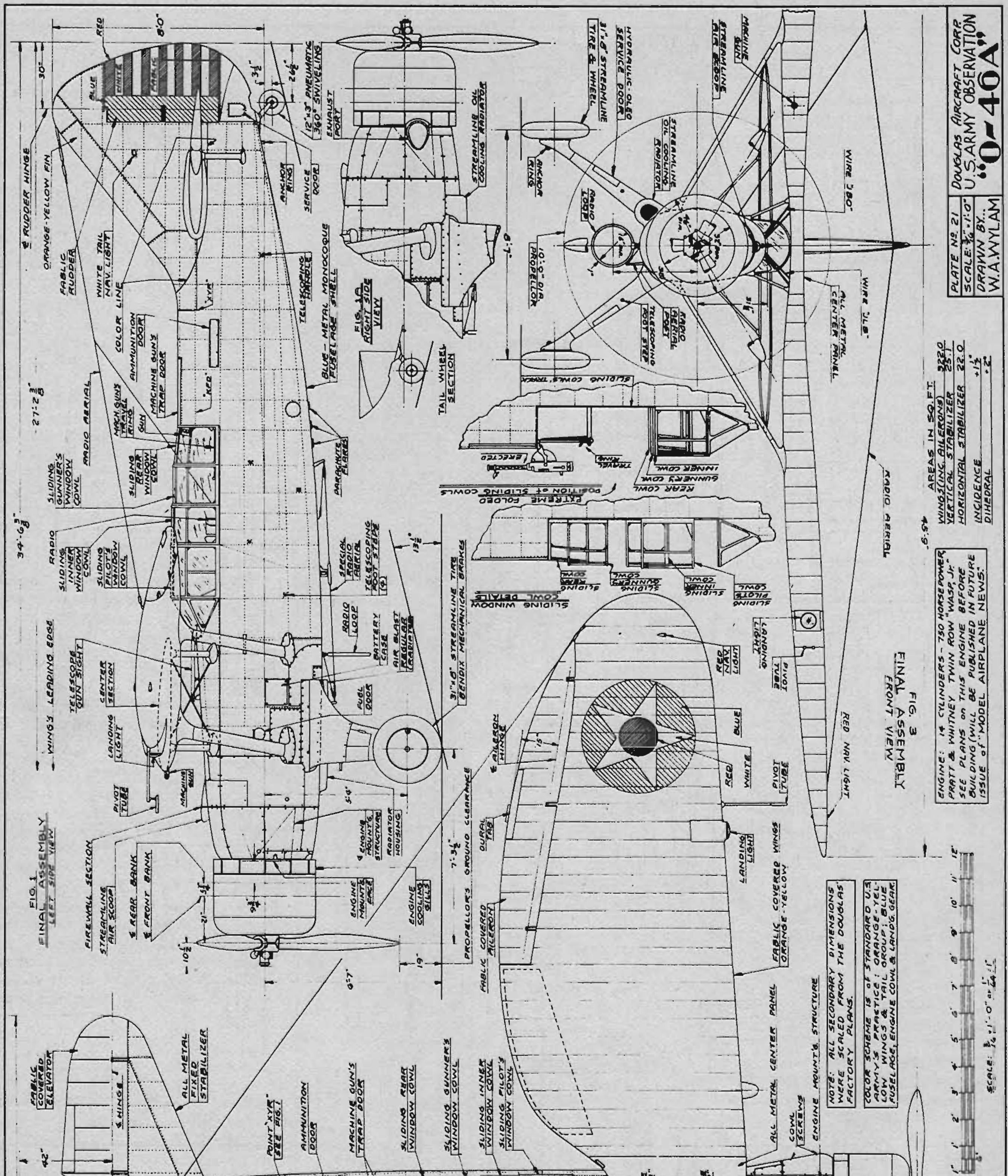

LAYOUT PLANS & CROSS SECTIONS
CURTISS SCOUT BOMBER
"SBC-3"
PLATE NO. 29
SCALE: 3/16"=1'-0"
DRAWN BY: W.A.WYLAM
FUSELAGE'S LAYOUT PLANS
WINGS' LAYOUT PLANS & ERECTION DETAILS
VERTICAL STABILIZER LAYOUT PLAN
HORIZONTAL STABILIZER LAYOUT PLAN
RUDDER STRUCTURE
WING RIB CROSS SECTIONS
FUSELAGE'S CROSS SECTIONS


FRONT & SIDE VIEWS' DETAILS of HINGED CABIN HOOD
HINGED TO SWING OUTWARD ON THIS HINGE
.23 MM. AIR CANNON
(2) .312 FIXED MACHINE GUNS
BACKFAC'G. EJECTOR EXHAUST PORTS
CARBURATOR AIR SCOOP
SIDE VIEW IN FLYING POSITION
CONTROLLABLE VANES
AIR FLAP'S CONTROL
AILERON'S CONTROL
ADJUSTABLE AIRFLOW CONTROL
REGULAR AIRFLOW OPENING - SEE BOTTOM VIEW BELOW
HANDLEY-PAGE AIR SLOTS
.312 WING GUN
.312 WING GUN
NAV. LIGHT
BLUNT WING TIPS
FABLIC COVERED AILERONS
WHITE
BLACK
LOCATION of MAIN SPAR
CARTRIDGE CHUTE UNIT
AIR FLAP'S & AILERONS' LEADING EDGE ON BOTTOM SIDE
WING WALK
HINGE'S LOCATION (FOR CABIN'S HOOD)
"Me-109" COLOR SCHEME
ENTIRE UPPER SURFACE IS DULL GREEN.
ENTIRE LOWER SURFACE (BELOW COLOR LINE & BOTTOM SURFACE of HORIZONTAL STABILIZER) IS CLOUDY GRAY.
PROPELLOR'S BLADES ARE BLACK.
HUB SPINNER IS DULL GREEN.
HANDLEY-PAGE AIR SLOTS
"VDM" ELECTRIC CONTROLLABLE PROPELLOR 9'-10" DIA.
ENGINE COOLING(K) RADIATORS
EXHAUST PORTS
CARBURATOR AIR SCOOP
BRAKE UNIT
GUN SIGHT
OIL COOLER
WING WALK
ANGULAR RETRACTING HYDRAULIC SHOCK UNIT
COLOR LINE
CARTRIDGE CHUTE UNIT
.312 MACHINE GUNS
PITOT ROD
MASS BALANCE
ENGINE: "DAIMLER-BENZ" 12 CYLINDERS, INVERTED "V-12" 1150 H.P.
32'-6"
6'-6"
7'
RADIO AERIAL
ALL METAL ADJUSTABLE STABILIZER
MASS BALANCE
FIXED FIN
FABLIC COVERED RUDDER
FABLIC COVERED ELEVATORS
BOTTOM of WING'S STREAMLINE FAIRING
AIR FLAP'S CONTROL
ADJUSTABLE RADIATORS COOLING CONTROL
REGULAR OPENING FOR NORMAL AIR PASSAGE
SPECIAL BOTTOM VIEW
MACHINED CAVITY for CANNON
BACKFACING EJECTOR PORTS SEE TOP VIEW
RADIATOR'S COOLING CONTROL
COLOR-LINE
ENGINE STARTER
MACHINE GUN TROUGH
POSITION of WHEEL BEFORE RETRACTION
22"x6" TIRE
HYDRAULIC BRAKE LINE
PITOT ROD
MASS BALANCE
CABIN VENT
CONTROLLABLE OIL COOLER
GUN SIGHT
WING'S LEADING EDGE
STREAMLINE AERIAL POST
HINGED HOOD
ALL METAL MONOCOQUE FLUSH RIVETED CONSTRUCTION
WHITE
BLACK
RADIO SECTION
COLOR-LINE
RADIO AERIAL
ANCHOR POST
COLOR LINE
RED
WHITE
BLACK
10½"x3" PNEUMATIC TAIL WHEEL SWIVELING
CONTROL HORN
NAV. LIGHT
32'-0"
25'-6"
SCALE: ¼"=1'-0"
DATE: OCT. 20, 1940
DRAWN BY... W.A. WYLAM
THREE VIEW OUTLINE & DETAILS
GERMANY'S MESSERSCHMITT
"Me-109J"


FUSELAGE LAYOUT PLAN
WING LAYOUT & ERECTION PLANS
SECTION "A-A"
SECTION "B-B"
HORIZONTAL STABILIZERS LAYOUT PLAN
ELEVATOR STRUCTURE
RUDDER STRUCTURE
FUSELAGE'S CROSS SECTIONS
VERTICAL REF. LINE IS 90° TO ℄ FUSELAGE
LAYOUT PLANS & DETAILS
GERMANY'S MESSERSCHMITT
Me-109J
DRAWN BY
W.A.WYLAM


THREE VIEW OUTLINE & DETAILS
ENGLAND'S SUPERMARINE
"SPITFIRE II"
SCALE: 3/16"-1'-0"
DATE: OCT. 30, 1940
DRAWN BY... W.A.WYLAM
COLOR SCHEME of "SPITFIRE II"
ENTIRE LOWER SURFACE (BELOW COLOR LINE & BOTTOM SURFACE of HORIZONTAL STABILIZER) IS PALE BLUE; CAMOUFLAGE IS SANDY BROWN & GREEN HAZE.
PROPELLOR & LETTERING ARE BLACK. HUB SPINNER IS SAME COLOR AS CAMOUFLAGE.
ROLL-ROYCE "MERLIN II" 1050 H.P. SUPERCHARGED 12 CYLINDERS VEE
FRONT VIEW of UNDERCARRIAGE
SPECIAL BOTTOM VIEW
NAV. LIGHT
CONTROL HORN
TAB CONTROL
FABRIC COVERED ELEVATORS
ALL METAL FIXED FIN & STABILIZER
REGULAR OPENINGS
ADJUSTABLE AIRFLOW CONTROL
HYDRAULIC BRAKE LINE
POSITION of WHEELS FULLY EXTENDED BEFORE RETRACTION
RADIO AERIAL
DECK LIGHT
STREAMLINE FAIRING
REAR WINDOWS
HEADREST PILLOW
OUTLINE of AIR FLAPS - SEE BOTTOM VIEW
OUTLINE of ENGINE COOLING RADIATOR
FABRIC COVERED AILERONS
NAV. LIGHT
ORANGE
WHITE
RED
BLUE
DETACHABLE SERVICE PANELS
RETRACTING LANDING LIGHT
SHARP WING TIPS
FLUSH RIVETED ALL METAL WING
(8) BROWNING MACHINE GUNS
RETRACTING LANDING LIGHT
STREAMLINE GLYCOL (ENGINE) COOLING RADIATOR HOUSING
SCREENED CARBURATOR AIR SCOOP
STREAMLINE OIL COOLING RADIATOR HOUSING
COLOR LINE
PITOT UNIT
36'-10"
12'-0" DIA. "ROTOL" VARIABLE PITCH-3 BLADED PROPELLOR
5'-8"
HEAD REST PILLOW
GUN SIGHT
BULKHEAD SECTION
31'-4 1/2"
25'-5 1/2"
WING'S LEADING EDGE
FABRIC COVERED RUDDER
SLIDING WINDOW HATCH
VENTILATION HOLE
HINGED PANEL SEE BELOW
HEADREST PILLOW
STREAMLINE RADIO MAST
DECK LIGHT
RADIO SECTION
RED
ORANGE
INSPECTION PANELS
EJECTOR EXHAUST MANIFOLD
PEEP SIGHT
GUN SIGHT
FUEL TANK
COLOR LINE
CARBURATOR AIR SCOOP
PITOT UNIT
OIL COOLER
GLYCOL ENGINE COOLER
ADJUSTABLE RADIATOR TEMPATURE CONTROL
FLUSH RIVETED ALL METAL MONOCOQUE FUSELAGE
WHITE
BLUE
COLOR LINE
10"-5" PNEUMATIC 550° SWIVELING
5'-1"
10"
5'-10"
6'-5 1/2"
WITH 6" SHOCK ABSORPTION & 1 1/2 TIRE DEFLECTION
27"-26" TIRE
POSITION of WHEELS AT ROLLING RADIUS
EXTREME FOLDED POSITION
TRUE SIDE VIEW AT THIS POINT IS OMITTED FOR CLEARNESS
HINGED PANEL
AIR FLAP
REGULAR OPENINGS FOR NORMAL AIR PASSAGE
RETRACTING LANDING LIGHT
WHEEL SHOWN IN EXTENDED POSITION
ADJUSTABLE RADIATORS AIRFLOW CONTROL
RADIATOR'S OUTLINE
CARBURATOR AIR SCOOP
POSITION of WHEEL IN RETRACTED POSITION


FUSELAGE LAYOUT PLAN
WING'S LOWER SURFACE
ELEVATOR STRUCTURE
RUDDER STRUCTURE
WING LAYOUT & ERECTION DETAILS
AILERON
AIR FLAP
SECTION "N-N"
SECTION "M-M"
MAX. WIDTH
LAYOUT PLAN OF HORIZONTAL STABILIZER
FUSELAGE'S CROSS SECTIONS
℄ FUSELAGE
INCIDENCE
SCALE: 3/8"=1'-0"
DATE: NOV. 5, 1940
DRAWN BY: W. A. WYLAM
LAYOUT PLAN & DETAILS
ENGLAND'S SUPERMARINE
"SPITFIRE II"



DOUGLAS AIRCRAFT CORP.
U.S. ARMY OBSERVATION
"O-40A"
PLATE No. 21
SCALE: 3/16"=1'-0"
DRAWN BY...
W.A. WYLAM
AREAS IN SQ. FT.
WINGS (INC. AILERONS) 322.0
VERTICAL STABILIZER 25.1
HORIZONTAL STABILIZER 22.0
INCIDENCE +1 1/2°
DIHEDRAL +2°
ENGINE: 14 CYLINDERS - 750 HORSEPOWER PRATT & WHITNEY TWIN ROW "WASP Jr." SEE PLANS of THIS ENGINE BEFORE BUILDING (WILL BE PUBLISHED IN FUTURE ISSUE of "MODEL AIRPLANE NEWS".
FIG. 1 FINAL ASSEMBLY LEFT SIDE VIEW
FIG. 1A RIGHT SIDE VIEW
FIG. 2 - FINAL ASSEMBLY TOP VIEW
FIG. 3 FINAL ASSEMBLY FRONT VIEW
SLIDING WINDOW COWL DETAILS
EXTREME FOLDED POSITION of SLIDING COWLS
TAIL WHEEL SECTION
NOTE: ALL SECONDARY DIMENSIONS WERE SCALED FROM THE DOUGLAS FACTORY PLANS.
COLOR SCHEME IS of STANDARD U.S. ARMY'S PRACTICE: ORANGE-YELLOW WINGS & TAIL GROUP; BLUE FUSELAGE, ENGINE COWL & LAND'G GEAR.
10'-0" HAMILTON-STANDARD CONSTANT SPEED-3 BLADE CONTROLLABLE PROPELLOR
BLUE-METAL MONOCOQUE FUSELAGE SHELL
31"x10" STREAMLINE TIRE BENDIX MECHANICAL BRAKES
12"x3" PNEUMATIC 360° SWIVELING
HYDRAULIC-OLEO SERVICE DOOR
FABRIC COVERED WINGS ORANGE-YELLOW
ALL METAL CENTER PANEL
ALL METAL AIR FLAP
ORANGE-YELLOW STABILIZER & ELEVATOR
ALL METAL FIXED STABILIZER
FABRIC COVERED ELEVATOR
PROPELLOR'S GROUND CLEARANCE
SCALE: 1/16"=1'-0" or 1/64"=1"

A Miniature Douglas O-46A

How You Can Build A Scale Model of the U.S. Army's Finest Observation Plane—Complete In Every Detail

By WILLIAM WYLAM

The Douglas O-46A U.S. Army Observation Plane

THE famous "Flying Razor," nicknamed because of its odd thin fuselage, namely, the Douglas Army Observation "O-46A" is one of the army's most successful observation models. The first airplane was delivered to the army in 1936 and this airplane was considered the greatest stride made toward the perfect observation-type of airplanes. It was powered by the 750 horsepower Pratt & Whitney's "Twin Wasp Jr." The fuselage of this airplane was built in such a way that there were hardly any blind spots with the exception of a small area in the wing's center panel and the area below the floorboard. The flying characteristic of this airplane permitted the ship to fly very slowly for mapping work, without stalling, and at the same time it could roar into a high speed of 245 miles per hour at a moment's notice. This ship is unusually stable in all kinds of weather, no matter what position it is flying in or what the weather, it will always right itself unaided. The "O-46As" were sent to practically every national guard post in the country and are very popular among guardsmen.

The Model "O-46A" Observation plane is a two place, enclosed cockpit, high-wing monoplane, designed solely for observation work. The 14 cylinders, 750 horsepower, twin row "Wasp Jr." is the powerplant. The armaments consist of one .30 caliber fixed machine gun, which is located in the left wing and one .30 caliber swivel gun, which is in the rear cockpit. The landing gears are of oleo type shock absorbers with Bendix mechanical brakes. The color scheme is the standard army blue fuselage and army yellow wings and tail groups.

The fuselage is constructed of rolled aluminum alloy frames stringers on a semi-monocoque principle. All-Metal, smooth stressed skin are then riveted onto the stringers and frames. The wings are of built-up aluminum alloy ribs and beams and are fabric covered. The fixed tail surfaces are constructed of all-metal frames and stressed skin covering. Some model "O-46A's" were equipped with fabric-covered horizontal stabilizers instead of the all-metal jobs. The movable tail and aileron surfaces were of aluminum alloy frames, encased in fabric. The entire chassis is enclosed in an all-metal streamlined housing.

The airfoil that is employed is the U.S.A. 45 modified.

Some Model Building Suggestions

The main reason the "O-46A" was drawn, was to give the gas modelers a suitable design for them to experiment with. Because of the "O-46A's" beautiful arrangement of the wings and tail surfaces it is very suitable for gas models. Its high parasol wings, high horizontal stabilizer and large vertical stabilizer should be very favorable for stable gas model flights and a gas model of this design should be considered by every serious gas modeler. A beautiful scale or super-detailed model can also be built from these plans. If the modeler wishes to make a gas model he must make several important changes in the entire design so that it will fly. These changes are only determined by experience and the knowledge of airfoils. Since all dimensions are shown on the plans the plans can safely be redrawn to any definite scale.

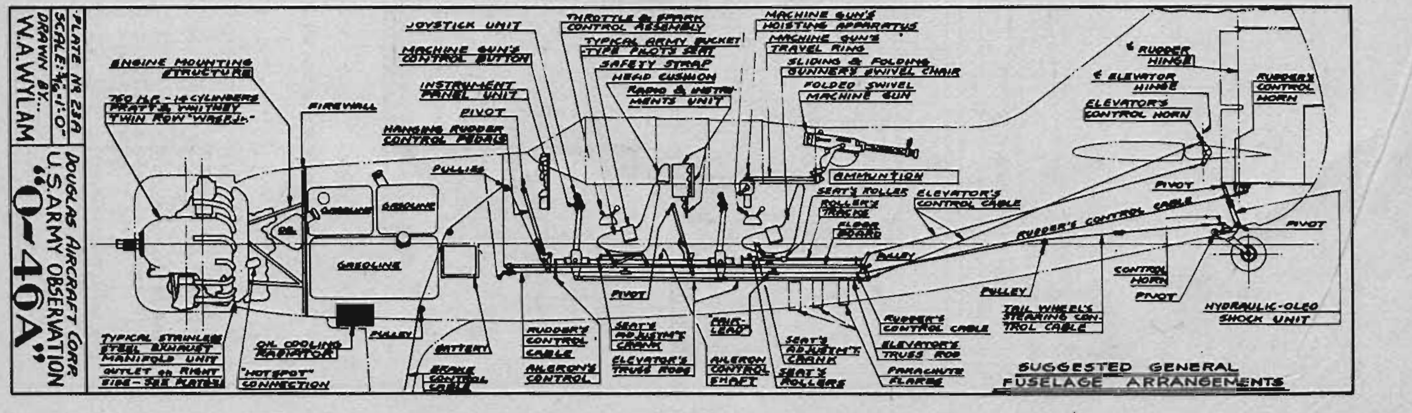
The wings should be drawn up first in its three elevations; the front, side and top view. By carefully drawing the entire layouts to your chosen scale, mistakes are less apt to occur. Also refer to the article on the "V-143 in Miniature", page 41, as you will find numerous suggestions in drawing up your plans. After the wings are all drawn begin to lay out the fuselage's side-view, then the front-view and finally the top. After the fuselage is completely drawn finish up the empennage section, then the undercarriage unit. After the plans are all drawn, the model can easily be planned out to suit the modeler's method of construction. It is suggested that the fuselage be carved out of a solid block or of two blocks screwed together; each block representing one-half of the fuselage and screwed together at the tail and nose ends. When the fuselage is completely carved the screws are removed and the hollowing-out procedure is very much easier. After the insides are all hollowed out and all roughness sanded smooth, the two halves are then glued together permanently.

The fixed tail surfaces should be made of solid wood while the movable tail surfaces should be of built-up construction. The wing's center panel should be of carved solid wood while the two outer panels should be built up in order to give your model a realistic appearance. The landing gear should be of solid construction because of its odd shape: The engine cowl can be turned down on the lathe to an exact shape and should be made thin enough so that it will fit snugly over your dummy engine. Before you start to build your engine it's best that you see the plans of the motor, on page 11. The insides of the fuselage should be lined with tinfoil to give a realistic metal finish. After the tin foil has dried add all the cockpit's details before you attach your sliding window cowls. The sliding window cowls should be built up of thin balsa strips and ising glass.

Brief Description of the Plans

Figs. 1, 2, 3. These three views show the final assembly or how the finished model

(continued on page 44)



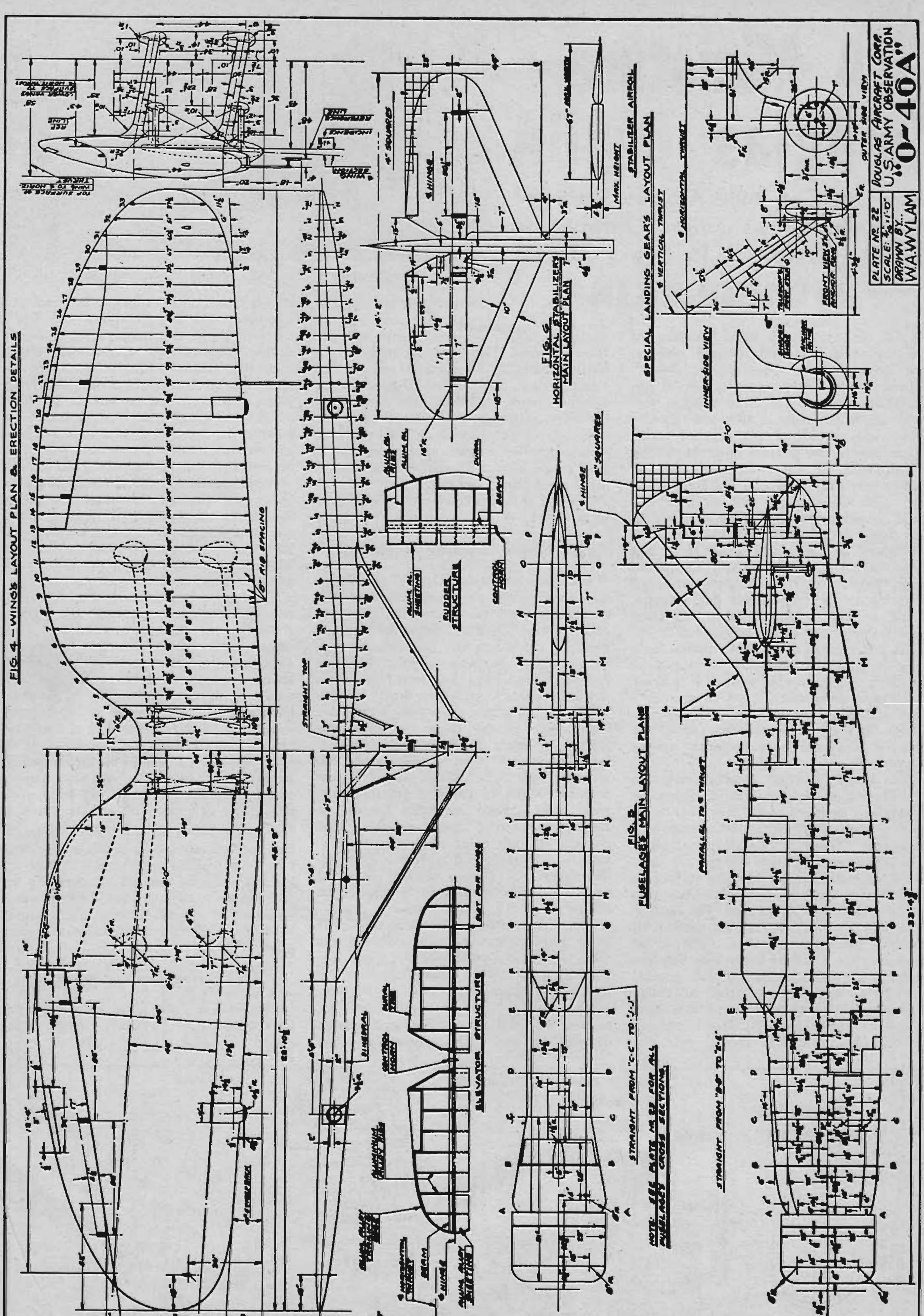


FIG. 4 - WINGS LAYOUT PLAN & ERECTION DETAILS
FIG. 6 HORIZONTAL STABILIZER MAIN LAYOUT PLAN
STABILIZER AIRFOIL
SPECIAL LANDING GEAR'S LAYOUT PLAN
RUDDER STRUCTURE
ELEVATOR STRUCTURE
FIG. 5 FUSELAGE'S MAIN LAYOUT PLANS
INNER SIDE VIEW
OUTER SIDE VIEW
PLATE No 22
DRAWN BY W.A. WYLAM
DOUGLAS AIRCRAFT CORP.
U.S. ARMY OBSERVATION
"O-46A"

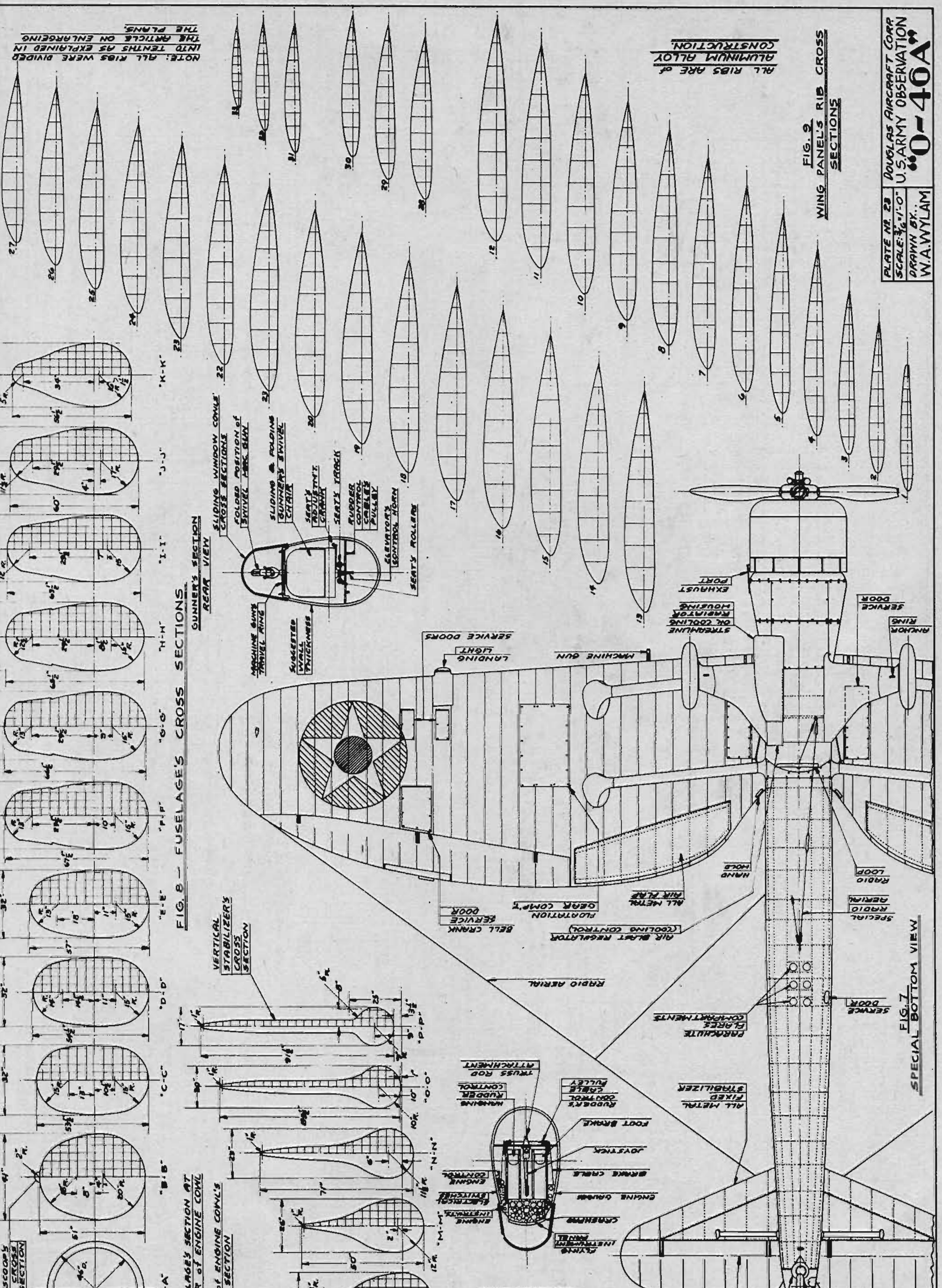


PLATE Nº 28
SCALE: 3/16"=1'-0"
DRAWN BY..
W.A.WYLAM
DOUGLAS AIRCRAFT CORP.
U.S.ARMY OBSERVATION
"O-46A"
FIG. 9
WING PANEL'S RIB CROSS SECTIONS
ALL RIBS ARE of ALUMINUM ALLOY CONSTRUCTION.
NOTE: ALL RIBS WERE DIVIDED INTO TENTHS AS EXPLAINED IN THE ARTICLE ON ENLARGEING THE PLANS.
FIG. 8 — FUSELAGE'S CROSS SECTIONS
AIRSCOOPS CROSS SECTION
FUSELAGE'S SECTION AT REAR of ENGINE COWL
REAR of ENGINE COWL'S CROSS SECTION
VERTICAL STABILIZER'S CROSS SECTION
GUNNER'S SECTION REAR VIEW
SLIDING WINDOW COWLS CROSS SECTIONS
FOLDED POSITION of SWIVEL MACH. GUN
SLIDING & FOLDING GUNNER'S SWIVEL CHAIR
SEAT'S ADJUSTM'T CRANK
SEAT'S TRACK
RUDDER CONTROL CABLE'S PULLEY
ELEVATOR'S CONTROL HORN
SEAT'S ROLLERS
MACHINE GUNS TRAVEL RING
SUGGESTED WALL THICKNESS
PILOT'S SECTION FORWARD VIEW
TRUSS ROD ATTACHMENT
RUDDER'S CONTROL CABLE PULLEY
HANGING RUDDER CONTROL
FOOT BRAKE
JOYSTICK
BRAKE CABLE
ENGINE CONTROL
ENGINE GAUGES
ELECTRICAL SWITCHES
ENGINE INSTRUMENTS
CRASHPAD
FLYING INSTRUMENT PANEL
FIG. 7
SPECIAL BOTTOM VIEW
SERVICE DOOR
ANCHOR RING
EXHAUST PORT
STREAMLINE RADIATOR OIL COOLING HOUSING
MACHINE GUN
LANDING LIGHT
SERVICE DOORS
ALL METAL AIR FLAP
FLOATATION GEAR COMP'T
BELL CRANK SERVICE DOOR
AIR BLAST REGULATOR (COOLING CONTROL)
RADIO AERIAL
HAND HOLE
RADIO LOOP
SPECIAL RADIO AERIAL
PARACHUTE FLARES COMPARTMENTS
ALL METAL FIXED STABILIZER
℄ HINGE
SWIVEL UNIT

