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T. O. NO. 01-25CK-3

OVERHAUL INSTRUCTIONS

FOR

ARMY MODEL P-40K Series

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PROCESS LITHO, DETROIT, MICH. 5-24-43-20M

OCTOBER 5, 1942
REVISED MAY 30, 1943

LIST OF REVISED PAGES ISSUED

<i>Page</i>	<i>Latest Revised Date</i>
3	May 30, 1943
72	May 30, 1943

NOTE: A heavy black vertical line, to the left of the text on revised pages, indicates the extent of the revision. This is omitted where more than 50 percent of the page is revised.

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TABLE OF CONTENTS

Section	Page	Section	Page
I <i>Introduction</i>	1	IV (5) <i>Empennage</i>	45
II <i>Heat-Treated Parts and Finishes</i>	1-14	(6) <i>Application of Dope to Fabric Surfaces</i>	46-48
1. <i>Heat-Treated Parts</i>	1-13	(a) <i>Materials</i>	46
a. <i>Aluminum Alloy</i>	1	(b) <i>Workshop Conditions</i>	46
b. <i>Steel Parts List</i>	1-13	(c) <i>Preparation of Materials</i>	46
2. <i>Finish Specification—General</i>	14	(d) <i>Application of Dope</i>	46-47
III <i>Dismantling, Cleaning, and Inspection</i>	14-19	(e) <i>Precautions</i>	47
1. <i>General</i>	14	(f) <i>Patching Torn Areas</i>	48
2. <i>Dismantling</i>	14-19	(7) <i>Refinishing Metal Surfaces</i>	48
a. <i>General</i>	14	2. <i>Wing</i>	48-54
b. <i>Precautions and Instructions</i>	14-19	a. <i>Disassembly</i>	48
(1) <i>Precautions</i>	14	b. <i>Inspection</i>	48-54
(2) <i>Instructions</i>	14-19	(1) <i>Wing Panels</i>	48-54
3. <i>Cleaning</i>	19	(2) <i>Wing Tips</i>	54
4. <i>Inspection—General</i>	19	(3) <i>Ailerons</i>	54
5. <i>Disposition of Equipment Submerged in Water</i>	19	(4) <i>Wing Flaps</i>	54
IV <i>Disassembly, Inspection, Repair, and Assembly</i>		c. <i>Repair</i>	54
1. <i>General</i>	20-48	d. <i>Assembly</i>	54
a. <i>General Instructions</i>	20	3. <i>Empennage</i>	54-58
b. <i>Disassembly</i>	20	a. <i>Disassembly</i>	54
c. <i>Special Airplane Tools</i>	20	b. <i>Inspection</i>	54-55
d. <i>Major Repair</i>	20-48	(1) <i>Stabilizers</i>	54-55
(1) <i>General</i>	20	(2) <i>Elevators and Rudder</i>	55
(a) <i>Tubing</i>	20	c. <i>Repair</i>	58
(b) <i>Fasteners</i>	20	d. <i>Assembly</i>	58
(c) <i>Bushings</i>	20	4. <i>Fuselage and Engine Mount</i>	58-59
(2) <i>Structural</i>	20-27	a. <i>Fuselage</i>	58
(3) <i>Wing</i>	27-45	(1) <i>Disassembly</i>	58
(a) <i>Stringers</i>	27	(2) <i>Inspection</i>	58
(b) <i>Skin</i>	27	(3) <i>Repair</i>	58
(c) <i>Outboard Bulkhead</i>	27-45	b. <i>Engine Mount</i>	59
(d) <i>Wing Tip</i>	45	(1) <i>Disassembly</i>	59
(4) <i>Fuselage</i>	45	(2) <i>Inspection</i>	59
(a) <i>Stringers</i>	45	(3) <i>Repair</i>	59
(b) <i>Bulkheads</i>	45	(4) <i>Assembly</i>	59
(c) <i>Skin</i>	45	5. <i>Cowling</i>	59-60
		a. <i>Inspection</i>	59-60
		(1) <i>Engine Section Cowling</i>	59-60

Section	Page	Section	Page
IV (2) Cowl Flaps	60	IV 16. Engine and Aeronautical Instruments	69
(Cont) b. Repair	60	(Cont) 17. Surface Controls	69-70
6. Spinner Assembly	62	a. Disassembly	69-70
7. Landing Gear	62-64	b. Inspection	70
a. Disassembly and Inspection	62	c. Repair and Assembly	70
(1) Strut Assemblies	62	18. Hydraulics	70-71
(2) Wheels and Brakes	62	a. System	70
(a) General	62	b. Hydraulic Pump—Motor Driven	70
(b) Tires and Tubes	62	c. Hydraulic Pump—Hand Operated	70
(3) Hydraulic Brake System	62	d. Control Valve	70-71
b. Repair and Assembly	62-64	e. Restricted Fittings, Check Valve, and Relief Valve	71
8. Tail Wheel	65	f. Landing Gear Retracting Strut	71
a. Disassembly and Inspection	65	g. Tail Wheel Retracting Strut	71
b. Repair and Assembly	65	b. Wing Flap Actuating Cylinder	71
9. Engine and Accessories	65	19. Ignition and Electrical System	71
a. Disassembly	65	20. Fuselage Equipment	71-72
(1) Engine	65	a. General	71
(2) Carburetor Air Intake System	65	b. Miscellaneous Equipment	72
(3) Accessories	65	c. Furnishings	72
b. Inspection	65	(1) Windshield	72
(1) Engine	65	(2) Cockpit Enclosure	72
(2) Exhaust System	65	21. Heating and Ventilating System	72
(3) Carburetor Air Intake System	65	22. Oxygen Equipment	72
c. Repairs—Exhaust System	65	23. Communications Equipment	72
d. Assembly	65	24. Bombing Equipment	72
10. Engine and Propeller Controls	68	25. Photographic Equipment—Gun Camera	72-73
11. Propeller and Hub	68	26. Gunnery Equipment	73
12. Starting System	68	V Final Assembly	73
13. Cooling System	68	1. Instructions	73
a. Cowl Flaps	68	2. Torque Loads	73
b. Oil Temperature Regulator Air Scoop	68	VI Additional Overhaul and Major Repair Instructions	74
(1) Disassembly	68	VII Storage	74
(2) Inspection and Repair	68		
14. Oil System	69		
15. Fuel System	69		

ILLUSTRATIONS

Figure	Page	Figure	Page
1 P-40K-1 Airplane	IV	23 Fuselage Skin—Small Patch	43
2 Auxiliary Hydraulic Test Equipment	15	24 Fuselage Skin Insert	44
3 Portable Electrical and Hydraulic Test Equipment	16	25 Wing—Flush Skin Patch	44
4 Portable Electrical Test Box—Panel	17	26 Flush Skin Patch at Overlap	45
5 Portable Electrical Test Box—Fuselage—Left-Hand	17	27 Wing—Skin Repair Data	49
6 Portable Electrical Test Box—Fuselage—Right-Hand	18	28 Inspection and Access Doors—Wing	50
7 Auxiliary Test Box—Control Stick	18	29 Wing Showing Construction	51
8 Major Disassembly	21	30 Trailing Edge of Wing—Bottom View	51
9 Wing Hoisting Sling	22	31 Right-Hand Wing Flap Skeleton—Top and Bottom Views	52
10 Wing Panel on Horizontal Cradles	22	32 Left-Hand Aileron Skeleton	52
11 Wing Panel Separated at Center Line Bulkhead	23	33 Vertical Stabilizer	53
12 Fuselage on Cradle	23	34 Horizontal Stabilizer	53
13 Bushing Chart	24-26	35 Elevator Skeleton—Top View	54
14 Wing Stringers Angle and Channel—Splice	28	36 Rudder Skeleton	55
15 Wing Stringers—"Z"—84016 and 75-03-043—Splice	29	37 Inspection and Access Doors—Fuselage	56
16 Wing Stringer—"Z"—87-03-691—Splice	31-32	38 Fuselage—Top Section Before Assembly	57
17 Wing Stringer—"Z"—87-03-178A—Splice	33-34	39 Fuselage—Bottom Section Before Assembly	57
18 Wing Spar Repair Data	35-36	40 Attaching Covering to Elevator	58
19 Cap-strip—Jay Section Splice	37-38	41 Tensionometer Installed on Elevator Cable	59
20 Cap-strip—Angle—Splice—Spars No. 2, 3 and 4	39-40	42 Engine and Mount Assembly Support Stand	60
21 Cap-strip—Angle—Splice—Spar No. 1	41-42	43 Engine Mount Disassembly	61
22 Fuselage—Stringer Insert at Bulkhead	43	44 Landing Gear Disassembly	63
		45 Tail Wheel Disassembly	64
		46 Engine Mount Vibration Absorber Front	66
		47 Engine Mount Vibration Absorber Rear	67

