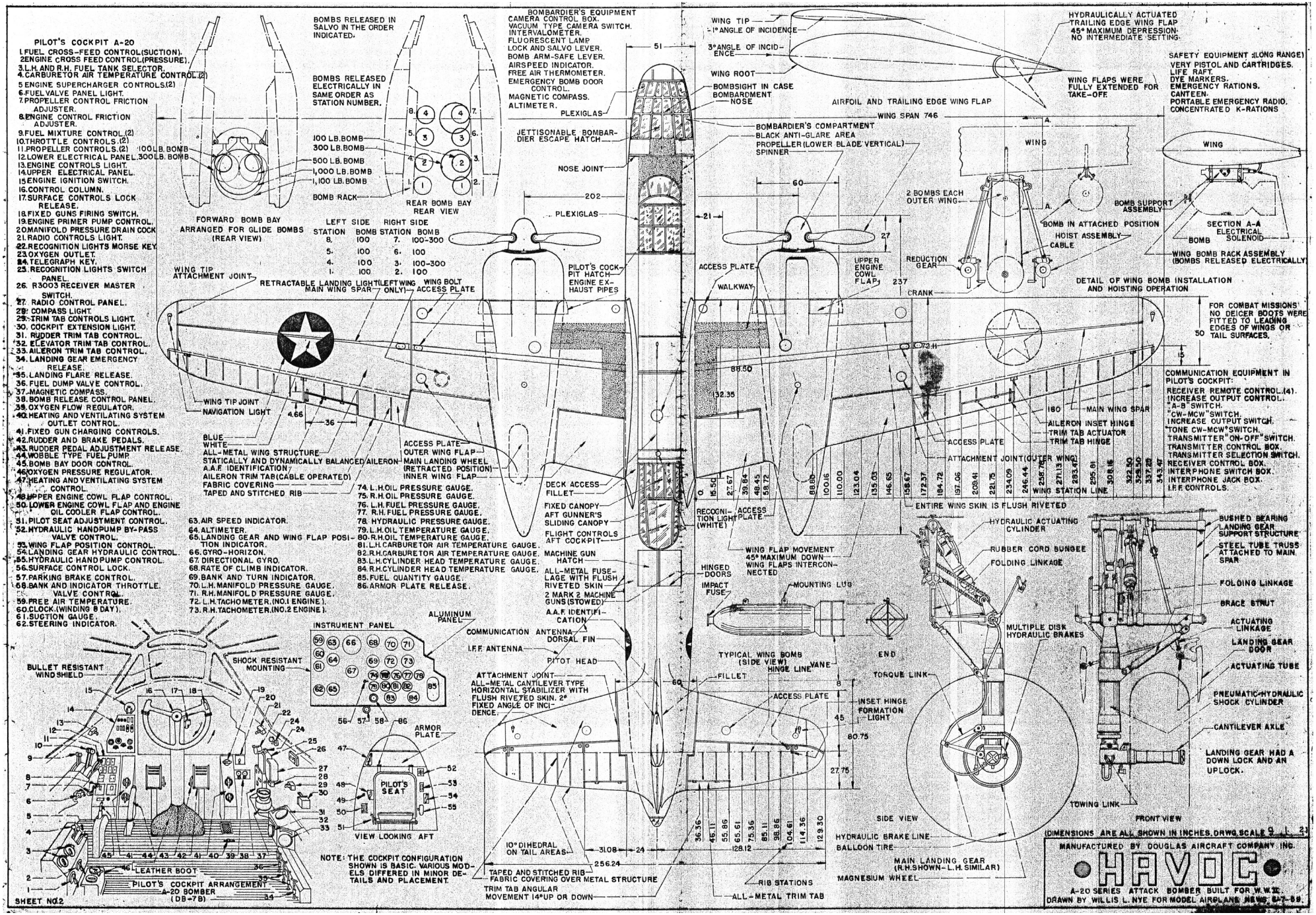
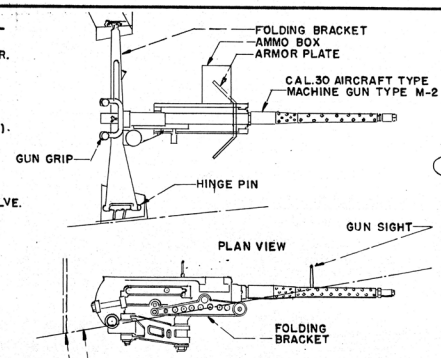