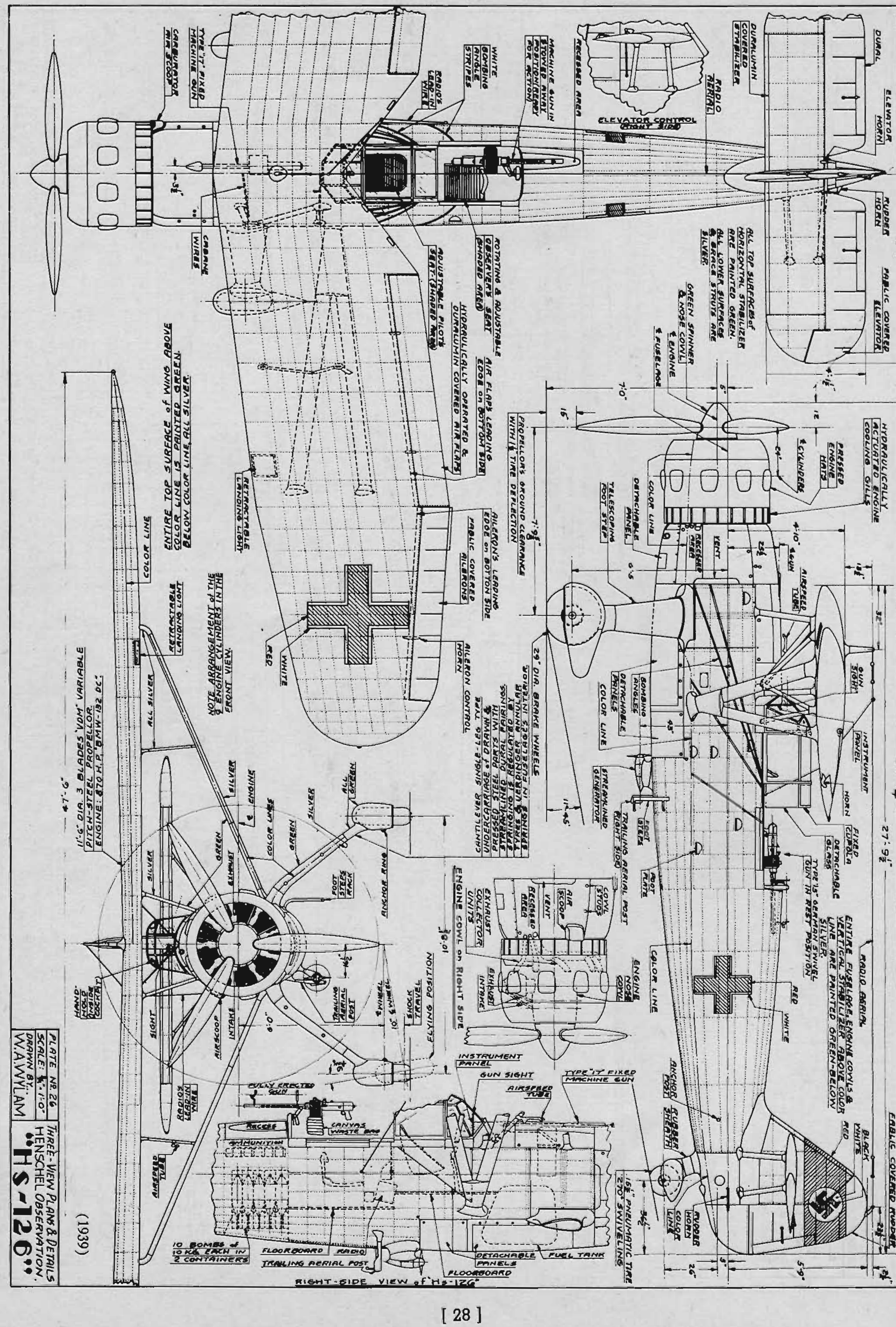


PLATE No. 26
SCALE: ⅛"-1'-0"
DRAWN BY: W.A.WYLAM
THREE-VIEW PLANS & DETAILS
HENSCHEL OBSERVATION
"HS-126"
(1939)
47'-6"
11'-6" DIA. 3 BLADES "VDM" VARIABLE PITCH-STEEL PROPELLOR.
ENGINE: 870 H.P. "BMW-132 DC".
HAND-HOLD (INSIDE COCKPIT)
SIGHT
SILVER
ALL SILVER
COLOR LINE
RETRACTABLE LANDING LIGHT
ENTIRE TOP SURFACE of WING ABOVE COLOR LINE IS PAINTED GREEN. BELOW COLOR LINE, ALL SILVER.
NOTE ARRANGEMENT of THE 9 ENGINE CYLINDERS IN THE FRONT VIEW.
AIRSPEED TUBE
RADIO'S LEAD-IN WIRE
10 BOMBS of 10 KG. EACH IN 2 CONTAINERS
AIRSCOOP
INTAKE
GREEN
EXHAUST
℄ ENGINE
COLOR LINES
FOOT STEPS RACK
ALL GREEN
ANCHOR RING
TRAILING AERIAL POST
SHOCK TRAVEL
FLYING POSITION
10'-8½"
ENGINE COWL on RIGHT SIDE
INSTRUMENT PANEL
GUN SIGHT
AIRSPEED TUBE
TYPE "17" FIXED MACHINE GUN
FULLY ERECTED GUN
CANVAS WASTE BAG
AMMUNITION
FLOORBOARD
RADIO
TRAILING AERIAL POST
DETACHABLE PANELS
FUEL TANK
RIGHT-SIDE VIEW of "Hs-126"
CANTILEVER SINGLE-LEG TYPE UNDERCARRIAGE of DRAWN & PRESSED STEEL PARTS WITH STREAMLINED DURAL FAIRINGS. SPRINGING IS REGULATED BY TYRES & VERDINGER ANNULAR SPRINGS IN FUSELAGE'S INTERIOR.
29" DIA. BRAKE WHEELS
PROPELLOR'S GROUND CLEARANCE WITH 1/3 TIRE DEFLECTION
AILERON'S LEADING EDGE on BOTTOM SIDE
FABRIC COVERED AILERONS
AILERON CONTROL HORN
AIR FLAPS LEADING EDGE on BOTTOM SIDE
HYDRAULICALLY OPERATED & DURALUMIN COVERED AIR FLAPS
ROTATING & ADJUSTABLE OBSERVER'S SEAT (SHADED AREA)
ADJUSTABLE PILOT'S SEAT (SHADED AREA)
WHITE BOMBING ANGLE STRIPES
MACHINE GUN IN STOWED AWAY POSITION (READY FOR ACTION)
RECESSED AREA
ELEVATOR CONTROL (RIGHT SIDE)
RADIO AERIAL
DURALUMIN COVERED STABILIZER
ALL TOP SURFACES of HORIZONTAL STABILIZER ARE PAINTED GREEN. ALL LOWER SURFACES & BRACE STRUTS ARE SILVER.
GREEN SPINNER & NOSE COWL
℄ ENGINE
℄ FUSELAGE
CARBURETOR AIR SCOOP
TYPE "17" FIXED MACHINE GUN
CABANE WIRES
ELEVATOR HORN
RUDDER HORN
FABRIC COVERED ELEVATOR
DURAL
15'-9"
HYDRAULICALLY ACTUATED ENGINE COOLING GILLS
PRESSED ENGINE HATS
℄ CYLINDERS
AIRSPEED TUBE
GUN SIGHT
INSTRUMENT PANEL
HORN
FIXED CUPOLA
DETACHABLE GLASS
TYPE "15" GERMAN SWIVEL GUN IN REST POSITION
ENTIRE FUSELAGE, ENGINE COWLS & VERTICAL STABILIZER ABOVE COLOR LINE ARE PAINTED GREEN-BELOW SILVER.
RADIO AERIAL
RED
WHITE
BLACK
FABRIC COVERED RUDDER
RUDDER HORN
COLOR LINE
ANCHOR POST
RUBBER SHEATH
16½" PNEUMATIC TIRE 270° SWIVELING
ENGINE NOSE COWL
COWL STUDS
AIR SCOOP
VENT
RECESSED AREA
EXHAUST COLLECTOR UNITS
EXHAUST INTAKE
STREAMLINED GENERATOR
TRAILING AERIAL POST (RIGHT SIDE)
FOOT STEPS
FOOT PLATE
COLOR LINE
BOMBING ANGLES
DETACHABLE PANELS
TELESCOPING FOOT STEP
DETACHABLE PANEL
35'-4¼"
27'-9½"
7'-0"

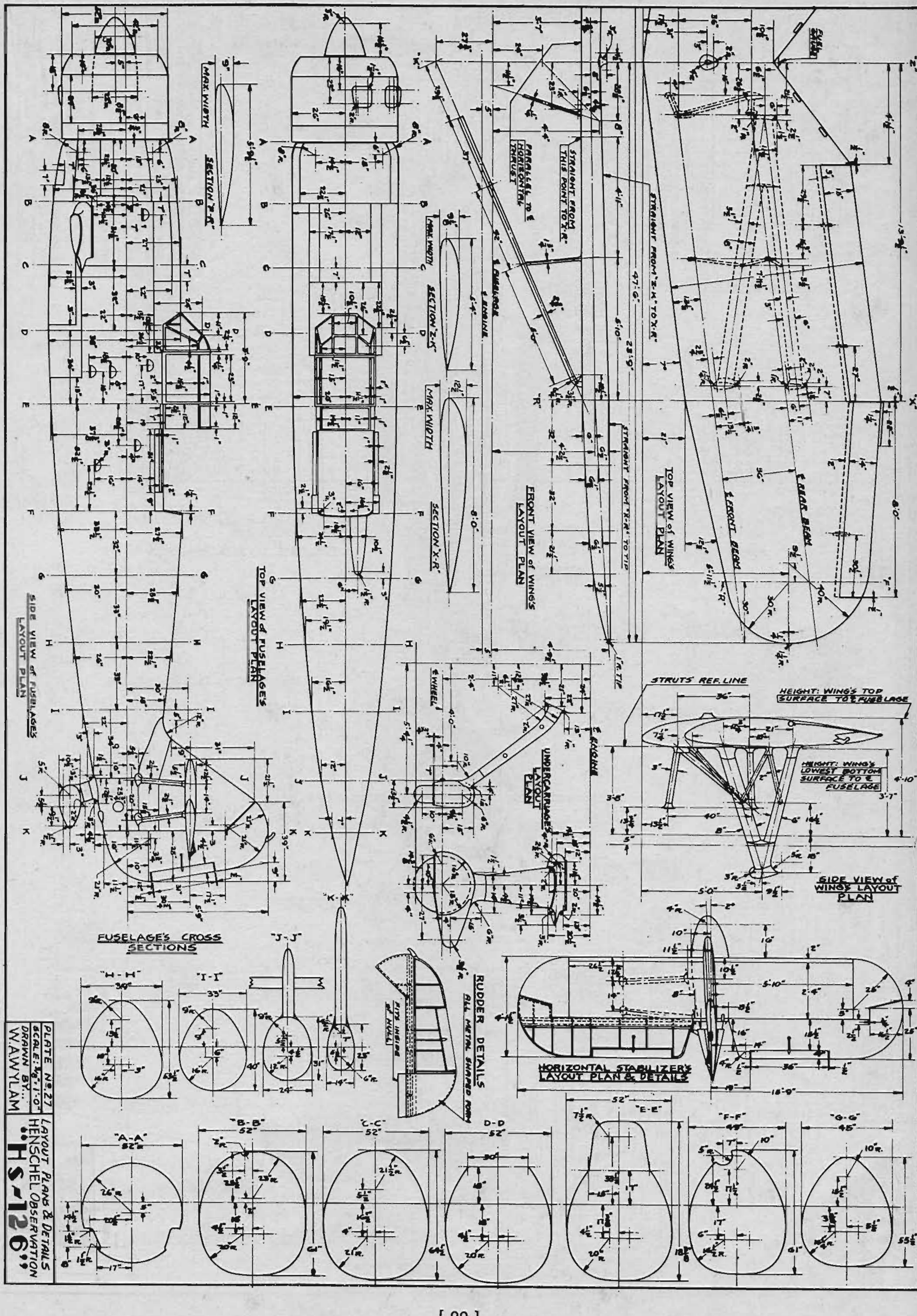
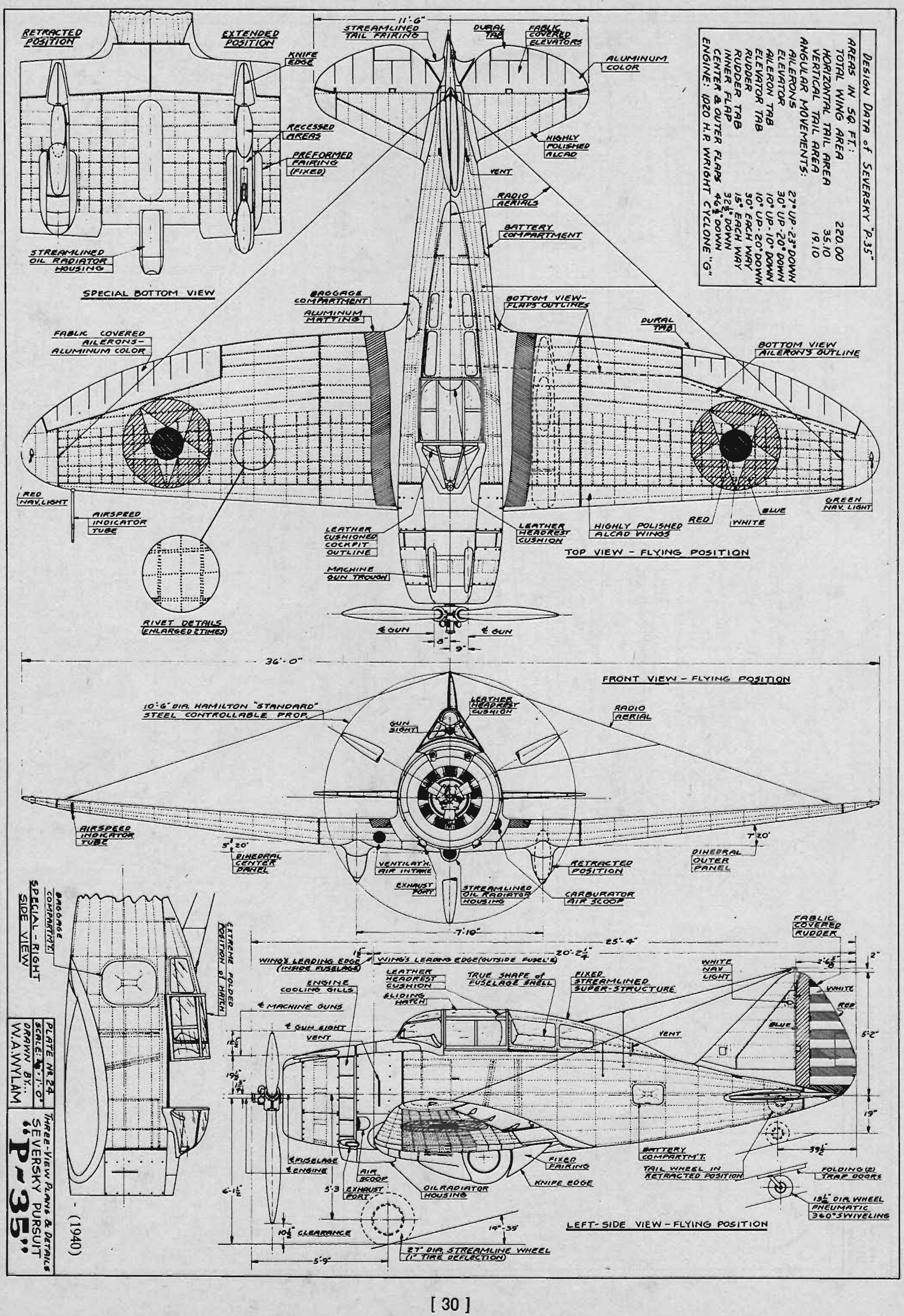


PLATE No. 27
SCALE: 1/8"-1'-0"
DRAWN BY... W.A.WYLAM
LAYOUT PLANS & DETAILS
HENSCHEL OBSERVATION
HS-126
SIDE VIEW of FUSELAGES LAYOUT PLAN
TOP VIEW of FUSELAGES LAYOUT PLAN
FRONT VIEW of WINGS LAYOUT PLAN
TOP VIEW of WINGS LAYOUT PLAN
SIDE VIEW of WINGS LAYOUT PLAN
UNDERCARRIAGE'S LAYOUT PLAN
RUDDER DETAILS
ALL METAL SHAPED FORM
HORIZONTAL STABILIZER'S LAYOUT PLAN & DETAILS
FUSELAGE'S CROSS SECTIONS
STRUTS' REF. LINE
FRONT BEAM
REAR BEAM


DESIGN DATA of SEVERSKY "P-35"
AREAS IN SQ. FT.:
TOTAL WING AREA 220.00
HORIZONTAL TAIL AREA 35.10
VERTICAL TAIL AREA 19.10
ANGULAR MOVEMENTS:
AILERONS 27° UP-23° DOWN
ELEVATOR 30° UP-20° DOWN
AILERON TAB 10° UP-10° DOWN
ELEVATOR TAB 10° UP-20° DOWN
RUDDER 30° EACH WAY
RUDDER TAB 15° EACH WAY
INNER FLAP 32½° DOWN
CENTER & OUTER FLAPS 46½° DOWN
ENGINE: 1020 H.P. WRIGHT CYCLONE "G"
RETRACTED POSITION
EXTENDED POSITION
KNIFE EDGE
RECESSED AREAS
PREFORMED FAIRING (FIXED)
STREAMLINED OIL RADIATOR HOUSING
SPECIAL BOTTOM VIEW
11'-6"
STREAMLINED TAIL FAIRING
DURAL TAB
FABRIC COVERED ELEVATORS
ALUMINUM COLOR
HIGHLY POLISHED ALCAD
VENT
RADIO AERIALS
BATTERY COMPARTMENT
BAGGAGE COMPARTMENT
ALUMINUM MATTING
BOTTOM VIEW-FLAPS OUTLINES
DURAL TAB
BOTTOM VIEW AILERONS OUTLINE
FABRIC COVERED AILERONS-ALUMINUM COLOR
RED NAV. LIGHT
AIRSPEED INDICATOR TUBE
LEATHER CUSHIONED COCKPIT OUTLINE
LEATHER HEADREST CUSHION
HIGHLY POLISHED ALCAD WINGS
RED
WHITE
BLUE
GREEN NAV. LIGHT
TOP VIEW - FLYING POSITION
MACHINE GUN TROUGH
RIVET DETAILS (ENLARGED 2 TIMES)
℄ GUN
℄ GUN
8"
9"
36'-0"
FRONT VIEW - FLYING POSITION
10'-6" DIA. HAMILTON "STANDARD" STEEL CONTROLLABLE PROP.
LEATHER HEADREST CUSHION
GUN SIGHT
RADIO AERIAL
AIRSPEED INDICATOR TUBE
5°20'
DIHEDRAL CENTER PANEL
VENTILAT'N. AIR INTAKE
EXHAUST PORT
STREAMLINED OIL RADIATOR HOUSING
7°20'
DIHEDRAL OUTER PANEL
RETRACTED POSITION
CARBURATOR AIR SCOOP
7'-10"
SPECIAL - RIGHT SIDE VIEW
BAGGAGE COMPARTM'T.
EXTREME FOLDED POSITION of HATCH
25'-4"
20'-2¼"
FABRIC COVERED RUDDER
WING'S LEADING EDGE (INSIDE FUSELAGE)
WING'S LEADING EDGE (OUTSIDE FUSEL'G)
LEATHER HEADREST CUSHION
TRUE SHAPE of FUSELAGE SHELL
FIXED STREAMLINED SUPER-STRUCTURE
WHITE NAV LIGHT
WHITE
RED
BLUE
ENGINE COOLING GILLS
SLIDING HATCH
℄ MACHINE GUNS
℄ GUN SIGHT
VENT
VENT
5'-2"
19"
39½
2'-6⅝"
2"
℄ FUSELAGE
℄ ENGINE
AIR SCOOP
EXHAUST PORT
OIL RADIATOR HOUSING
BATTERY COMPARTM'T.
FIXED FAIRING
KNIFE EDGE
TAIL WHEEL IN RETRACTED POSITION
FOLDING (2) TRAP DOORS
13½" DIA. WHEEL PNEUMATIC 360° SWIVELING
6'-1½"
5'-3
10½" CLEARANCE
14°-35'
27" DIA. STREAMLINE WHEEL (1" TIRE DEFLECTION)
5'-9"
LEFT-SIDE VIEW - FLYING POSITION
PLATE NR. 24
SCALE: ¼"-1'-0"
DRAWN BY... W.A. WYLAM
THREE-VIEW PLANS & DETAILS
SEVERSKY PURSUIT
"P-35"
- (1940)

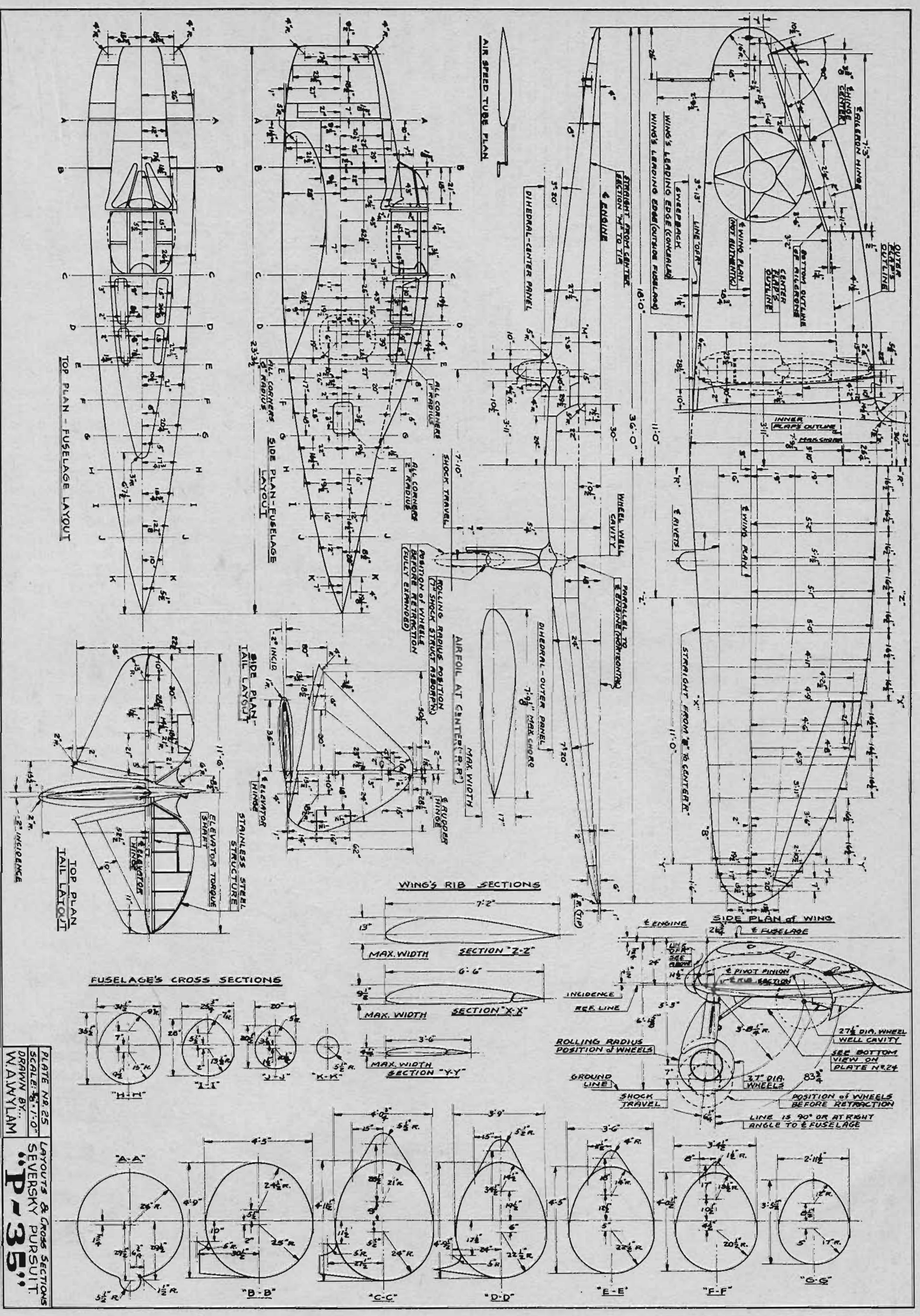


PLATE Nº 25
LAYOUTS & CROSS SECTIONS
SEVERSKY PURSUIT
"P-35"
DRAWN BY...
W.A.WYLAM
TOP PLAN - FUSELAGE LAYOUT
SIDE PLAN - FUSELAGE LAYOUT
AIR SPEED TUBE PLAN
TOP PLAN TAIL LAYOUT
SIDE PLAN - TAIL LAYOUT
STAINLESS STEEL STRUCTURE
ELEVATOR TORQUE SHAFT
WING'S RIB SECTIONS
SECTION "Z-Z"
SECTION "X-X"
SECTION "Y-Y"
MAX. WIDTH
FUSELAGE'S CROSS SECTIONS
SIDE PLAN of WING
ROLLING RADIUS POSITION of WHEELS
GROUND LINE
SHOCK TRAVEL
POSITION of WHEELS BEFORE RETRACTION
LINE IS 90° OR AT RIGHT ANGLE TO ℄ FUSELAGE
"A-A"
"B-B"
"C-C"
"D-D"
"E-E"
"F-F"
"G-G"
"H-H"
"I-I"
"J-J"
"K-K"

WRIGHT "WHIRLWIND" 420 H.P.

621	SCALE: 1/16 = 1'-0		DRAWN BY... WILLIAM A. WYLAM
Y	OIL PRESSURE GAUGE CONN.	A	OIL LUBRICATION LINE
Z	OIL SUMP ENTRANCE	B	EXHAUST PORTS
A°	FELT PADS	C	WIRE HARNESS
B°	CASTLE NUTS	D	INTER-CYLINDER BAFFLE
C°	PROP. HUB RETAINER NUT	E	CYLINDER-HEAD BAFFLE
D°	PROP. HUB FRONT CONE	F	LEATHER STRIPS
E°	PROP. HUB TAPER RING	G	GENERATOR DRIVE CONN.
	··COLORS··	H	STARTER CONN.
a	GOLD	I	OIL ENTRANCE CONN.
b	DULL BLACK	J	OIL EXIT CONN.
c	DULL BROWN	K	OIL PRESSURE ADJ. CONN.
d	DULL BLUE GREEN	L	OIL THERMOCOUPE CONN.
e	RED ORANGE	M	FUEL PRESSURE CONN.
f	SHINEY BROWN	N	GUN SYNCHRONIZER CONN.
g	SHINEY BLACK	O	VENT TO OIL
h	ALUMINUM	P	MAGNETO
i	COPPER	Q	CARBURATOR
		R	THROTTLE CONN.
		S	INTAKE PIPE
		T	CONTRO'E. PROP. VALVE
		U	SAE. #30 SPLINE
		V	MOUNTING BOLT HOLES
		W	BRAIDED WIRE SHIELD
		X	CARBURATOR HEATER

FRONT VIEW of COLLECTOR RING

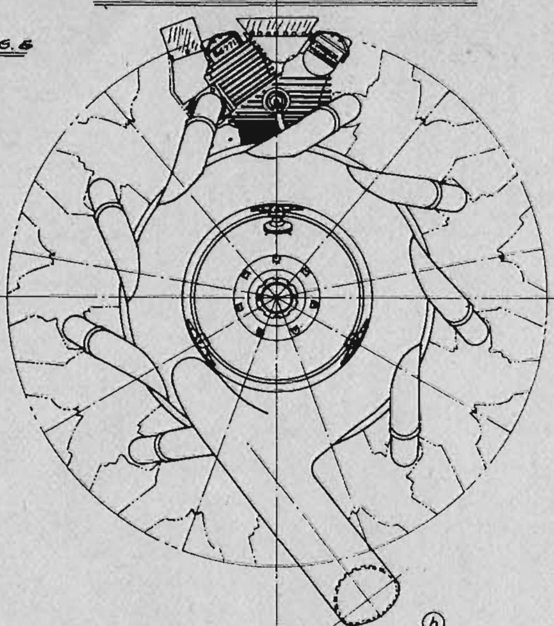


FIG. 5

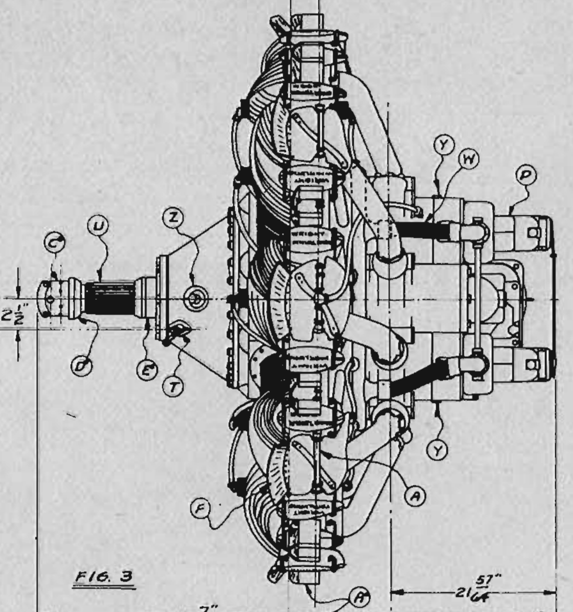


FIG. 3

WHEN COLLECTOR RING IS INSTALLED, REVERSE THE EXIT (TOWARD THE PROPELLOR HUB).