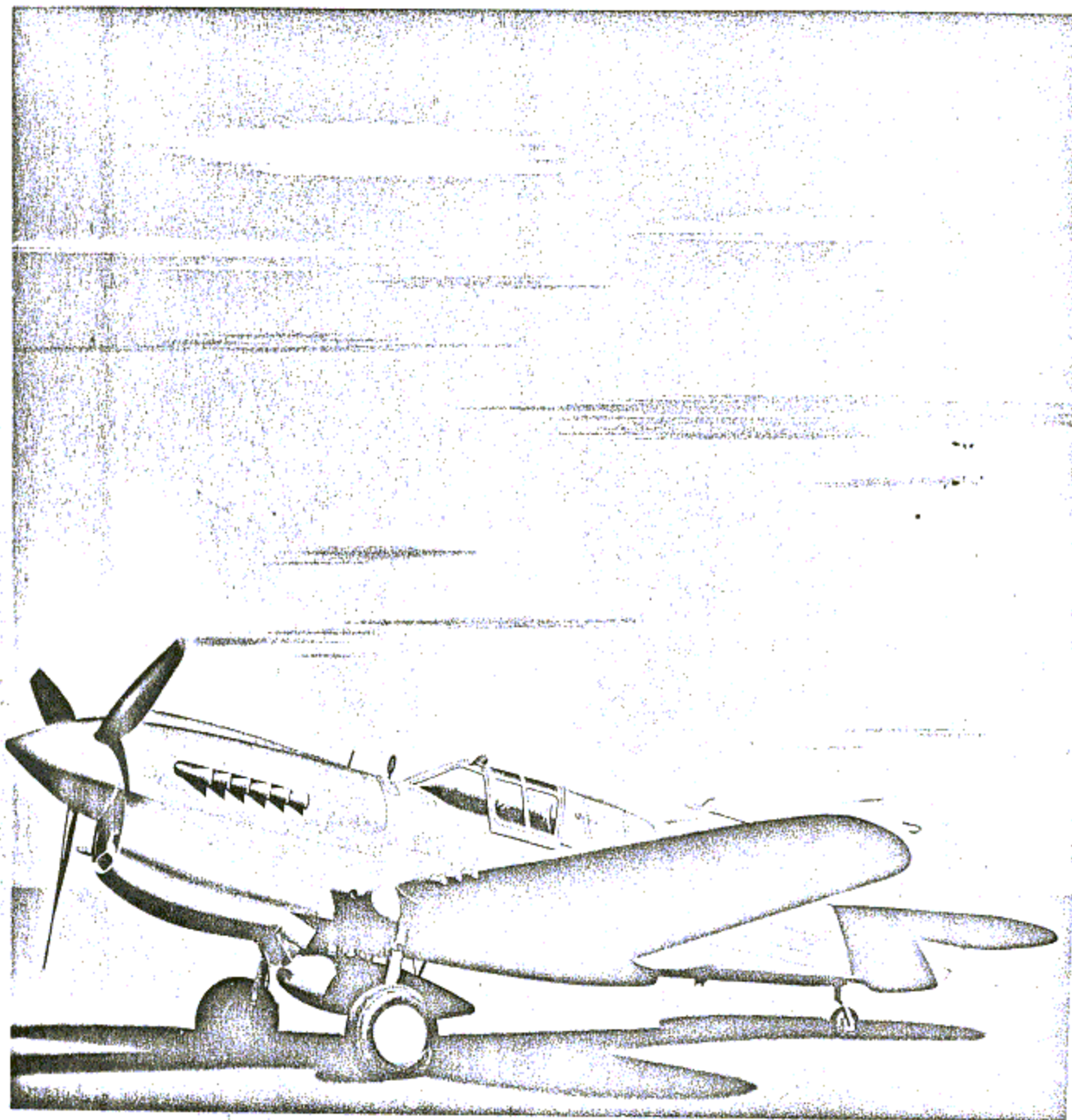


FIGURE 1

P-40K-1 AIRPLANE

SECTION I INTRODUCTION

1. This Technical Order is the Overhaul Instructions for the Model P-40K and P-40K-1 Pursuit Airplanes. It includes all necessary information for the major overhaul of these airplanes. Overhaul personnel will read and be familiar also with the information contained in T.O.'s 01-25CK-1 and 01-25CK-2, which form a part of the complete overhaul instructions.

SECTION II HEAT-TREATED PARTS AND FINISHES

1. HEAT-TREATED PARTS.

a. Aluminum Alloy.—Aluminum alloy 24ST Army Specification No. 57-152-6 type II and 24SO Army Specification No. 57-152-6 type I constitute the major materials used in the construction of the wing and fuselage. All forgings, extruded sections, and bar stock, with few exceptions, are 14ST aluminum alloy Specification No. QQ-A-367, grade 5. Specification No. 98-10026 covers both the annealing and heat treatment of these materials. All rivets used in external covering and fittings are A17ST or 17ST aluminum alloy. Rivets used on the internal structure are flat head, round head, brazier head, or modified brazier head rivets of 17ST, A17ST, or steel, solid or tubular rivets. Fuel, vent, oil, and coolant lines are of 52SO aluminum alloy Specifica-

tion No. 57-187-3, with the exception of some lines or parts of lines which are of copper.

b. Steel.—The bearer tubes and truss assemblies of the engine mount are constructed of X-4130 chrome-molybdenum steel tubing, Specification No. 57-180-2; the bearer tubes have been heat treated to 180,000 pounds per square inch, while the truss assemblies are heat treated to 150,000 pounds per square inch. The steel parts of the landing gear, landing gear retracting strut and landing gear retracting mechanism are heat treated from 120,000 to 180,000 pounds per square inch. This also applies to the tail wheel. All parts mentioned above are heat treated according to Specification No. 98-10025. The following is a list of steel parts which have been heat treated to the tensile strengths as noted.