PILOT'S COCKPIT A-20
1. FUEL CROSS-FEED CONTROL(SUCTION).
2. ENGINE CROSS FEED CONTROL(PRESSURE).
3. L.H. AND R.H. FUEL TANK SELECTOR.
4. CARBURETOR AIR TEMPERATURE CONTROL.(2)
5. ENGINE SUPERCHARGER CONTROLS.(2)
6. FUEL VALVE PANEL LIGHT.
7. PROPELLER CONTROL FRICTION ADJUSTER.
8. ENGINE CONTROL FRICTION ADJUSTER.
9. FUEL MIXTURE CONTROL.(2)
10. THROTTLE CONTROLS.(2)
11. PROPELLER CONTROLS.(2)
12. LOWER ELECTRICAL PANEL.
13. ENGINE CONTROLS LIGHT.
14. UPPER ELECTRICAL PANEL.
15. ENGINE IGNITION SWITCH.
16. CONTROL COLUMN.
17. SURFACE CONTROLS LOCK RELEASE.
18. FIXED GUNS FIRING SWITCH.
19. ENGINE PRIMER PUMP CONTROL.
20. MANIFOLD PRESSURE DRAIN COCK
21. RADIO CONTROLS LIGHT.
22. RECOGNITION LIGHTS MORSE KEY.
23. OXYGEN OUTLET.
24. TELEGRAPH KEY.
25. RECOGNITION LIGHTS SWITCH PANEL.
26. R3003 RECEIVER MASTER SWITCH.
27. RADIO CONTROL PANEL.
28. COMPASS LIGHT.
29. TRIM TAB CONTROLS LIGHT.
30. COCKPIT EXTENSION LIGHT.
31. RUDDER TRIM TAB CONTROL.
32. ELEVATOR TRIM TAB CONTROL.
33. AILERON TRIM TAB CONTROL.
34. LANDING GEAR EMERGENCY RELEASE.
35. LANDING FLARE RELEASE.
36. FUEL DUMP VALVE CONTROL.
37. MAGNETIC COMPASS.
38. BOMB RELEASE CONTROL PANEL.
39. OXYGEN FLOW REGULATOR.
40. HEATING AND VENTILATING SYSTEM OUTLET CONTROL.
41. FIXED GUN CHARGING CONTROLS.
42. RUDDER AND BRAKE PEDALS.
43. RUDDER PEDAL ADJUSTMENT RELEASE.
44. WOBBLE TYPE FUEL PUMP.
45. BOMB BAY DOOR CONTROL.
46. OXYGEN PRESSURE REGULATOR.
47. HEATING AND VENTILATING SYSTEM CONTROL.
48. UPPER ENGINE COWL FLAP CONTROL.
50. LOWER ENGINE COWL FLAP AND ENGINE OIL COOLER FLAP CONTROL.
51. PILOT SEAT ADJUSTMENT CONTROL.
52. HYDRAULIC HANDPUMP BY-PASS VALVE CONTROL.
53. WING FLAP POSITION CONTROL.
54. LANDING GEAR HYDRAULIC CONTROL.
55. HYDRAULIC HAND PUMP CONTROL.
56. SURFACE CONTROL LOCK.
57. PARKING BRAKE CONTROL.
58. BANK AND INDICATOR THROTTLE VALVE CONTROL.
59. FREE AIR TEMPERATURE.
60. CLOCK.(WINDING 8 DAY).
61. SUCTION GAUGE.
62. STEERING INDICATOR.
63. AIR SPEED INDICATOR.
64. ALTIMETER.
65. LANDING GEAR AND WING FLAP POSITION INDICATOR.
66. GYRO-HORIZON.
67. DIRECTIONAL GYRO.
68. RATE OF CLIMB INDICATOR.
69. BANK AND TURN INDICATOR.
70. L.H. MANIFOLD PRESSURE GAUGE.
71. R.H. MANIFOLD PRESSURE GAUGE.
72. L.H. TACHOMETER.(NO.1 ENGINE).
73. R.H. TACHOMETER.(NO.2 ENGINE).
74. L.H. OIL PRESSURE GAUGE.
75. R.H. OIL PRESSURE GAUGE.
76. L.H. FUEL PRESSURE GAUGE.
77. R.H. FUEL PRESSURE GAUGE.
78. HYDRAULIC PRESSURE GAUGE.
79. L.H. OIL TEMPERATURE GAUGE.
80. R.H. OIL TEMPERATURE GAUGE.
81. L.H. CARBURETOR AIR TEMPERATURE GAUGE.
82. R.H. CARBURETOR AIR TEMPERATURE GAUGE.
83. L.H. CYLINDER HEAD TEMPERATURE GAUGE.
84. R.H. CYLINDER HEAD TEMPERATURE GAUGE.
85. FUEL QUANTITY GAUGE.
86. ARMOR PLATE RELEASE.
BULLET RESISTANT WIND SHIELD
SHOCK RESISTANT MOUNTING
INSTRUMENT PANEL
ALUMINUM PANEL
ARMOR PLATE
PILOT'S SEAT
VIEW LOOKING AFT
LEATHER BOOT
PILOT'S COCKPIT ARRANGEMENT
A-20 BOMBER
(DB-7B)
SHEET NO.2
NOTE: THE COCKPIT CONFIGURATION SHOWN IS BASIC. VARIOUS MODELS DIFFERED IN MINOR DETAILS AND PLACEMENT.
BOMBS RELEASED IN SALVO IN THE ORDER INDICATED.
BOMBS RELEASED ELECTRICALLY IN SAME ORDER AS STATION NUMBER.
100 LB. BOMB
300 LB. BOMB
500 LB. BOMB
1,000 LB. BOMB
1,100 LB. BOMB
BOMB RACK
REAR BOMB BAY
REAR VIEW
FORWARD BOMB BAY
ARRANGED FOR GLIDE BOMBS
(REAR VIEW)
LEFT SIDE
RIGHT SIDE
STATION BOMB STATION BOMB
8. 100 7. 100-300
5. 100 6. 100
4. 100 3. 100-300
1. 100 2. 100
BOMBARDIER'S EQUIPMENT
CAMERA CONTROL BOX.
VACUUM TYPE CAMERA SWITCH.
INTERVALOMETER.
FLUORESCENT LAMP
LOCK AND SALVO LEVER.
BOMB ARM-SAFE LEVER.
AIRSPEED INDICATOR.
FREE AIR THERMOMETER.
EMERGENCY BOMB DOOR CONTROL.
MAGNETIC COMPASS.
ALTIMETER.
PLEXIGLAS
JETTISONABLE BOMBARDIER ESCAPE HATCH
NOSE JOINT
PLEXIGLAS
PILOT'S COCKPIT HATCH
ENGINE EXHAUST PIPES
WING TIP ATTACHMENT JOINT
RETRACTABLE LANDING LIGHT
MAIN WING SPAR
(LEFT WING ONLY)
WING BOLT ACCESS PLATE
WING TIP JOINT
NAVIGATION LIGHT
BLUE
WHITE
ALL-METAL WING STRUCTURE
STATICALLY AND DYNAMICALLY BALANCED AILERON
A.A.F. IDENTIFICATION
AILERON TRIM TAB(CABLE OPERATED)
FABRIC COVERING
TAPED AND STITCHED RIB
ACCESS PLATE
OUTER WING FLAP
MAIN LANDING WHEEL (RETRACTED POSITION)
INNER WING FLAP
DECK ACCESS FILLET
FIXED CANOPY
AFT GUNNER'S SLIDING CANOPY
FLIGHT CONTROLS AFT COCKPIT
MACHINE GUN HATCH
ALL-METAL FUSELAGE WITH FLUSH RIVETED SKIN
2 MARK 2 MACHINE GUNS(STOWED)
A.A.F. IDENTIFICATION
COMMUNICATION ANTENNA
DORSAL FIN
I.F.F. ANTENNA
PITOT HEAD
ATTACHMENT JOINT
ALL-METAL CANTILEVER TYPE HORIZONTAL STABILIZER WITH FLUSH RIVETED SKIN. 2° FIXED ANGLE OF INCIDENCE.
10° DIHEDRAL ON TAIL AREAS
TAPED AND STITCHED RIB
FABRIC COVERING OVER METAL STRUCTURE
TRIM TAB ANGULAR MOVEMENT 14° UP OR DOWN
RIB STATIONS
ALL-METAL TRIM TAB
WING TIP
1° ANGLE OF INCIDENCE
3° ANGLE OF INCIDENCE
WING ROOT
BOMBSIGHT IN CASE BOMBARDMENT NOSE
AIRFOIL AND TRAILING EDGE WING FLAP
WING SPAN 746
BOMBARDIER'S COMPARTMENT
BLACK ANTI-GLARE AREA
PROPELLER(LOWER BLADE VERTICAL)
SPINNER
HYDRAULICALLY ACTUATED TRAILING EDGE WING FLAP
45° MAXIMUM DEPRESSION.
NO INTERMEDIATE SETTING.
WING FLAPS WERE FULLY EXTENDED FOR TAKE-OFF
SAFETY EQUIPMENT (LONG RANGE)
VERY PISTOL AND CARTRIDGES.
LIFE RAFT.
DYE MARKERS.
EMERGENCY RATIONS.
CANTEEN.
PORTABLE EMERGENCY RADIO.
CONCENTRATED K-RATIONS
WING
2 BOMBS EACH OUTER WING
BOMB SUPPORT ASSEMBLY
BOMB IN ATTACHED POSITION
HOIST ASSEMBLY
CABLE
REDUCTION GEAR
UPPER ENGINE COWL FLAP
CRANK
DETAIL OF WING BOMB INSTALLATION AND HOISTING OPERATION
SECTION A-A
ELECTRICAL SOLENOID
BOMB
WING BOMB RACK ASSEMBLY (BOMBS RELEASED ELECTRICALLY)
FOR COMBAT MISSIONS NO DEICER BOOTS WERE FITTED TO LEADING EDGES OF WINGS OR TAIL SURFACES.
COMMUNICATION EQUIPMENT IN PILOT'S COCKPIT:
RECEIVER REMOTE CONTROL.(4).
INCREASE OUTPUT CONTROL.
"A-B" SWITCH.
"CW-MCW" SWITCH.
INCREASE OUTPUT SWITCH.
TONE CW-MCW SWITCH.
TRANSMITTER "ON-OFF" SWITCH.
TRANSMITTER CONTROL BOX.
TRANSMITTER SELECTION SWITCH.
RECEIVER CONTROL BOX.
INTERPHONE SWITCH BOX.
INTERPHONE JACK BOX.
I.F.F. CONTROLS.
MAIN WING SPAR
AILERON INSET HINGE
TRIM TAB ACTUATOR
TRIM TAB HINGE
ACCESS PLATE
ATTACHMENT JOINT(OUTER WING)
WING STATION LINE
ENTIRE WING SKIN IS FLUSH RIVETED
RECOGNITION LIGHT (WHITE)
ACCESS PLATE
WING FLAP MOVEMENT 45° MAXIMUM DOWN WING FLAPS INTERCONNECTED
HINGED DOORS
IMPACT FUSE
MOUNTING LUG
TYPICAL WING BOMB (SIDE VIEW)
HINGE LINE
VANE
FILLET
ACCESS PLATE
INSET HINGE FORMATION LIGHT
END
TORQUE LINK
HYDRAULIC ACTUATING CYLINDER
RUBBER CORD BUNGEE
FOLDING LINKAGE
MULTIPLE DISK HYDRAULIC BRAKES
BUSHED BEARING LANDING GEAR SUPPORT STRUCTURE
STEEL TUBE TRUSS ATTACHED TO MAIN SPAR
FOLDING LINKAGE
BRACE STRUT
ACTUATING LINKAGE
LANDING GEAR DOOR
ACTUATING TUBE
PNEUMATIC-HYDRAULIC SHOCK CYLINDER
CANTILEVER AXLE
LANDING GEAR HAD A DOWN LOCK AND AN UPLOCK.
TOWING LINK
SIDE VIEW
FRONT VIEW
HYDRAULIC BRAKE LINE
BALLOON TIRE
MAIN LANDING GEAR (R.H. SHOWN-L.H. SIMILAR)
MAGNESIUM WHEEL
(DIMENSIONS ARE ALL SHOWN IN INCHES. DRWG. SCALE 3/4" = 1'-0")
MANUFACTURED BY DOUGLAS AIRCRAFT COMPANY INC.
HAVOC
A-20 SERIES ATTACK BOMBER BUILT FOR W.W.II.
DRAWN BY WILLIS L. NYE FOR MODEL AIRPLANE NEWS. 847-89.