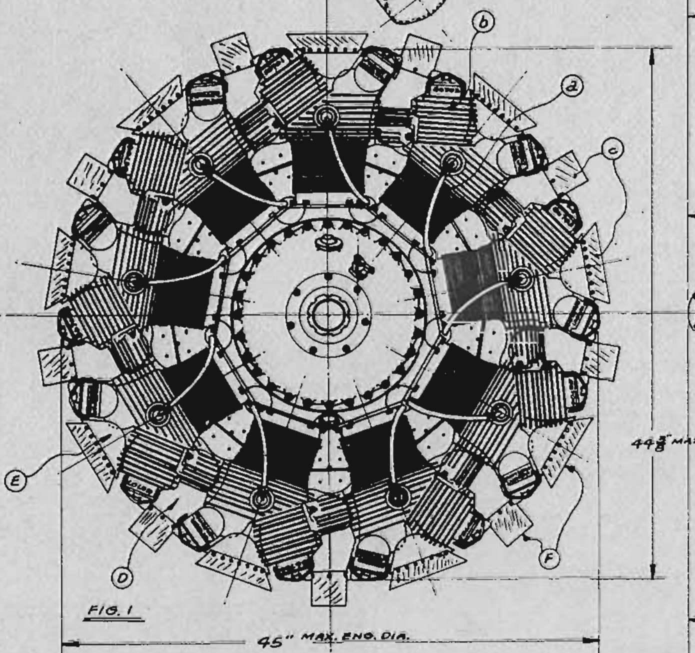


FIG. 1

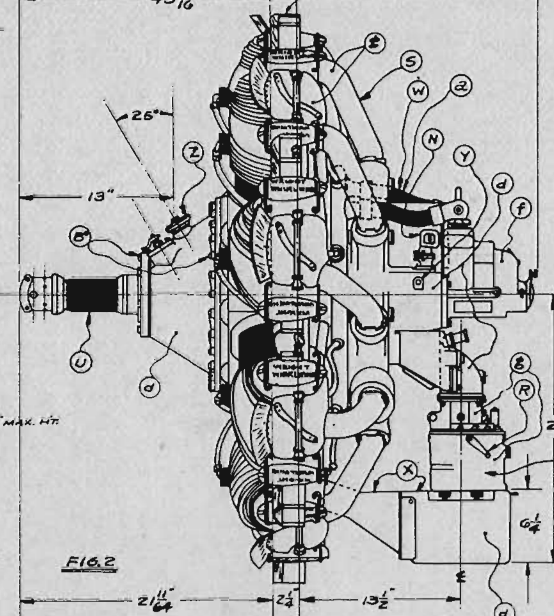


FIG. 2

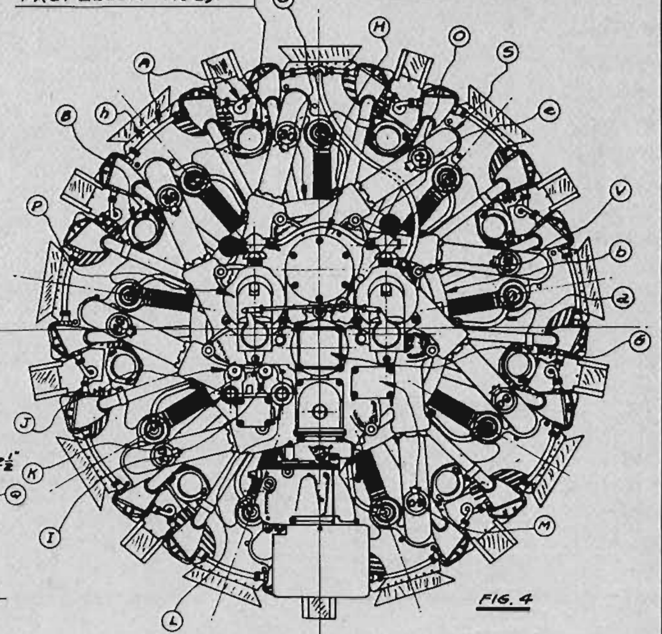


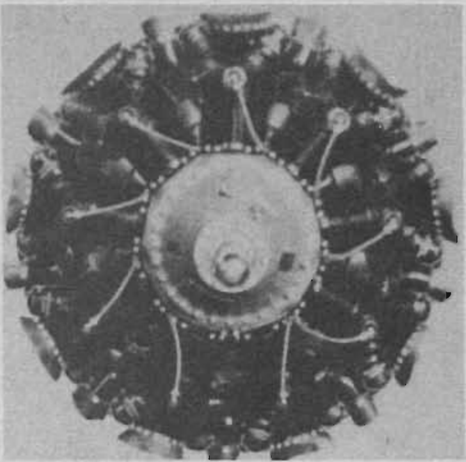
FIG. 4

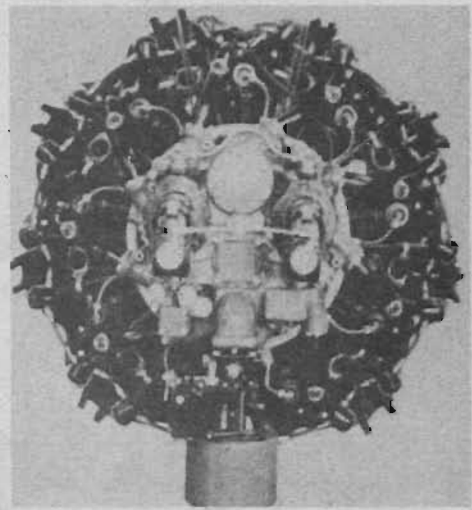
W. A. WYLAM

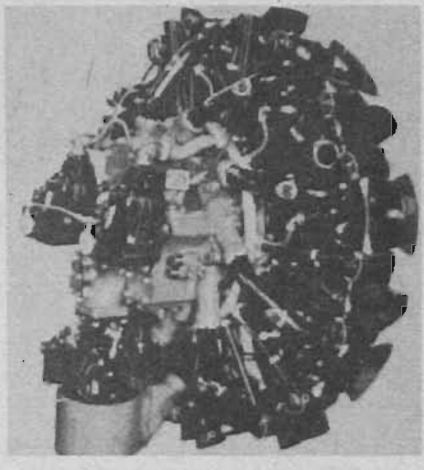
"WHIRLWINDS" IN MINIATURE

The History of the Wright Whirlwind Engines and How You Can Create an Exact Scale Miniature of One for Your Model

By WILLIAM WYLAM







THE design of the Wright "Whirlwind" was first conceived in 1924. In its period of developments and experiments it was called a complete success by its first feat that attracted world wide attention. This was on May 9, 1926, when Commander R. E. Byrd and Pilot Floyd Bennett flew a tri-motored Fokker, powered by Whirlwinds, from Spitsbergen to the North Pole and return. This trip proved the reliabilities of the Whirlwinds under all kinds of operating conditions; and started a series of famous Whirlwind flights that made history. Lindy and his Whirlwind-powered Ryan made the most memorable flight of all: his New York-Paris non-stop hop. Then came Clarence Chamberlain, who flew non-stop from New York to Germany in his Whirlwind-powered Bellanca monoplane. These are only a few of famous Whirlwind flights which have made history over and over. These flights are proof of the reliabilities and dependabilities of Wright's products. Not only did these famous flights prove to the world its dependabilities, but its qualities were shown in the millions of miles flown by airplanes, powered by Whirlwinds, in the transportation of passengers and air mail. Today, Wright Whirlwinds are used throughout the world in many types of private, military and commercial airplanes.

Description of the Wright "Whirlwind"

The "Whirlwinds" are divided into four classes: five cylinders of 165 horsepower, seven cylinders of 240 horsepower and nine cylinders of 300 and 420 horsepower. Each type can be optionally equipped with a rear exhaust or a front exhaust system. All types have the same cylinder design, the same gear housing and the same rear section, with the exception of minor electrical changes. When the supercharger's ratio is changed, the horsepower is changed, making some models of the same type having different ratings from the standard types.

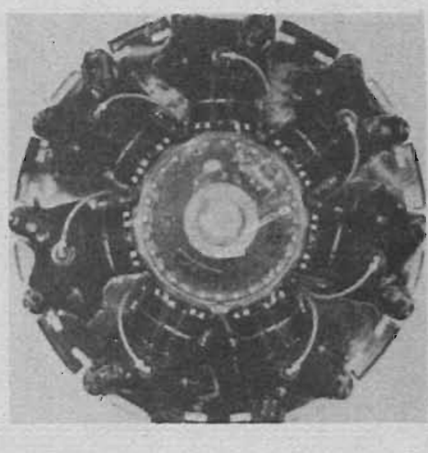
When rear exhaust models are chosen, the exhaust pipes are manufactured by the airplane's manufacturer and the design of the pipes are so numerous that it is almost impossible to show illustrations. Some manufacturers equip the Whirlwinds with single-bolted exhaust pipes, some use single exhaust pipes that are connected to two exhaust ports and some makes a rear ring exhaust collector. When a front exhaust system is chosen, the engines are equipped with a standard ring collector manufactured by the Wright Aeronautical Corporation.

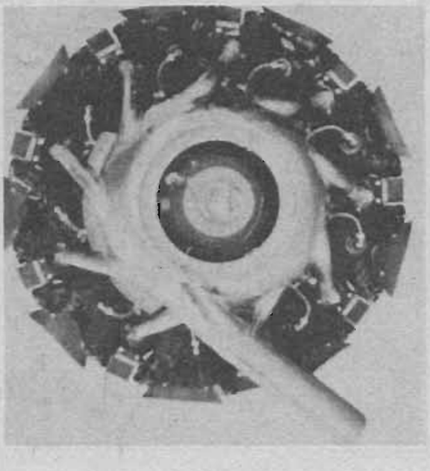
Cylinders

The cylinders are built up of a forged steel barrel and a cast aluminum head of Wright design. The fins are cast integral with the cylinder head to provide cooling for the exhaust valve and combustion

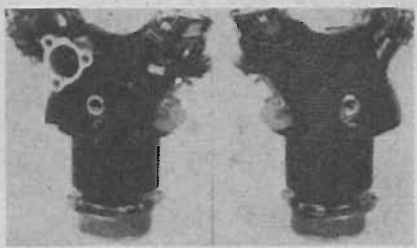
(continued on page 36)

Right, top: Front view of a 7-cylinder Whirlwind. Below this are two views of the rear of this engine showing the carburetor and magnetos





Extreme right: Front view of the 420 hp. rear exhaust Whirlwind. Right: The same engine with a front exhaust manifold



Below: Individual cylinders of the Wright Whirlwind engines

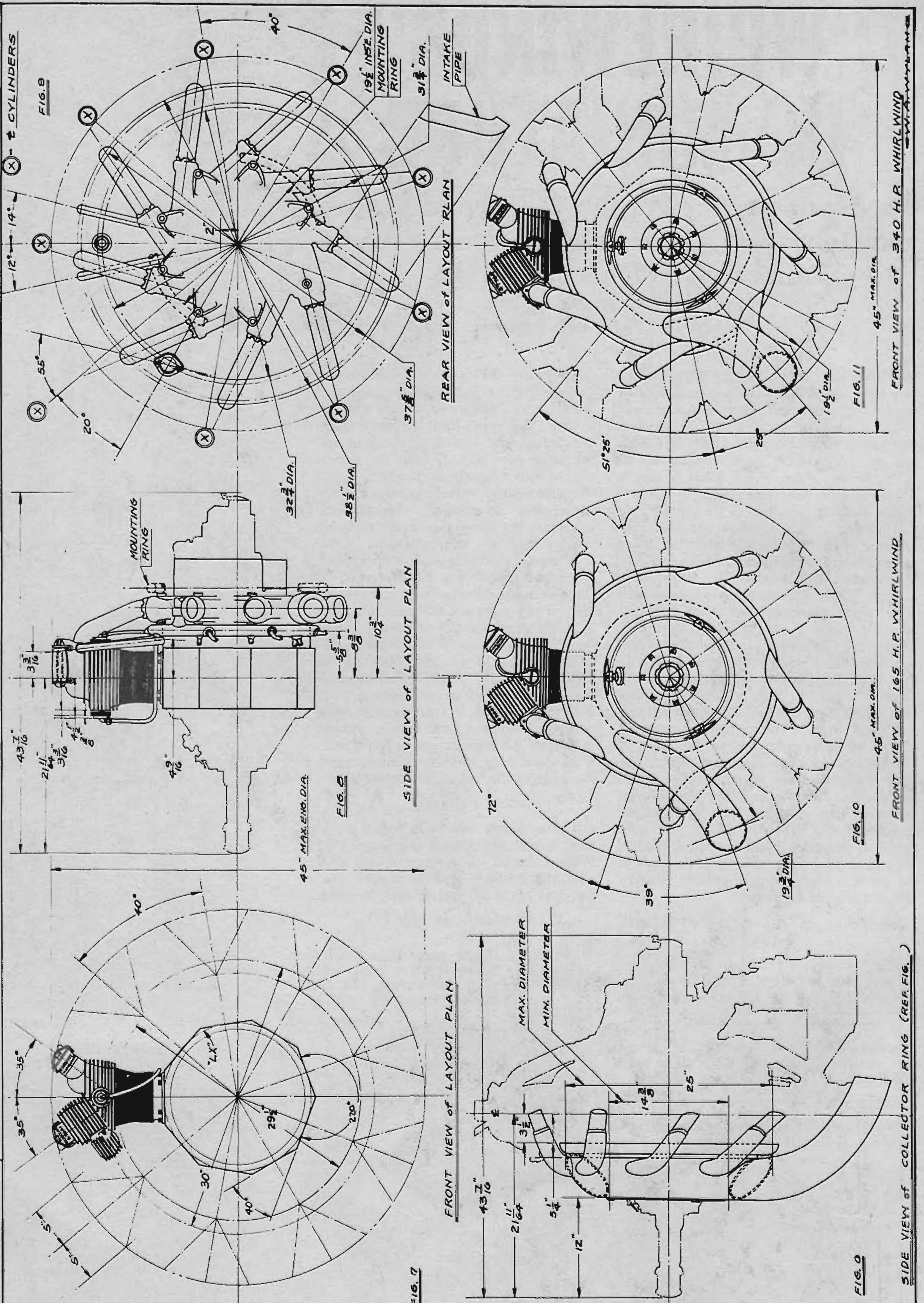


FIG. 7
FRONT VIEW of LAYOUT PLAN
FIG. 8
SIDE VIEW of LAYOUT PLAN
MOUNTING RING
45" MAX. ENG. DIA.
FIG. 9
REAR VIEW of LAYOUT PLAN
Ⓧ - ℄ CYLINDERS
19½" INSD. DIA. MOUNTING RING
31¾" DIA.
INTAKE PIPE
37⅝" DIA.
32¾" DIA.
38½" DIA.
FIG. 0
SIDE VIEW of COLLECTOR RING (REF. FIG.)
MAX. DIAMETER
MIN. DIAMETER
FIG. 10
FRONT VIEW of 165 H.P. WHIRLWIND
45" MAX. DIA.
19¾" DIA.
FIG. 11
FRONT VIEW of 340 H.P. WHIRLWIND
45" MAX. DIA.
19½" DIA.

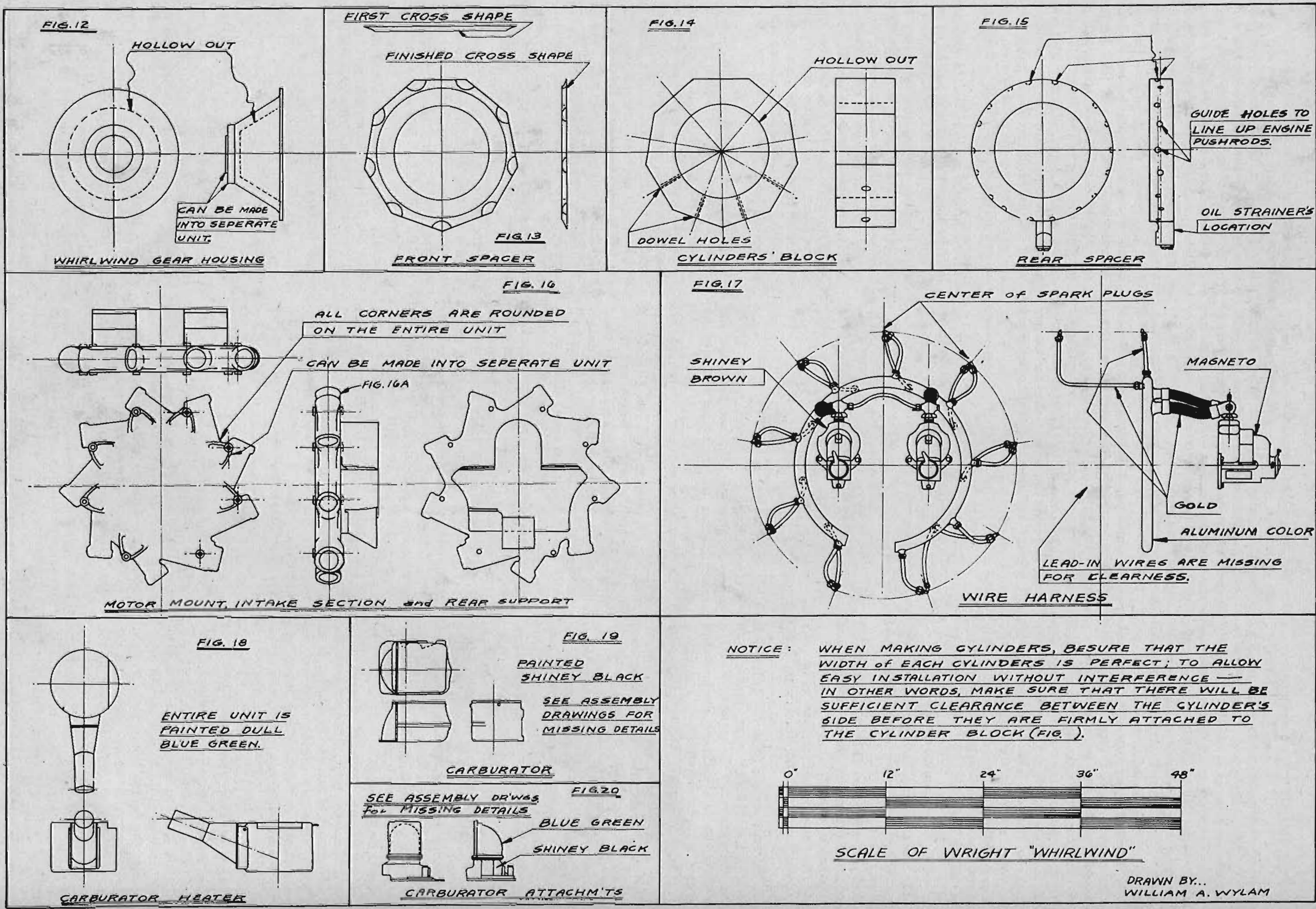


FIG. 12
HOLLOW OUT
CAN BE MADE INTO SEPERATE UNIT.
WHIRLWIND GEAR HOUSING
FIRST CROSS SHAPE
FINISHED CROSS SHAPE
FIG. 13
FRONT SPACER
FIG. 14
HOLLOW OUT
DOWEL HOLES
CYLINDERS' BLOCK
FIG. 15
GUIDE HOLES TO LINE UP ENGINE PUSHRODS.
OIL STRAINER'S LOCATION
REAR SPACER
FIG. 16
ALL CORNERS ARE ROUNDED ON THE ENTIRE UNIT
CAN BE MADE INTO SEPERATE UNIT
FIG. 16A
MOTOR MOUNT, INTAKE SECTION and REAR SUPPORT
FIG. 17
CENTER of SPARK PLUGS
SHINEY BROWN
MAGNETO
GOLD
ALUMINUM COLOR
LEAD-IN WIRES ARE MISSING FOR CLEARNESS.
WIRE HARNESS
FIG. 18
ENTIRE UNIT IS PAINTED DULL BLUE GREEN.
CARBURATOR HEATER
FIG. 19
PAINTED SHINEY BLACK
SEE ASSEMBLY DRAWINGS FOR MISSING DETAILS
CARBURATOR
FIG. 20
SEE ASSEMBLY DR'WGS FOR MISSING DETAILS
BLUE GREEN
SHINEY BLACK
CARBURATOR ATTACHM'TS
NOTICE: WHEN MAKING CYLINDERS, BESURE THAT THE WIDTH of EACH CYLINDERS IS PERFECT; TO ALLOW EASY INSTALLATION WITHOUT INTERFERENCE — IN OTHER WORDS, MAKE SURE THAT THERE WILL BE SUFFICIENT CLEARANCE BETWEEN THE CYLINDER'S SIDE BEFORE THEY ARE FIRMLY ATTACHED TO THE CYLINDER BLOCK (FIG.).
0" 12" 24" 36" 48"
SCALE OF WRIGHT "WHIRLWIND"
DRAWN BY... WILLIAM A. WYLAM

(continued from page 33)

chamber. Additional cooling is provided by two spark plug coolers which are inserted in the cylinder heads.

The side exhaust system is another feature of the Whirlwinds, which permits the use of either a front or rear exhaust system. The exhaust ports are provided with detachable finned elbows for the use of the standard front exhaust system (collector ring). Another type of elbows are available for the rear exhaust system.

Rocker support boxes are cast integral with the cylinder head and are provided with a cover, which are held in place by springs or clamps. The springs or clamps are easily removable for inspection of the valve mechanism. The cover forms a rigid support for the anti-drag ring, eliminating the use of brackets.

Crankcase

The crankcase consist of five major castings of high tensile aluminum **alloy. The** sections are:

1. The nose section (Fig. No. 12), which supports the propeller thrust bearings and is conical in shape.
2. The intermediate section (Fig. No. 13), which supports the front main bearings.
3. The main section (Fig. No. 14), which provides the cylinder pads, holds down studs and support for the crankshaft. Also, the cams and cams-follower are housed at the rear of this section.
4. The supercharger section (Fig. No. 15) has a diaphragm that carries the impellor and its drive. The diffuser and distributor is located in this section and in section Fig. No. 16A.
5. The rear section (Fig. No. 16) houses the accessory drives and supports the various accessories such as magnetos, generator, starter and various connections. The mounting lugs are also in this section.

Exhaust Manifold

The front exhaust collector ring, which scavenges the exhaust gases, is standard equipment. Rear exhaust can be made into small stacks or a collector ring system; they are to be determined by the design of the engine cowl and airplane before the system is decided upon.

The cowl and manifold support is a formed aluminum plate, fitted between the exhaust manifold and the crankcase front section. They are rigidly attached by riveted plates at the fastening points and are provided with cowl fasteners at its outer circumference. The front of the cowl is open and no shutters are used. There is an opening at the lower part of the cowl to connect with the carburetor preheater (commonly called carburetor heater) and air cleaner.

Carburetor Air Preheater and Cleaner

The combination carburetor air preheater and cleaner insures a supply of a clean, heated mixture to the carburetor; and it prevents ice formation in the carburetor during cold operation. Controls are provided to permit the regulation of the amount of preheat in different climatic conditions.

Specifications of "Whirlwind" models

	165 H.P.	240 H.P.	300 H.P.	420 H.P.
No. of Cylinders	5	7	9	9
H.P. at R.P.M.	2,000	2,000	2,000	2,150
Bore	5"	5"	5"	5"
Stroke	5-1/2"	5-1/2"	.5-1/2"	5-1/2"
Length	40-11/16"	40-5/32"	43-7/16"	43-7/16"
Max. Eng. Dia.	45"	45"	45"	45"

Building the "Whirlwind" Model

When building a model motor for a model airplane of a known scale, use the same scale on the motor as you used on the airplane.

The first piece to make is Fig. No. 14. Use your scale and, besides referring to Fig. No. 14, refer to Figs. No. 7 and No. 8 to determine the width, length and thickness of this section. Secure a block of wood that will be about an inch over these dimensions, except for the thickness. Plane both sides (front and rear sides) down to the exact thickness, making sure that the whole side is parallel to the other side. On both the rear and front sides, lay out the horizontal and vertical center-lines—be sure that the two centers are in exact linage. Refer to Fig. No. 7 and draw the scaled circle "LX" on both sides from the engine centers. Draw a much larger circle from the same centers and divide this circle into nine equal segments. At each division, place a point, which totals nine in all. Do this on both sides. Draw nine lines from the center that will pass through the points on the large circle. Do the same on the other side. At the points where the cylinder center-lines meet the circle "LX," draw nine lines that will be at right angles (90 degrees) to the cylinders' center-lines that will pass through the points on the circle "LX." Use the same operation on the other side but make sure that the angles will be parallel to the other sides. Now cut away the surplus to your best judgment. When complete, check each angle for perfect squareness to all sides. Draw the cylinders' side center-line around the block; drawing the lines that will join the front and rear center-lines and that will pass through the side center-lines. Mark each exact cylinder mounting center with a distinctive point. Hollow out the center and when finished drill the dowel holes, if you are going to use the same system as explained in the Wright "F-50" directions.

Now proceed to Fig. No. 13 and make the first shape the best that you know how. When it is all shaped, finish it off with the offset circles. Attach the section to Fig. No. 14 and smooth all the nine sides evenly.

If you wish, you can turn Fig. No. 12 on the lathe and finish it off like the assembly drawings show (Fig. No. 1 and No. 2). Fig. No. 15 can also be turned on the lathe. It is best to drill the pushrods' holes as shown on the plan, for when assembling the rods will be less apt to get out of line.

Now proceed to Fig. No. 16A, which is rather a difficult job. It's best to make a template first and, after it is completed, figure out your best way to make the section. If you can carve it out of one single block, do it. If you can make a better job by building it up, then do it this way. When the job is completed, make the rear section and attach both pieces together. On Fig. No. 16A, round *all* corners and also the same corners where the rear section is attached to Fig. 16A. Also by referring to the photographs, you can get a good idea of the curves and requirements.

If the nose section is completed, detailed according to the assembly drawings, then make the cylinders as shown in the Wright "F-50" directions. Attach the cylinders to the block and at the same time make sure that the pushrods are attached in exact linage. Add the wire harness (Fig. No. 17) with its accessories . . . later add the baffles and all rear gadgets. Paint it now, and, when the paint is dry, add the metal fixtures.

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(continued from page 9)

section connect the aileron control cable to the bell crank unit. (See Figures 6 and 7.) After the top wing panel is permanently attached to the cabane section begin to cover the entire wing with a good grade cloth or paper. (Some prefer to cover their wings before attaching them to the fuselage, but use your own judgment.) Attach the lower wing panel to the fuselage as shown in Figure 7 or use your own method of building the wing fittings.

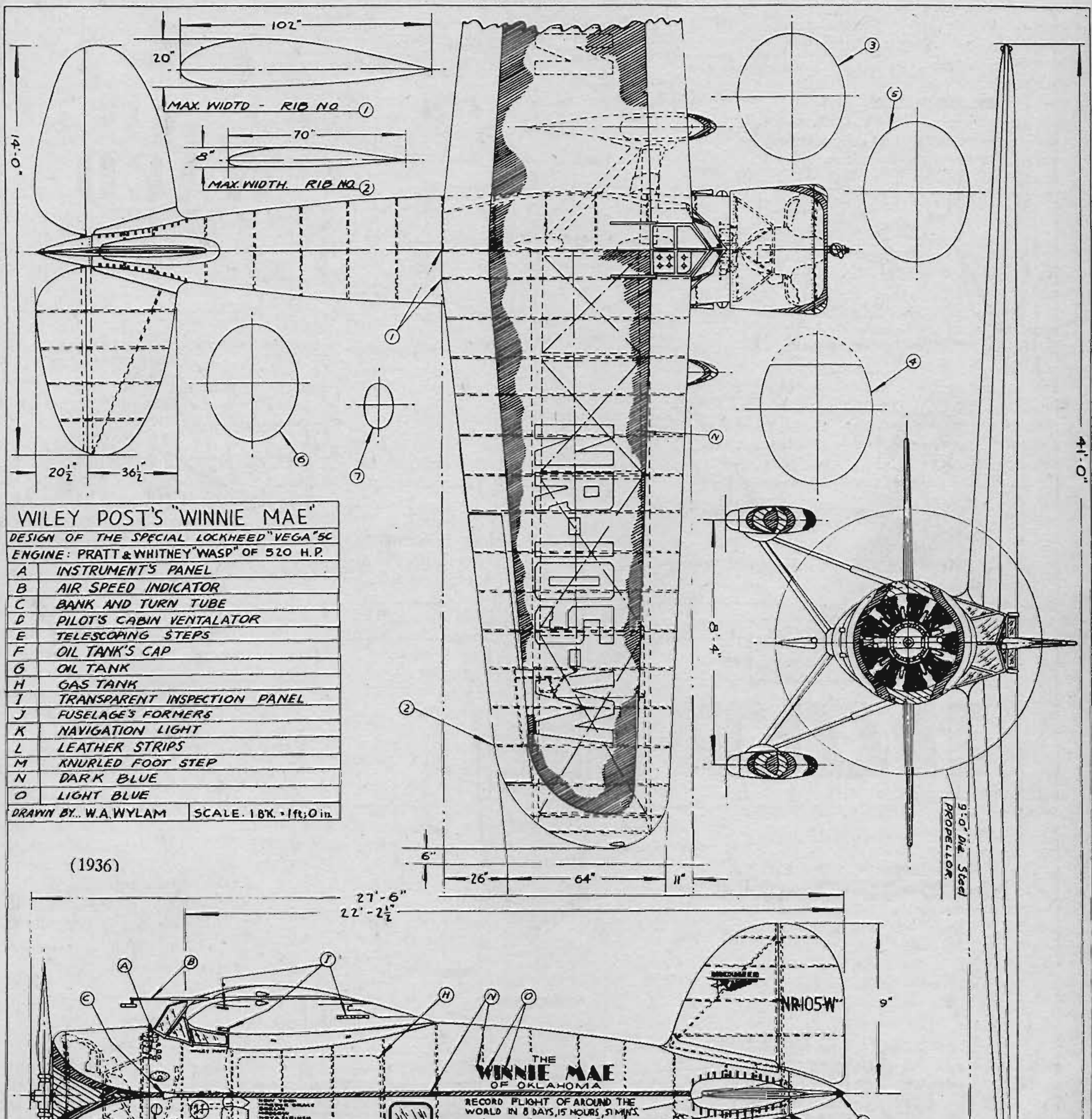
After the airplane is finished spray the surfaces with the best grade paint or enamel that you can possibly use; as a good quality paint would make a very excellent finish. The fuselage and all-metal surfaces should be sprayed with light navy or battleship gray enamel. All fabric surfaces should be painted or sprayed with aluminum, with the exception of the upper wing top surface, which is orange-yellow. Paint all lettering black, also all small details that would be constantly handled are painted black, with a few exceptions. Paint the squadron colors with any primary or secondary color, according to the squadron pictures that you have on hand.

Model Airplane Pedestal

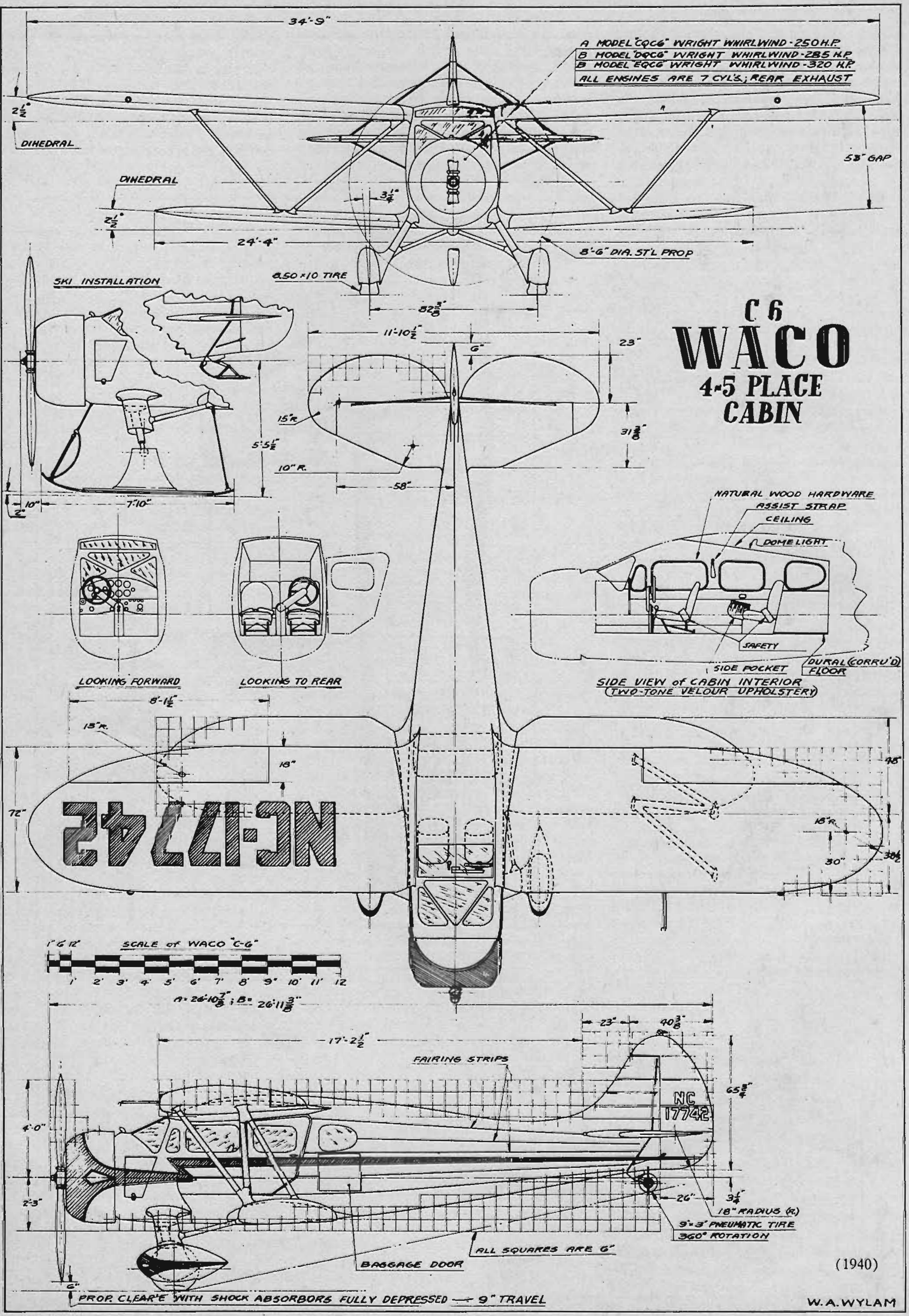
The pedestal as shown in Figure 10A is about the best way to exhibit all model airplanes with a retractable landing gear system. These pedestals add beauty to the model bv showing how the airplane appears with the wheels folded away or in extended position. It is possible to show the model in both air and land position by having one wheel folded and one wheel extended.