Nomenclature	Part No.	Next Assembly	Material	Heat Treat Tensile Strength Pounds Per Square Inch
Actuator-Tail Wheel Retracting-Strut-Piston	75-37-024	87-37-905	11062	150,000
Adapter-Rear Mount-Inboard Wing Gun	87-69-548	87-69-917	AN-QQ-S-756 Condition C	150,000
Adapter-Rear Mount-Outboard Wing Gun	87-69-546	87-69-500	AN-QQ-S-756 Condition C	150,000
Angle-Support-Intermediate Station No. 100	87-69-719-1	87-03-809	AN-QQS-757	80,000
Angle-Support-Intermediate Station No. 100	87-69-719	87-03-901	AN-QQ-S-757	80,000
Angle-Tapping-Nose Rib Rudder	87-14-015	87-14-601	AN-QQ-S-685	65,000
Angle-Tapping-Nose Rib Rudder	87-14-015-1	87-14-601	AN-QQ-S-685	65,000
Arm-Aileron Control	87-05-013	87-05-014	57-107-18	120,000
Arm-Landing Gear Retracting Strut Indicator	75-33-029-1	87-31-505	57-136-8	125,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Arm-Landing Gear Retracting Mechanism	87-31-521-1	87-31-901	10083	150,000
Arm-Landing Gear Retracting Mechanism	87-31-529	87-31-521	10083	150,000
Arm-Rocker-Landing Gear Retracting				
Strut Indicator	75-33-029-1	87-31-505	57-136-8	125,000
Arm-Seat Safety Belt Torque Tube				
Attaching	87-65-525	87-65-528	57-136-8	65,000
Arm-Valve Actuating	87-26-540-1	87-26-503	X-4130 Steel	90,000
Arm-Valve Actuating	87-26-540-2	87-26-503	X-4130 Steel	90,000
Axle-Assembly-Landing Gear (30SC)				
Wheel	87-31-528	87-31-520	AN-QQ-S-752 "C"	180,000 Spec. 25269
Ball-Piston End-Hydraulic Hand Pump	87-33-528	87-33-504	57-107-17	180,000
Bar-Catch Assembly Seat Safety				
Belt Lock	87-65-514-1	87-65-504	10083	65,000
Barrel-Flap Control Tube-Turnbuckle	75-64-061	87-03-809	57-107-17	125,000
Barrel-Turnbuckle Landing Gear Fairing	87-34-037	87-34-501	10083 (I)	125,000
Bearing-Ammunition Box	87-69-527	87-69-714	AN-QQ-S-757	80,000
Bell Crank-Brake Control Cylinder	87-32-519	87-32-501	AN-QQ-S-756 Condition C	125,000
Blast Tube-.50 Caliber Fixed Gun	87-69-766-2	87-69-771	Type 347-3805 AN-WW-T-861	80,000
Blast Tube-.50 Caliber Fixed Gun	87-69-766-1	87-69-770	Type 347-3805 AN-WW-T-861	80,000
Blast Tube-.50 Caliber Fixed Gun	87-69-766-3	87-69-772	Type 347-3805 AN-WW-T-861	80,000
Block-Landing Gear Side Strut Hinge	87-31-527-1	87-31-901	10083 (I)	150,000
Block-Forging-Landing Gear Side Strut Hinge	87-31-534	87-31-527	10083 (I)	150,000
Block-Supporting Feed Chute-Inboard Wing Gun	87-69-533	87-69-701	10083	65,000
Body-Hydraulic Hand Pump	87-33-067	87-33-504	Commercial SAE X1335	120,000
Bolt-Adapter Wing Gun	67-69-560	87-69-917	AN-QQ-S-752	125,000
Bolt-Aileron Control Arm	75-05-024	75-05-018	57-107-17	125,000
Bolt-Cabin Pulley Rear	87-25-642	87-25-570	AN-QQ-S-689 "C"	65,000
Bolt-Clamp-Tail Wheel Position Indicator	87-66-692	87-66-504	57-107-17	65,000
Bolt-Clevis-Elevator Control Rear Horn	75-64-112	87-64-501	57-107-17	125,000
Bolt-Engine Bearer to Fire Wall-Rear	87-22-034-6	87-22-702	57-107-17	125,000
Bolt-Engine Bearer to Fire Wall-Rear	87-22-034-7	87-22-702	57-107-17	125,000
Bolt-Elevator Trim Tab Control	87-13-020	87-13-501-20	57-107-17	125,000
Bolt-Engine Mount Vib Absorber Housing	87-22-532	87-22-702	57-107-17	125,000
Bolt-Eye-Oil System	87-50-044	87-46-702	57-107-17	125,000
Bolt-Kingpin-Wing to Fuselage	87-21-642	87-511	10074	150,000
Bolt-Landing Gear Inner Strut Hinge	75-31-061	87-31-901	57-107-18 Condition C	120,000
Bolt-Landing Gear Oleo Strut Scissors	75-31-054	87-31-913	57-107-18 Condition C	Core Strength 120,000
Bolt-Landing Gear Oleo Strut Scissors	87-31-937	87-31-910	57-107-18	120,000
Bolt-Landing Gear Oleo Strut Scissors Joint	87-31-939	87-31-910	57-107-18	Core Strength 120,000
Bolt-Landing Gear Retr Cylinder End	75-31-065	87-31-501	57-107-18	Core Strength 120,000
Bolt-Landing Gear Retracting Mechanism Arm	75-31-066	87-31-901	57-107-18	120,000 Core Strength

RESTRICTED

T. O. No. 01-25CK-3

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Bolt-Landing Gear Retracting Mechanism Links	75-31-064	87-31-901	57-107-18	120,000
Bolt-Pedal-Stop Special	75-64-037	87-64-501	10083 (I)	Core Strength 125,000
Bolt-Release Handle Locking Bar	87-25-592	87-25-506	57-107-17	65,000
Bolt-Retaining-Cabin Control Handle	87-25-590	87-25-571	57-107-17	125,000
Bolt-Bell Crank-Flap Control	75-03-317	87-03-809	57-107-17	125,000
Bolt-Eye-Rudder Pedal	75-63-004	87-63-501	57-107-17	125,000
Bolt-Six Gun Install Wing-.50 Caliber	87-69-762	87-69-701	57-107-17	125,000
Bolt-Special-Cabin Control Pulley	87-25-611	87-25-570	57-107-17	90,000
Bolt-Special Engine Mount Attach	87-21-598-2	87-21-705	AN-QQ-S-689 Condition C	150,000
Bolt-Tail Erection-Elevator	75-15-013	87-15-501	57-107-17	125,000
Bracket Assembly-Trunnion-Front Wing Gun	87-69-537	87-69-701	11062	125,000
Bracket-Auto Recognition Device	87-71-511-2	87-71-529	AN-WW-T-850	95,000
Bracket-Bomb Rack Support	87-70-517	87-70-501	AN-QQ-S-752	100,000
Bracket-Carburetor-Air Heat Tube	87-51-534	87-52-508	57-136-8	65,000
Bracket-Door Propeller Station 9-10	87-21-528	87-21-526	11068 Temper 1/2 Hard	150,000
Bracket-Gun Trunnion-Front	80905		11062	125,000
Bolt-Landing Gear Side Strut	75-31-062	87-37-901	57-107-18	120,000
Bracket-Pulley-Ground Charger	87-69-987	87-69-988	AN-QQ-S-685 Condition A	Core Strength 85,000
Bracket-Pulley-Parking Brake	87-32-531	87-32-532	57-136-8	65,000
Bracket-Pulley Rudder Run-around Cable	75-64-093-1	87-64-501	57-108-2	90,000
Bracket-Seat Safety Belt Attaching	87-65-535	87-65-504	57-136-8	65,000
Bracket-Seat Safety Belt Plunger Attaching	87-65-517	87-65-533	52-136-8	65,000
Bracket-Top-Holding Strut Landing Gear Fairing Door	87-34-021	87-34-525	10083 (I)	65,000
Bushing-Bell Crank-Bomb Rack Cocking	87-70-544	87-70-501	57-180-2	90,000
Bushing-Engine Vib. Absorber Unit Housing	87-22-528	87-22-712	10083 (I)	90,000
Bushing-Hydraulic Tank Reducer	87-33-089	87-33-018	57-107-17	150,000
Bushing-Landing Gear Hydraulic Arm	75-31-060	87-31-521	10083 (I)	150,000
Bushing-Landing Gear Oleo Strut Upper Trunnion	75-31-040	87-31-041	10083 (I)	90,000
Bushing-Rear Mount Wing Gun	87-69-561	87-69-500	10083 (I)	65,000
Bushing-Tail Wheel Station 13 Lower Fuselage	75-21-167	75-21-057	10083 (I)	150,000
Bushing-Trunnion-Landing Gear Oleo Strut Upper	75-31-041	87-31-041	10083 (I)	90,000
Button-Wing Gun Adapter-Front	87-69-566	87-69-511	10083 (I)	125,000
Button-Wing Gun Adapter-Front	87-69-596	87-69-916	AN-QQ-S-752 Condition C	65,000
Cable End	87-81-027	87-81-501	57-107-17	125,000
Cam Shaft Assembly	87-33-040	87-33-513		120,000
Cap-Inner Fitting-Landing Gear Oleo Strut	75-31-013	87-31-559	AN-QQ-S-756 Condition D	150,000
Cap-Landing Gear Oleo Strut	87-31-547	87-31-910	11062	180,000