HYDRAULIC SYSTEM COMPONENT LIST.

ENGINE-DRIVEN HYDRAULIC PUMPS(2)
HYDRAULIC FLUID PRESSURE ACCUMULATOR.
LANDING GEAR ACTUATING CYLINDERS(2).
WING FLAP ACTUATING CYLINDERS(2).
BOMB BAY DOORS ACTUATING CYLINDER(1).
WING FLAP PRESSURE RELIEF VALVE(2).
COWL FLAP ACTUATING CYLINDER(4).
HYDRAULIC FLUID RESERVOIR.(728 CU.IN).
LOWER COWL FOUR WAY VALVE(2).
HYDRAULIC PRESSURE GAUGE.
HYDRAULIC BRAKE CONTROL VALVE(2).
NOSE WHEEL ACTUATING CYLINDER.
WING FLAP FOUR WAY VALVE.
BOMB BAY DOORS ADJUSTABLE RELIEF VALVE.
BOMB BAY DOORS FOUR WAY VALVE.
R.H. MANIFOLD BLOCK(1).
HAND HYDRAULIC PUMP(1).
LANDING GEAR RELIEF VALVE.
L.H.MANIFOLD BLOCK(1).
LANDING GEAR FOUR WAY VALVE.
HYDRAULIC PRESSURE REGULATOR.
HYDRAULIC BRAKE DEBOOSTER.(2)
CHECK VALVES.
RESTRICTORS.
HYDRAULIC GUN CHARGER(NOSE GUNS)
BY-PASS VALVES.
PRESSURE REDUCING CYLINDERS.
SPRING LOADED RETURN VALVE.
BRAKE VALVES(2).
DISCONNECT VALVES.
HYDRAULIC FLUID FILTER.
NOSE WHEEL HYDRAULIC SNUBBER.
ORIFICE CHECK VALVE AND CONSTANT FLOW DIVIDER.
HAND PUMP BY-PASS VALVE.
HYDRAULIC DISCONNECT VALVE.
BRAKE LINE SWIVEL JOINT.
GUN CHARGER CONTROL VALVE.
HYDRAULIC PRESSURE AND SUPPLY LINES.



AFT 30 CALIBER MACHINE GUN ATTACHED TO A FOLDING BRACKET. IT IS OPERABLE WHEN AFT LOWER DOOR IS OPENED.

NOSE WHEEL DOORS
BOMB BAY DOOR
FLARE CHUTE DOOR (NIGHT LANDING)
BOMBARDIER'S ACCESS DOOR
PLEXIGLAS NOSE

EXHAUST COLLECTOR PIPE MADE IN THREE SECTIONS

RED, AMBER AND GREEN RECOGNITION LIGHTS
AFT GUNNER ACCESS DOOR
ACCESS PLATES
INNER WING FLAP
FILLET
LANDING GEAR NACELLE DOORS
RECONNAISSANCE FLARE DOOR
TAIL SKID

BOTTOM VIEW A-20
I.F.F. ANTENNA
FORMATION LIGHT

OUTER WING FLAP
ACCESS PLATE
MAIN SPAR

3 SEGMENT ENGINE COWL

DEMOUNTABLE OUTER WING

LANDING LIGHT(RETRACTABLE)
MAIN SPAR JOINT

ACCESS PLATE

OUTER WING BOMB RACK (CHEMICAL SMOKE TANK) BOMBS RELEASED BY ELECTRICAL SOLENOID OPERATION. SMOKE TANKS ARE ELECTRICALLY ACTUATED.

FORWARD SPAR
HORIZONTAL STABILIZER ROOT STRUCTURE
ELEVATOR TORQUE TUBE
TRIM TAB
AILERON
MAIN ELEVATOR SPAR
SELF-ALIGNMENT INSET BALL-BEARING HINGE
CHANNEL SECTION RIB
RUDDER TORQUE TUBE
TRIM TAB
MAIN SPAR
WING TIP JOINT
NAVIGATION LIGHT
UPPER HINGED HATCH
PLEXIGLAS DOME
BOMB HOISTS STOWED IN UPPER COMPARTMENT
UPPER BOX BEAM
FUSELAGE TRUSS
CORRUGATED PANEL
LONGITUDINAL STRINGER (EXTRUDED)
FORMER(SOLID WEB)
FLUSH RIVETED SKIN
KEEL BOX STRUCTURE
BOMB BAY
BOMB BAY DOORS

FUSELAGE STRUCTURE (TYPICAL FOR BOMB BAY)

7 RECONNAISSANCE FLARES WERE CARRIED ON NIGHT BOMBING MISSIONS. (STA. 372)

—OIL SYSTEM COMPONENTS—

ENGINE OIL TANKS(2).
HYDROMATIC OIL PUMP
"Y" DRAIN COCKS(2).
ENGINE OIL COOLERS(2).
OIL DILUTION SOLENOID VALVES(2).
OIL PRESSURE GAUGES(2).
OIL TEMPERATURE GAUGES(2).

—OXYGEN SYSTEM COMPONENTS—

OXYGEN TANKS(8 LOW PRESSURE)
FLOW INDICATORS(4).
PRESSURE REGULATOR.
MANIFOLDS(2).
OXYGEN VALVE.