Use an old lamp-stand (wooden table lamp), an automobile engine valve or make a pedestal somewhat like the shape as shown in Figure 10A. Be sure that you make the base large enough so it will give a very rigid non-swaying support to your model, so that it can't be easily tipped or blown over. When the pedestal is all shaped sand the wood down to a very smooth finish; then use the best wood stains to bring out the beauty of the wood. When the pedestal is all stained, shellac with white shellac, sanding down the dry shellac finish, then finally covering the pedestal with a varnish coat. It is best to glue a felt pad to the base so it will deaden all vibrations and rattling. Also, it is suggested that you have your jeweler engrave a silver or shiny brass nameplate for the pedestal . . . this will add a very distinctive touch to the appearance of the whole exhibit.

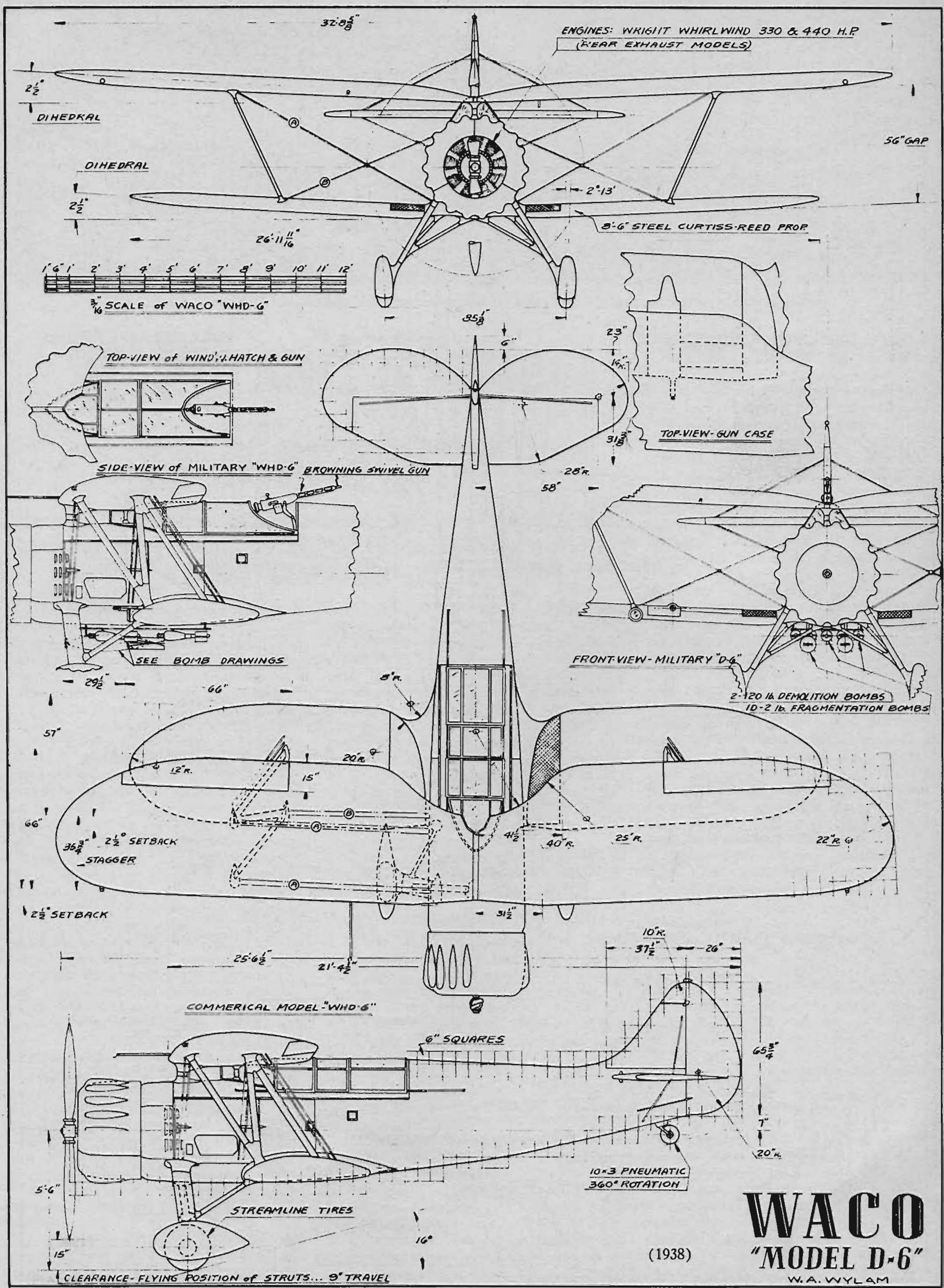
-1939

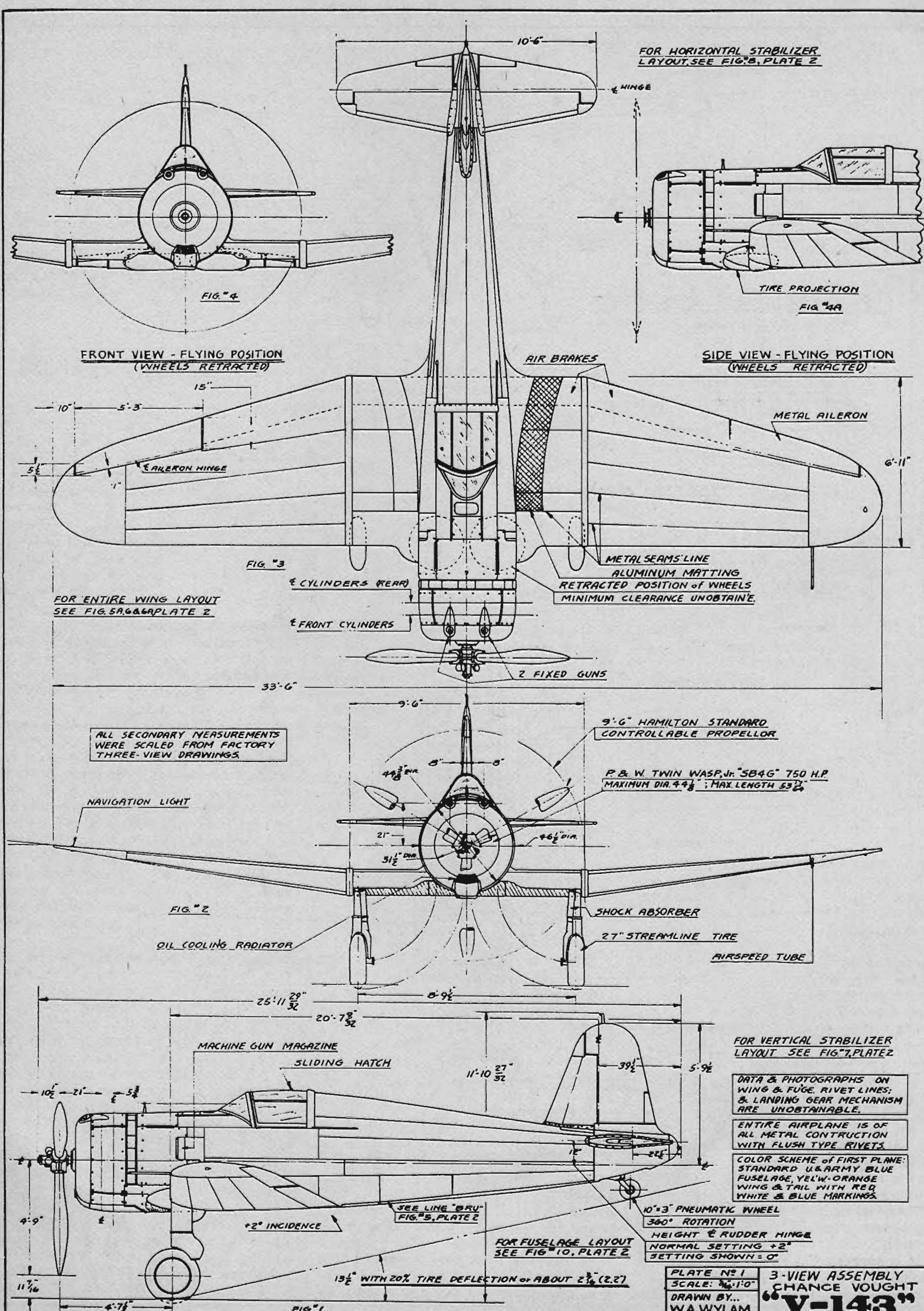


(1936)



C 6
WACO
4-5 PLACE
CABIN
34'-9"
A MODEL "CQC6" WRIGHT WHIRLWIND - 250 H.P.
B MODEL "DQC6" WRIGHT WHIRLWIND - 285 H.P.
B MODEL "EQC6" WRIGHT WHIRLWIND - 320 H.P.
ALL ENGINES ARE 7 CYL'S.; REAR EXHAUST
DIHEDRAL
58" GAP
24'-4"
8'-6" DIA. ST'L PROP
8.50×10 TIRE
82 5/8"
SKI INSTALLATION
11'-10 1/2"
23"
6"
15" R.
5'-5 1/2"
31 3/8"
10" R.
58"
7'-10"
10"
2"
NATURAL WOOD HARDWARE
ASSIST STRAP
CEILING
DOME LIGHT
SAFETY
SIDE POCKET
DURAL (CORRU'D) FLOOR
LOOKING FORWARD
LOOKING TO REAR
SIDE VIEW of CABIN INTERIOR
(TWO-TONE VELOUR UPHOLSTERY)
8'-1 1/2"
15" R.
18"
72"
NC-17742
48"
18" R.
30"
38 1/2"
SCALE of WACO "C-6"
1' 6 12"
1' 2' 3' 4' 5' 6' 7' 8' 9' 10' 11' 12
A = 26'-10 7/8" ; B = 26'-11 3/8"
17'-2 1/2"
23"
40 3/8"
FAIRING STRIPS
NC 17742
65 3/4"
4'-0"
2'-3"
26"
3 1/4"
18" RADIUS (R.)
9"×3" PNEUMATIC TIRE
360° ROTATION
ALL SQUARES ARE 6"
BAGGAGE DOOR
6"
PROP. CLEAR'E WITH SHOCK ABSORBORS FULLY DEPRESSED — 9" TRAVEL
(1940)
W.A. WYLAM


ENGINES: WRIGHT WHIRLWIND 330 & 440 H.P.
(REAR EXHAUST MODELS)
DIHEDRAL
56" GAP
2°13'
8'-6" STEEL CURTISS-REED PROP.
3/16" SCALE of WACO "WHD-6"
TOP-VIEW of WIND'W, HATCH & GUN
TOP-VIEW-GUN CASE
SIDE-VIEW of MILITARY "WHD-6"
BROWNING SWIVEL GUN
SEE BOMB DRAWINGS
FRONT-VIEW-MILITARY "D-6"
2-120 lb. DEMOLITION BOMBS
10-2 lb. FRAGMENTATION BOMBS
2½° SETBACK
STAGGER
COMMERICAL MODEL-"WHD-6"
6" SQUARES
10×3 PNEUMATIC
360° ROTATION
STREAMLINE TIRES
CLEARANCE-FLYING POSITION of STRUTS... 9" TRAVEL
(1938)
WACO
"MODEL D-6"
W. A. WYLAM


FOR HORIZONTAL STABILIZER LAYOUT, SEE FIG. 8, PLATE 2
FIG. 4
TIRE PROJECTION
FIG. 4A
FRONT VIEW - FLYING POSITION (WHEELS RETRACTED)
SIDE VIEW - FLYING POSITION (WHEELS RETRACTED)
AIR BRAKES
METAL AILERON
AILERON HINGE
FIG. 3
METAL SEAMS LINE
ALUMINUM MATTING
RETRACTED POSITION of WHEELS
MINIMUM CLEARANCE UNOBTAIN'E.
CYLINDERS (REAR)
FRONT CYLINDERS
FOR ENTIRE WING LAYOUT SEE FIG. 5A, 6 & 6A PLATE 2
2 FIXED GUNS
33'-6"
ALL SECONDARY MEASUREMENTS WERE SCALED FROM FACTORY THREE-VIEW DRAWINGS.
9'-6" HAMILTON STANDARD CONTROLLABLE PROPELLOR
P. & W. TWIN WASP, Jr. "SB4G" 750 H.P.
MAXIMUM DIA. 44 1/8"; MAX. LENGTH 53 1/2"
NAVIGATION LIGHT
FIG. 2
SHOCK ABSORBER
OIL COOLING RADIATOR
27" STREAMLINE TIRE
AIRSPEED TUBE
MACHINE GUN MAGAZINE
SLIDING HATCH
FOR VERTICAL STABILIZER LAYOUT SEE FIG. 7, PLATE 2
DATA & PHOTOGRAPHS ON WING & FUGE. RIVET LINES; & LANDING GEAR MECHANISM ARE UNOBTAINABLE.
ENTIRE AIRPLANE IS OF ALL METAL CONTRUCTION WITH FLUSH TYPE RIVETS.
COLOR SCHEME of FIRST PLANE: STANDARD U.S. ARMY BLUE FUSELAGE, YEL'W-ORANGE WING & TAIL WITH RED, WHITE & BLUE MARKINGS.
+2° INCIDENCE
SEE LINE "BRU" FIG. 5, PLATE 2
10"x3" PNEUMATIC WHEEL
360° ROTATION
HEIGHT ℄ RUDDER HINGE
NORMAL SETTING +2°
SETTING SHOWN = 0°
FOR FUSELAGE LAYOUT SEE FIG. 10, PLATE 2
13 1/2° WITH 20% TIRE DEFLECTION or ABOUT 2 3/16" (2.2")
FIG. 1
PLATE No 1
SCALE: 3/16":1'-0"
DRAWN BY... W.A.WYLAM
3-VIEW ASSEMBLY
CHANCE VOUGHT
"V-143"

The Chance Vought V-143 pursuit low-wing monoplane. The landing gear wheels are clearly visible

A Pursuit Plane In Miniature

Here's What the Scale Model Builders Have Been Looking For—Complete Detail Plans and Instructions to Build a V-143 Vought Pursuit Monoplane

By WILLIAM WYLAM

THE "V-143" Chance Vought pursuit monoplane is one of America's finest example of clean airplane design. It is built by Chance Vought Aircraft, a division of the United Aircraft Corporation, at East Hartford, Connecticut. It is powered by a Twin Wasp Junior, Model "SB4-6," with horsepower ratings of 750 at 2550 R.P.M. at 9000 feet altitude and 825 H.P. at 2625 R.P.M. for take off. Plans on this engine appear on page 11 of this book, and it suggested that the builder build his dummy motor from these plans. Details on the rivet's centerlines, both lengthwise and crosswise on the wings, fuselage and tails are unobtainable. Also, due to stringent regulations, data on the landing gear mechanism is also unobtainable but word informations say that it is hinged on a pivot, which is connected to an electric motor by pinion gears. Also the motor is operated by a switch in the cockpit. The rivets are of flush type, about 1/4" diameter. All secondary measurements outside of the main specifications such as span, height and length overall were scaled from the original factory three-views. They were put on the plans to aid the modeler in redrawing up his plans. The drawings as shown on the General Arrangements Plan (Plate No. 3) were drawn to aid builders in building the entire internal details in correct proportions to the scale. Nearly all military airplanes in the United States military services are equipped with hanging pedals, standard type pilot seats and controls.

It is suggested that all model builders should redraw up their airplane plans for several reasons. First, after the modeler finishes the plans, he will understand the entire airplane design better than by following somebody else's plans. Second, the ability to read fine drawings and blueprints is an asset to anybody wishing to enter the aviation industries; either as a mechanic, skilled workman, metal worker, machinist, draftsman or as an aviator. One way or another, persons connected with the aviation industry come in contract with blueprints and the subject must be grasped without spending any excessive amount of time. So the best method of the ability to read blueprints is to learn by doing. Aeronautical drafting is a fascinating game to those interested in aviation so we are giving some points on drawing up the plans in three-view form like they do at the factory.

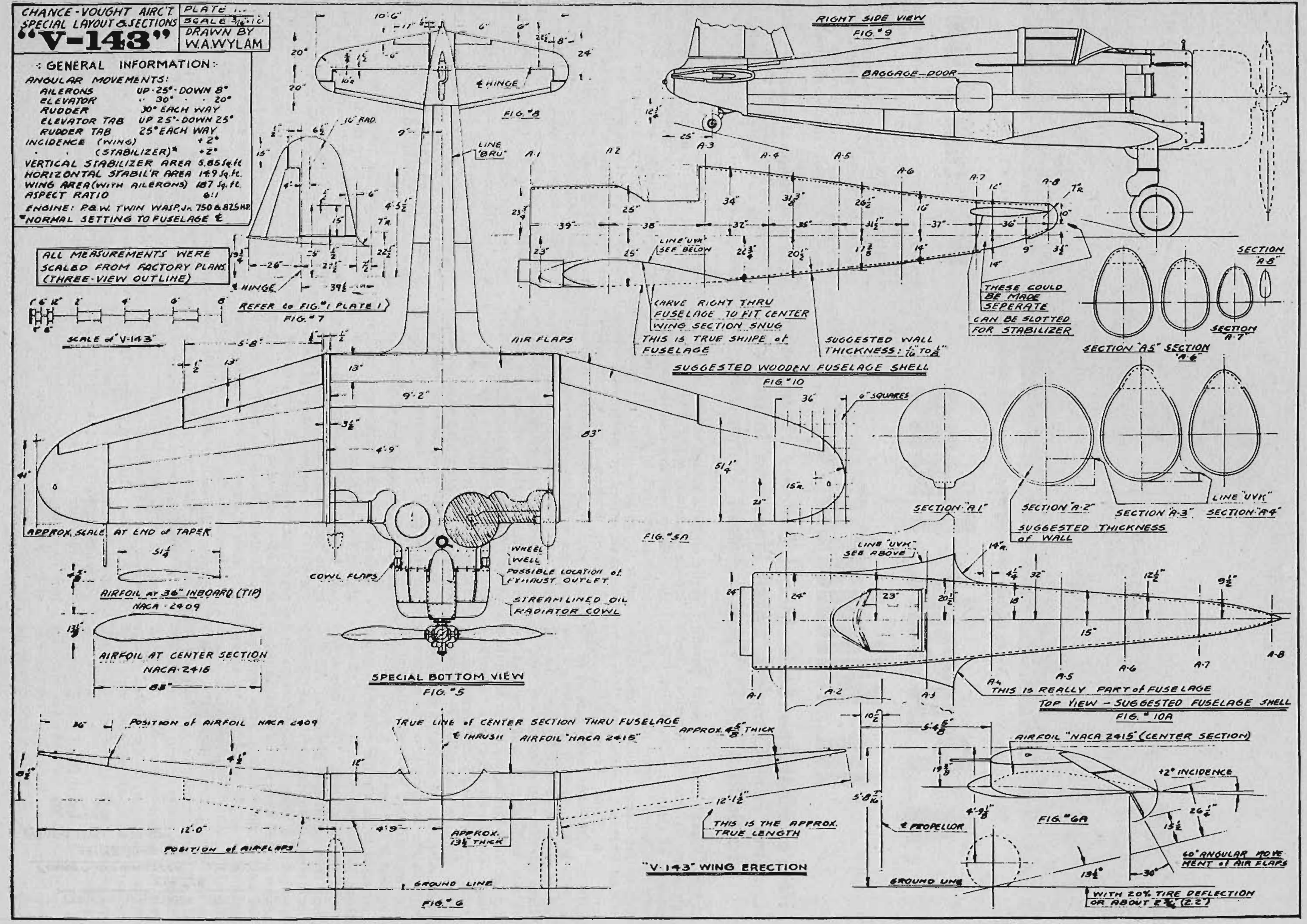
Redrawing the V-143

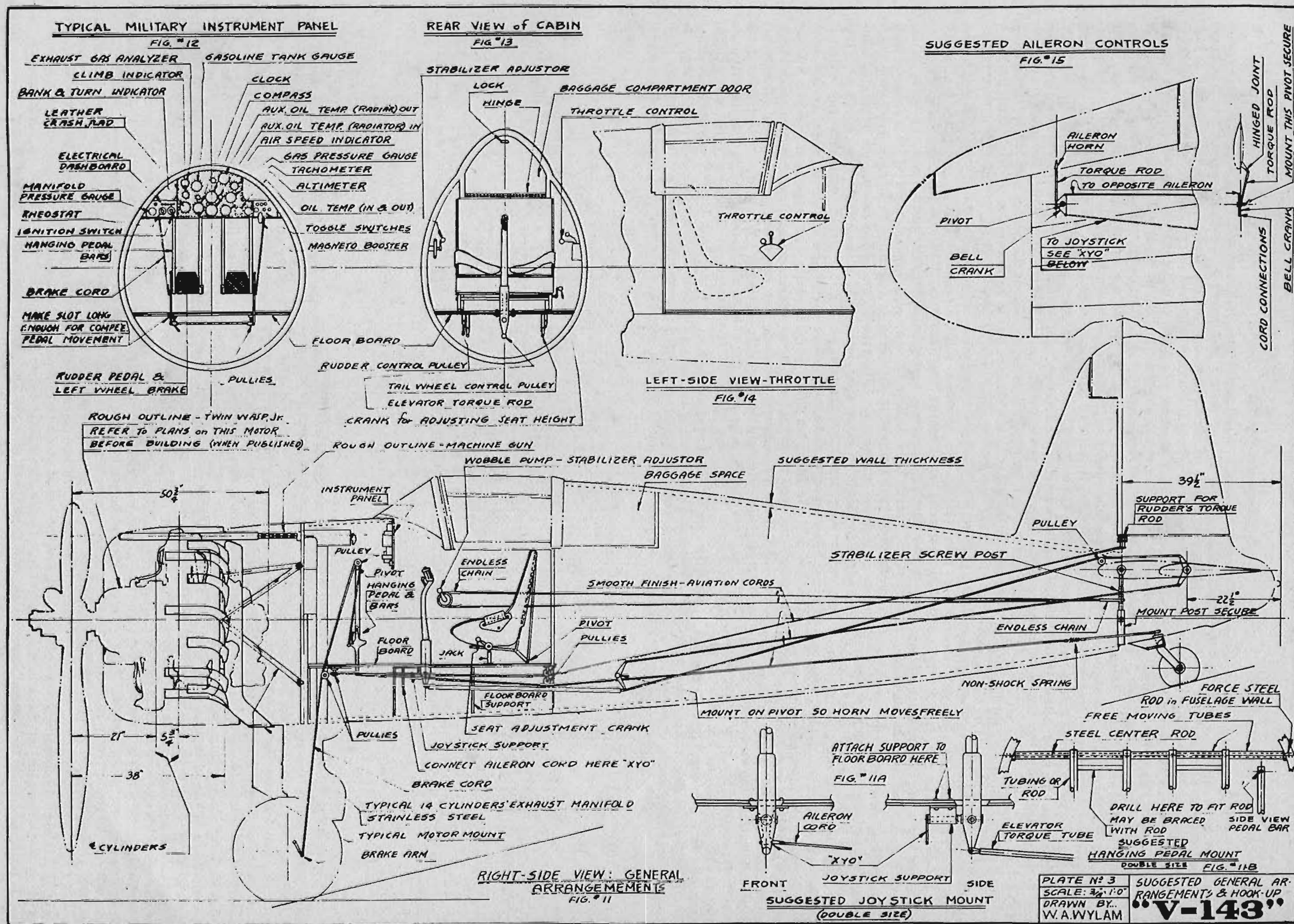
Before you start to draw your plans choose the scale that you wish to build your model. Use this scale and measure up the span, height and length overall of the V-143 and secure a sheet of drawing paper that will allow the drawing of the three-view outline in standard "L" shape layout plus a few inches more for margins (top view in upper left-hand corner, front view below the top view in line with the top view's center line; the left side view in the right side corner in line with the front view's horizontal center-line). After you are sure that the paper is large enough for the drawing of plans to your chosen scale, attach the paper to the board. It is best to draw a border equal distances from all sides, say 3/4" margin. Now measure the space (height and length) inside the border and make a note of it. Now refer to Plate No. 1 and scale the three main demensions outside the border in order as listed: Length of top view and height of front view on left side (outside of border); and span of front view and length overall of side view underneath the border-line. On the left side space outside the border-line measure up in inches the height and length, then add together. Subtract the result of the addition of the length and height in scaled distance from the height of the space inside of the border, divide the results by three and this will give you the clearance of all the even spaces; i.e., the height of the ground line from the border, the distance from the top of the tail to the leading edge of the propeller and the space between the rudder and top border line.

Use this same procedure on the front view and the left side view; by adding up the scaled distance in inches of the span and length overall, subtracting the results from the lengthwise size of the space inside the border, dividing the balance by three for the clearance of the left wing tip and left side border-line, the distance between the right wing tip and leading edge of the propeller, and the space between the rudder and the right side border-line. Draw all these clearance lines very light with the exception of the ground line on the front and left side view, which should be as heavy as the drawing itself.

Now draw the center line of the top view right down to the front view, making sure that it is in true center and make the line very sharp. Refer to Fig. No. 6A for the height of the thrust line and make this scaled distance up from the ground line on the top view's center line. At this point draw the horizontal center line right across the entire page; parallel to the ground line. Refer to Fig. No. 2 and draw the entire engine cowl, machine gun housings and propeller. Refer to Fig. No. 6 and draw the entire front wing layout. Refer to Fig. No. 6A and lay out the center line of the propeller before drawing it. Lay out the line parellel to the propeller's center line; that is, the scaled distance from the propeller's center line to the leading edge of the wing. Using the specifications shown on Fig. No. 6A, draw the wing by projecting lines

(continued on page 44)


CHANCE-VOUGHT AIRC'T.
SPECIAL LAYOUT & SECTIONS
"V-143"
DRAWN BY W.A.WYLAM
: GENERAL INFORMATION :
ANGULAR MOVEMENTS:
AILERONS UP 25° - DOWN 8°
ELEVATOR 30° 20°
RUDDER 30° EACH WAY
ELEVATOR TAB UP 25° - DOWN 25°
RUDDER TAB 25° EACH WAY
INCIDENCE (WING) +2°
(STABILIZER)* +2°
VERTICAL STABILIZER AREA 5.85 Sq.ft.
HORIZONTAL STABIL'R AREA 14.9 Sq.ft.
WING AREA (WITH AILERONS) 187 Sq.ft.
ASPECT RATIO 6:1
ENGINE: P&W. TWIN WASP Jr. 750 & 825 HP.
*NORMAL SETTING TO FUSELAGE ℄
ALL MEASUREMENTS WERE SCALED FROM FACTORY PLANS (THREE-VIEW OUTLINE)
SCALE of "V-143"
REFER to FIG."1 PLATE 1
FIG."7
FIG."8
RIGHT SIDE VIEW
FIG."9
BAGGAGE DOOR
CARVE RIGHT THRU FUSELAGE TO FIT CENTER WING SECTION SNUG
THIS IS TRUE SHAPE of FUSELAGE
SUGGESTED WALL THICKNESS: 1/16" TO 1/8"
SUGGESTED WOODEN FUSELAGE SHELL
FIG."10
THESE COULD BE MADE SEPERATE
CAN BE SLOTTED FOR STABILIZER
SECTION "A5"
SECTION "A6"
SECTION "A7"
SECTION "A8"
SECTION "A1"
SECTION "A2"
SECTION "A3"
SECTION "A4"
LINE "UVK"
SUGGESTED THICKNESS of WALL
AIR FLAPS
APPROX. SCALE AT END of TAPER
AIRFOIL AT 36" INBOARD (TIP) NACA-2409
AIRFOIL AT CENTER SECTION NACA-2416
COWL FLAPS
WHEEL WELL
POSSIBLE LOCATION of EXHAUST OUTLET
STREAMLINED OIL RADIATOR COWL
SPECIAL BOTTOM VIEW
FIG."5
FIG."5A
THIS IS REALLY PART of FUSELAGE
TOP VIEW - SUGGESTED FUSELAGE SHELL
FIG."10A
POSITION of AIRFOIL NACA 2409
TRUE LINE of CENTER SECTION THRU FUSELAGE
℄ THRUST
AIRFOIL "NACA 2415"
APPROX. 4 5/8" THICK
THIS IS THE APPROX. TRUE LENGTH
APPROX. 13 1/2" THICK
POSITION of AIRFLAPS
GROUND LINE
FIG."6
"V-143" WING ERECTION
AIRFOIL "NACA 2415" (CENTER SECTION)
+2° INCIDENCE
℄ PROPELLOR
FIG."6A
60° ANGULAR MOVEMENT of AIR FLAPS
GROUND LINE
WITH 20% TIRE DEFLECTION OR ABOUT 2 3/4" (2.2)


TYPICAL MILITARY INSTRUMENT PANEL
FIG. #12
EXHAUST GAS ANALYZER
GASOLINE TANK GAUGE
CLIMB INDICATOR
CLOCK
BANK & TURN INDICATOR
COMPASS
LEATHER CRASH PAD
AUX. OIL TEMP. (RADIAR) OUT
AUX. OIL TEMP. (RADIATOR) IN
AIR SPEED INDICATOR
ELECTRICAL DASHBOARD
GAS PRESSURE GAUGE
TACHOMETER
MANIFOLD PRESSURE GAUGE
ALTIMETER
RHEOSTAT
OIL TEMP (IN & OUT)
IGNITION SWITCH
TOGGLE SWITCHES
HANGING PEDAL BARS
MAGNETO BOOSTER
BRAKE CORD
MAKE SLOT LONG ENOUGH FOR COMPLETE PEDAL MOVEMENT
FLOOR BOARD
RUDDER PEDAL & LEFT WHEEL BRAKE
PULLIES
REAR VIEW of CABIN
FIG. #13
STABILIZER ADJUSTOR
LOCK
HINGE
BAGGAGE COMPARTMENT DOOR
THROTTLE CONTROL
RUDDER CONTROL PULLEY
TAIL WHEEL CONTROL PULLEY
ELEVATOR TORQUE ROD
CRANK for ADJUSTING SEAT HEIGHT
THROTTLE CONTROL
LEFT-SIDE VIEW-THROTTLE
FIG. #14
SUGGESTED AILERON CONTROLS
FIG. #15
AILERON HORN
TORQUE ROD
TO OPPOSITE AILERON
PIVOT
BELL CRANK
TO JOYSTICK SEE "XYO" BELOW
HINGED JOINT
TORQUE ROD
MOUNT THIS PIVOT SECURE
CORD CONNECTIONS
BELL CRANK
ROUGH OUTLINE - TWIN WASP, Jr.
REFER TO PLANS on THIS MOTOR BEFORE BUILDING (WHEN PUBLISHED)
ROUGH OUTLINE - MACHINE GUN
WOBBLE PUMP - STABILIZER ADJUSTOR
BAGGAGE SPACE
SUGGESTED WALL THICKNESS
INSTRUMENT PANEL
50¾"
39½"
SUPPORT FOR RUDDER'S TORQUE ROD
PULLEY
STABILIZER SCREW POST
PULLEY
ENDLESS CHAIN
PIVOT
HANGING PEDAL & BARS
SMOOTH FINISH-AVIATION CORDS
22½°
MOUNT POST SECURE
FLOOR BOARD
JACK
PIVOT
PULLIES
ENDLESS CHAIN
NON-SHOCK SPRING
FLOOR BOARD SUPPORT
MOUNT ON PIVOT SO HORN MOVES FREELY
FORCE STEEL ROD in FUSELAGE WALL
FREE MOVING TUBES
21"
5¾"
38"
PULLIES
SEAT ADJUSTMENT CRANK
JOYSTICK SUPPORT
CONNECT AILERON CORD HERE "XYO"
BRAKE CORD
TYPICAL 14 CYLINDERS' EXHAUST MANIFOLD STAINLESS STEEL
TYPICAL MOTOR MOUNT
BRAKE ARM
℄ CYLINDERS
RIGHT-SIDE VIEW: GENERAL ARRANGEMEMENTS
FIG. #11
ATTACH SUPPORT TO FLOOR BOARD HERE
FIG. #11A
AILERON CORD
"XYO"
JOYSTICK SUPPORT
FRONT
SIDE
SUGGESTED JOYSTICK MOUNT
(DOUBLE SIZE)
STEEL CENTER ROD
TUBING OR ROD
ELEVATOR TORQUE TUBE
DRILL HERE TO FIT ROD
MAY BE BRACED WITH ROD
SIDE VIEW PEDAL BAR
SUGGESTED HANGING PEDAL MOUNT
DOUBLE SIZE
FIG. #11B
PLATE No 3
SCALE: ¾" = 1'-0"
DRAWN BY... W. A. WYLAM
SUGGESTED GENERAL ARRANGEMENTS & HOOK-UP
"V-143"

(continued from page 41)

over from the tront view.