Revised May 30, 1943

- 3 -

RESTRICTED

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Cap-Landing Gear Oleo Strut Outer Fitting	87-31-546	87-31-548	10083 (I)	150,000
Cap-Outer Fitting Landing Gear Oleo Strut	75-31-011	87-31-548	10083 (I)	150,000
Cap-Tail Wheel Post Bearing Housing	87-37-932	87-37-901	10083 Amend I	150,000
Cap-Tail Wheel Retracting Strut Cylinder	75-37-019	87-37-905	AN-QQ-S-689	125,000
Case Chute Assembly Wing Gun No. 1	87-69-557	87-03-833	11068 1/2 Hard	150,000
Case Chute Assembly Wing Gun No. 2	87-69-556	87-03-833	11068 1/2 Hard	150,000
Case Chute Assembly Wing Gun No. 3	87-69-708	87-03-833	11068 1/2 Hard	150,000
Channel-Bell Crank Landing Gear Warning Switch Assembly	75-66-175-1	75-66-175	57-136-8	90,000
Channel-Counter Weight Assembly Rudder	87-14-603-3	87-14-901	57-136-8	65,000
Channel-Support-Cable Drum-Aileron Control	75-64-053-3	87-64-034	57-136-8	90,000
Channel-Torque Tube-Rudder Horn and Lower Bearing	75-14-033-2	75-14-012-5	57-136-8	100,000
Channel-Torque Tube Rudder Horn and Lower Bearing	75-14-033-3	75-14-012-5	57-136-8	100,000
Clamp-Cabin Control Cable	87-25-606	87-25-608	10083	90,000
Clamp-Engine Mount Bolt Puller	87-88-584-1	87-88-587	10083 (I)	150,000
Clamp-Landing Gear Retracting Strut Lines	75-33-134	87-31-505	57-136-8	125,000
Clamp-Drop Control Fair-Lead	87-52-524	87-52-702	57-136-8	65,000
Clevis-Aileron Control Link	75-64-068	75-64-066	57-107-17	125,000
Clevis-Hoisting Wing	87-88-522	87-88-509	57-136-8	65,000
Clevis-Strut End-Control Stick Stop	75-64-104	75-64-004	57-107-17	125,000
Clevis-Turnbuckle Assembly Fletner Control	75-64-110-1	75-64-110	57-107-17	125,000
Clevis-Tail Wheel Door Operating	87-37-024	87-37-901	57-107-19	65,000
Clip-Feed Chute Attach .50 Caliber Wing Gun	87-69-723-2	87-69-709	AN-QQ-S-772—Class-2 Comp G—Condition C-2	150,000
Clip-Feed Chute Attach .50 Caliber Wing Gun	87-69-723-1	87-69-710	AN-QQ-S-772—Class-2 Comp G—Condition C-2	150,000
Clip-Handle Attaching	87-69-731-1	87-69-714	11068 1/2 Hard	150,000
Clip-Hinge-Tie Down Ring	75-03-150	75-03-176	57-136-8	90,000
Clip-Inner-Landing Gear Fairing-Front	87-34-038	87-31-910	57-136-8	125,000
Clip-Inner-Landing Gear Fairing-Front	87-34-038	87-31-913	57-136-8	125,000
Clip-Instrument Flying Hood Shock Cord	87-88-582	87-21-901	AN-QQ-685	125,000
Clip-Shaft Support	87-26-539-1	87-26-503	57-136-8	125,000
Clip-Shaft Support	87-26-544	87-26-503	57-136-8	125,000
Collar-.50 Caliber Blast Tube	87-69-765	87-69-772	AN-WW-T-858 Type 347	75,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Collar-Engine Mount Vibration Absorber Unit	87-22-529	87-22-522	10083	90,000
Collar-Rudder Lower Hinge	75-14-016	75-14-012-5	57-180-2	100,000
Collar Starter Shaft-Crank Extension	87-43-519-2	87-43-501	57-180-2 (I)	90,000
Counter Balance Elevator	87-13-518-2	87-13-501-20	57-108-2	90,000
Cylinder Assembly Spring Strut-Landing Gear Fairing Door	87-34-018	87-34-016	57-180-2	100,000
Cylinder Forging Landing Gear Oleo	87-31-915	87-31-916	11062	65,000
Cylinder-Landing Gear Oleo Strut	87-31-916	87-31-921	11062	180,000
Cylinder-Landing Gear Retracting Strut	87-33-510	87-31-505	11062	180,000
Cylinder-Panel Flap Actuating Mech.	75-64-071	87-64-004	11062	125,000
Cylinder-Tail Wheel Retracting Strut	87-37-920	87-37-905	11062	150,000
Cylinder-Tail Wheel Oleo	87-37-013	87-37-905	11062	150,000
Doubler Plate Gun No. 2	87-03-611	87-03-901	AN-QQ-S-757	80,000
Doubler Plate Gun No. 3	87-03-836	87-03-901	AN-QQ-S-757	80,000
Door Landing Gear Fairing	87-34-017	87-34-016	57-107-17	100,000
Dowel-Special-Spinner Locating	87-42-528	87-42-532	Comm. S. R.	80,000
End Elevator Control-Jackshaft	75-64-039	87-64-510	57-107-17	125,000
End-Landing Gear Retracting Cylinder Piston	75-33-015	87-31-005	11062	150,000
End-Landing Gear Retracting Cylinder Piston	75-33-015-1	87-33-515	11062	150,000
End-Landing Gear Retracting Cylinder Piston	87-33-515	87-33-505	11062	150,000
End-Lower Landing Gear Oleo Strut Plunger	87-31-515	87-31-512	10083	125,000
End-Seat Support Tube	75-65-004	87-65-502	57-107-19	90,000
End-Threaded-Aileron Control Link	75-64-067	75-64-066	57-107-17	125,000
End-Turnbuckle	75-64-110-2	75-64-110	57-107-17	125,000
End-Turnbuckle	75-64-110-3	75-64-110	57-107-17	125,000
End-Upper Landing Gear Oleo Strut Plunger	87-31-014	87-31-512	10083 (I)	125,000
Extension-12.50" Tail Wheel Knuckle	85-37-022	87-37-550	11062	180,000
Extension-Shackle Assembly-Belly Tank	87-45-533-5	87-45-508	AN-QQ-S-685	95,000
Eyebolt	87-64-053	87-21-605	57-107-17	125,000
Eyebolt-Landing Gear Fairing	87-34-036	87-34-501	57-107-17	125,000
Eyebolt-Steerable Tail Wheel Control	75-37-075	75-37-076	57-107-17	125,000
Eyebolt-Wheel Position Indicator	75-66-109-3	75-37-019	AN-QQ-S-689	125,000
Filler Strip-Support-Station No. 122				
Ammunition Box No. 2	87-69-716-2	87-03-809	AN-QQ-S-757	80,000
Filler-Support-Propeller Control-Front	87-52-520-4	87-52-702	57-180-2 Type I	65,000
Fitting-Bomb Rack Mounting Front	87-45-519	87-45-508	AN-QQ-S-685	90,000
Fitting-Diagonal Tube to Engine Bearer-Front	87-22-513	87-22-512	10083	65,000
Fitting-Expanding Ring-Oil Cooler Support	87-50-072	87-46-571	57-107-17	65,000
Fitting-Engine Mount Bearer Tube	87-22-516-1	87-22-531	AN-QQ-S-756 Condition C	150,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Fitting-Forging-Drag Truss Retracting Tail Wheel Front	87-37-526	87-37-525	10083 (I)	150,000
Fitting Forging-Inboard Landing Gear Hinge	87-31-940	87-31-918	10083	150,000
Fitting Forging-Landing Gear Inboard Wing	87-31-922	87-31-926	11062	65,000
Fitting-Forging Outboard Landing Gear Hinge	87-31-533	87-31-517	AN-QQ-S-752	150,000
Fitting-Front-Cabin Support	87-25-515	87-25-501	10083	125,000
Fitting Fuse Station No. 1 Lower	87-21-593	87-21-402	AN-QQ-S-756	150,000
Fitting-Ground Charger	87-69-990	87-69-988	AN-QQ-H-201	125,000
Fitting-Gun Adapter Wing Gun	87-69-547	87-69-500	AN-QQ-S-756	150,000
Fitting-Inboard Landing Gear Hinge	87-31-918	87-31-938	11083	150,000
Fitting-Inner Strut Hinge Landing Gear	75-31-012	87-31-906	10083 (I)	150,000
Fitting-Inner Strut Hinge Landing Gear	87-31-906-4	87-31-901	10083 (I)	150,000
Fitting-Jack Pad-Panel	75-03-048	87-03-383	10083 (I)	150,000
Fitting-Landing Gear Oleo Strut Axle	87-31-537	87-31-520	10083	150,000
Fitting-Landing Gear Tow Ring and Jack Pad	87-31-507	87-31-520	AN-QQ-S-756	150,000
Fitting-Landing Gear Wing Web No. 1	75-31-019	87-31-906-1	10083 (I)	150,000
Fitting-Line-Landing Gear Retracting Strut Hydraulic	87-33-539-1	75-33-038-4	AN-QQ-S-689 Condition D	150,000
Fitting-Line-Landing Gear Retracting Strut Hydraulic	87-33-539-2	75-33-038-5	AN-QQ-S-689 Condition D	150,000
Fitting-Link Assembly Aileron	87-64-911	75-64-066	AN-QQ-S-689	125,000
Fitting-Outboard Landing Gear Hinge	87-31-517	87-31-548	AN-QQ-S-752 Condition C	150,000
Fitting-Rear-Cabin Support	87-25-516	87-25-501	10083	125,000
Fitting-Rib to Counterweight Rudder	75-14-023	87-14-603	57-136-8	65,000
Fitting-Upper Engine Mount at Fire Wall	87-22-514	87-22-512	10083	65,000
Follower-Poppet Valve	75-33-112	87-33-513	57-107-18	120,000
Follower-Tail Wheel Retracting Strut	75-37-080	87-37-905	10083 (I)	125,000
Fork-Landing Gear Fairing Door Lock	87-34-529	87-34-501	10083	65,000
Fork-Tail Wheel Position Indicator	87-66-176	87-66-901	57-107-17	125,000
Fork-Turnbuckle	87-37-539	87-37-901	57-107-19	125,000
Fork-Turnbuckle Landing Gear Fairing	87-34-035	87-34-501	10083 (I)	125,000
Gear-Fuel Cock Control	75-44-038	87-44-514	AN-QQ-S-752 Condition C	125,000
Gear-Landing Gear Oleo Strut Aligning	87-31-936	87-31-910	SAE No. 3245 Steel	200,000
Grip-Cabin Control Cable	87-25-607	87-25-608	10083	90,000
Guard-Support-Cable Drum-Aileron Control	75-64-053-2	87-64-034	57-136-8	90,000
Guide-Bulkhead Panel and Junction	87-06-028-4	87-06-528	AN-QQ-S-772 II Comp G Condition C-2	175,000
Guide-Tail Wheel Retracting Strut Piston	87-37-016	87-37-905	57-180-2	90,000
Gusset-Bracket-Tie Down Ring	75-03-151-3	75-03-176	57-136-8	90,000
Gusset-Support-Cable Drum-Aileron Control	75-64-053-4	87-64-034	57-136-8	90,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Handle-Ammunition Box	87-69-525	87-69-713	57-180-2 Type-1	90,000
Handle-Assembly Cabin	75-25-055	87-25-571	57-107-19	125,000
Handle-Ground Charger	87-69-989	87-69-988	AN-WW-T-850	95,000
Hinge Pin Lower Trim Tab Control	87-14-552-2	87-14-553	57-107-17	125,000