—A-20C ELECTRICAL CIRCUITRY LIST.—

FUEL QUANTITY GAUGES.(L. & R. TANKS)
OIL TEMPERATURE GAUGE.
OIL DILUTION SYSTEM.
HEATER SYSTEM.
PITOT HEAD HEATER SYSTEM.
BOMBARDIER'S FREE AIR THERMOMETER.
ENGINE CYLINDER HEAD TEMPERATURE INDICATORS.
CARBURETOR AIR TEMPERATURE INDICATOR.
PROPELLER FEATHERING SYSTEM.
RADIO RECEPTION CIRCUITS.
RADIO POWER CIRCUITS.
RADIO TRANSMISSION CIRCUITS.
ENGINE TACHOMETER INDICATORS.
TOW TARGET EQUIPMENT.
BOMBARDIER'S ELECTRICAL PANEL.
PILOT'S ELECTRICAL PANEL.
ENGINE STARTERS.
ENGINE-DRIVEN GENERATORS.
STORAGE BATTERY CONTROLS.
RECOGNITION LIGHTS.
LANDING GEAR WARNING HORN.
LANDING LIGHT(LEFT WING ONLY)
CREW POSITION LIGHTS.
CALL LIGHTS.
INSTRUMENT LIGHTING.
FORMATION LIGHTS.
RUNNING LIGHTS.
ENGINE IGNITION.
AERIAL CAMERA.
WARNING BELLS.
GUN CAMERAS.
BOMB ARMING CONTROLS.
DEMOLITION AND GLIDE BOMB RACKS.
BOMB RELEASE MECHANISM.
OUTBOARD BOMB RELEASES.
WING BOMB CIRCUITS.
WING SMOKE TANKS.
GUN SIGHT.(PILOT)
FUEL PUMPS.
FUEL PRIMER SOLENOIDS.
FUEL QUANTITY GAUGES(MAIN AND AUXILIARY FUEL TANKS).
FUEL QUANTITY GAUGES(AFT BOMB BAY FUEL TANK).
FUEL QUANTITY GAUGE (LONG RANGE FUEL TANKS).
FUEL TRANSFER PUMPS.
PROPELLER ANTI-ICER.
BOMBSIGHT.
INTERVALOMETER.
I.F.F. EQUIPMENT.
TORPEDO DIRECTOR SIGHT.
MULTI-PLACE INTERPHONE.
HEATER FOR FLYING SUITS.
ELECTRICAL VOLTAGE: 28

—CABLE CONTROLS LIST—

LANDING GEAR MECHANICAL RELEASE.
CARBURETOR AIR MIXTURE.
SUPERCHARGER CONTROLS.
THROTTLE CONTROLS.
FUEL MIXTURE CONTROLS.
PROPELLER PITCH CONTROLS.
FUEL VALVE CONTROLS.
AILERON CONTROLS.
AILERON TRIM TAB CONTROL.
ELEVATOR CONTROL.
ELEVATOR TRIM TAB CONTROL.
RUDDER CONTROL CONTROL.
RUDDER TRIM TAB CONTROL.
FLARE RELEASE.
BRAKE SYSTEM CONTROLS.
BOMBARDIER EMERGENCY BOMB BAY DOOR RELEASE.

—PROPELLER ANTI-ICER SYSTEM COMPONENTS

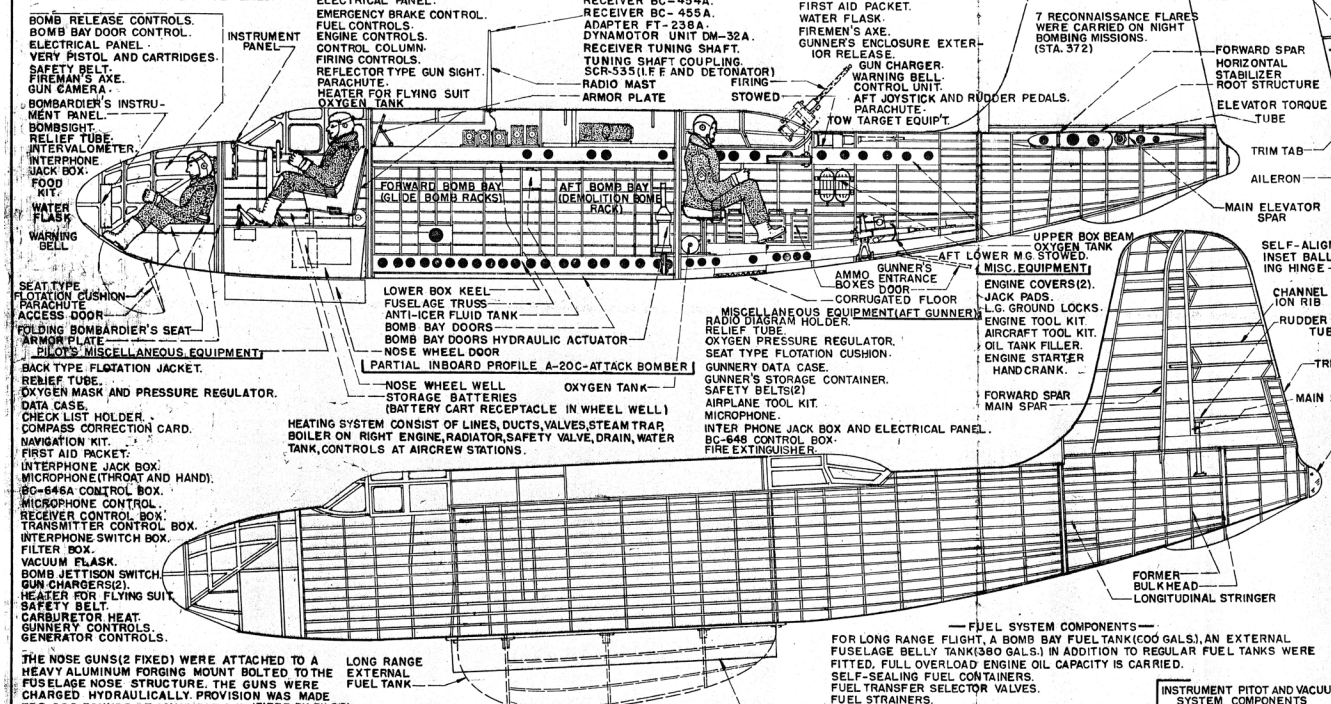
ELECTRIC FLUID PUMP
SOLENOID VALVE, CHECK VALVE.
FLUID FILTER.
FLUID TANK AND SUPPLY LINES

(DIMENSIONS ARE ALL SHOWN IN INCHES. DRWG SCALE: 0 1 2)

MANUFACTURED BY DOUGLAS AIRCRAFT COMPANY, INC.

HAVOC

A-20 SERIES ATTACK BOMBER BUILT FOR W.W.II.
DRAWN BY WILLIS L. NYE FOR MODEL AIRPLANE NEWS 6-7-59.



THE NOSE GUNS(2 FIXED) WERE ATTACHED TO A HEAVY ALUMINUM FORGING MOUNT BOLTED TO THE FUSELAGE NOSE STRUCTURE. THE GUNS WERE CHARGED HYDRAULICALLY. PROVISION WAS MADE FOR 200 ROUNDS OF AMMO PER GUN.(FIRED BY PILOT)

FOR LONG RANGE OPERATION: 4 ADDITIONAL WATER FLASKS, PORTABLE EMERGENCY RADIO, INFLATABLE LIFE RAFT, 400 ROUNDS AMMUNITION, WERE CARRIED, IN ADDITION TO EXTRA FUEL TANKS.

THE AUTHOR OF THESE DRAWINGS WAS CIVILIAN ADMINISTRATOR IN CHARGE, AIR TECHNICAL SERVICE COMMAND, A.A.F, OF PROCUREMENT OF ALL SPARE PARTS, SPECIAL MAINTENANCE TOOLS, ALL TECHNICAL DATA, AND SPECIAL PROJECT MATERIEL, FOR 999 A-20B PRODUCED AT DOUGLAS LONG BEACH PLANT 1942-1943.

SHEET NO. 3

—LONGITUDINAL STRUCTURAL CONFIGURATION A-20—

(PLANE DRAWN WITH WING AT ZERO ANGLE OF ATTACK)

FUSELAGE SKIN	WING SKIN	TAIL SKIN
.020	.025	.022
.025	.032	.032
.032	.040	
.072	.051,064,.072.	