When the wing is drawn, refer to Fig. No. 1 and start to draw the side view of the engine cowl. When finished, draw the front wheels and under-carriage. Now refer to Fig. No. 10 and lay out the fuselage contour. Refer to Fig. No. 7 and draw the vertical stabilizer. Refer to Figs. No. 1 and No. 8 and draw the horizontal stabilizer. Then start drawing the windshield. Draw all fine details with the exception of the wing details which are to be added when the top view is finished.

Refer to Fig. No. 2 and fill in all details around the under side of the engine cowl and add the landing gear chassis by projecting lines from the left side view and by referring to Fig. No. 2. When the lower works are drawn, start to draw the windshield and vertical stabilizer.

On the top view, start the propeller's center line and start the top view drawing in the same order as you draw the left side view; i.e., draw the wing first, then engine cowl, propeller. Refer to Fig. No. 10A and draw the fuselage top view. Refer to Fig. No. 8 and draw the entire horizontal stabilizer. Refer to your side view and draw the top view of the vertical stabilizer; also the top view of the windshield by referring to Fig. No. 3 and your side view drawing. Add all the fine details to the top view and proceed to do so on the other view.

Building the Model

The large airplane is of all metal construction. However if you do not wish to make the model of metal you may make it of wood. A beautiful job may be made of it by either method you may choose to use. Every modeler has his own "pet method" of building the fuselage . . . and the plans were drawn to accommodate the different methods of building this difficult section. Some may make the fillet (line "UVK" on Fig. No. 10 and 10A) as a part of the fuselage; and some make these as two separate units. Whatever methods he chooses, there are provisions in the plans to help him in his work in laying out the rough fuselage. He may make the fuselage in one piece or he may choose the common split-method (screwing two boards together, shaping the fuselage, unscrew and take the boards apart, then hollow it out. When finished, sand the insides, then glue the two sections together.) Whatever methods you choose to make your fuselage, make your templates accordingly. If you are just going to make the fuselage shell and add the fillets on later (beeswax or plastic wood or any forming compound) just make the templates to check only the fuselage curve and leave out the fillet curve, (as shown in sections "A-2" and "A-3.")

After the fuselage is shaped on the outside, hollow it out according to the way you planned to build the model (the dotted lines on sections "A-3" to "A-7" may be hollowed out, remain solid or be a separate piece without spoiling the true curve of the ship.) When the fuselage is hollowed to the size you want it to be, begin to make the center wing section as shown on the plans. If you wish to cut away the portion to allow the fitting of the wing to the underneath of the fuselage shell, you may do this; or you may carve a depression on the top side of the center section to fit the lower side of the fuselage. Whatever method you choose, make allowance to make the fillets realistic. When the center panels are about ready to attach, make the right and left wing panels.

Then make the tail surfaces and attach all units the way you plan the model. Before you attach permanently check up on your controls if you are going to install them as shown on Plate 3. If you wish to add inside details in correct proportion to your scale, refer to the Suggested General Arrangement page which is Plate No. 3. Before attaching any external parts sand the entire model smooth with medium size sandpaper. After all the coarseness has been removed resand with fine sandpaper; then shellac all external surfaces. When dry, resand with extra fine sandpaper down to a finish that feels like glass. The first V-143 was painted the standard U.S. Army color scheme; which is Army-blue fuselage, Army-yellow orange wing and tail surfaces with red, white and blue cocades and stripes.

-1938

(continued from page 25)

should appear before the squadron colors or markings are painted on to the fuselage or wings. You will note the exact position ot all rivet lines and all cowl screws besides numerous detachable cowls.

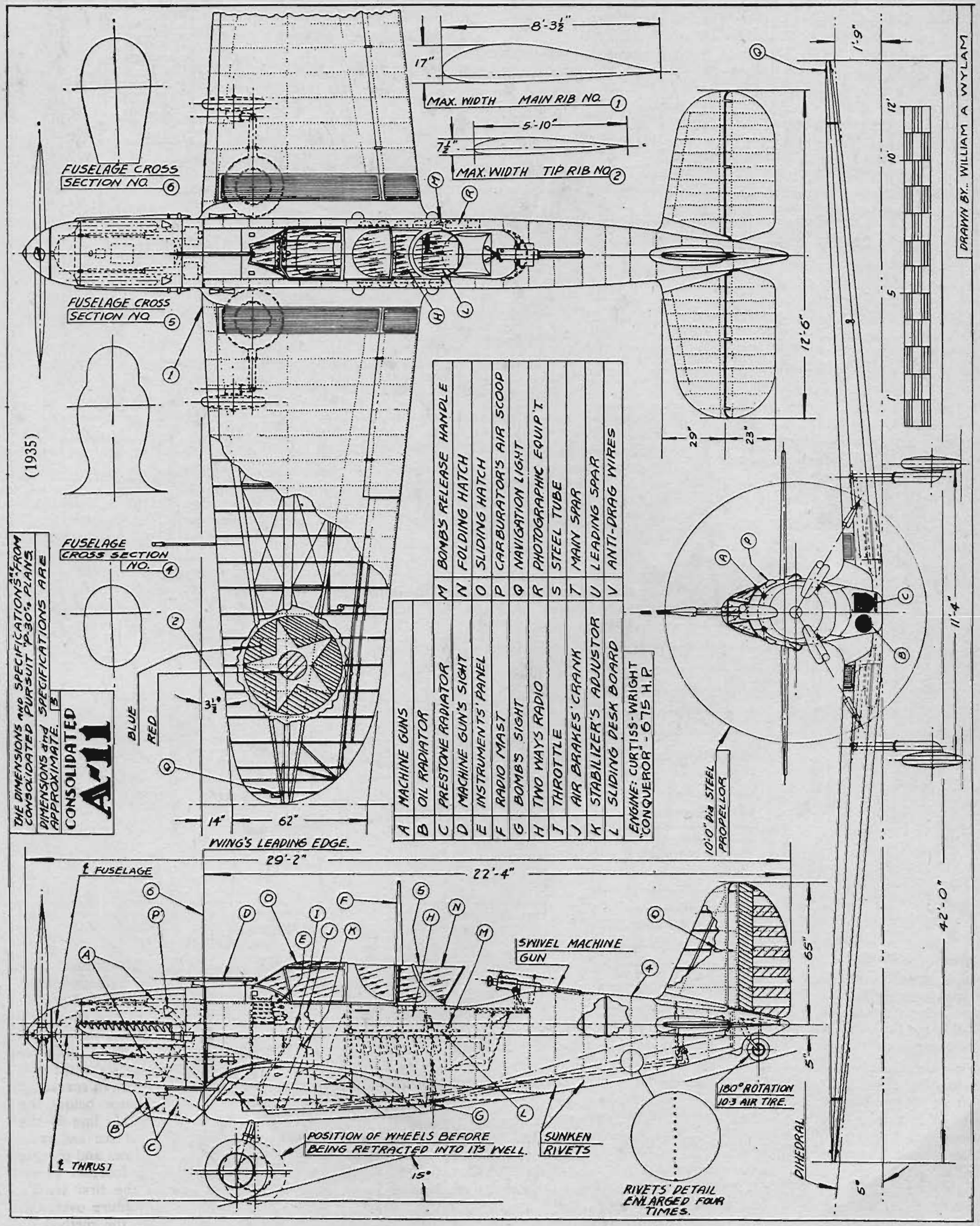
Fig. 4, 5, 6. If the reader would make careful use of all the data that is shown in these three figures he can draw his model plans to any scale that he prefers to use and would have almost an exact outline of the airplane; by simply scaling down the dimensions to your chosen scale. After the plans are all drawn refer to the final assembly views and fill in all the missing detail.

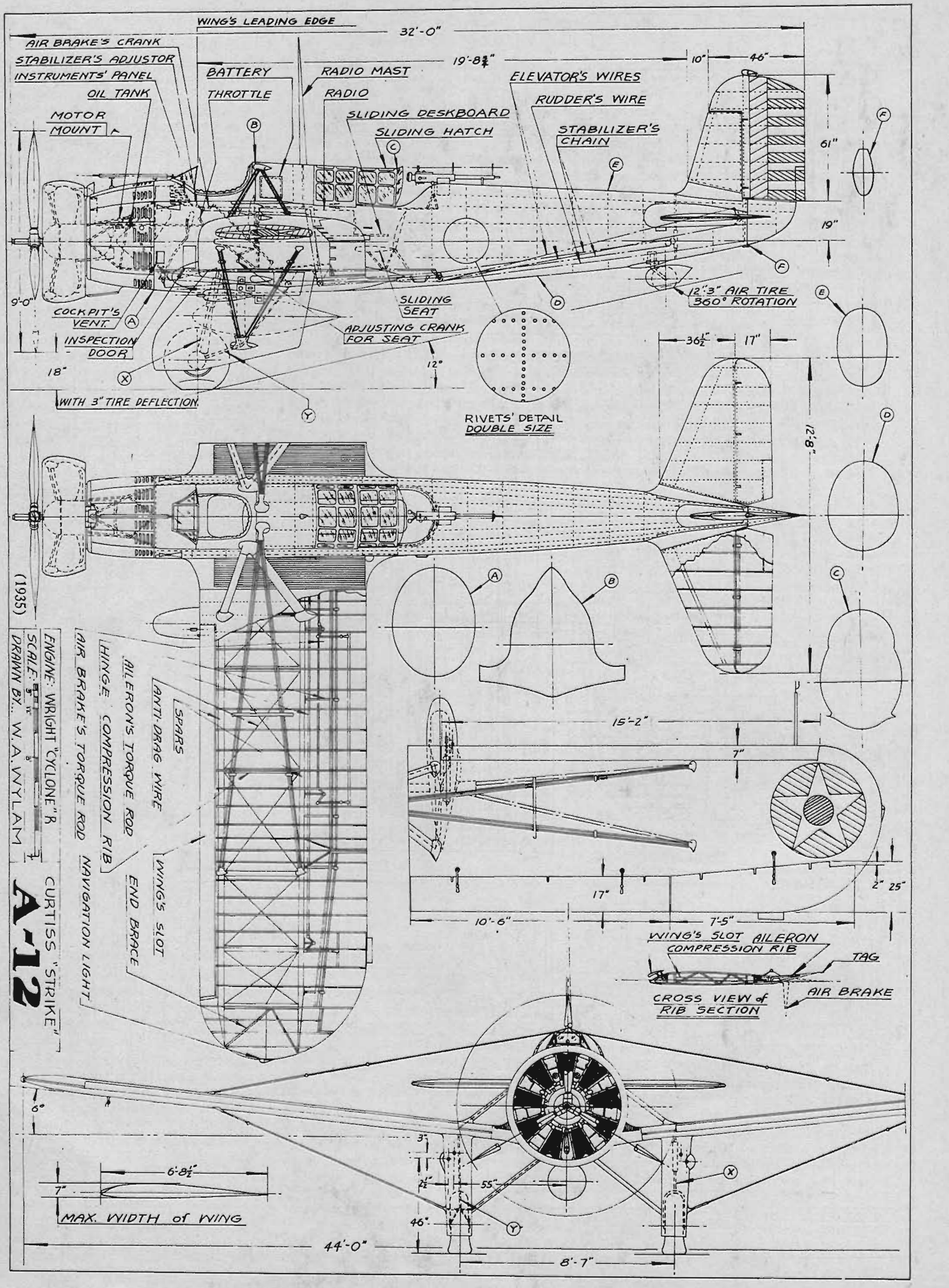
Fig. 7. The special bottom view has been drawn so that all details on the left-side view is understood from the bottom view. You will see numerous details that are not seen on any other final assembly views of this airplane.

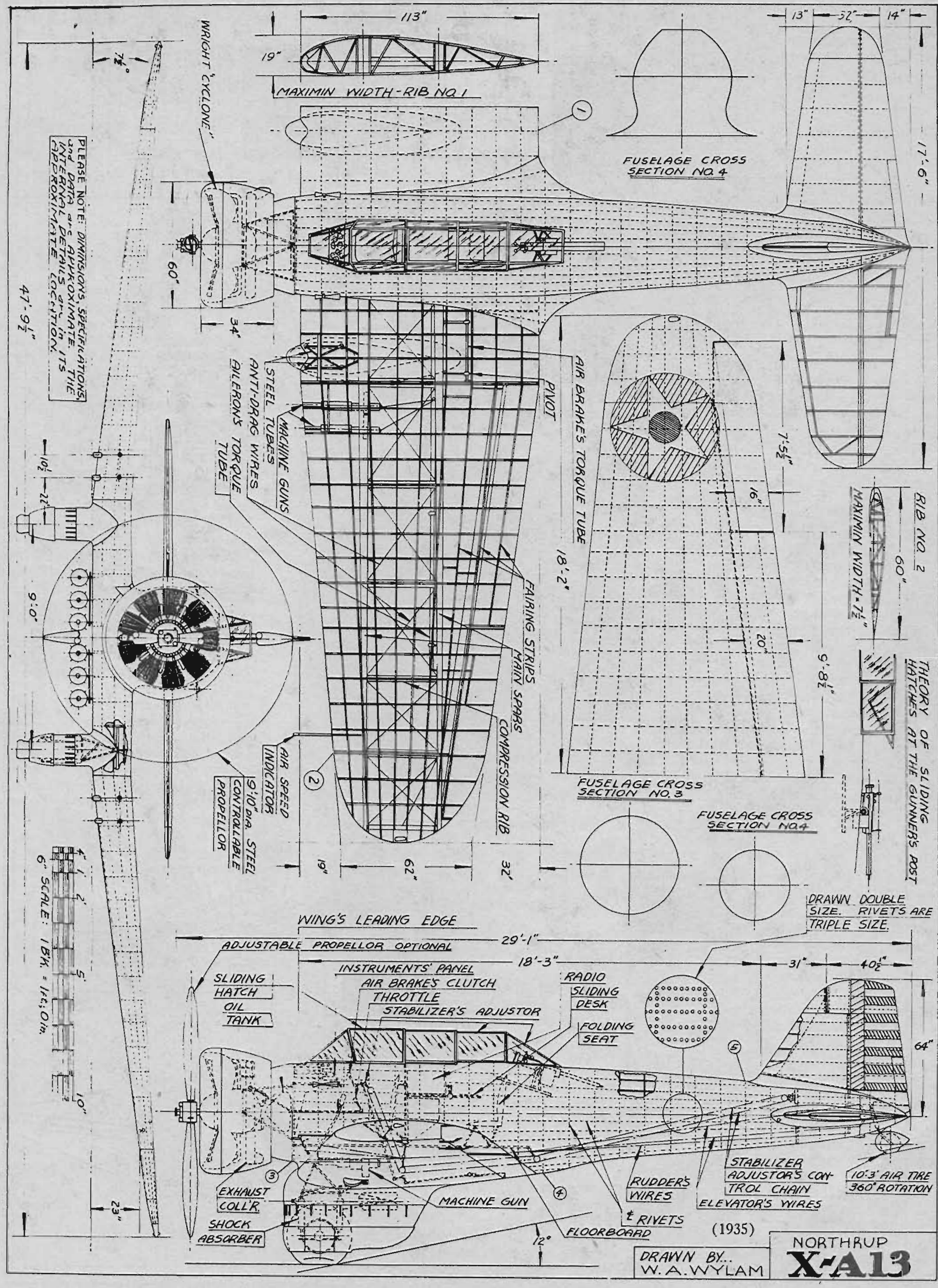
Fig. 8. The drawing of all cross sections will be appreciated, we believe, as a great help; these sections can be used in solid or built up fuselage construction work. The builder must use his best judgment of how he wishes to make his patterns or templates.

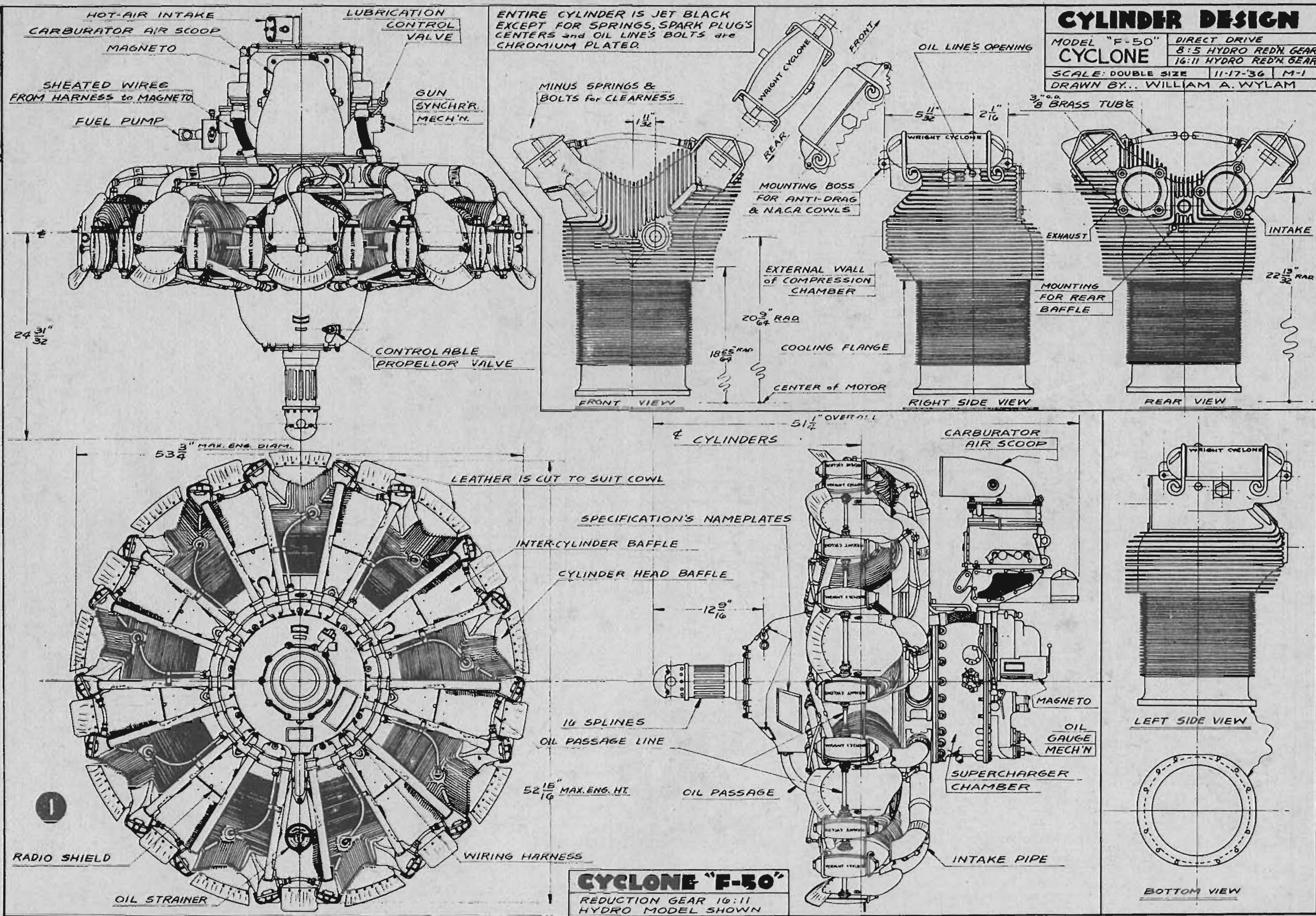
Fig. 9. All the rib sections that are shown were divided into tenths so they can be easily enlarged as follows: If the modeler wishes to build his model to a ¾" scale he must enlarge the ribs by four (4) times. First you must draw the section's center line, then lay out the width of the rib and the height above and below the centerline. Divide the rib into ten segments and draw lines at right angles to the center lines which will represent each tenth's line. Spread your dividers to the distance on the first tenth's line from the center line to the curve of the rib above the center line, multiply this distance four times on the first tenth's line of your rib plan and place the point in its respective location. Repeat the procedure in spreading your dividers to the distance below the center line on the first tenth's line to the curve of the lower rib's surface and multiply this distance by four times and placing the point in its respective location below your rib's center line on the first tenth's line. By studying this procedure over and over, you will easily grasp the method of enlarging the ribs with the least amount of time. This method is fairly accurate for scale model work.

-1939


(1935)
THE DIMENSIONS AND SPECIFICATIONS ARE FROM CONSOLIDATED PURSUIT "P-30's" PLANS.
DIMENSIONS and SPECIFICATIONS ARE APPROXIMATE.
CONSOLIDATED
A-11
BLUE
RED
FUSELAGE CROSS SECTION NO. 6
FUSELAGE CROSS SECTION NO. 5
FUSELAGE CROSS SECTION NO. 4
MAX. WIDTH MAIN RIB NO. 1
MAX. WIDTH TIP RIB NO. 2
8'-3½"
17"
5'-10"
7½"
14"
62"
WING'S LEADING EDGE.
29'-2"
22'-4"
12'-6"
29"
23"
11'-4"
42'-0"
1'-9"
65"
5"
5°
15°
A MACHINE GUNS
B OIL RADIATOR
C PRESTONE RADIATOR
D MACHINE GUN'S SIGHT
E INSTRUMENTS' PANEL
F RADIO MAST
G BOMBS SIGHT
H TWO WAYS RADIO
I THROTTLE
J AIR BRAKES' CRANK
K STABILIZER'S ADJUSTOR
L SLIDING DESK BOARD
M BOMB'S RELEASE HANDLE
N FOLDING HATCH
O SLIDING HATCH
P CARBURATOR'S AIR SCOOP
Q NAVIGATION LIGHT
R PHOTOGRAPHIC EQUIP'T.
S STEEL TUBE
T MAIN SPAR
U LEADING SPAR
V ANTI-DRAG WIRES
ENGINE: CURTISS-WRIGHT "CONQUEROR" - 675 H.P
10'-0" Dia STEEL PROPELLOR
℄ FUSELAGE
℄ THRUST
SWIVEL MACHINE GUN
POSITION OF WHEELS BEFORE BEING RETRACTED INTO ITS WELL.
SUNKEN RIVETS
RIVETS' DETAIL ENLARGED FOUR TIMES.
180° ROTATION 10·3 AIR TIRE.
DIHEDRAL
DRAWN BY.. WILLIAM A WYLAM


CURTISS "STRIKE"
A-12
(1935)
ENGINE: WRIGHT "CYCLONE" R.
SCALE:
DRAWN BY... W. A. WYLAM
WING'S LEADING EDGE
32'-0"
AIR BRAKE'S CRANK
STABILIZER'S ADJUSTOR
INSTRUMENTS' PANEL
OIL TANK
MOTOR MOUNT
BATTERY
THROTTLE
RADIO MAST
RADIO
19'-8¾"
SLIDING DESKBOARD
SLIDING HATCH
ELEVATOR'S WIRES
RUDDER'S WIRE
STABILIZER'S CHAIN
10"
46"
61"
19"
9'-0"
COCKPIT'S VENT.
INSPECTION DOOR
18"
WITH 3" TIRE DEFLECTION.
SLIDING SEAT
ADJUSTING CRANK FOR SEAT
12°
12"3" AIR TIRE 360° ROTATION
RIVETS' DETAIL DOUBLE SIZE
36½"
17"
8'-12"
SPARS
ANTI-DRAG WIRE
AILERON'S TORQUE ROD
HINGE COMPRESSION RIB
AIR BRAKE'S TORQUE ROD
WING'S SLOT
END BRACE
NAVIGATION LIGHT
15'-2"
7"
17"
10'-6"
7'-5"
2" 25"
WING'S SLOT
AILERON
COMPRESSION RIB
TAG
AIR BRAKE
CROSS VIEW of RIB SECTION
6"
3"
6'-8½"
7"
2½"
55"
46"
MAX. WIDTH of WING
44'-0"
8'-7"

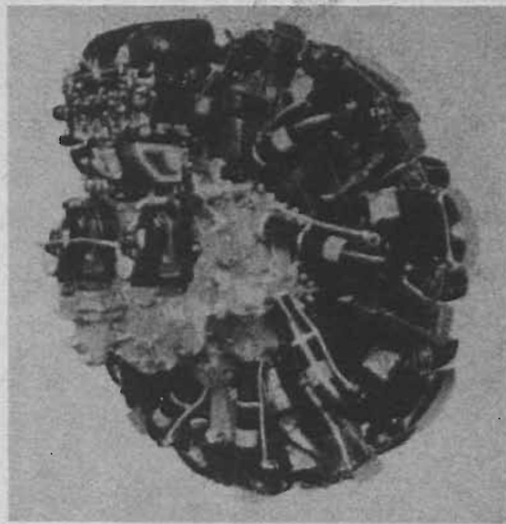

113"
19"
MAXIMIN WIDTH-RIB NO. 1
FUSELAGE CROSS SECTION NO. 4
13"
32"
14"
17'-6"
WRIGHT "CYCLONE"
PLEASE NOTE: DIMENSIONS, SPECIFICATIONS, and DATA are APPROXIMATE. THE INTERNAL DETAILS are in ITS APPROXIMATE LOCATION.
47'-9½"
60"
34"
AIR BRAKE'S TORQUE TUBE
PIVOT
MACHINE GUNS
STEEL TUBES
ANTI-DRAG WIRES
AILERON'S TORQUE TUBE
18'-2"
7'-5½"
16"
20"
9'-8½"
RIB NO. 2
MAXIMIN WIDTH - 7½"
60"
THEORY OF SLIDING HATCHES AT THE GUNNER'S POST
9'-0"
FAIRING STRIPS
MAIN SPARS
COMPRESSION RIB
AIR SPEED INDICATOR
9'-10" DIA. STEEL CONTROLLABLE PROPELLOR
FUSELAGE CROSS SECTION NO. 3
FUSELAGE CROSS SECTION NO. 4
19"
62"
32"
6" SCALE: 1 BK. = 1 ft. 0 in.
DRAWN DOUBLE SIZE. RIVETS ARE TRIPLE SIZE.
WING'S LEADING EDGE
29'-1"
ADJUSTABLE PROPELLOR OPTIONAL
18'-3"
31"
40½"
SLIDING HATCH
OIL TANK
INSTRUMENTS' PANEL
AIR BRAKE'S CLUTCH
THROTTLE
STABILIZER'S ADJUSTOR
RADIO
SLIDING DESK
FOLDING SEAT
64"
EXHAUST COLL'R.
SHOCK ABSORBER
MACHINE GUN
FLOORBOARD
RUDDER'S WIRES
℄ RIVETS
STABILIZER ADJUSTOR'S CONTROL CHAIN
ELEVATOR'S WIRES
10'-3" AIR TIRE 360° ROTATION
23"
12°
(1935)
DRAWN BY.. W. A. WYLAM
NORTHRUP X-A13


CYLINDER DESIGN
MODEL "F-50" CYCLONE
DIRECT DRIVE
8:5 HYDRO REDN. GEAR
16:11 HYDRO REDN. GEAR
SCALE: DOUBLE SIZE
11-17-'36
M-1
DRAWN BY.. WILLIAM A. WYLAM
ENTIRE CYLINDER IS JET BLACK EXCEPT FOR SPRINGS, SPARK PLUG'S CENTERS and OIL LINE'S BOLTS are CHROMIUM PLATED.
HOT-AIR INTAKE
CARBURATOR AIR SCOOP
MAGNETO
SHEATED WIRES FROM HARNESS to MAGNETO
FUEL PUMP
LUBRICATION CONTROL VALVE
GUN SYNCHR'R. MECH'N.
CONTROLABLE PROPELLOR VALVE
24 31/32"
MINUS SPRINGS & BOLTS for CLEARNESS
11/32"
WRIGHT CYCLONE
FRONT
REAR
MOUNTING BOSS FOR ANTI-DRAG & N.A.C.A. COWLS
OIL LINE'S OPENING
5 11/32"
2 1/16"
3/8" o.d. BRASS TUBG
EXTERNAL WALL of COMPRESSION CHAMBER
20 9/64" RAD
18 55/64" RAD
COOLING FLANGE
CENTER of MOTOR
EXHAUST
INTAKE
MOUNTING FOR REAR BAFFLE
22 13/32" RAD
FRONT VIEW
RIGHT SIDE VIEW
REAR VIEW
51 1/4" OVERALL
℄ CYLINDERS
53 3/4" MAX. ENG. DIAM.
LEATHER IS CUT TO SUIT COWL
SPECIFICATION'S NAMEPLATES
INTER-CYLINDER BAFFLE
CYLINDER HEAD BAFFLE
12 9/16"
16 SPLINES
OIL PASSAGE LINE
52 15/16" MAX. ENG. HT.
OIL PASSAGE
RADIO SHIELD
WIRING HARNESS
OIL STRAINER
CARBURATOR AIR SCOOP
MAGNETO
OIL GAUGE MECH'N
SUPERCHARGER CHAMBER
INTAKE PIPE
LEFT SIDE VIEW
BOTTOM VIEW
1
CYCLONE "F-50"
REDUCTION GEAR 16:11
HYDRO MODEL SHOWN

The "F-50" Cyclone in Miniature

Interesting Phases of the Development and Construction Details of This Famous Engine and How You Can Build a Model of It

By WILLIAM WYLAM



A rear view of the "F-50" Cyclone

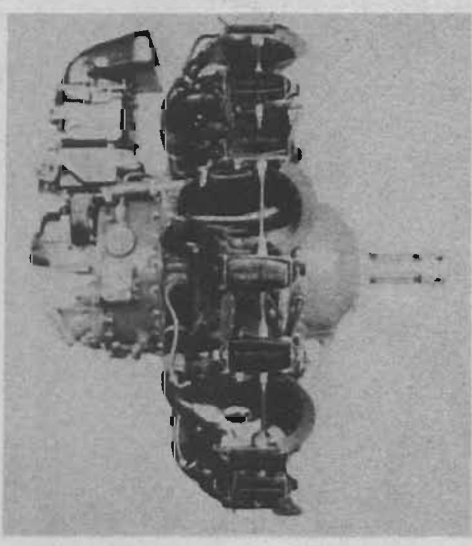
History of the "F" Cyclone

THE Wright Cyclones are building up an enviable reputation since their first design was created in 1924. It was the first built job for the Navy order, which was to replace the obsolete and worn out Liberty engines in the Navy patrol boats. Since then, the Cyclones were progressively developed from 420 horsepower to the rating of 820 horsepower as shown in the "F-50" models; recent developments have boosted the horsepower rating to over 1,200!