Hinge Pin Upper Trim Tab Control	87-14-552-1	87-14-553	57-107-17	125,000
Hinge-Tie Down Ring	75-03-149	75-03-176	57-136-8	125,000
Hook-Pulley Bracket-Ground Charger	87-69-994	87-69-998	AN-QQ-S-752 Condition C	125,000
Horn Forging-Tail Wheel Steerable	87-37-524	87-37-522	AN-QQ-S-756 Condition C	150,000
Horn-Torque Tube Rudder Horn and Lower Bearing	75-14-011	75-14-033	10083 (I)	100,000
Housing-Poppet Valve	75-33-103	87-33-022	10083	125,000
Housing-Poppet Valve	87-33-514	87-33-513	10083	125,000
Knuckle-12.50 Smooth Contour Tail Wheel	87-37-541	87-37-550	11062	180,000
Lever-Cabin Control Cam	87-25-632	87-25-571	57-136-8	125,000
Lever-Heater Shaft	87-81-926-1	87-81-026	57-107-17	65,000
Lever-Panel Release	87-25-521	87-25-501	10083	125,000
Link-Elevator Cable Upper Horn	87-64-048-1	87-64-501	57-136-8	125,000
Link-Elevator Cable Upper Horn	87-64-048-2	87-64-501	57-136-8	125,000
Link-Landing Gear Oleo Strut Scissors	87-31-924	87-31-910	11062	180,000
Link-Landing Gear Oleo Scissors Upper	87-31-923	87-31-910	11062	180,000
Link-Landing Gear Retracting Mechanism Lower	87-31-539	87-31-524	11062	150,000
Link-Landing Gear Upper	87-31-519-3	87-31-901	11062	150,000
Link-Landing Gear Upper	87-31-519-4	87-31-901	11062	150,000
Link-Landing Gear Retracting Mechanism Lower	87-31-524-1	87-31-524	AN-QQ-S-756 Condition C	150,000
Link-Landing Gear Retracting Mechanism Upper	87-31-021	87-31-519	11062	150,000
Link-Rudder Cable Idler Pulley	81-64-017	87-64-501	57-136-8	125,000
Link-Seat Safety Belt Torque Tube	87-65-534	87-65-504	57-136-8	65,000
Link-Universal-Control Stick Stop	75-64-105	75-64-004	57-107-17	100,000
Lock-Blast Tube Fairing	87-69-920	87-69-911	AN-QQ-S-757	100,000
Locking Plate-Rear Mount Wing Gun	87-69-541	87-69-500	AN-QQ-S-752	125,000
Lug-Tail Wheel Retracting Strut	81-37-130	87-37-905	11062	125,000
Nipple-Fitting-Solderless Steel	75-33-101	87-32-501	57-107-17	150,000
	HT-5-2330			
Nipple-Line-Landing Gear Retracting Strut Hydraulic	75-33-101- FT-5-2330	75-33-038-5	57-107-17	150,000
Nipple-Special-Hydraulic Flap Line	75-33-115	87-33-901	57-107-17	150,000
Nut-Fitting Solderless Steel	75-33-101- BT-5-2330	75-33-038	57-107-17	150,000
Nut-Landing Gear Oleo Strut Upper Trunnion	75-31-043	87-31-041	AN-QQ-S-689 Condition C	125,000
Nut-Line-Landing Gear Retracting Strut Hydraulic	75-33-101- BT-5-2330	75-33-038-5	57-107-17	150,000
Nut-Lower-Hydraulic Shuttle-Valve	87-33-523	87-33-520	57-107-17	125,000
Nut-Special-Stick Assembly	75-64-111	87-64-501	57-107-17	
Nut-Sway Brace Check	87-70-019	87-70-500	57-107-17	65,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Nut-Upper-Hydraulic Shuttle Valve	87-33-522	87-33-520	57-107-17	125,000
Packing Ring-Hydraulic Hand Pump	87-33-063	87-33-504	57-107-17	150,000
Pawl-Landing Gear Ret Strut	75-33-021	87-31-505	57-107-18	120,000
Pin-Assembly-Cabin Control Lock	87-25-629	87-25-571	10079 Condition 1A	Core Str 75,000
Pin-Cabin Lock Bar	87-25-560-1	87-25-623	10083	65,000
Pin-Cabin Lock Bar	87-25-560-2	87-25-623	10083	65,000
Pin-Control Arm Position Lock	87-25-574	87-25-571	10079 Condition 1A	75,000
Pin-Engine Mount Bolt Puller	87-88-585	87-88-587	10083 (I)	150,000
Pin-Folding Rear Support-Wing Gun	87-69-735	87-69-701	AN-QQ-5-689 Condition C	125,000
Pin-Landing Gear Oleo Strut Metering	75-31-050	87-31-510	57-107-17	125,000
Pin-Landing Gear Retracting Strut Indicator	75-33-026-2	87-31-505	57-107-17	125,000
Pin-Landing Gear Retracting Strut Indicator	75-33-026-1	87-31-505	57-107-17	125,000
Pin-Ratchet Flap Control Lever	87-29-043	87-29-030	57-107-18	120,000
Pin-Ring Weld Assembly Air Duct to Radiator	87-50-049-6	87-50-049	10079 Condition 1A	90,000
Pin-Starter Crankshaft	87-43-523-1	87-43-519	57-107-3A	231,600
Pin-Starter Crankshaft	87-43-523-2	87-43-519	57-107-3A	231,600
Pin-Tain Wheel Oleo Metering	87-37-516	87-37-510	57-107-17	125,000
Pin-Tail Wheel Knuckle Extension	85-37-023-1	87-37-550	10083 (I)	125,000
Pinion-Landing Gear Oleo Strut Aligning	87-31-935	87-31-910	SAE No. 3245	200,000
Piston Forging-Landing Gear Oleo Strut	87-31-914	87-31-912	AN-QQ-S-756 Condition C	65,000
Piston-Hydraulic Hand Pump	87-33-048	87-33-504	57-107-17	150,000
Piston-Landing Gear Oleo Strut	87-31-912	87-31-910	AN-QQ-S-756	180,000
Piston-Landing Gear Retr Strut	87-31-027	87-31-505	11062	180,000
Piston-Tail Wheel Oleo Strut	87-37-514	87-37-510	AN-QQ-S-756	150,000
Piston-Tail Wheel Retr Strut	87-37-919	87-37-905	11062	180,000
Plate-Bracket-Tie Down Ring	75-03-151-1	75-03-176	57-136-8	90,000
Plate-Bracket-Tie Down Ring	75-03-151-2	75-03-176	57-136-8	90,000
Plate-Inboard-Trailing Edge Panel	87-93-406	87-03-809	10083	125,000
Plate-Lift Tube Support	87-21-559-2	87-21-559	57-136-8	65,000
Plate-Optical Sight Support	87-69-609	87-69-615	11068 Grade A Temper 1/2 Hard	150,000
Plate-Reinforcement Web 3 Lower	87-06-530	87-06-901	57-136-8 AN-QQ-S-685	150,000
Plate-Rub-Cabin Control	87-25-589	87-25-571	AN-QQ-S-772 Cl 2 Comp G—Condition C-2	150,000
Plate-Rudder Pedal Adjustment	87-63-504-2	87-63-501	57-136-8	125,000
Plate-Seat Safety Belt Lock	87-65-524	87-65-504	57-136-8	65,000
Plate-Shackle Control Cable	87-64-051	87-64-501	57-136-8	125,000
Plate-Shackle Control Cable	75-64-113	87-64-501	57-136-8	125,000
Plate-Spring Assembly Retaining Feed Chute Gun No. 2	87-69-724-2	87-69-724	11068 1/2 Hard	150,000
Plate-Spring Assembly Retaining Feed Chute-Outboard Gun No. 3	87-69-720-2	87-69-720	11068 1/2 Hard	150,000
Plate-Strap Assembly Fuselage Fuel Tank	87-45-579-2	87-44-509	57-136-8	90,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Plate-Support-Cable Drum-Aileron Control	75-64-053-1	87-64-034	57-136-8	90,000
Plug-Brace-Fuel Cock	75-44-506-2	87-44-509	10083 (I)	90,000
Plug-Cylinder Flap Actuating Mechanism	75-64-073	87-64-073	11062 AN-QQ-S-756 Condition C	125,000
Plug-Shaft Assembly Starter Crank	87-43-524-2	87-43-519	AN-QQ-S-646	150,000
Rack-Support Assembly Cowl Flap Control	87-29-529	87-29-531	57-107-18	120,000
Reinforcement-Support-Intermediate-Station No. 100	87-69-719-2	87-03-901	AN-QQ-S-757	80,000
Reinforcing-Channel-Rudder Nose	87-14-014	87-14-601	AN-QQ-S-685	65,000
Retainer-Blast Tube	87-69-764	87-69-701	AN-WW-T-858	75,000
Retainer-Packing-Hydraulic Hand Pump	87-33-062	87-33-504	57-107-17	125,000
Retainer Plate-Reflector Support Assembly-Optical Sight	87-69-685	87-69-593	11068 1/2 Hard	150,000
Retainer-Poppet Valve	87-33-021-1	87-33-513	10083	65,000
Retainer-Poppet Valve	87-33-021-2	87-33-513	10083	65,000
Retainer Spring-Valve Body	87-33-100	87-33-513	11068 1/2 Hard	150,000
Ring-Air Duct to Radiator	87-50-049-1	87-50-047	57-180-3 Grade 155	90,000
Ring-Hoisting-Wing	87-88-521	87-88-509	57-107-19	125,000
Ring-Landing Gear Oleo Strut Piston	75-31-048	87-31-913	10083 (I)	90,000
Ring-Station No. 205 Tie Down-Panel Web No. 2	75-03-073	75-03-176	10083 (I)	125,000
Rod End-Flap Control	87-64-025-1	87-64-040	10083 (I)	125,000
Rod End-Flap Control-Adjustable	87-64-025	87-64-040	10083 (I)	125,000
Rod End-Cockpit Bomb Control	87-70-037-1R	87-70-534	10083 (I)	65,000
Rod End-Cockpit Bomb Control	87-70-037-L/R	87-70-501	10083 (I)	65,000
Rod End-Cockpit Bomb Control	87-70-037-2L/R	87-70-026	10083 (I)	65,000
Rod End-Oil Cooler Scoop Controls	75-28-135	1081-D-2B	10083 (I)	100,000
Rod End-Small-Rod Assembly Cowl Flap Control	87-29-039	87-29-031	10083 (I)	65,000
Rod-Extension-Breeze-Elevator	87-13-040	87-13-501-20	57-107-17	125,000
Screw-Expanding Ring-Oil Cooler Support	87-50-071	87-46-571	57-107-17	125,000
Screw-Landing Gear Oleo Strut	95593	87-31-510		125,000
Screw-Socket Head Wing Match Angle	87-03-290	87-06-901	3135 Comm	125,000
Screw-3/8 Socket Head Cap-Wing Match Angle	87-03-404	87-06-901	AN-QQ-S-756 Condition C	125,000
Screw-Soldering Flap and Landing Gear Position Indicator	87-66-061	87-66-555-1	57-107-17	125,000
Screw-Special Drum Support	87-64-038	87-64-034	57-107-17	125,000
Screw-Sway Brace Wing Bomb	87-70-018	87-70-500	57-101-17	125,000
Screw-Wing Match Angle	87-03-290-12A	87-06-901	Comm 3135	125,000
Segment-Hydraulic Landing Gear Control	87-33-031	87-33-513	57-107-18	120,000
Set-Hydraulic Bleeder Valve	200430	87-33-025	57-107-17	65,000
Set Screw-Carburetor Control	81-52-218	81-81-226	AN-QQ-P-421	
Set Screw-Rudder Trim Tab Control	87-14-552-3	87-14-553	57-107-17	125,000
Shaft-Auxiliary Cowl Flap Control	87-29-022	87-29-520	57-180-2	180,000