ALL SKIN PLATING IS ALCLAD 24ST ALLOY.

—FUEL SYSTEM COMPONENTS—

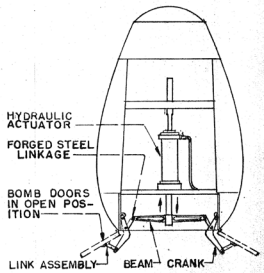
FOR LONG RANGE FLIGHT, A BOMB BAY FUEL TANK(200 GALS.), AN EXTERNAL FUSELAGE BELLY TANK(380 GALS.) IN ADDITION TO REGULAR FUEL TANKS WERE FITTED. FULL OVERLOAD ENGINE OIL CAPACITY IS CARRIED.
SELF-SEALING FUEL CONTAINERS.
FUEL TRANSFER SELECTOR VALVES.
FUEL STRAINERS.
ENGINE-DRIVEN FUEL PUMPS.
ENGINE FUEL PRIMER.
MAIN FUEL SELECTOR VALVES.
FUEL QUANTITY GAUGES.(WITH TRANSMITTERS).
FUEL PRESSURE GAUGES.
AUXILIARY FUEL PUMPS.(TRANSFER AND BOOSTER)
FUEL PRIMERS.
FUEL SHUT-OFF VALVES.

INSTRUMENT PITOT AND VACUUM SYSTEM COMPONENTS
ENGINE OIL SEPARATOR.
AIR RELIEF VALVE.
AIR CHECK VALVE.
ENGINE-DRIVEN VACUUM PUMP
THROTTLE VALVE.
VACUUM "Y" VALVE.
SUCTION REGULATOR.
AIR ACTUATED INSTRUMENTS.

—FIRE EXTINGUISHING COMPONENTS—

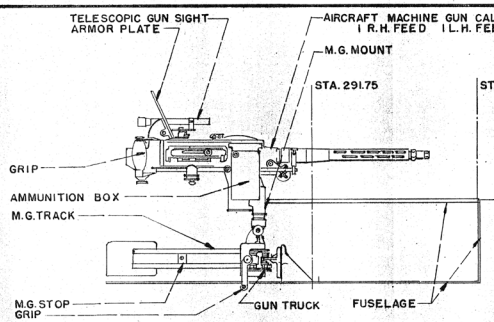
HIGH PRESSURE CO_2 CYLINDERS AND SUPPLY LINES.
SOLENOID VALVES(2).
HAND EXTINGUISHERS(3).

NOTE: TWO KINDS OF BOMB RACKS WERE FITTED IN THE BOMB BAY, I.E. ONE FOR FRAGMENTATION BOMBS AND ONE FOR DEMOLITION BOMBS.



BOMB BAY DOORS ACTUATING MECHANISM (BOMB BAY CROSS SECTION)

NOTE: BOMB BAY DOORS WERE PROVIDED WITH A CABLE OPERATED SYSTEM FOR EMERGENCY OPERATION. THIS SYSTEM WAS OPERABLE BY THE BOMBARDIER.



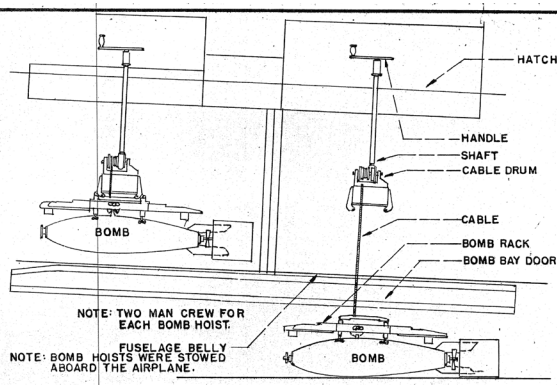
UPPER TWIN FLEXIBLE M.G. INSTALLATION (FIRING POSITION) WHEN NOT IN USE MACHINE GUNS WERE STOWED AT STATIONS 291.75 AND 312, BOLTED IN PLACE TO CLEAR THE CANOPY. TWO HINGED DOORS COVERED THE GUNS WHEN NOT IN USE.

NOTE: FOR LONG RANGE FERRY FLIGHTS, THE FOLLOWING FUEL CAPACITIES ARE CARRIED:

BOMB BAY FUEL TANK	600	GALLONS
WING TANKS (RIGHT)	195	DO
WING TANK (LEFT)	195	DO
FUSELAGE FUEL TANK	100	DO
EXTERNAL FUEL TANK	380	DO

THE INSIGNIA, MARKING AND CAMOUFLAGE
THE INSIGNIA, MARKING AND CAMOUFLAGE ON THE EXTERIOR SURFACES OF THE AIRPLANE IS AS FOLLOWS:
ENTIRE TOP SURFACE: DARK OLIVE DRAB.
ENTIRE LOWER SURFACE: NEUTRAL GRAY.
ON THE FUSELAGE AND ENGINE NACELLES, AS WELL AS THE WINGS THE COLORS ARE MERGED ALONG AN IRREGULAR LINE.
R.A.F. DB-7 AIRCRAFT WERE COLORED DARK OLIVE DRAB AND IRREGULAR GREEN.
LANDING GEAR TIRES: BLACK.
NOSE GEAR TIRE: BLACK.
LANDING STRUCTURE: ALUMINUM.
NOSE GEAR STRUCTURE: ALUMINUM.
PROPELLERS: ALUMINUM.
WALKWAYS: BLACK.
CREW COMPARTMENT: LIGHT GREEN.

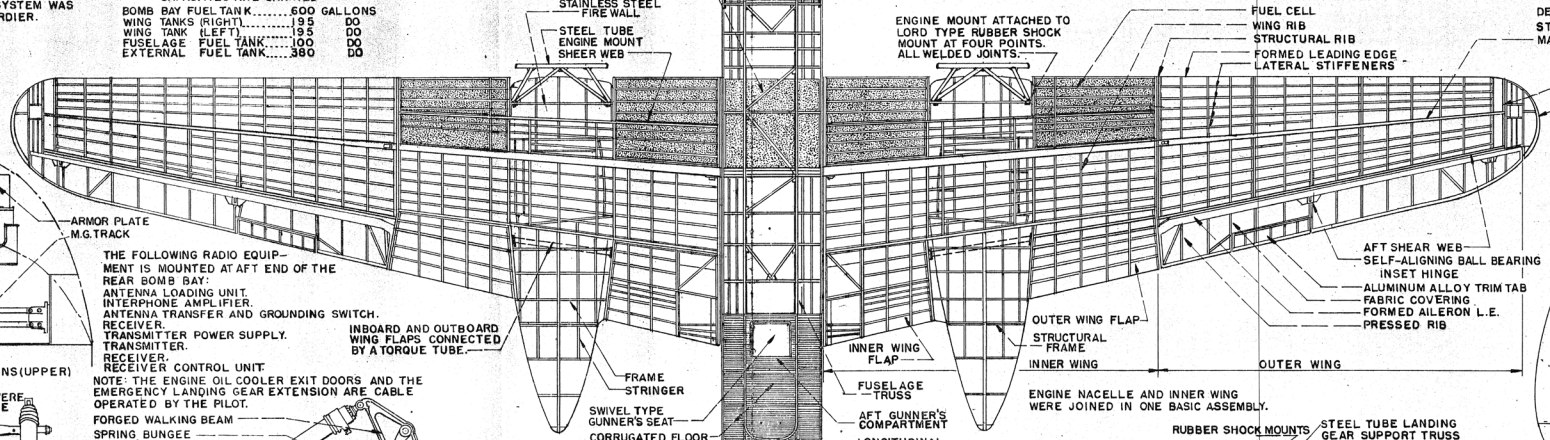
THE BULLET SEALING FUEL CELL IS MADE OF 3-PLY LAMINATED MATERIAL:
U.S. RUBBER CO. 1897 FABRIC NEOPRENE ON THE FUEL AND A PLASTIC MATERIAL ON THE EXTERIOR SURFACE.
FABRIC RETAINER NO. 3, U.S. RUBBER CO.
U.S. RUBBER SEALANT.
THE LINER FORMS A SEMI-RIGID SELF-SUPPORTING FUEL CELL THAT IS SHAPED TO FIT INTO THE WING OR FUSELAGE.