The different models which have successfully marked each stage in its development, are widely used by the United States Army and Navy; by foreign governments throughout the world and by various commercial air lines. The Cyclone's greatest contribution to the truthfulness of its reliability was shown by its achievement in powering the high speed Martin Bombers on the mass flight to Alaska, from Washington, D.C., and return.

The Cyclone engine is used in the most recent and advanced types of military and commercial airplanes because of the lightness per horsepower, its simple mounting system and its instant reaction to the operator's touch. In the commercial field, Wright Cyclones power the majority of latest highspeed transports.

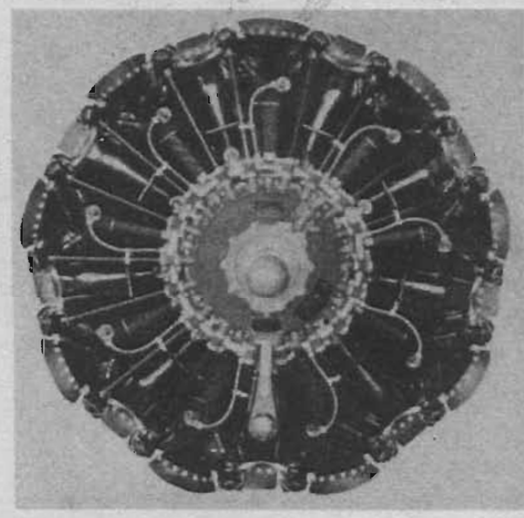
Lindbergh flew the Atlantic with a Whirlwind, a small version of the cyclone.



Side view. Note carburetor at rear

Description of the "F-50" Cyclone

Fundamentally, the design of the "F-50" follows closely the original model from which the "F-50" was developed. No change has been made in the basic design; and all its parts are interchangeable. By substituting supercharger drive gears of a lower or higher ratio and by altering the carburetor settings correspondingly, the performance characteristics of any series may be adapted to desired operating conditions.



Front view showing cylinder arrangement

Five major refinements are incorporated in the "F-50" models to produce higher power outputs, both at sea level and at higher altitudes. The refinements are the dynamic damper, controlled pressure lubrication of the valve gears, a new cylinder head, specially hardened cylinder barrels and improved supercharger unit.

The dynamic damper incorporated in the crankshaft assembly is a device to permit a smoother operation never attained before in any radial engines. Also this counterweight removes engine speed restrictions.

The controlled pressure lubrication of the valve gear system employed on the "F-50" brings all parts of the engine under lubrication from the main oil system. Complete control of the lubrication oil entering the system is provided by a manually operated (hand) valve on the main oil pump. By opening this valve for 15 seconds or more the entire mechanism is lubricated and this system eliminates the removal of engine cowlings, reduced maintenance and does away with the external lubrication equipments.

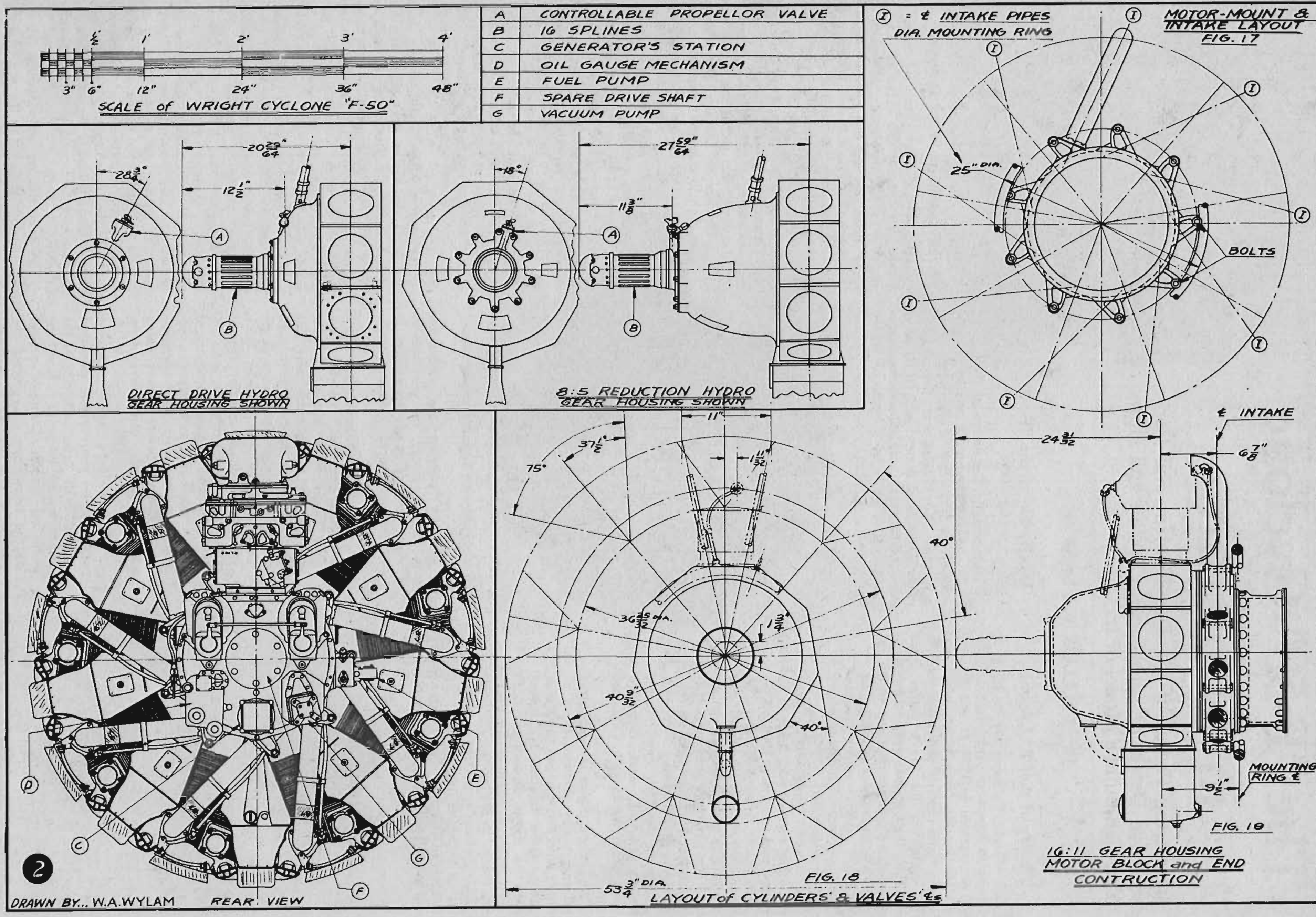
The cylinder heads are built up in accordance with standard Wright practice; aluminum alloy heads are screwed and shrunk on to the alloy steel barrels and are fitted with an ingenious system of pressure baffles. The rocker support boxes are cast whole and are machined to the desired finish. Both exhaust and intake ports are located at the rear of the cylinders. The exhaust ports are provided with four studs instead of two. This permits a more rigid attachment of exhaust pipes or manifold units to the cylinders, increasing the life and power of the engine. The exhaust valves have sodium filled heads and stem to help decrease the heat at the valve heads. The exhaust valves are "faced" with Stellite and these valves have stainless steel seats.

The cylinder barrels follow the same design as the first series. They are machined from alloy steel forgings and are threaded on the upper ends for attachment to the cylinder heads. The barrels are treated to a special process that will give them an exceptionally hard surface on the inside.

The cooling systems of the cylinder heads and barrels are by the use of inter-cylinder baffles and cylinder head baffles, which are made of pressed steel. This baffling system insures a smooth flow of air over all portions of the cylinder heads and barrels and permits the uniformity of cooling. The inter-cylinder baffling directs the cooling air to the rear of the barrels while the head baffles force the air to flow around the contour of the cylinder head to the rear spark plugs. On the rocker support boxes, lugs are provided for attachment of ring, anti-drag cowl or full NACA cowls.

The supercharger unit has an eleven inch impeller installed in the supercharger

(continued on page 52)


SCALE of WRIGHT CYCLONE "F-50"
A CONTROLLABLE PROPELLOR VALVE
B 16 SPLINES
C GENERATOR'S STATION
D OIL GAUGE MECHANISM
E FUEL PUMP
F SPARE DRIVE SHAFT
G VACUUM PUMP
DIRECT DRIVE HYDRO GEAR HOUSING SHOWN
8:5 REDUCTION HYDRO GEAR HOUSING SHOWN
Ⓘ = ℄ INTAKE PIPES
DIA. MOUNTING RING
25" DIA.
BOLTS
MOTOR-MOUNT & INTAKE LAYOUT
FIG. 17
℄ INTAKE
MOUNTING RING ℄
FIG. 18
LAYOUT of CYLINDERS' & VALVES' ℄s
FIG. 18
16:11 GEAR HOUSING
MOTOR BLOCK and END
CONTRUCTION
DRAWN BY... W.A.WYLAM
REAR VIEW

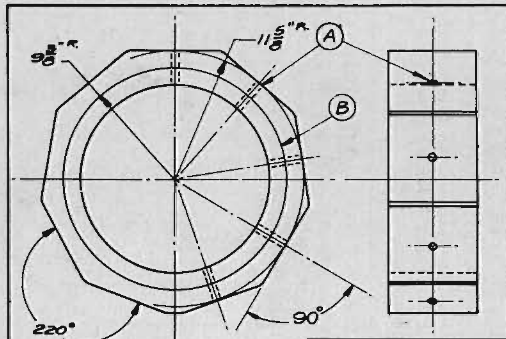


FIGURE 1

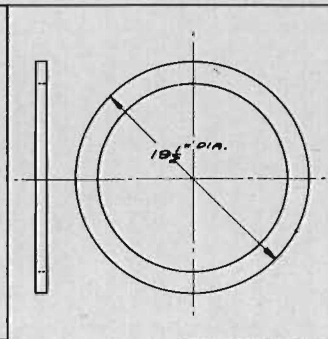


FIGURE 2

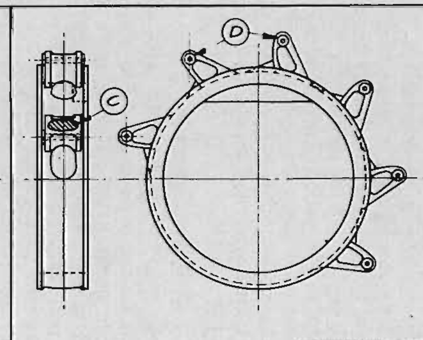


FIGURE 3

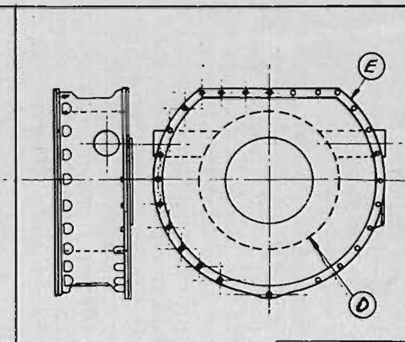


FIGURE 4

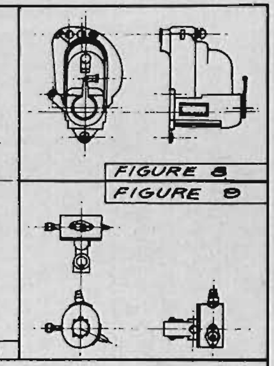


FIGURE 8

FIGURE 9

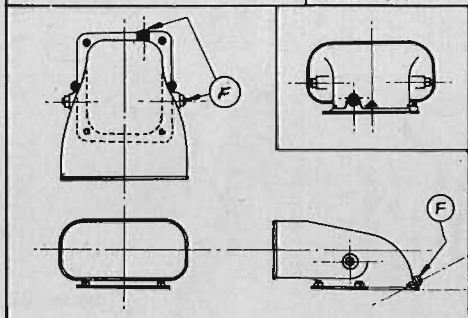


FIGURE 5

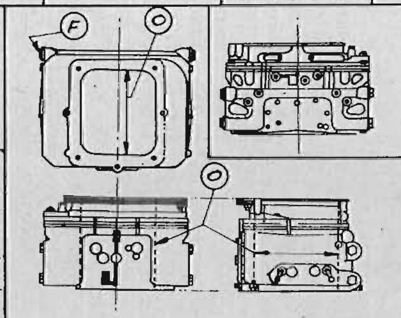


FIGURE 6

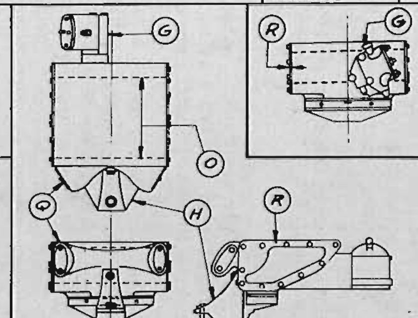


FIGURE 7

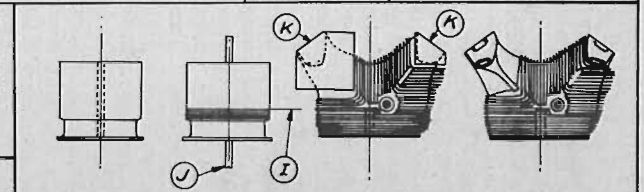


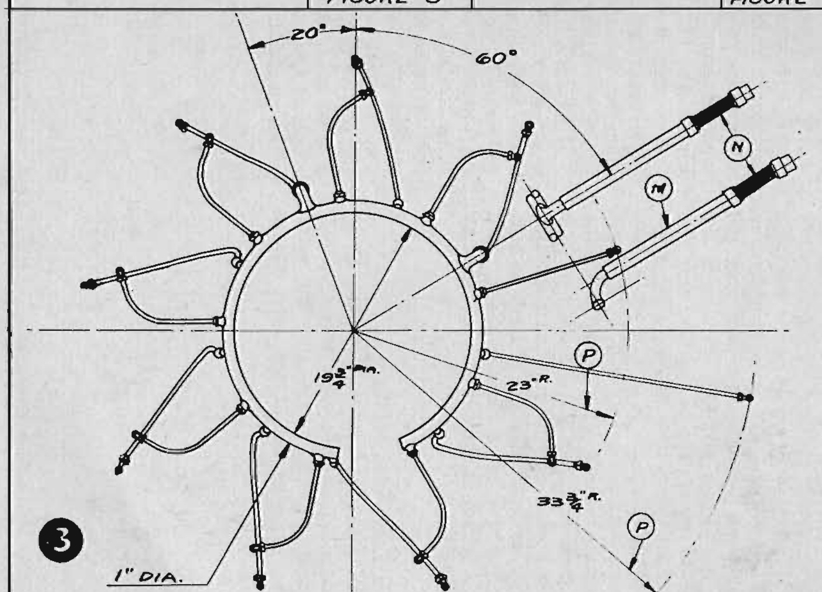
FIGURE 11

A SUGGESTIVE METHOD of MAKING UP EACH CYLINDER — 2 PEICES for 1 UNIT.

SEVERAL THREE-VIEW DRAWINGS ON THIS PAGE ARE MINUS A FEW FIXTURES for CLEARNESS— LOOK TO ENGINE'S FOUR-VIEW DRAWING for the MISSING DETAILS.

R	GRID PLATE(SCREEN MISSING).
Q	EXHAUST CONNECTIONS for HOT-AIR PASSAGE
P	MINIMUM RADUS
O	HOLLOW SPACE
N	BRAIDED WIRES' COVERING
M	METAL SLIEVE (BEND TO CONTOUR of BLOCK)
K	WOOD BLOCK (CARVE TO SHAPE of VALVE HOUS'G.)
J	GLUED DOWEL
I	THREAD
H	MOUNTING POST
G	HOT-AIR EXHAUST
F	ADJUSTMENT BOLTS
E	REINFORCEMENT RING
D	BUSHINGS
C	INTAKE PORT
B	GUIDE LINE for GEAR HOUSING
A	DOWEL HOLES (DRILLED TO SUIT DOWELS)

FIGURES	NAME	COLOR	MISCELLANEOUS
1	MOTOR BLOCK	BLUE-GRAY	
2	SPACER	BLUE-GRAY	
3	ENGINE MOUNT	BLUE-GRAY	
4	SUPERCHARGER CHAMBER	BLUE-GRAY	
5	CARBURATOR AIR SCOOP	SHINEY BLACK	
6	CARBURATOR MIXING CHAMBER	SHINEY BLACK	CHROM. PL'D. FIXTURES
7	CARBURATOR ADAPTER	SHINEY BLACK	CHROM. PL'D. SIDES CHROM. PL'D. FIXTURES
8	MAGNETO	SHINEY BROWN	CHROM. PL'D. FIXTURES
9	FUEL PUMP UNIT	ALL STEEL	
10	WIRING HARNESS	ALUMIMUN SHIELD RING	GOLD S.P. WIRES CHROM. PL'D. FIXTURES



3

FIGURE 10

DRAWN BY.... W. A. WYLAM

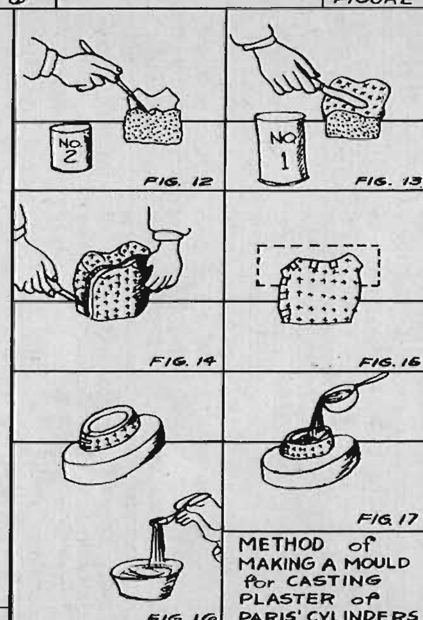


FIG. 12 FIG. 13 FIG. 14 FIG. 15 FIG. 16 FIG. 17

METHOD of MAKING A MOULD for CASTING PLASTER of PARIS' CYLINDERS

(continued from page 49)

chamber. It runs at low speed and operates on plain roller bearings, mounted on the crankshaft. This unit keeps the engine's performance uniform at all heights.

Building the Cyclone "F-50" Model

If you are planning to build an authentic scale model of the "F-50" for a model airplane, use the same scale in full proportion with both the engine and airplane miniatures. To make the last statement clear, if the model airplane scale is 3/8"; the engine scale is 1/32" equals one inch or the engine scale is also 3/8". After you have the scales all worked out, use the engine's scale throughout the entire building of the "F-50."

Motor Block

The first piece to make is the motor block (Figure 1 on plate 3). Use your scale to find out the width, height and thickness of this block; obtain a straight-grained piece of wood whose dimensions are a half inch over the dimensions of the block's. On the front and rear sides of the block, after the exact thickness has been reached, draw the vertical and horizontal center lines. Form the centers of the two sides, draw a circle equal to the scaled radius of 11 5/8". Scribe also from the same center on the front side, another circle equal to the scaled radius of 9 3/8". At the top, where the vertical center line meets the largest circle, divide the circle into 9 equal segments. At the end of each segment, mark a point which will total 9 in all. From the center of the engine, draw 9 cylinder center lines that will pass through the points on the circle. You will get a better idea of this layout if you refer to Figure 18 on page 50 On the points where the cylinder center lines meet the circle, draw 9 lines that will be at right angles to the cylinder's center lines; these newly formed lines are the angles of the cylinder's bases. Now use your own judgment in cutting away the surplus of each base, and when completed, see that all angles are equal and are square to both the rear and front sides. Now draw the two right angle center lines on each base and mark each center. On these centers, drill 9 holes "A" toward the center of the engine. Drill the holes large enough to admit the size of your chosen dowels. Drill at the front side through the rear side, a hole large enough to lighten the block without harm. The hole as shown in the drawing (Figure 1) is sufficient.

Rear Sections

Now make the piece for Figure 2 of any material that you choose. When finished hollowing out the center, glue the piece on the exact center of the rear side of Figure 1. The unit as shown in Figure 3 is next to make. I suggest that it should be made in three pieces (not counting the mounting gadgets and intake ports); two thin layers for the thin outside rims (two) and a thick piece for the center. After the center piece has been shaped, make the 9 mounting gadgets and attach; finish off the entire piece to resemble the drawing and then add the two outside rims later. When completed, hollow out the center to your best judgment but make sure that the top is closed up like the drawing shows. Glue or attach Figure 3 to Figure 2 on the motor block.

Now make the complete unit for the supercharger chamber (Figure 4). The heavy center piece can be made on a lathe, cutting off the top of the piece as shown on the drawing. After the piece is carefully hollowed out, drill a hole through the location of the gun synchronizers (refer to the top-view drawing on page 48). Add all small plain bases (odd ones) for different parts now, then add a thin layer (heavy paper will do) to cover up the back; and on top of this layer, lay another thin layer to represent the bolted rim. When completed, glue the entire unit onto the exact center of the back of Figure 3.

Cylinders

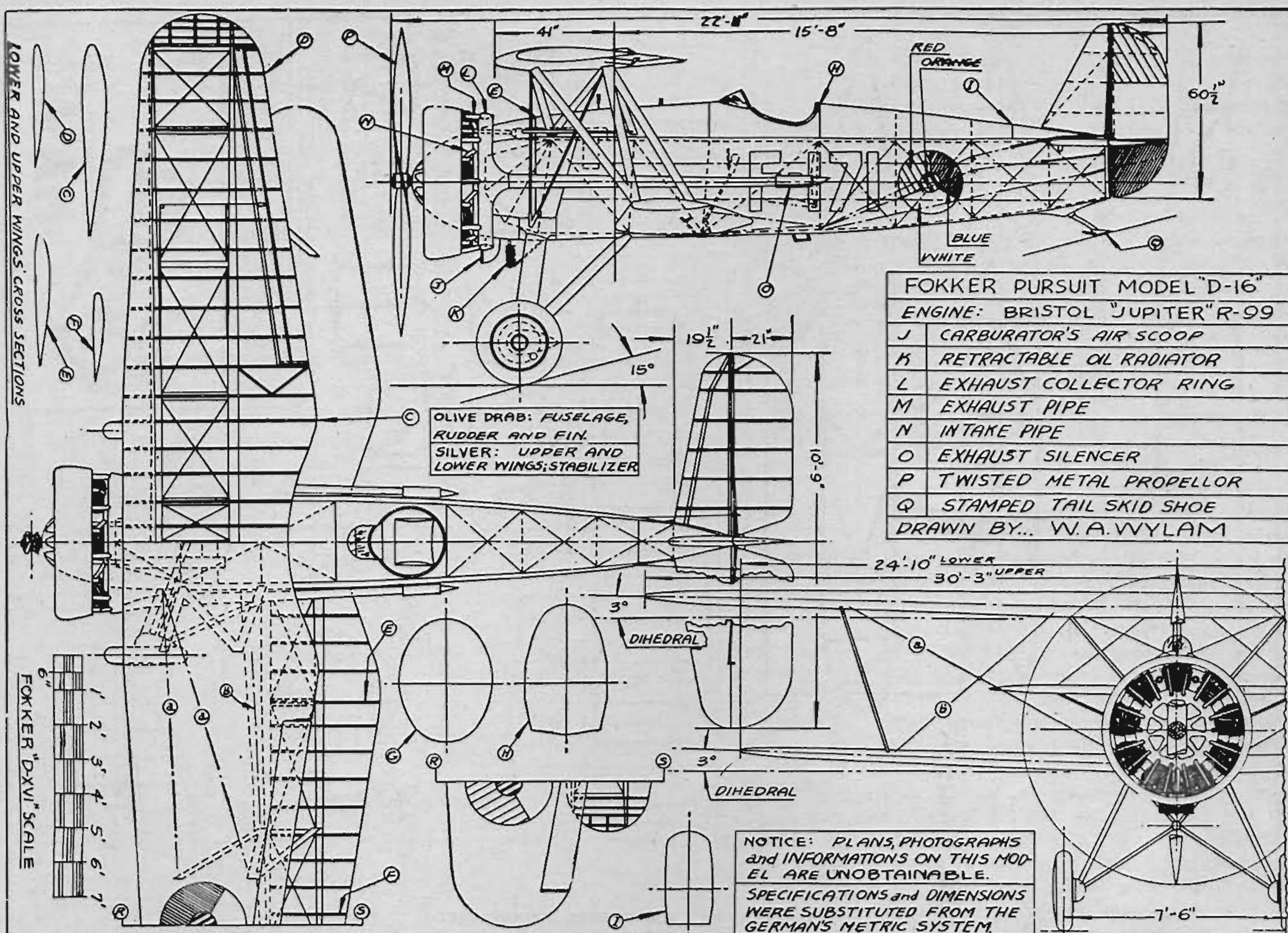
The nine cylinders should be made next. On Figure 11 of page 51 you will get a suggested idea to make a lifelike cylinder. On page 48 the four-view drawings of the cylinder design will give you a broad idea of the cylinder's appearance. From Figure 11, it is suggested to make the whole cylinder head into halves. The lower unit can be made on the lathe and finished off to exactness, by winding thread at the proper place. Before threading, it is best to drill through the center, to insert a dowel that is the same size as the holes "A" on Figure 1. It is also suggested that the upper half should be built up of alternating layers and that the rocker houses should be carved separate from the block as shown on Figure 11. (It's best to not attach the houses until it is all carved). When the entire upper half of the cylinders is finished, glue the two halves together and attach to the motor block, one at a time.

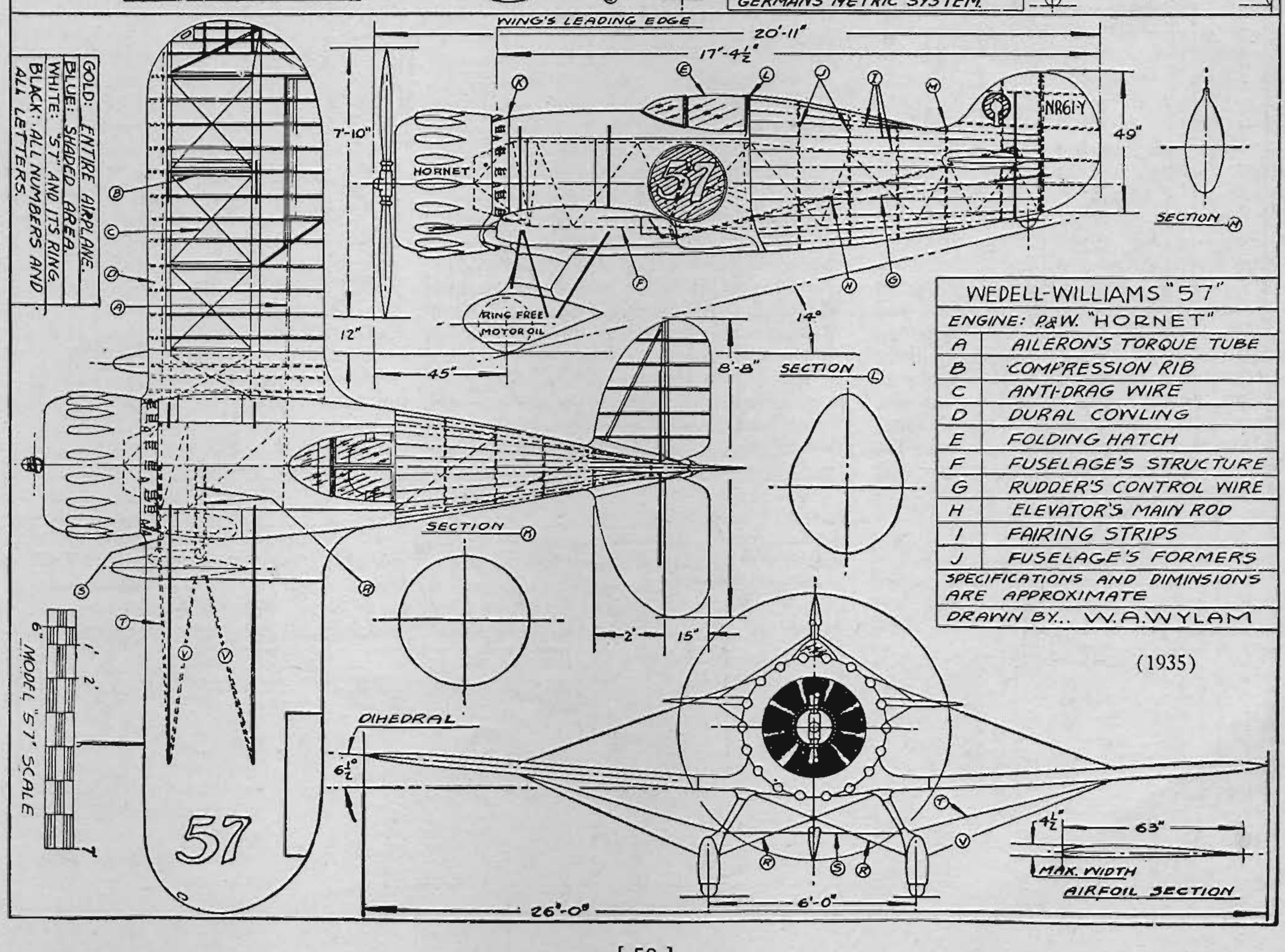
If the model builder wishes to make an exact pattern of one cylinder and cast the others from this pattern, here are my suggestions. On the market, there is a company that manufactures liquid rubber in two states (conditions) that will enable anybody to make flexible moulds. To use this method, the pattern must be made first and the first rubber is applied like paint; the second rubber is applied like putty to a window. This company's (So-Lo-Go-Ma Works of Cincinnati, Ohio) product comes in two cans, called "Number 1" and "Number 2." Number two is painted on the pattern in six or more coats; each coat is applied after the last coat is dry (Figure 12). When a sufficient thickness of number two is obtained, then spread on Number one (Figure 13). Put the mould away after a sufficient thickness of Number one is secured and let it stand for about 24 hours. When Number one is dry and hard, cut an opening around the mould in such a way that it will permit you to remove the castings with the greatest ease (Figure 14). On Figure 15, you will see that adhesive tape is used to keep the opening together and that the dotted box is a suggested support for the mould. Make the support out of plaster or a carved block. Turn the block around as it appears in Figure 16. Also in Figure 16, you will notice how to sift the plaster into the bowl of water. To make the proper plaster mixture, use plaster of Paris, fill up the mould with water and dump the water in a bowl. Now add the plaster as shown in Figure 16; be careful to build up an even pile and when the plaster is even with the water, let it stand for 10 minutes. Then slowly mix the plaster with a circular movement for a few seconds. When through, pour the plaster into the mould very slowly to prevent the formation of air bubbles. Put the mould in a warm dry spot to harden; when the plaster is hard, remove the tape and carefully open the mould to remove the casting.