Nomenclature	Part No.	Next Assembly	Material	Heat Treat
				Tensile Strength Pounds Per Square Inch
Shaft-Cabin Control Drive	87-25-575	87-25-571	10083	125,000
Shaft-Carburetor Air Control	87-52-542	87-52-508	57-107-19	100,000
Shaft-Elevator Control Jackshaft	87-64-036	87-64-003	57-107-17	125,000
Shaft-Engine Mount Bolt Puller	87-88-029	87-88-587	57-107-17	150,000
Shaft-Flap Actuating Mechanism	87-64-057	75-64-072	11062	125,000
Shaft-Fuel Cock Control-Lower	75-44-039	87-44-514	57-107-17	125,000
Shaft-Fuel Cock Control-Upper	75-44-076	87-44-514	57-107-17	125,000
Shaft-Starter-Crank	87-43-524-1-15 $\frac{1}{16}$	87-43-519	57-180-2	150,000
Shutter-Blast Tube Fairing	87-69-798	87-69-911	AN-QQ-S-757	100,000
Sleeve-Feed Chute Station 89 $\frac{5}{8}$ -Weld Assembly	87-69-717	87-03-901	AN-QQ-S-757	80,000
Sleeve-Fuel Cock Control	75-44-077	87-44-534	57-180-2	100,000
Sleeve-Landing Gear Oleo Strut Piston	75-31-045	87-31-913	AN-WW-T-850	90,000
Sleeve-Line-Landing Gear Retracting Strut Hydraulic	75-33-101-T-5-2330	75-33-038-5	57-107-17	125,000
Sleeve-Starter Crankshaft	87-43-522-1	87-43-519	57-180-2 Type (I)	146,000
Spacer-Bell Crank Assembly	87-70-016	87-70-014	57-180-2	90,000
Spacer-Bell Crank Assembly-Outer	87-70-527	87-70-533	57-180-2	90,000
Spacer-Brake Control Cylinder Bell Crank	87-32-525	87-32-501	57-180-2	95,000
Spacer-Control Lever Cowl Flap Control	87-29-032	87-29-030-1	57-180-2	90,000
Spacer-Guide Pulley Cable	87-64-062	87-64-546	57-108-2	100,000
Spacer-Oil Cooler Support	87-46-575-2	87-46-702	10083 (I)	100,000
Spacer-Plate Assembly Carburetor to Duct	87-51-734-3	87-41-702	57-108-2 Type (I)	146,000
Spacer-Retracting Landing Gear Scissors	75-31-056	87-31-510	57-107-19	150,000
Spring-Control Lever-Cowl Flap Control	87-29-040	87-29-030	48-26	220,000
Spring-Landing Gear Retracting Strut	75-33-463	87-31-505	100-3 (I)	180,000
Spring-Assembly Retaining Feed Chute-Gun No. 2	87-69-724-1	87-69-724	10068 $\frac{1}{2}$ Hard	150,000
Spring-Assembly-Retaining Feed Chute-Gun No. 3	87-69-720-1	87-69-720	11068 $\frac{1}{2}$ Hard	150,000
Sprocket-Tab-Control-Rudder	75-64-078	87-64-006	10083 (I)	65,000
Stamping-Support Propeller-Control Front	87-52-520-1	87-52-702	57-136-8	65,000
Stiffener-Hat Section	87-69-732	87-69-714	11068 $\frac{1}{2}$ Hard	150,000
Stop-Cowl Flap-Control Lever	87-29-530	87-29-531	57-136-8	125,000
Stop-Engine Mount Vibration Absorber-Upper-Left-Hand Rear	87-22-533-1	87-22-702	10083 (I)	100,000
Stop-Engine Mount Vibration Absorber-Upper-Right-Hand Rear	87-22-533-2	87-22-702	10083 (I)	100,000
Stop-Engine Mount Vibration Absorber-Upper Front-Left-Hand	87-22-542-1	87-22-702	10083	100,000
Stop-Engine Mount Vibration Absorber-Upper Front-Right-Hand	87-22-542-2	87-22-702	10083	100,000
Stop-Hydraulic Landing Gear Control	87-33-030	87-33-090	57-107-18	120,000
Stop-Seat Assembly	87-65-503-6	87-88-504	57-136-8	150,000
Stop-Seat Assembly	87-65-503-7	87-88-504	57-136-8	150,000