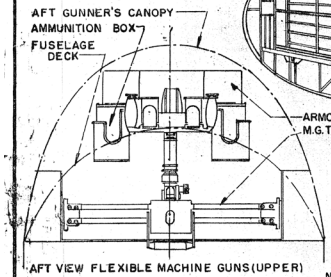
NOTE: TWO MAN CREW FOR EACH BOMB HOIST.

NOTE: BOMB HOISTS WERE STOWED ABOARD THE AIRPLANE.

BOMB HOISTING OPERATION OF FRAGMENTATION BOMBS



OUTER WING WAS FABRICATED AS A MAJOR ASSEMBLY

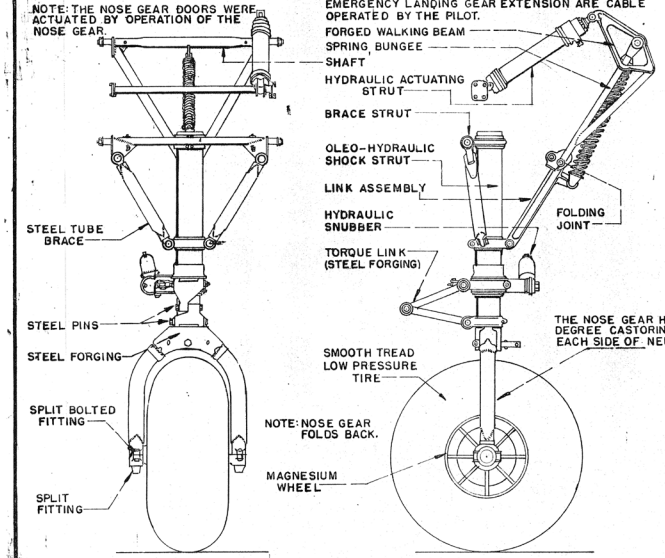


AFT VIEW FLEXIBLE MACHINE GUNS (UPPER)

THE FOLLOWING RADIO EQUIPMENT IS MOUNTED AT AFT END OF THE REAR BOMB BAY:
ANTENNA LOADING UNIT.
INTERPHONE AMPLIFIER.
ANTENNA TRANSFER AND GROUNDING SWITCH.
RECEIVER.
TRANSMITTER POWER SUPPLY.
TRANSMITTER.
RECEIVER.
RECEIVER CONTROL UNIT.

NOTE: THE ENGINE OIL COOLER EXIT DOORS AND THE EMERGENCY LANDING GEAR EXTENSION ARE CABLE OPERATED BY THE PILOT.

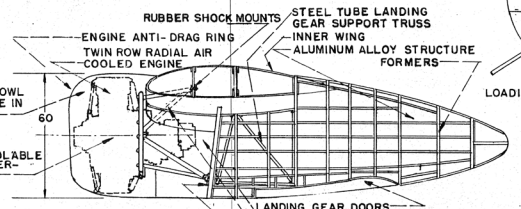
NOTE: THE NOSE GEAR DOORS WERE ACTUATED BY OPERATION OF THE NOSE GEAR.



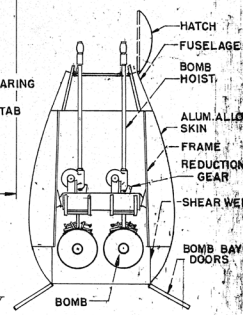
THE BASIC WING STRUCTURE WAS MADE IN FOUR MAJOR ASSEMBLIES AND JOINED TOGETHER AT FOUR FITTINGS. AT EACH FITTING HIGH STRENGTH BOLTS WITH A PRESSED FIT AND RECESSED HEAD NUTS SECURED EACH MAJOR ASSEMBLY. INNER WINGS ATTACHED TO THE MAIN FUSELAGE FRAME.

THE FUSELAGE WAS MADE IN TWO HALVES FOR FAST PRODUCTION AND RIVETED TOGETHER AFTER ALL FUNCTIONAL COMPONENTS WERE INSTALLED.

ENGINE NACELLE AND INNER WING WERE JOINED IN ONE BASIC ASSEMBLY.



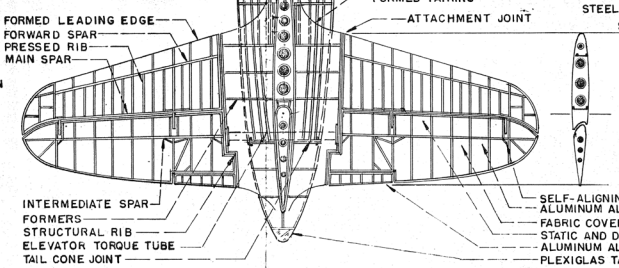
STRUCTURAL CONFIGURATION OF ENGINE NACELLE

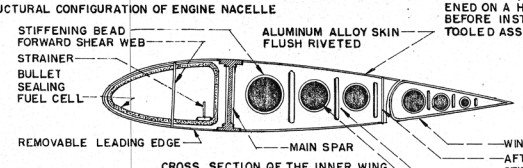


LOADING OF FRAGMENTATION BOMBS (CROSS SECTION)

MAIN WING SPAR

THE MAIN WING SPAR WAS MADE FROM A SPECIAL ALUMINUM ALLOY HIGH STRENGTH BILLET. THIS BILLET WAS MACHINED TO THE REQUIRED CROSS SECTION ON A SPAR CAP MILLING MACHINE. AFTER THE SPAR WAS MILLED, IT WAS STRAIGHTENED ON A HYDRAULIC PRESS BEFORE INSTALLING IT IN A TOOLED ASSEMBLY JIG.





CROSS SECTION OF THE INNER WING

NOTE: ALL FLIGHT CONTROLS ARE CABLE OPERATED USING THE CONVENTIONAL "DEP" TYPE CONFIGURATION.
TRIM TABS WERE ALSO CABLE OPERATED.
PROPELLER PITCH, ENGINE THROTTLE EMERGENCY FLARES, AND FUEL CONTROLS WERE CABLE OPERATED.

NOTE: EACH ENGINE COMPARTMENT WAS PROVIDED WITH A FIRE WARNING SYSTEM AND A CARBON DIOXIDE PRESSURE TYPE FIRE EXTINGUISHING SYSTEM OPERABLE BY THE PILOT.

(DIMENSIONS ARE ALL SHOWN IN INCHES. DRWG SCALE) 0 1 2

MANUFACTURED BY DOUGLAS AIRCRAFT COMPANY, INC.

HAVOC

A-20 SERIES ATTACK BOMBER BUILT FOR W.W.II.

DRAWN BY WILLIS L. NYE, FOR MODEL AIRPLANE NEWS 6-7-59.

SHEET NO. 4. DETAILS OF NOSE WHEEL

THE DOUGLAS TYPE A-20 ATTACK BOMBER.