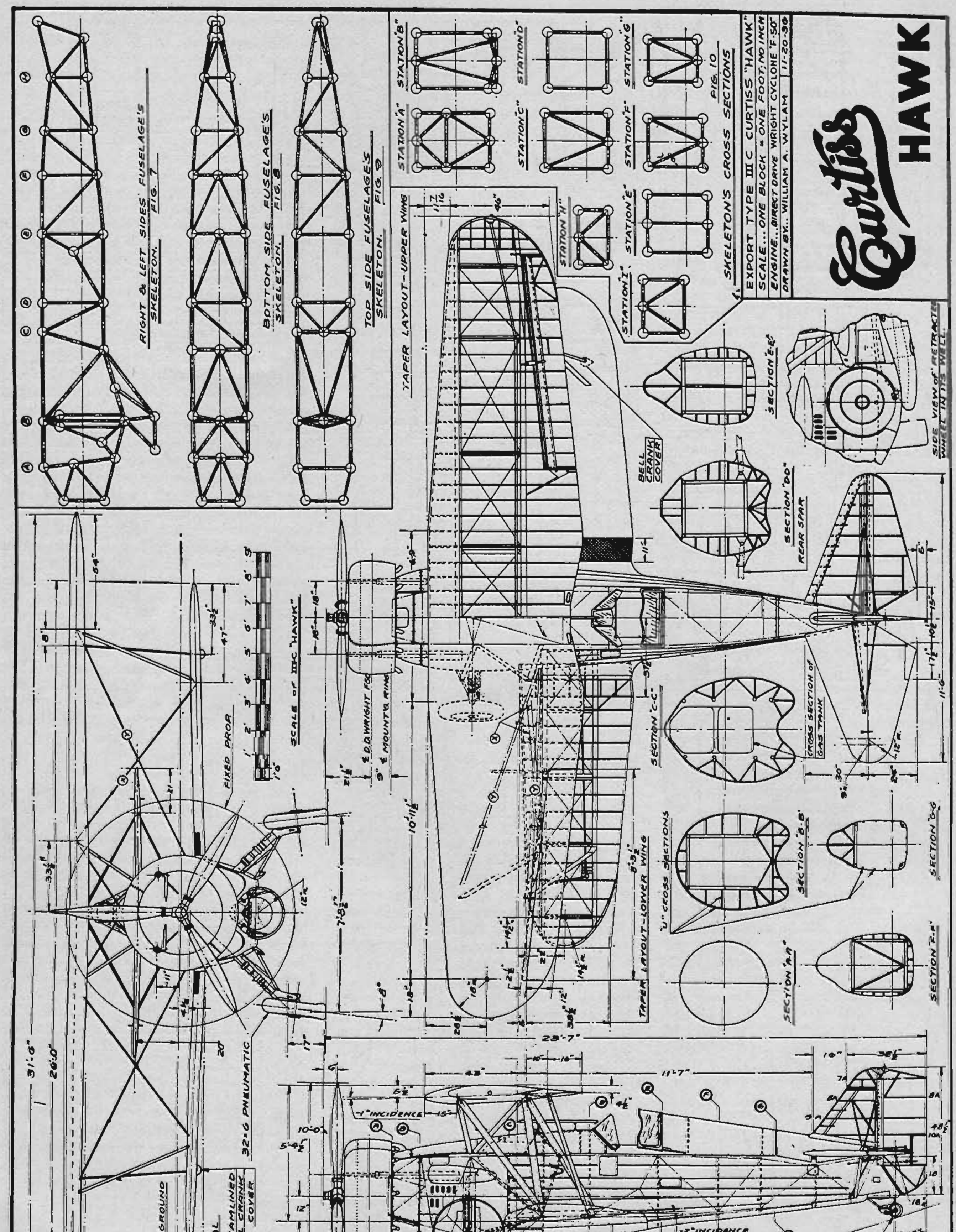
Miscellaneous

Figures 5, 6, 7, 8 and 9 can be made with the same procedure as employed in making the other units. After all these units are finished, attach them to the motor in their proper position. Now make the intake tubes of soft wire or anything that you think is best. Now paint the entire unfinished engine according to the information set on page 3. (Don't paint the surface inside of the guide circle). Attach the finished wire harness (Figure 10) which must be painted before attaching, with all its fixtures to the engine. When the harness is attached, add the baffle plates and oil passage line. Now add the correct gear housing on the nose of the engine; make sure that it is on the guide line as shown in Figure 1. When the gear housing is secured to the block, add all the cam rods, bolts and the oil strainer system. When the entire model is all painted and polished, add all the metal gadgets. They are so numerous that space does not permit me to put it all down in writing but you will get a broad idea of the quantity of these details by referring to the assembly drawings. (The "87" band on the intake pipes is painted red-orange, the intake pipes are a shiny black color . . . the same color is used on the baffles, name plates and other similar devices.)

-1936


LOWER AND UPPER WINGS' CROSS SECTIONS
FOKKER PURSUIT MODEL "D-16"
ENGINE: BRISTOL "JUPITER" R-99
J CARBURATOR'S AIR SCOOP
K RETRACTABLE OIL RADIATOR
L EXHAUST COLLECTOR RING
M EXHAUST PIPE
N INTAKE PIPE
O EXHAUST SILENCER
P TWISTED METAL PROPELLOR
Q STAMPED TAIL SKID SHOE
DRAWN BY... W.A. WYLAM
OLIVE DRAB: FUSELAGE, RUDDER AND FIN.
SILVER: UPPER AND LOWER WINGS; STABILIZER
RED
ORANGE
BLUE
WHITE
22'-8"
41"
15'-8"
60½"
19½"
21"
15°
10'-6"
24'-10" LOWER
30'-3" UPPER
3°
DIHEDRAL
7'-6"
NOTICE: PLANS, PHOTOGRAPHS and INFORMATIONS ON THIS MODEL ARE UNOBTAINABLE.
SPECIFICATIONS and DIMENSIONS WERE SUBSTITUTED FROM THE GERMAN'S METRIC SYSTEM.
FOKKER "D-XVI" SCALE

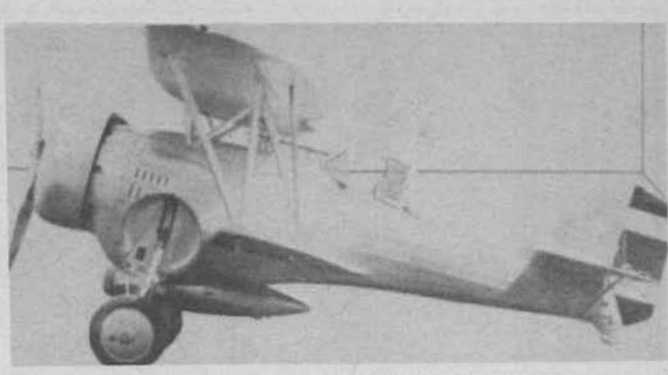

GOLD: ENTIRE AIRPLANE.
BLUE: SHADED AREA.
WHITE: "57" AND ITS RING.
BLACK: ALL NUMBERS AND ALL LETTERS.
WING'S LEADING EDGE
20'-11"
17'-4½"
7'-10"
49"
HORNET
NR61-Y
57
RING FREE MOTOR OIL
12"
45"
14°
8'-8"
SECTION
WEDELL-WILLIAMS "57"
ENGINE: P&W. "HORNET"
A AILERON'S TORQUE TUBE
B COMPRESSION RIB
C ANTI-DRAG WIRE
D DURAL COWLING
E FOLDING HATCH
F FUSELAGE'S STRUCTURE
G RUDDER'S CONTROL WIRE
H ELEVATOR'S MAIN ROD
I FAIRING STRIPS
J FUSELAGE'S FORMERS
SPECIFICATIONS AND DIMINSIONS ARE APPROXIMATE
DRAWN BY... W.A. WYLAM
(1935)
2'
15"
DIHEDRAL
6½"
4½"
63"
MAX. WIDTH
AIRFOIL SECTION
26'-0"
6'-0"
MODEL "57" SCALE


Curtiss
HAWK
EXPORT TYPE III C CURTISS "HAWK"
SCALE... ONE BLOCK = ONE FOOT; NO INCH
ENGINE... DIRECT DRIVE WRIGHT CYCLONE "F-50"
DRAWN BY... WILLIAM A. WYLAM 11-20-30
SKELETON'S CROSS SECTIONS
FIG. 10
RIGHT & LEFT SIDES FUSELAGE'S SKELETON.
FIG. 7
BOTTOM SIDE FUSELAGE'S SKELETON.
FIG. 8
TOP SIDE FUSELAGE'S SKELETON.
FIG. 9
TAPER LAYOUT-UPPER WING
TAPER LAYOUT-LOWER WING
SCALE of IIIC "HAWK"
SIDE VIEW of RETRACTED WHEEL IN ITS WELL.
BELL CRANK COVER
SECTION "C-C"
SECTION "B-B"
SECTION "A-A"
SECTION "D-D"
SECTION "E-E"
SECTION "F-F"
SECTION "G-G"
REAR SPAR
CROSS SECTION of GAS TANK
"U" CROSS SECTIONS
FIXED PROP.
32x6 PNEUMATIC
STREAMLINED BELL CRANK COVER
DIHEDRAL
PARALLEL TO GROUND
-1° INCIDENCE
-2° INCIDENCE
6"x1½" SOLID RUBBER 360° ROTAT'N.
WITH 2" TIRE DEFLECTION
31'-6"
26'-0"
23'-7"
11'-7"
10'-0"
1

The Hawk "III-C" In Miniature

Instructions and Plans for Building a Miniature Pursuit Ship That Will Stir the Heart of Every Scale Model Builder

By WILLIAM WYLAM



The Curtiss Hawk "III-C" pursuit plane

THE Type "III-C" Hawk is one of the latest additions to the illustrious family of Hawks—known throughout the world for its high performance and high maneuverability. With its powerful heart, namely the Wright Cyclone "F-50," it can tear through the air at a terrific rate; climb like a balloon at a fictional rate, too.

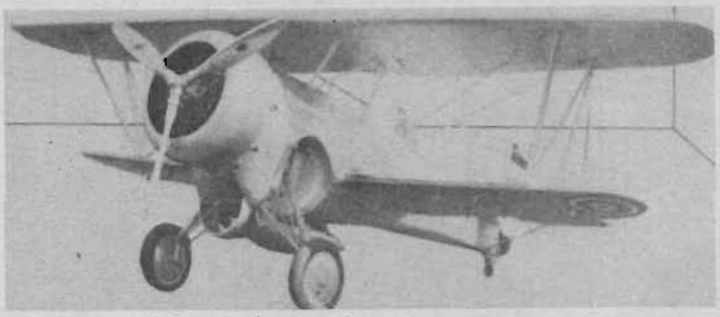
This model represents 12 years of intensive research by the engineering department of the Curtiss Airplane Division. As the years rolled by, it was constantly refined in performance, maintenance and structure; to the highest degree of perfection. No doubt, this new Hawk has established new standards of maneuverability and performance in the pursuit plane class.

General Description of the Construction The Fuselage Structure

The fuselage is of welded steel (chrome-molybdenum) tubular construction. Attaching brackets and fittings are of sheet steel and forgings. They are welded into the fuselage structure for attaching the engine mount, wings, empennage, tail wheel unit and landing gear unit to the structure by means of bolts. All bulkheads, supports and formers are also welded onto the structure, and they are of "U" cross section, steel sheets. The fairing strips are of dural tubing and are also welded to the supports.

The fuselage, from the engine compartment to the cockpit, is cowled with large metal hinged doors, which permits easy access to all parts of the front portion of the airplane. The cowlings are made of aluminum alloy sheets, reinforced and stiffened to withstand abuses and long wear. From the cockpit to the tailpost, the fuselage is fabric covered, with the exception of the turtledeck. The turtledeck is of hinged aluminum alloy sheet cowl construction; and this provides the baggage compartment. On the front part of the turtledeck, a sliding antidraft shield is mounted which is made of transparent pyralin. The shield can be locked while in flight and can be quickly unlocked in case of emergency. The bottom of the turtledeck is of heavy canvas floor, which is easily opened for access to the inside of the fuselage. The rear of the turtledeck and under the fin is cowled with metal, which is removable for servicing purposes. Large inspection doors are provided in the covering and a door is provided at the bottom of the fuselage near the controls.

The cockpit has a full floor of aluminum alloy sheet, and the sides are lined with the same materials. They are fitted about with various controls, and are very clean and neat in appearance. The windshield is mounted on a welded super-structure of the fuselage. It is of three pieces of shatterproof glass and it is set in moulded rubber channels which protect the glass from damage. The instruments are grouped on a board, directly parallel to the vertical line, and the main center of the board is covered with leather crash pad. For night flying, the instruments are indirectly lighted and a rheostat is provided to reduce the glare or reflections. The pilot seat is made of aluminum alloy and is shaped for the use of standard seat-type parachutes. The seat height is adjustable in the air by an operating crank on the side. A cushion back is provided, which can be used as a life preserver.



Note the bomb and landing gear details

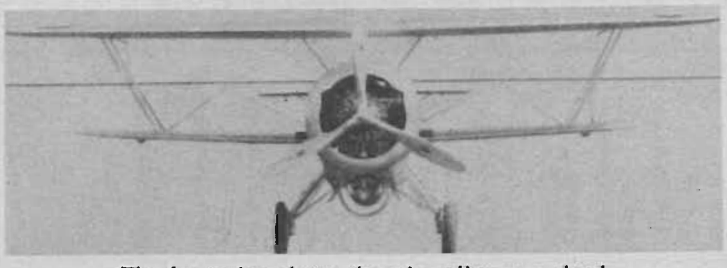
Rudder controls are of hanging type, and are made of welded steel tubing. Large aluminum brake pads are hinged to the lower end of the pedal bars. Heavy cables are attached to the sides of these pedals, passed through pullies and runs out to the rudder horn. The control stick unit is of ball bearing construction; and is bolted to the floor of the cockpit.

The aileron control is of push and pull system which is located in the lower wing; and it operates the ailerons by a strut, which is attached to a bell crank. The elevator control is a connected rod from the stick to a balanced pivot behind the pilot's seat. At the pivot, a push pull rod runs to another pivot then to the internal elevator horn. The stabilizer control in the cockpit is a crank, which is made with a recording dial, which shows the number of degrees of the stabilizer's nose position. It is connected to the crank and screw post by means of an endless chain. The elevator's flettners are hinged to the elevator's frame and are connected by a rod to a stiff horn, fixed to the stabilizer's frame. The rudder's flettner is adjustable from the cockpit by means of a spinning wheel and an endless chain.

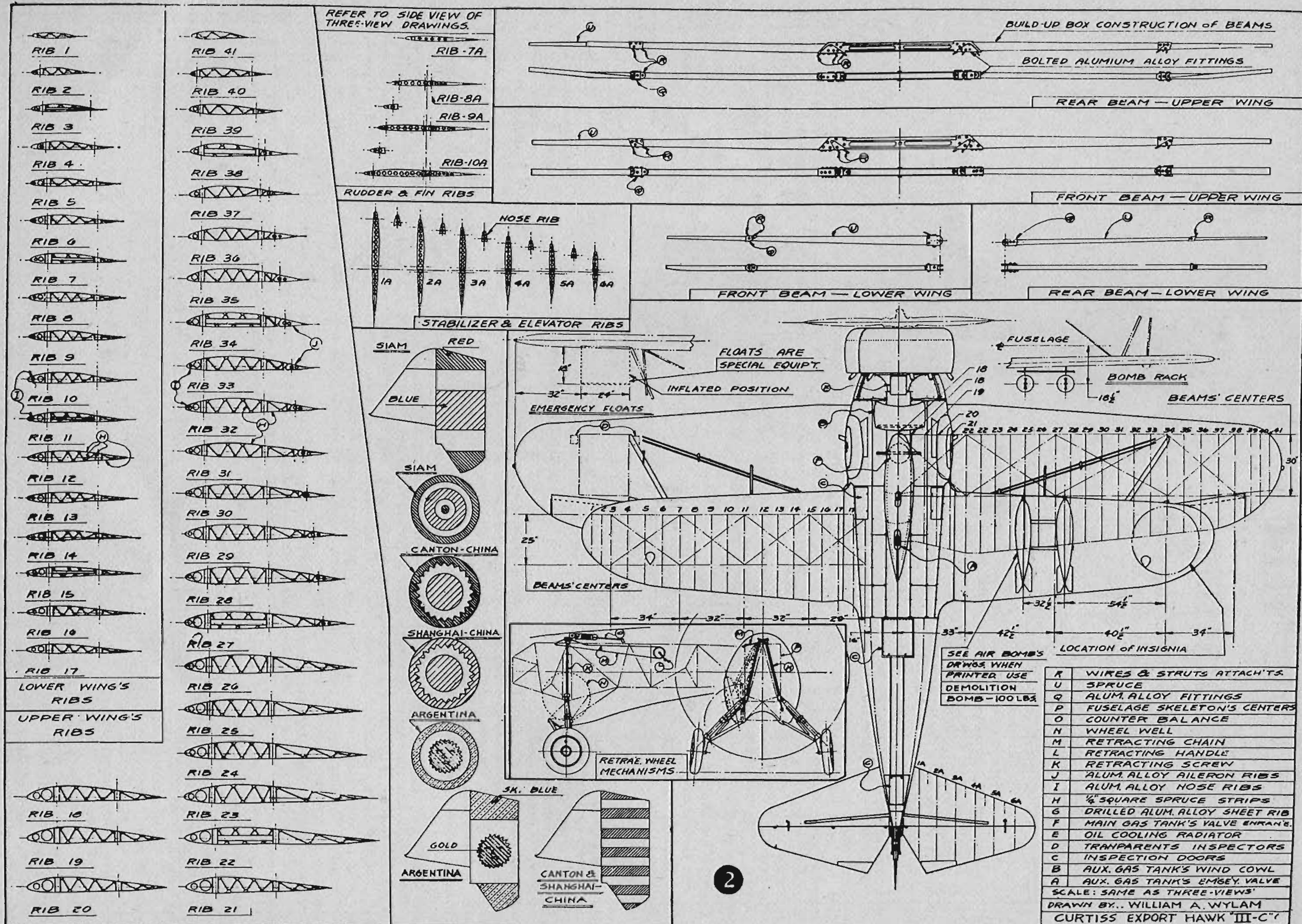
Wing Cellule

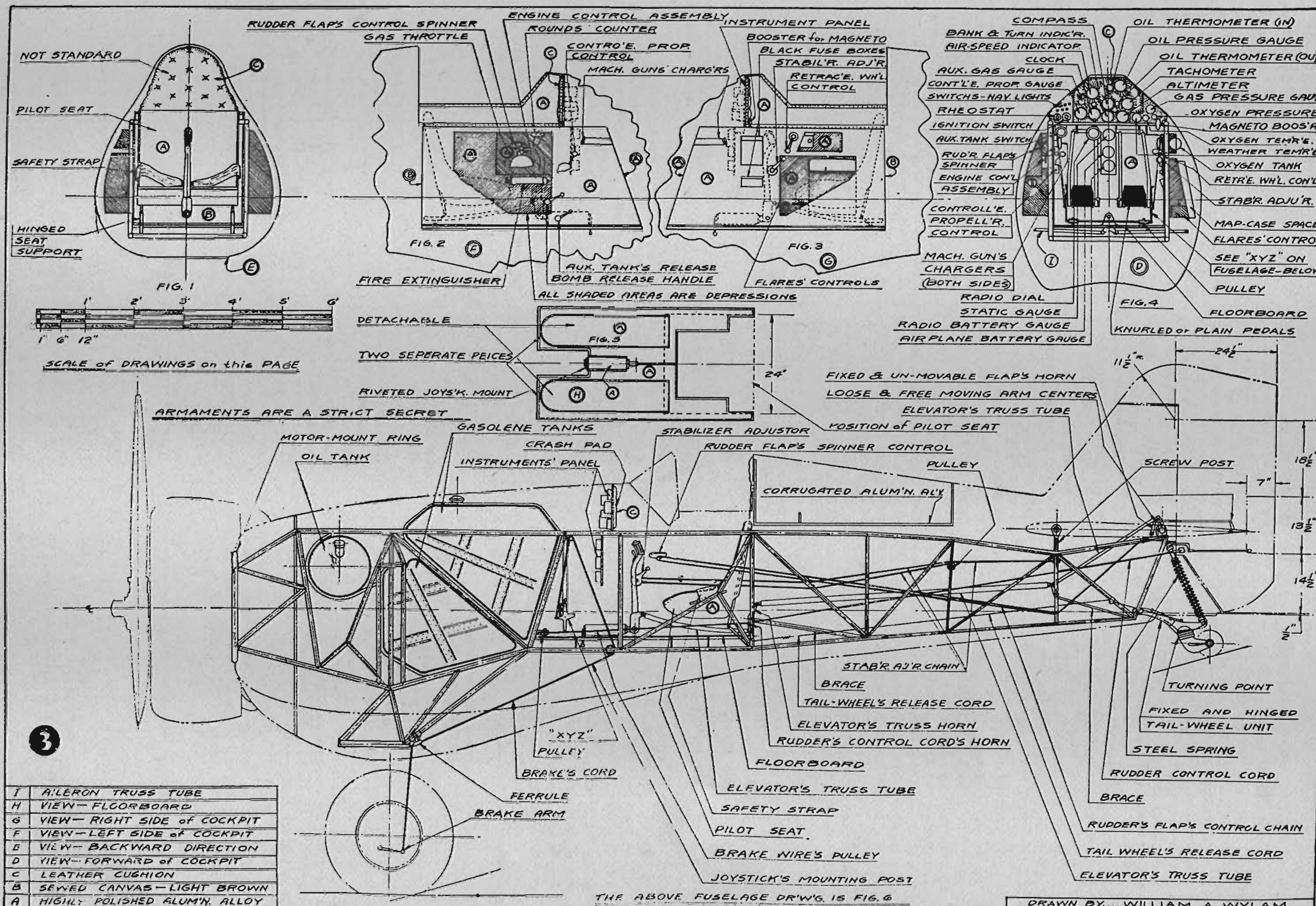
The upper wing is of one continuous panel of light rigid construction. The beams are of hollow box section of spruce and plywood construction. Welded steel fittings are formed about the beams, and are bolted on, for attachments of struts and wires. The ribs are built up of spruce diagonal bracings and plywood webs. Diagonal anti-drag wires are of steel tie rods and are attached to steel compression trusses. The lower panels are of similar construction as the upper one is. The inboard end of each lower panel is attached to the fuselage by steel pins, which pass through the lugs, which are bolted to the beams' ends. Double flying wires are provided for both front and rear beams of the upper panel; and run to fittings, which are attached to the front beams of the lower panels. The wires are connected with separators to deaden the vibration, and are of streamlined shape. The leading edges of both wings, from the front beam around the nose are covered with dural sheets. Wings, panels and ailerons are covered with cotton cloth and are sewed to the ribs. The ailerons' ribs are of dural sheets and are welded to their beams. The beams are hinged to the rear beams of the upper wings; and the

(continued on page 58)



The front view shows the wing alignment clearly


REFER TO SIDE VIEW OF THREE-VIEW DRAWINGS.
RIB-7A
RIB-8A
RIB-9A
RIB-10A
RUDDER & FIN RIBS
NOSE RIB
STABILIZER & ELEVATOR RIBS
BUILD-UP BOX CONSTRUCTION of BEAMS
BOLTED ALUMIUM ALLOY FITTINGS
REAR BEAM — UPPER WING
FRONT BEAM — UPPER WING
FRONT BEAM — LOWER WING
REAR BEAM — LOWER WING
RIB 1
RIB 2
RIB 3
RIB 4
RIB 5
RIB 6
RIB 7
RIB 8
RIB 9
RIB 10
RIB 11
RIB 12
RIB 13
RIB 14
RIB 15
RIB 16
RIB 17
LOWER WING'S RIBS
UPPER WING'S RIBS
RIB 18
RIB 19
RIB 20
RIB 41
RIB 40
RIB 39
RIB 38
RIB 37
RIB 36
RIB 35
RIB 34
RIB 33
RIB 32
RIB 31
RIB 30
RIB 29
RIB 28
RIB 27
RIB 26
RIB 25
RIB 24
RIB 23
RIB 22
RIB 21
SIAM
RED
BLUE
SIAM
CANTON-CHINA
SHANGHAI-CHINA
ARGENTINA
SK. BLUE
GOLD
ARGENTINA
CANTON & SHANGHAI-CHINA
FLOATS ARE SPECIAL EQUIP'T.
INFLATED POSITION
EMERGENCY FLOATS
FUSELAGE
BOMB RACK
BEAMS' CENTERS
BEAMS' CENTERS
LOCATION of INSIGNIA
RETRA'E. WHEEL MECHANISMS
SEE AIR BOMB'S DRWGS. WHEN PRINTED USE DEMOLITION BOMB-100 LBS.
R WIRES & STRUTS ATTACH'TS.
U SPRUCE
Q ALUM. ALLOY FITTINGS
P FUSELAGE SKELETON'S CENTERS
O COUNTER BALANCE
N WHEEL WELL
M RETRACTING CHAIN
L RETRACTING HANDLE
K RETRACTING SCREW
J ALUM. ALLOY AILERON RIBS
I ALUM. ALLOY NOSE RIBS
H ¼" SQUARE SPRUCE STRIPS
G DRILLED ALUM. ALLOY SHEET RIB
F MAIN GAS TANK'S VALVE ENRAN'E.
E OIL COOLING RADIATOR
D TRANPARENTS INSPECTORS
C INSPECTION DOORS
B AUX. GAS TANK'S WIND COWL
A AUX. GAS TANK'S EMGEY. VALVE
SCALE: SAME AS THREE-VIEWS'
DRAWN BY.. WILLIAM A. WYLAM
CURTISS EXPORT HAWK "III-C"
2


RUDDER FLAP'S CONTROL SPINNER
GAS THROTTLE
ENGINE CONTROL ASSEMBLY
ROUNDS COUNTER
CONTRO'E. PROP. CONTROL
MACH. GUNS' CHARG'RS
INSTRUMENT PANEL
BOOSTER for MAGNETO
BLACK FUSE BOXES
STABIL'R. ADJ'R.
RETRAC'E. WH'L CONTROL
NOT STANDARD
PILOT SEAT
SAFETY STRAP
HINGED SEAT SUPPORT
FIG. 1
FIG. 2
FIG. 3
FIRE EXTINGUISHER
AUX. TANK'S RELEASE
BOMB RELEASE HANDLE
ALL SHADED AREAS ARE DEPRESSIONS
FLARES' CONTROLS
COMPASS
BANK & TURN INDIC'R.
AIR-SPEED INDICATOR
CLOCK
AUX. GAS GAUGE
CONT'L'E. PROP. GAUGE
SWITCHS-NAV. LIGHTS
RHEOSTAT
IGNITION SWITCH
AUX. TANK SWITCH
RUD'R. FLAPS SPINNER
ENGINE CON'L ASSEMBLY
CONTROLL'E. PROPELL'R. CONTROL
MACH. GUN'S CHARGERS (BOTH SIDES)
RADIO DIAL
STATIC GAUGE
RADIO BATTERY GAUGE
AIRPLANE BATTERY GAUGE
OIL THERMOMETER (IN)
OIL PRESSURE GAUGE
OIL THERMOMETER (OUT)
TACHOMETER
ALTIMETER
GAS PRESSURE GAUGE
OXYGEN PRESSURE
MAGNETO BOOS'R.
OXYGEN TEMP'E.
WEATHER TEMP'E.
OXYGEN TANK
RETR'E. WH'L. CON'L.
STAB'R. ADJU'R.
MAP-CASE SPACE
FLARES' CONTROL
SEE "XYZ" ON FUSELAGE-BELOW
PULLEY
FLOORBOARD
KNURLED or PLAIN PEDALS
FIG. 4
1' 2' 3' 4' 5' 6'
1' 6" 12"
SCALE of DRAWINGS on this PAGE
DETACHABLE
TWO SEPERATE PEICES
RIVETED JOYS'K. MOUNT
FIG. 5
24"
ARMAMENTS ARE A STRICT SECRET
FIXED & UN-MOVABLE FLAP'S HORN
LOOSE & FREE MOVING ARM CENTERS
ELEVATOR'S TRUSS TUBE
POSITION of PILOT SEAT
24½"
11½"R.
18½"
7"
13½"
14½"
½"
GASOLENE TANKS
MOTOR-MOUNT RING
OIL TANK
CRASH PAD
INSTRUMENTS' PANEL
STABILIZER ADJUSTOR
RUDDER FLAP'S SPINNER CONTROL
PULLEY
CORRUGATED ALUM'N. AL'Y
SCREW POST
STAB'R. AJ'R. CHAIN
BRACE
TAIL-WHEEL'S RELEASE CORD
ELEVATOR'S TRUSS HORN
RUDDER'S CONTROL CORD'S HORN
FLOORBOARD
ELEVATOR'S TRUSS TUBE
SAFETY STRAP
PILOT SEAT
BRAKE WIRE'S PULLEY
JOYSTICK'S MOUNTING POST
"XYZ" PULLEY
BRAKE'S CORD
FERRULE
BRAKE ARM
TURNING POINT
FIXED AND HINGED TAIL-WHEEL UNIT
STEEL SPRING
RUDDER CONTROL CORD
BRACE
RUDDER'S FLAP'S CONTROL CHAIN
TAIL WHEEL'S RELEASE CORD
ELEVATOR'S TRUSS TUBE
3
I AILERON TRUSS TUBE
H VIEW—FLOORBOARD
G VIEW—RIGHT SIDE of COCKPIT
F VIEW—LEFT SIDE of COCKPIT
E VIEW—BACKWARD DIRECTION
D VIEW—FORWARD of COCKPIT
C LEATHER CUSHION
B SEWED CANVAS—LIGHT BROWN
A HIGHLY POLISHED ALUM'N. ALLOY
THE ABOVE FUSELAGE DR'W'G. IS FIG. 6
DRAWN BY.... WILLIAM A. WYLAM

(continued from page 55)

hinges are of ball bearing construction.

The Empennage

The front and rear beams of the fin are of steel tubular structure; the front beam of the stabilizer is of steel tubing, while the rear beam is of channel section of dural, and the torque tube of the elevator is of steel tubular structure. The ribs are riveted to the beams and are of dural channel section. They are provided with lightening holes of varying diameters. The outside edges are of dural sheets, which are riveted to the ribs. The leading edges of stabilizer are covered with dural; the entire empennage is covered with cotton, with the exception of the flettners, which are of metal.

The Chassis

Both sides of the landing gear are separate units. The welded steel drag trusses are of fixed length and are hinged to one at two fittings on the lower parts of the fuselage's side truss. On the other end, it is hinged to the shock absorber's strut by a horizontal pin joint. The axle is rigidly attached to the lower portion of the oleo strut. The retracting nut on the top of the oleo strut is internally threaded and mounted to pass through a retracting screw. Rotation of the retraction screws raises and lowers the oleo and drag struts; in and out of the wheel well. The upper ends of the two retracting screws are joined by bevel gears and are mounted with a sprocket. This sprocket is connected to the retracting crank in the cockpit by means of an endless chain.

The tail-wheel unit is of 360 degrees rotation and can be locked in fore, aft and straight position; and is controllable from the cockpit.

Making the Model of the "III-C"

If the model builder wishes to build a solid scale model from these plans, he may do so. First, choose the size you wish to build the model and enlarge the general three-view outline to that scale; omit all internal details. Draw the fuselage's cross sections and the rib's cross sections to the same scale as the rough drawings' scale is. With these rough drawings on the cross sections, make all necessary templates; either out of cardboard or metal. After the templates are made, refer to the rough drawings and determine the width, length and height of the fuselage. Secure a fine grained stock of wood that will be a half inch over these dimensions and square up all sides. Draw the center lines through all sides; secure its exact location by referring to the rough drawing.

Trace or draw the fuselage's outline of the side, one left and one right. Cut away all surplus and when complete, square the recent cut side with the other sides. Now trace or draw the top and bottom fuselage's outline on their correct sides; and cut away all surplus. After all sides are found to be square, now begin to shape the cross sections. First use template made for section "C-C," locate this section on the block and shave away all surplus to the shape of the template. Locate section "B-B" on the block and shave from "C-C" to "B-B" into a smooth exact contour. After "B-B" is shaped, locate section "A-A" and work section "B-B" smoothly into "A-A"; without spoiling the fuselage contour. Reverse this procedure when shaping toward the tail post. After the entire fuselage is correctly shaped, make the engine cowl and attach to the fuselage. Carve out the wheel well, add all small gadgets and details and then add the wing butts for the lower wings.