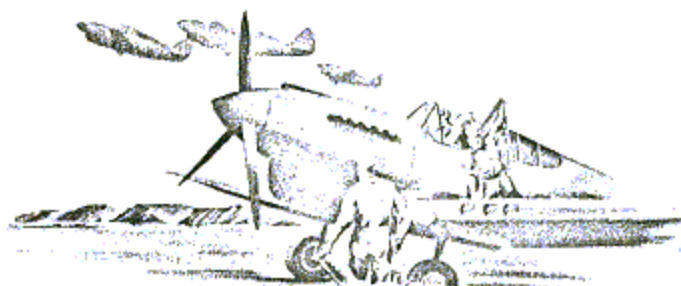
<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Stop-Valve-Hydraulic Check	87-33-080	87-33-071	57-107-17	65,000
Strap-Oil Cooler Support	87-46-575-1	87-46-702	57-136-8	100,000
Strap-Tie-Oil Cooler Support	87-46-575-3	87-46-702	57-136-8	100,000
Strap-Lower-Door Propeller Station 9-10	87-21-532	87-21-526	AN-QQ-S-757	150,000
Strap-Assembly Fuse-Fuel Tank	87-45-579-1	87-44-509	51-136-8	90,000
Strap-Assembly Fuse-Fuel Tank Front	87-45-097-1	87-44-509	57-136-8	90,000
Strap-Assembly Fuse-Fuel Tank Rear	87-45-096	87-44-509	57-136-8	90,000
Strap-Upper-Door Propeller Station 9-10	87-21-531	87-21-526	AN-QQ-S-757	150,000
Strip-Door Fastener Rubbing	87-21-645	87-21-401	11068 Grade A—1/2 Hard	150,000
Strut-Assembly Landing Gear Oleo Side	87-31-522-1	87-31-901	AN-QQ-S-756 Condition C	180,000
Strut Forging-Landing Gear Oleo Side	87-31-530	87-31-522	AN-QQ-S-756 Condition C	180,000
Stud Assembly Panel Jacking	87-03-531	87-88-505-17	57-107-17	125,000
Stud-Blast Tube Retainer	87-69-763	87-69-701	10068 1/2 Hard	75,000
Stud-Cabin Control Lock	87-25-628	87-25-571	57-107-17	65,000
Stud-Forward Support Auxiliary Fuel Tank	95029	75-43-433	10083	125,000
Stud-Landing Gear Oleo Strut Lower Trunnion	75-31-032	87-31-525	57-107-17	125,000
Stud-Landing Gear Hinge Fitting	87-31-558	87-31-548	57-107-17	150,000
Stud-Landing Gear Retracting Cylinder Support	87-33-518	87-33-542	57-107-17	125,000
Stud-Landing Gear Retracting Cylinder Support	75-33-018-1	87-33-542	57-107-17	125,000
Stud-Oil Tank Support	87-46-526-1	87-46-502	57-107-17	125,000
Stud-Oil Tank Support	87-46-526-2	87-46-502	57-107-17	125,000
Stud-Rudder Hinge Center-Fin	75-21-156	87-21-214	57-107-17	125,000
Stud-Rudder-Hinge Center-Fin	75-21-156-1	87-21-214	57-107-17	125,000
Stud-Stabilizer Attach Fitting	75-11-011	87-11-515	AN-QQ-S-756	150,000
Stud-Support-Propeller Control-Front	87-52-520-2	87-52-702	10083	65,000
Stud-Tail Wheel Retracting Strut Piston Actuator	75-37-025	87-37-905	11062	150,000
Support Assembly Intermediate Ammunition Box-Wing Gun	87-69-528	87-03-901	AN-QQ-S-757	80,000
Support-Assembly Intermediate Ammunition Box-Wing Gun	87-69-529	87-03-809	AN-QQ-S-757	80,000
Support-Belly Tank-Front	68027	75-45-433	10083 (I)	125,000
Support-Belly Tank-Rear	68028	75-45-433	10083 (I)	125,000
Support-Cabin Crank Arm	87-25-631	87-25-571	57-136-8	125,000
Support-Engine Mount-Vibration Absorber Housing-Rear Left-Hand	87-22-527-1	87-22-531	AN-QQ-M-181	150,000
Support-Engine Mount-Vibration Absorber Housing-Rear Right-Hand	87-22-527-2	87-22-531	AN-QQ-M-181	150,000
Support-Engine Mount-Vibration Absorber Housing-Front Left-Hand	87-22-527-3	87-22-531	AN-QQ-M-181	150,000
Support-Engine Mount-Vibration Absorber Housing-Front Right-Hand	87-22-527-4	87-22-531	AN-QQ-M-181	150,000
Support-Intermediate-Station No. 122	87-69-718	87-03-809	AN-QQ-S-757	80,000
Support-Intermediate-Station No. 122	87-69-718-1	87-03-901	AN-QQ-S-757	80,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Support-Landing Gear Retracting Strut	87-33-542-1	87-33-502	11062	150,000
Support-Lower-Ammunition Box No. 4- 50 Caliber-Wing Gun	87-69-529	87-03-901	AN-QQ-S-772	80,000
Support-Lower-Station No. 895/8 Ammunition Box No. 1	87-69-175	87-03-901	57-136-9 Grade I-SS	80,000
Support-Lower Station No. 122- Ammunition Box No. 2	87-69-716-1	87-03-901	AN-QQ-S-757	80,000
Support-Pitot Tube	75-66-064-2	75-66-063	57-108-2	90,000
Support-Rear-Auxiliary Fuel Tank	68028	70205	10083 II	125,000
Support-Rear Wing Gun	87-69-540	87-65-500	10083 (I)	125,000
Support-Seat Assembly	87-65-503-9	87-88-640	57-136-8	150,000
Support-Starter Crank Extension	87-43-512-14	87-43-501	57-136-8	95,000
Tab-Engine Mount	87-22-543-1	87-22-702	57-136-8	65,000
Tap Plate-Mounting-Starter Pedal	87-03-730	87-03-820	10083 (I)	65,000
Terminal-Fuse Fuel Tank Support	87-45-580	87-45-579	AN-QQ-S-685	90,000
Terminal-Swagged Type-Antenna	87-67-532	87-67-511	10079	75,000
Terminal-Tie Rod Aileron Trim Tab	87-05-035	87-05-501	57-107-17	125,000
Torque Shaft-Cowl Flap Control	87-29-528	87-29-520	57-180-2	150,000
Trunnion-Flap Control	75-08-013	87-08-501	57-107-17	125,000
Trunnion-Landing Gear Oleo Strut- Lower	87-31-525-1	87-31-913	AN-QQ-S-756 Condition C	150,000
Trunnion-Landing Gear Oleo Strut- Lower	87-31-525-2	87-31-913	AN-QQ-S-756 Condition C	150,000
Trunnion-Landing Gear Oleo Strut- Lower	87-31-549	87-31-525	AN-QQ-S-756	150,000
Trunnion-Landing Gear Oleo Strut- Upper	75-31-027	87-31-041	AN-QQ-S-756 Condition C	180,000
Tube-Brace-Fuel Cock	75-44-506-1	87-44-509	57-180-2	90,000
Tube-Bracket-Auto Recognition Device	87-71-511-3	87-71-529	AN-QQ-S-685	95,000
Tube-Control Assembly Fuel Cock (Type PK-3)		87-44-509	AN-WW-T-850	100,000
Tube-Control Assembly Fuel Cock (Type PK-3)	87-44-534-3	87-44-509	AN-WW-T-850	100,000
Tube-Control Assembly Fuel Cock (Type PK-3)	87-44-534-5	87-44-509	AN-WW-T-850	100,000
Tube-Drag Truss-Tail Wheel	87-37-513	87-37-901	57-180-2	150,000
Tube-Elevator Control-Jackshaft	87-64-541	87-64-510	57-180-2	90,000
Tube End-Spring Strut-Landing Gear Fairing Door	87-34-190	87-34-016	10083 (I)	100,000
Tube-Engine Bearer	87-22-515	87-22-531	57-180-2	180,000
Tube-Engine Mount Bracket Tube to Fire Wall	87-22-512-1	87-22-702	AN-WW-T-850	150,000
Tube-Engine-Mount-Lower Diagonal	87-22-518	87-22-702	57-180-2	95,000
Tube-Insert-Seat Assembly	87-65-503-5	87-88-640	57-180-2	150,000
Tube-Landing Gear Oleo Strut Plunger	87-31-532	87-31-512	57-180-2 (I)	125,000
Tube-Landing Gear Retracting Strut- Indicator	75-33-029-2	87-31-505	57-180-2	125,000
Tube-Pulley Bracket	75-64-093-2	87-64-501	57-108-2	90,000