THIS AIRPLANE WAS KNOWN AS THE DB-7 SERIES IN ENGLAND, FRANCE AND THE NETHERLANDS. IN THE U.S.A.A.F AND IN RUSSIA IT WAS DESIGNATED AS THE A-20. THERE WERE EIGHTEEN MODELS OF THIS AIRPLANE, OF WHICH 17 WERE BUILT. 7097 AIRPLANES WERE SUPPLIED TO THE ARMED FORCES OF THE ALLIED NATIONS. OF THIS AMOUNT, THE U.S.A.A.F. RECEIVED 5289. THIS AIRPLANE SERVED IN EVERY THEATER OF WORLD WAR II. IT WAS FLOWN BY THE A.A.F AS WELL AS ALLIED AIR FORCES.

THE FOLLOWING ARE THE BASIC MODELS OF THIS AIRPLANE:

MODEL 7A (ENGINEERING DESIGN ONLY)
" 7B (EXPERIMENTAL PROTOTYPE BUILT)
" DB-7 (FRENCH AIR COMMISSION) 100 PLANES.
" DB-13 (TWIN TAIL VERSION) 1 PROTOTYPE.
" DB-7A (R.A.F "BOSTON I.") 75 PLANES.
" A-20A (SEE BELOW).
" F-3 (PHOTO VERSION)
" DB-7B (R.A.F "BOSTON" II.) (NETHERLANDS)
" A-20B (RUSSIAN LEND-LEASE 990 PLANES)
" A-20C (SEE BELOW)
" A-20 (SEE BELOW)
" P-70 (RADAR NIGHT FIGHTER)
" DB-7C (R.A.F "BOSTON" III.)
" A-20G (SEE BELOW)
" A-20J (" ")
" A-20H (" ")
" A-20K (" ")

THE FOLLOWING ARE THE MODELS SUPPLIED TO U.S.A.A.F.: (HAVOC)

A-20 (PRODUCTION MODEL DB-7, BUILT AT DOUGLAS EL SEGUNDO. LATER MODIFIED TO F-3 (31) AND 60 TO P-70 (NIGHT FIGHTER).
A-20A (UNSUPERCHARGED ENGINES) 17 MODIFIED TO A-20E (DOUGLAS EL SEGUNDO)
XA-20B (DOUGLAS EL SEGUNDO) 3 POWER DRIVEN M.G. TURRETS. 1 PLANE.
A-20B (DOUGLAS LONG BEACH) 1990 TO RUSSIA ON LEND LEASE. 9 TO U.S. NAVY BD-2 AS TOW TARGET PLANES.
A-20C (SAME AS DB-7A) 808 BUILT AT DOUGLAS SANTA MONICA. (R.A.F SPECIFICATIONS)
A-20C-380 BUILT FOR R.A.F ON LEND LEASE UNDER SUBCONTRACT. (BOEING-SEATTLE).
A-20D - PROJECT CANCELLED. (A.A.F)
A-20E - MODIFIED FROM A-20A (DOUGLAS EL SEGUNDO) 17 PLANES.
XA-20F (DOUGLAS EL SEGUNDO) 1 PLANE.
A-20G (DOUGLAS SANTA MONICA) 2850 PLANES.
A-20H (DOUGLAS SANTA MONICA) 412 PLANES.
A-20J (DOUGLAS SANTA MONICA) 450 PLANES.
A-20K (DOUGLAS SANTA MONICA) 413 PLANES.
O-53 (PROJECT CANCELLED). (LONG BEACH)
P-70A-1 (DOUGLAS SANTA MONICA) 13 PLANES.
P-70A-2 (DOUGLAS SANTA MONICA) 26 PLANES.
P-70B-1 (DOUGLAS SANTA MONICA) 1 PLANE.
XF-3 (DOUGLAS SANTA MONICA) 1 PLANE.
YF-3 (DOUGLAS SANTA MONICA) 2 PLANES.
F3A (DOUGLAS SANTA MONICA) 46 PLANES.

NOTE: SOME OF THE AIRPLANE MODELS WERE MODIFICATIONS OF BASIC PRODUCTION AIRPLANE.

NOTE: AN A-20H WAS MODIFIED TO RECEIVE 2 P&W. R-2800 ENGINES AS A PRIVATE VENTURE USING WATER INJECTION AS AN EXPERIMENTAL PROJECT. NOT PROCURED BY A.A.F

THE BASIC CONCEPT OF THIS AIRPLANE WAS DEVELOPED IN 1936. BEFORE THE AIRPLANE WAS PHASED OUT OF PRODUCTION, 3,521,173 ENGINEERING MAN HOURS HAD BEEN EXPENDED. THE A-20 ATTACK-BOMBER WAS THE FIRST AIRPLANE IN THE UNITED STATES TO BE PRODUCED ON A MOVING PRODUCTION LINE. THE FIRST LETTER OF INTENT ISSUED BY THE U.S. ARMY AIR CORPS WAS IN JULY, 1939 FOR 123 A-20A AIRPLANES. THE A-20A WAS AN IMPROVED VERSION OF THE BASIC DB-7. THE MODEL 7B PROTOTYPE WAS DEVELOPED AND BUILT AT THE DOUGLAS EL SEGUNDO DIVISION. THE MOVING PRODUCTION LINE WAS INSTALLED AT DOUGLAS SANTA MONICA PLANT.

MAJOR ASSEMBLIES WERE FABRICATED BY THE PRIME CONTRACTOR, WHEREAS SUBASSEMBLES WERE FABRICATED BY SUBCONTRACTOR FACILITIES. FOR DELIVERY TO THE WAR ZONES, THE PLANES WERE FITTED WITH LONG RANGE FERRY TYPE FUEL TANKS. ALL ARMENT WAS REMOVED.

HAMILTON-STANDARD HYDROMATIC QUICK FEATHERING PROPELLER

AIRFLOW THROUGH ENGINE OIL COOLER IS AIR TEMPERATURE THERMALLY REGULATED BY MEANS OF A FLAP AT THE EXIT. THIS FLAP WAS ALSO OPERABLE WITH THE ENGINE COWL FLAPS.

10° DIHEDRAL ANGLE ON HORIZONTAL TAIL AREA

SPINNER

RADIO ANTENNA
RADIO MAST
PILOT'S HATCH
ANTI-GLARE AREA
BULLET RESISTANT WINDSHIELD
WALK WAY

CURTISS-WRIGHT R-2600-11 RADIAL AIRCOOLED ENGINE TWO-SPEED CONTROLLABLE SUPERCHARGER. LOW BLOWER RATIO 7:1 4 TO 1. HIGH BLOWER RATIO 10:1

AIRFOIL AND FILLET AT WING ROOT STATION O.

LANDING LIGHT (EXTENDED)
OUTBOARD WING PANEL JOINT
AIRFOIL
WING ROOT FILLET
NAVIGATION LIGHT
WING TIP JOINT
REAR SPAR
WING FLAPS IN EXTENDED POSITION
LANDING GEAR DOOR
OLEO-HYDRAULIC SHOCK STRUT
FWD M.G. PORT
BOMBARDIER ENTRANCE HATCH
SMOOTH TREAD TIRE
FUSELAGE REFERENCE LINE
C.L. THRUST
NACELLE STATION O
M.A.C.
MAIN LANDING GEAR (RETRACTED POSITION)
AFT GUNNER'S ENTRANCE DOOR

STATION DIAGRAM

NOSE WHEEL IN RETRACTED POSITION
CARBURETION AIR INDUCTION (RAM TYPE)
PILOT'S ENTRANCE HATCH
PLEXIGLAS PANEL
ANTI-GLARE AREA
FORWARD GUN SIGHT

THE FUSELAGE WAS BUILT IN TWO HALVES TO FACILITATE PRODUCTION. EACH HALF WAS RIVETED TOGETHER AT THE TOP AND BOTTOM CENTER-LINE. (STA. O TO STA. 372)

LEADING EDGE OF WING (STA. 106)
RADIO ANTENNA
LEAD-IN INSULATOR
STREAMLINE MAST

UPPER FLEXIBLE M.G. CAL. 30 (2) ARE STOWED IN FUSELAGE AFT OF REAR GUNNER WHEN NOT IN USE.