Now proceed on the wings. After the height, width and length are known, obtain a fine grained block of wood that is a half inch over these dimensions; for clearness. On this block, lay out the general outline of the top sides of each separate wing panel. Now carefully cut away all surplus on both the leading edges and trailing edges of the panels; when completed, make sure that the newly cut sides are square to the other sides. Now lay out the dihedral angles of the bottom sides of the panels; on both the leading and trailing edges. Plane or shave away the surplus toward the tips. After the bottom is found square to the other sides, mark off the location of rib No. 22 on both the top and bottom sides of the top wing (refer to bottom view drawing on page 2 to find the location of this rib No. 22). Use a template of this rib's cross section to check the shaving and shaping of this section to its exact shape. When finished, mark off the location of rib No. 36 on both sides of the top and bottom, the upper wing and shape this section to fit the template of rib No. 36. When the spaces between rib No. 22 and rib No. 36 are smoothly shaped, finish up the tips by using the same method employed in shaping the fuselage. Do the same on the small ribs in the center of the upper wing. Use the same procedure used in shaping the upper wing to shape the two separate lower wings. Start off with using rib No. 16 and work this section into rib No. 6. The ailerons on the upper wing may be cut out and made into two separate hinged sections. On the top wing and lower wing mark off the location of all strut and wire attachments. Insert the fittings of your own design into their correct places, making sure that the attachments are secure and strong. Now add all extra wing details, such as thread for imitation ribs, the imitation turnbuckles and so on.

Now rig up a jig that will permit the attachment of the wings to the fuselage with the greatest accuracy. It is best to attach the cabane struts to the upper wing first; then connect the wing to the fuselage; add the "N" struts and attach the two lower panels separately. When the wings are strongly mounted, add the flying wires and separators. Now make up the entire tail section and attach to the tailpost in the same manner as the wings are attached. After all other details are worked out, you may make the chassis into a movable unit or make the wheel fixed in its wheel well or retracted position.

After all details are finished and the model is ready for the paint, shellac the entire model. Make the shellac thinner by adding alcohol; give the model several coats, sandpaper between coats to give the foundation a smooth surface. Now paint or spray the model with your chosen color; if you spray the model, the appearance is more apt to be better than a hand-painted finish.

Official color scheme of the export Hawks:

Country	Color of Airplane	Colors of Insigne
Argentina	All Silver	Sky Blue and Gold Red, White and Blue
Canton, China	All Cream	Tan and White Stripes on the Rudder
Shanghai, China	All Dark Khaki	Blue and White Cocade Blue and White Stripes on the Rudder
Siam	All Silver	Red, White and Blue

Explanations of the figures on the drawings:

Fig. 1—This shows the view of the cockpit looking backward from the instrument panel's vertical line. (All details of the controls are shown in Fig. 4.)

Fig. 2—This shows the left side of the fuselage with all its controls and partitions.

Fig. 3—This shows the right side of the fuselage with all its controls and partitions.

Fig. 4—This shows the view looking forward from the pilot's seat (the joystick is missing for clearness.)

Fig. 5—This is the top view of the floorboard, showing all its joints and removable panels.

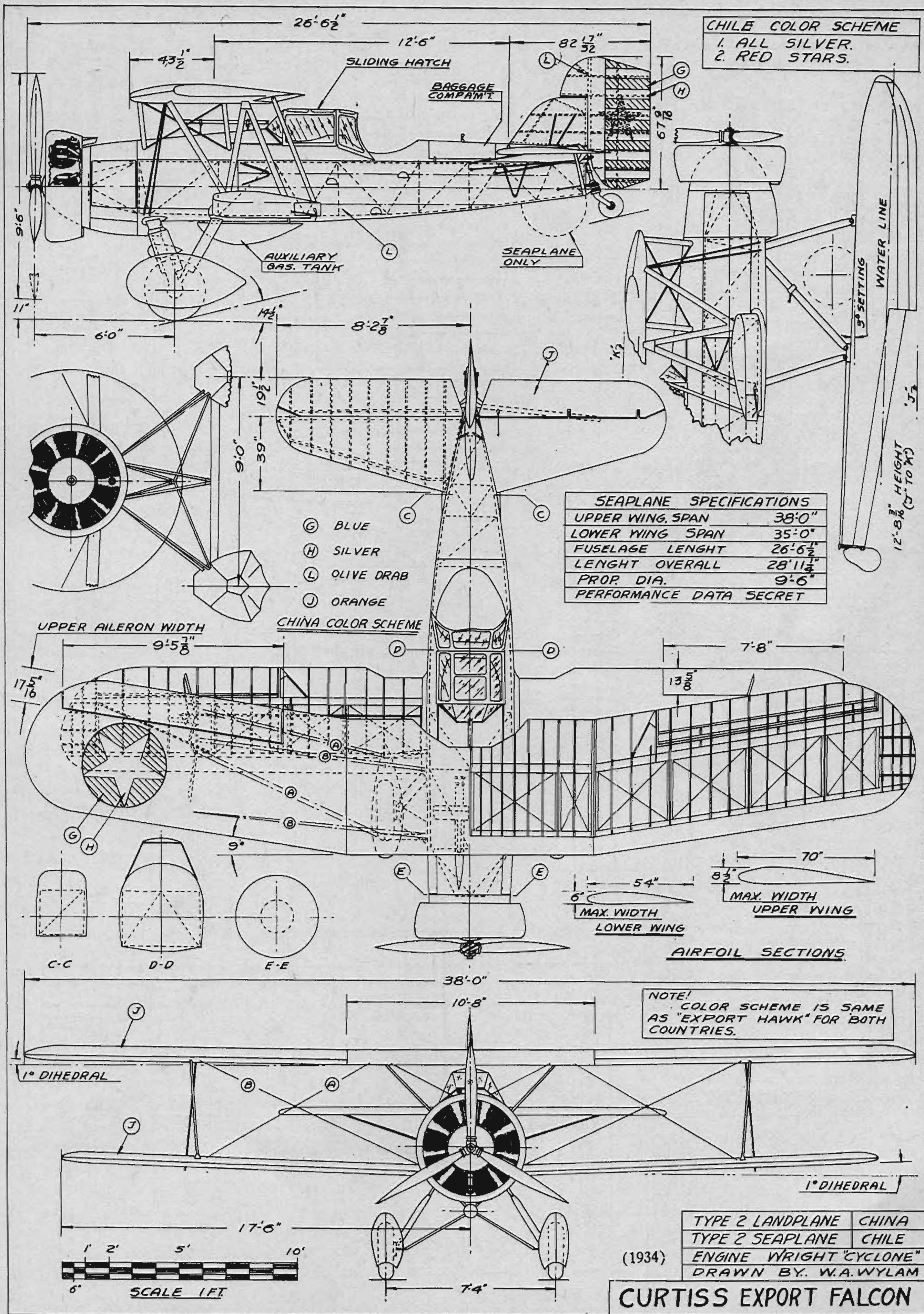
Fig. 6—This is side view of the fuselage showing the entire control hook-ups, the pilot seat, the fuel tanks and the instrument boards.

Fig. 7—This is the right and left side view of the fuselage's skeleton.

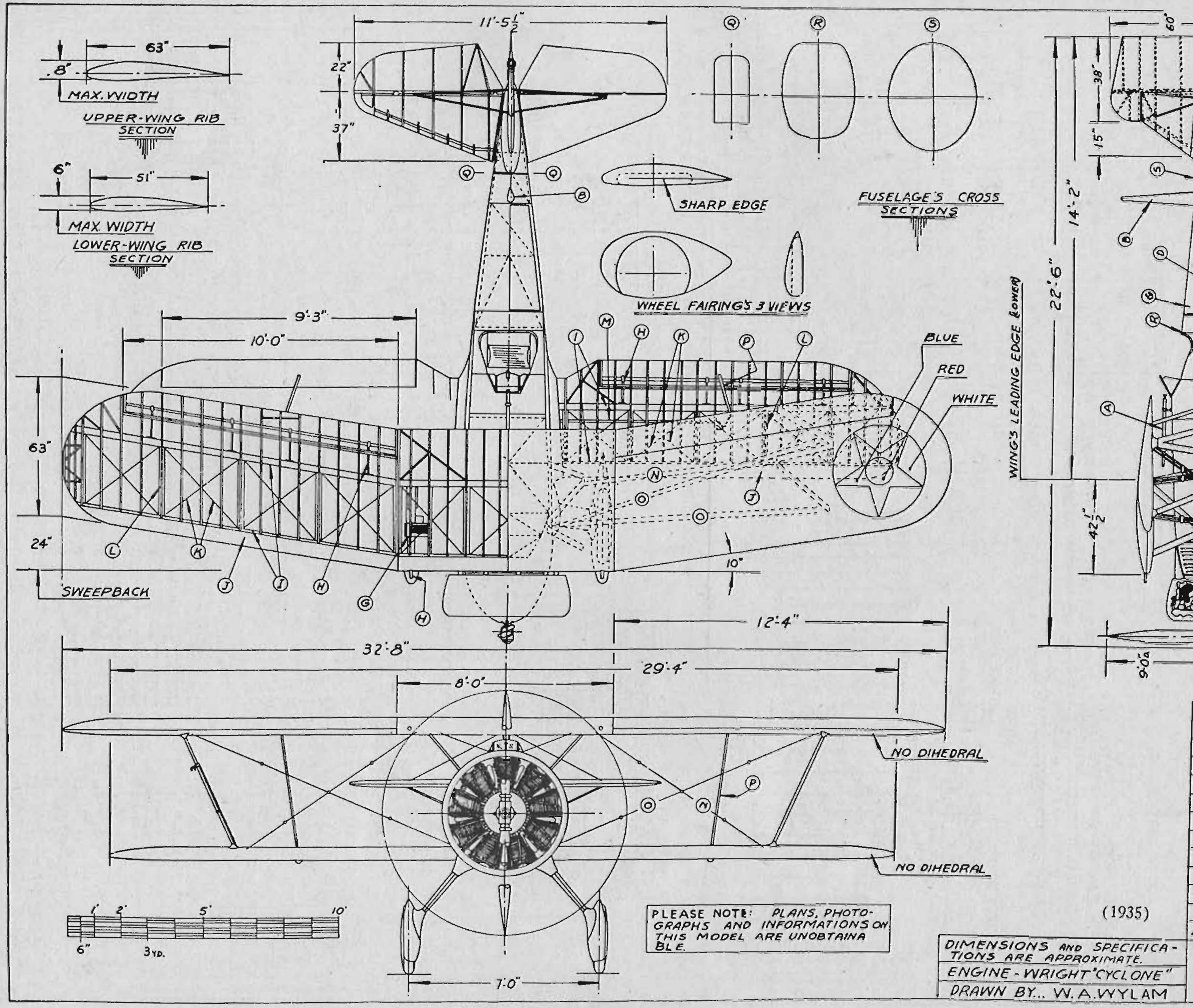
Figs. 8 & 9—This is the bottom and top views of the fuselage's skeleton.

Fig. 10—This group shows all internal braces of the fuselage skeleton (the circles on the corners are the exact centers of the center-lines.)

-1936



CHILE COLOR SCHEME
1. ALL SILVER.
2. RED STARS.
26'-6 1/2"
12'-6"
43 1/2"
82 17/32"
SLIDING HATCH
BAGGAGE COMPAM'T.
67 9/16"
9'-6"
11"
6'-0"
AUXILIARY GAS. TANK
SEAPLANE ONLY
14 1/2°
8'-2 7/8"
19 1/2"
39"
9'-0"
5° SETTING
WATER LINE
12'-8 3/16" HEIGHT ("J" TO "K")
G BLUE
H SILVER
L OLIVE DRAB
J ORANGE
CHINA COLOR SCHEME
SEAPLANE SPECIFICATIONS
UPPER WING SPAN 38'-0"
LOWER WING SPAN 35'-0"
FUSELAGE LENGHT 26'-6 1/2"
LENGHT OVERALL 28'11 1/4"
PROP. DIA. 9'-6"
PERFORMANCE DATA SECRET
UPPER AILERON WIDTH
9'-5 7/8"
17 5/16"
7'-8"
13 5/8"
9°
54"
6"
MAX. WIDTH LOWER WING
70"
8 1/2"
MAX. WIDTH UPPER WING
AIRFOIL SECTIONS
C-C
D-D
E-E
38'-0"
10'-8"
NOTE!
COLOR SCHEME IS SAME AS "EXPORT HAWK" FOR BOTH COUNTRIES.
1° DIHEDRAL
1° DIHEDRAL
17'-6"
7'-4"
SCALE 1 FT.
TYPE 2 LANDPLANE CHINA
TYPE 2 SEAPLANE CHILE
ENGINE WRIGHT "CYCLONE"
DRAWN BY. W.A.WYLAM
(1934)
CURTISS EXPORT FALCON



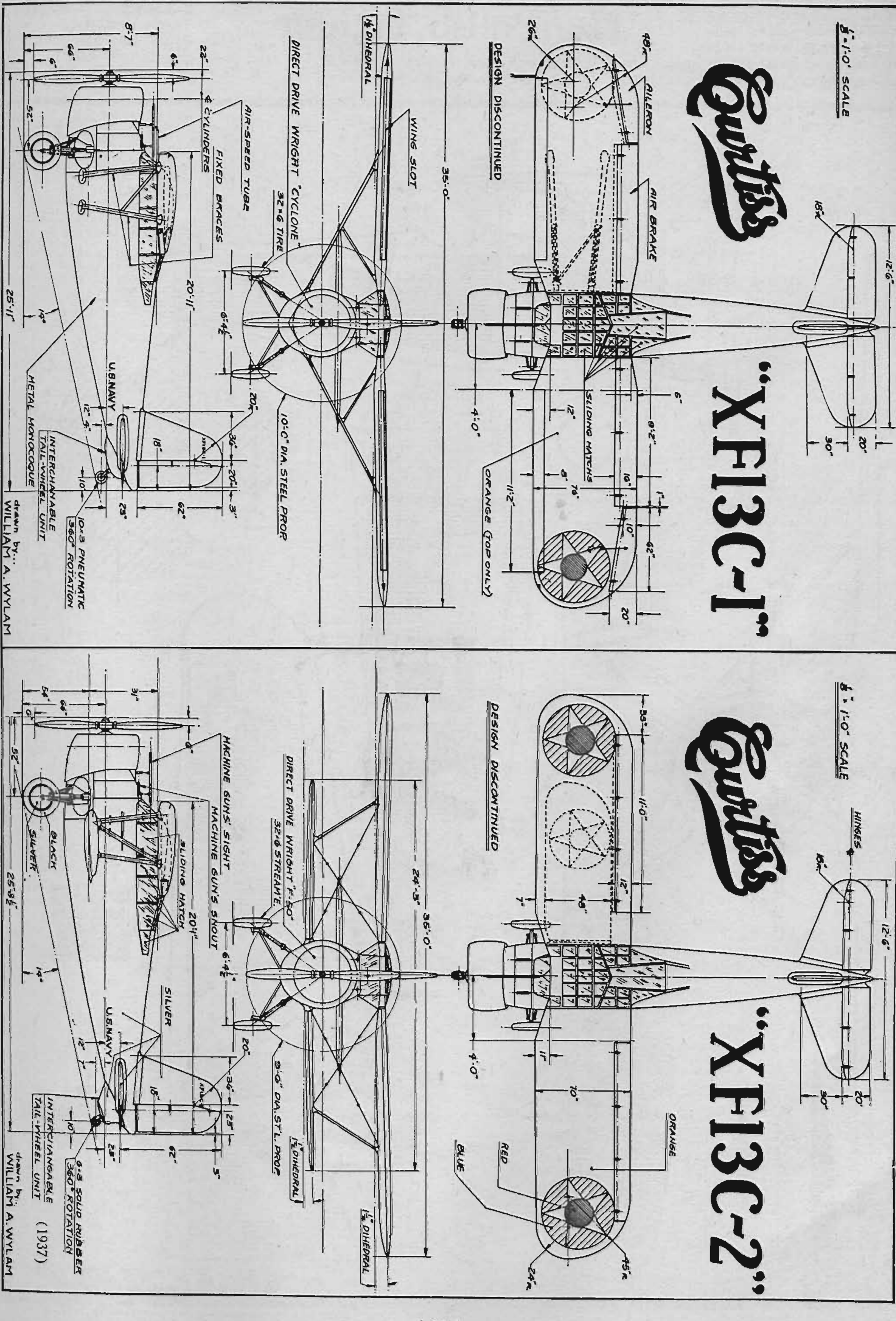
PLEASE NOTE: PLANS, PHOTOGRAPHS AND INFORMATIONS ON THIS MODEL ARE UNOBTAINABLE.

(1935)

A	MACHINE GUN'S SIGHT
B	RADIO MAST
C	BAGGAGE COMPART'T.
D	TOOL BOX
E	ARRESTING BAR
F	MACHINE GUN'S SNOUT
G	MACHINE GUN
H	HINGE
I	MAIN SPARS
J	METAL EDGE
K	ANTI-DRAG WIRES
L	COMPRESSION RIBS
M	AILERON TORQUE TUBE

DIMENSIONS AND SPECIFICATIONS ARE APPROXIMATE.
ENGINE - WRIGHT "CYCLONE"
DRAWN BY... W. A. WYLAM

CURTISS "SEAHAWK"
XF7C-3



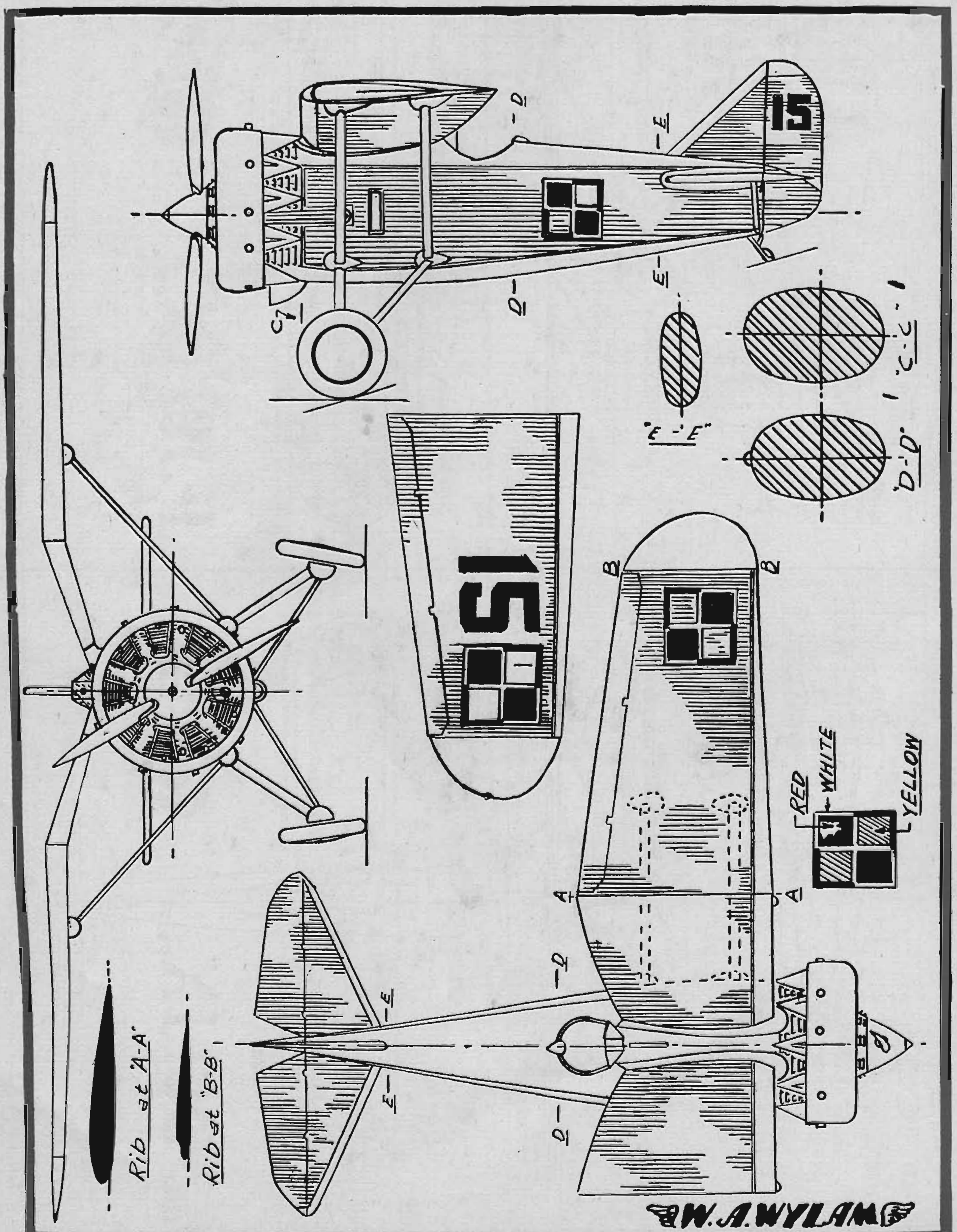
Curtiss
"XF13C-1"
1/8":1'-0" SCALE
DESIGN DISCONTINUED
AILERON
AIR BRAKE
SLIDING HATCHS
ORANGE (TOP ONLY)
WING SLOT
35'-0"
1/4" DIHEDRAL
DIRECT DRIVE WRIGHT "CYCLONE"
32"x6 TIRE
10'-0" DIA. STEEL PROP
9 CYLINDERS
AIR-SPEED TUBE
FIXED BRACES
U.S.NAVY
METAL MONOCOQUE
INTERCHANGABLE TAIL-WHEEL UNIT
10x3 PNEUMATIC 360° ROTATION
drawn by... WILLIAM A. WYLAM
Curtiss
"XF13C-2"
1/8":1'-0" SCALE
HINGES
DESIGN DISCONTINUED
ORANGE
RED
BLUE
24'-5"
36'-0"
DIRECT DRIVE WRIGHT "F-50"
32x6 STREAM'E.
9'-6" DIA. ST'L. PROP
1/2" DIHEDRAL
1/4" DIHEDRAL
MACHINE GUNS' SIGHT
MACHINE GUN'S SHOUT
SLIDING HATCH
BLACK
SILVER
U.S.NAVY
INTERCHANGABLE TAIL-WHEEL UNIT
6x3 SOLID RUBBER 360° ROTATION
drawn by... WILLIAM A. WYLAM
(1937)

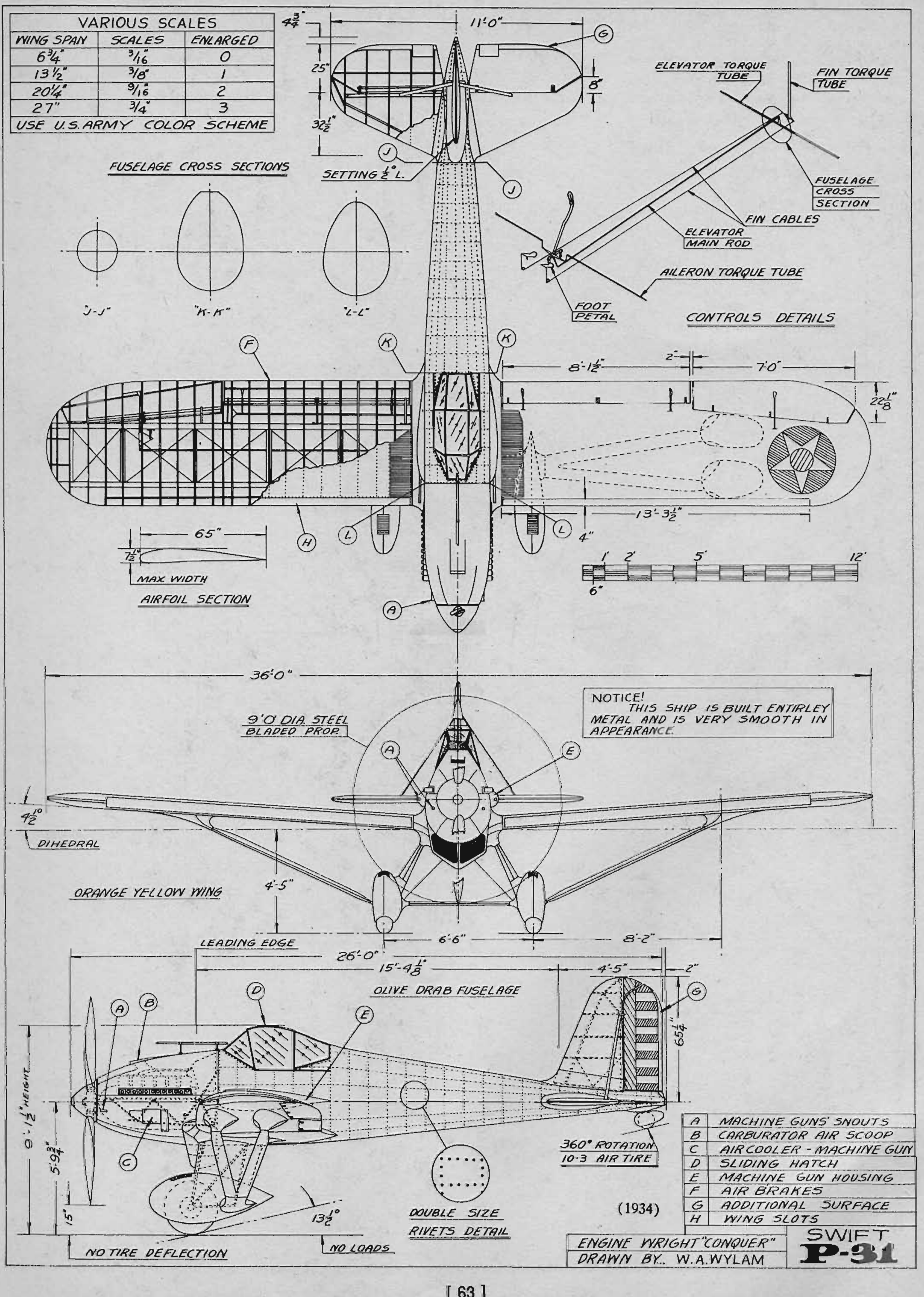
The Polish Fighter

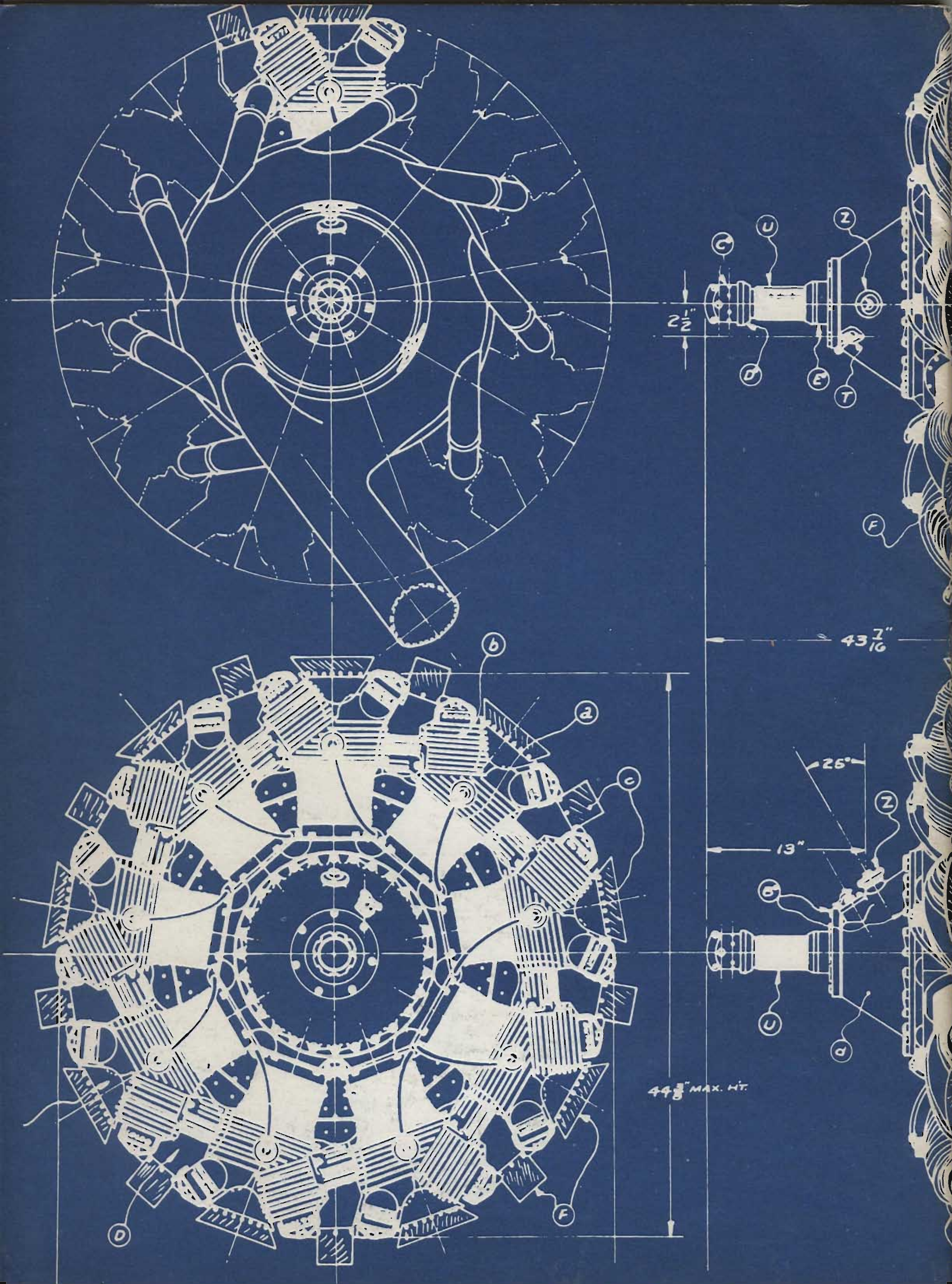
THIS is considered to be one of the most perfect military planes in the world. It is built entirely of metal, partly smooth and partly corrugated duralumin. The color is silver with black markings. Actual performance and specifications have been kept a closely guarded secret by the Polish government.

These drawings were made from plans directly from Poland.

Build a solid scale model of it. -1934




VARIOUS SCALES
WING SPAN | SCALES | ENLARGED
6 3/4" | 3/16" | 0
13 1/2" | 3/8" | 1
20 1/4" | 9/16" | 2
27" | 3/4" | 3
USE U.S. ARMY COLOR SCHEME
FUSELAGE CROSS SECTIONS
"J-J"
"K-K"
"L-L"
SETTING 1/2° L.
11'-0"
ELEVATOR TORQUE TUBE
FIN TORQUE TUBE
FUSELAGE CROSS SECTION
FIN CABLES
ELEVATOR MAIN ROD
AILERON TORQUE TUBE
FOOT PETAL
CONTROLS DETAILS
8'-1 1/2"
7'-0"
13'-3 1/2"
65"
MAX. WIDTH
AIRFOIL SECTION
36'-0"
NOTICE!
THIS SHIP IS BUILT ENTIRLEY METAL AND IS VERY SMOOTH IN APPEARANCE.
9'0" DIA. STEEL BLADED PROP.
4 1/2° DIHEDRAL
ORANGE YELLOW WING
4'-5"
6'-6"
8'-2"
LEADING EDGE
26'-0"
15'-4 1/8"
OLIVE DRAB FUSELAGE
9'-1 1/2" HEIGHT
360° ROTATION 10-3 AIR TIRE
DOUBLE SIZE RIVETS DETAIL
NO TIRE DEFLECTION
NO LOADS
A MACHINE GUNS' SNOUTS
B CARBURATOR AIR SCOOP
C AIRCOOLER - MACHINE GUN
D SLIDING HATCH
E MACHINE GUN HOUSING
F AIR BRAKES
G ADDITIONAL SURFACE
H WING SLOTS
(1934)
ENGINE WRIGHT "CONQUER"
DRAWN BY.. W.A. WYLAM
SWIFT
P-31



G
U
Z
$2\frac{1}{2}$"
D
E
T
F
$43\frac{7}{16}$"
b
a
25°
c
Z
13"
G
U
d
$44\frac{5}{8}$" MAX. HT.
D
F