PITOT HEAD
ACCESS PLATE
INSULATOR
INSET HINGE
FABRIC COVERING
ACCESS PLATE
STITCHED AND TAPED RIB
ALUMINUM ALLOY SKIN
AFT M.G. HATCH
AFT GUNNER'S SLIDING HATCH
HAND GRIP COVER ACCESS PLATE FOR TOW TARGET VERY PISTOL OUTLET
BOMB BAY ENCLOSURE HAND HOLE DOORS ACCESS PLATE
A.A.F SERIAL NO. ACCESS PLATE
A.A.F IDENTIFICATION BLUE WHITE
DOUGLAS A-20G
13040
OPERABLE TRIM TAB
TRIM TAB ACTUATOR
FORMATION, NAVIGATION, AND BOMBING LIGHT
TAIL CONE JOINT
TAIL SKID
FUEL VALVE CONTROL ACCESS PLATE
A.A.F SQUADRON NUMBER
BOMBARDIER EMERGENCY EXIT
370
I.F.F ANTENNA
FUSELAGE JOINT
LOWER FLEXIBLE M.G. CAL. 30 WAS STOWED IN LOWER AFT FUSELAGE WHEN NOT IN USE
CANTED THRUST LINE
TORQUE LINK
ACCESS PLATE
HYDRAULIC BRAKES
WHEEL BASE
ADJUSTABLE COOLING FLAPS
ENGINE EXHAUST PIPES
RETRACTABLE STEP
MAIN LANDING GEAR DOOR
BOMB BAY DOOR
FORWARD 30 CAL. M.G. (FIXED POSITION)
BOMBARDIER'S ENTRY ACCESS PLATE TO FORWARD M.G. ALSO TO ATTACH AN ADDITIONAL FIXED M.G. EACH SIDE. (A-20C)
10.1" ROLLING RADIUS
26" SMOOTH CONTOUR TIRE
CASTORING NOSE WHEEL
SHOCK ABSORBER STRUT
HYDRAULIC SNUBBER
NOSE WHEEL DOOR
18.77 ROLLING RADIUS
44" SMOOTH CONTOUR TIRE (LOW PRESSURE)

LEFT SIDE VIEW

(A-20C LOADED CONDITION AT T.O.)
(RIGHT SIDE VIEW IS SIMILAR)

NORMAL CREW CONSISTED OF BOMBARDIER, PILOT AND REAR GUNNER. HOWEVER, CERTAIN MODELS WERE MODIFIED SO A FOUR MAN CREW (2 GUNNERS) COULD BE USED. PHOTO (F-3) VERSIONS CARRIED EXTENSIVE CAMERA INSTALLATIONS.

TECHNICAL DATA DOUGLAS A-20

WING AIRFOIL (ROOT)	NACA 23018
" (TIP)	" 23010
TOTAL WING AREA	464.8 SQ.FT.
WING SPAN	61'-4"
WING ROOT CHORD	138.5
" TIP "	44.5
" TAPER RATIO	.32
" INCIDENCE INBOARD PANEL	3°
" " OUTBOARD (ROOT)	3°
" " " (TIP)	-1°
" DIHEDRAL ANGLE	4°7'
" SWEEPBACK	0°
" MAXIMUM RIB SPACING	15.5"
" LOCATION—MAIN SPAR	38%
" " SHEAR WEB	65.9%
" ASPECT RATIO	8.07
" M.A.C. LENGTH	100.23
" THICKNESS (ROOT CHORD)	24.33
" " (TIP CHORD)	4.40
AILERON AREA	42.1 SQ.F
ANGULAR MOVEMENT UP 30° DOWN 20°	
DIFFERENTIAL MOTIO RATIO	1.5:1
DISTANCE FROM PLANE OF SYMMETRY TO CENTROID OF AILERON AREA	260"
HORIZONTAL TAIL SURFACE AREA	100 SQ.FT
" " " SPAN	21'-1.5
DISTANCE FROM DESIGN GROSS WEIGHT C.G. TO 1/3 MAXIMUM CHORD POINT	294"
HORIZONTAL STABILIZER AREA	60.8 SQ.FT
" " INCIDENCE	2°
ELEVATOR AREA	39.2 SQ.FT
" ANGULAR MOVEMENT UP 30° DOWN 30	
VERTICAL STABILIZER AREA	24.8 SQ.FT.
NORMAL SETTING	0°
ANGULAR MOVEMENT	0°
RUDDER AREA	35.1 SQ.FT.
RUDDER ANGULAR MOVEMENT:	
" " RIGHT AND LEFT	22.5°
FUEL 540 GALLONS	3300 POUNDS
OIL 40	310 "
2100 ROUNDS FIXED GUNS	654 "
1200 " FLEXIBLE GUNS	373 "
FUEL SYSTEM WEIGHT PER GALLON	2.3 POUNDS
OIL " " " "	8.5 "
WING GROUP 5 POUNDS PER SQUARE FOOT	
TAIL " 2.2 " " " "	

ATTACK CONDITION GROSS WEIGHT:
C.G. LOCATION, WHEELS UP, AFT, L.E. M.A.C. 30% M.A.C.
C.G. LOCATION N. WHEELS UP, BELOW L.E. M.A.C. 15.6% M.A.C.
C.G. LOCATION, WHEELS DOWN, AFT L.E. M.A.C. 29.4% M.A.C.

FLYING BALANCE RANGE 16% AND 30% WITH WHEELS UP OR DOWN.

AT DESIGN GROSS WEIGHT OF 19,750 POUNDS.
POSITIVE LOAD MANEUVERLOAD FACTOR 4.0
NEGATIVE " " " " -2.0
LIMIT GUST LOAD FACTOR, AT DESIGN GROSS WEIGHT, FLAPS UP, POSITIVE 4.0
AT DESIGN GROSS WEIGHT, FLAPS DOWN, POSITIVE 2.27
LIMIT LANDING FACTOR, GROUND LANDINGS, AT DESIGN GROSS WEIGHT, (19,750 POUNDS) 3.33
LIMIT DIVING SPEED, 120% OF MAXIMUM LEVEL FLIGHT SPEED AT DESIGN GROSS WT.
ULTIMATE LOAD FACTOR 9 Gs.
TAKE-OFF RUN 1900 FT. OVER 50 FT. OBSTACLE.
STALLING SPEED I.A.S. 115 M.P.H.
NORMAL LANDING SPEED I.A.S. 100 M.P.H.
CLIMBING SPEED (23,000) 167 M.P.H.
GROUND ROLL (23,000 LBS.) 1850 FT.
MAXIMUM FLIGHT RANGE (760 GALS) 1200 MILES
HIGH SPEED AT 5000 FT. 354 M.P.H.
ANGLE OF THRUST TO FUSELAGE R.L. 2°
THE A-20C WILL MAINTAIN ALTITUDE ON ONE ENGINE, PROVIDED THE ENGINE IS DEVELOPING MAXIMUM RATED POWER AND THE GROSS WEIGHT DOES NOT EXCEED 27,800 POUNDS AT 4,000 FEET ALTITUDE.

YELLOW
DARK BLUE
WHITE
RED

R.A.F IDENTIFICATION (FUSELAGE)

(DIMENSIONS ARE ALL SHOWN IN INCHES. DRWG. SCALE 0 1 2)

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