<i>Nomenclature</i>	<i>Part No.</i>	<i>Next Assembly</i>	<i>Material</i>	<i>Heat Treat Tensile Strength Pounds Per Square Inch</i>
Tube-Ring Weld Assembly Air Duct to Radiator	87-50-049-5	87-50-049	57-180-2	90,000
Tube-Rod Assembly Elevator Push-Pull	87-64-509-1	87-64-501	57-180-2	90,000
Tube-Rod Assembly Propeller Control-Bell Crank to Governor	87-52-516-2	87-52-702	57-180-2 Type I	95,000
Tube-Seat Assembly	87-65-503-8	87-88-640	57-180-2	150,000
Tube-Side Support Seat Assembly	87-65-503-3	87-88-640	57-180-2	150,000
Tube-Side-Seat Assembly	87-65-504-4	87-88-640	57-180-2	150,000
Tube-Spreader Assembly Hoisting Sling-Front	87-88-018-2	87-88-018-10	AN-WW-T-850	90,000
Tube-Spreader Assembly Hoisting Sling-Front	87-88-018-3	87-88-018-11	AN-WW-T-850	90,000
Tube-Stick Control-Torque	75-62-019	87-62-501	57-180-2	100,000
Tube-Support-Crank Extension	87-43-512-6	87-43-501	57-180-2	95,000
Tube-Support-Crank Extension	87-43-512-7	87-43-501	57-180-2	95,000
Tube-Support-Crank Extension	87-43-512-8	87-43-501	57-180-2	95,000
Tube-Support-Crank Extension	87-43-512-9	87-43-501	57-180-2	95,000
Tube-Support-Crank Extension	87-43-512-11	87-43-501	57-180-2	95,000
Tube-Support-Crank Extension	87-43-512-13	87-43-501	57-180-2	95,000
Tube-Support-Propeller Control-Front	87-52-520-3	87-52-702	57-180-2 Type I	65,000
Tube-Top Section Rudder	75-14-032	75-14-012-5	57-180-2	100,000
Tube-Torque Lower Rudder	75-14-028	75-14-012-5	57-180-2	100,000
Tube-Torque-Rudder Center Bearing and Flap Control Support	75-14-027	75-14-012	57-180-2	100,000
Tube-Torque Tube Rudder Horn and Lower Bearing	75-14-033-1	75-14-012-5	57-180-2	100,000
Universal-Tail Wheel Door Operating-Single	75-37-045	87-34-501	10083 (I)	90,000
Universal-Tail Wheel Oleo Lower Joint	85-37-015	87-37-901	11062	150,000
Valve-Body-Hydraulic Check	87-33-079	87-33-071	57-107-17	65,000
Valve-Poppet	87-33-019	87-33-513	57-107-18	120,000
Valve-Stop-Hydraulic Check	87-22-080	87-33-071	57-107-17	65,000
Washer-Bracket-Tie Down Ring	75-03-151-4	75-03-176	57-136-8	90,000
Washer-Bushing-Aileron Control Arm	87-05-012	87-05-014	10083	65,000
Washer-Poppet Valve	87-33-020	87-33-513	10083	150,000
Washer-Poppet Valve	75-33-113-1	87-33-513	10083	150,000
Washer-Rudder Center Hinge	75-14-026	75-14-012-5	57-136-9 Gr 1SS	80,000
Washer-Rudder Center Hinge	75-14-026-1	75-14-012-5	57-136-9 Gr 1SS	80,000
Washer-Rudder Center Hinge	75-14-026-2	75-14-012-5	57-136-9 Gr 1SS	80,000
Washer-Support Cable Drum Aileron Control	75-64-053-5	87-64-034	57-136-8	90,000
Washer-Tail Wheel Retracting Strut Piston Actuator Stud	75-37-026	87-37-905	11062	150,000
Wrench-Hand Pump	87-88-032	87-88-505-4	57-136-8	150,000
Wrench-Metering Pin-Landing Gear and Tail Wheel	87-88-031	87-88-505-2	57-180-2	150,000

2. FINISHES—GENERAL.

At overhaul, the application of protective coatings, finishes, colors, markings, and insignia will conform to T.O. Nos. 01-1-3, 07-1-1, Specification No. 3-1.0-H and Drawing No. 87-91-501. The data in the above publications and Curtiss Finish Specification No. S-615g including Amendment No. 2 of November 29, -940, were followed by the manufacturer in the original construction of the airplane.



SECTION III

DISMANTLING, CLEANING AND INSPECTION

1. GENERAL.

a. The work outlined in this section consists of preparing the airplane for overhaul. The inspections accomplished should be as complete as possible at this stage of disassembly. Major subassemblies which cannot be inspected should be marked "Repairable" and routed to the subassembly group for further disassembly, inspection, repair, and assembly as outlined in section IV.

b. The following is a list of special airplane tools furnished by the contractor for use in connection with the work prescribed in this section.

Drawing No.	Description
87-88-031	Wrench—Metering Pin—Landing Gear and Tail Wheel
87-88-030	Wrench—Actuating Strut—Landing Gear Wing Flap
87-88-032	Wrench—Hand Pump
87-88-019	Hoisting Sling—Tail
87-88-020	Hoisting Sling—Front
87-88-509	Hoisting Sling—Wing
87-88-587	Puller Assembly—Engine Mount Bolts
87-88-556	Bag—Duffle
87-88-524	Pad—Panel Throw Over—Gun Servicing
87-88-525 R/L	Pad—Walkover (Wing)
87-64-570	Parking Harness
87-69-737	Ratchet Wrench—Gun Mounting
87-88-594	Locating Tool—Filler Opening—Wing Fuel Cells
87-88-595	Locating Tool—Gage Opening—Wing Fuel Cells
87-88-597	Wrench—Nut—Wing Fuel Cell
87-88-596	Wrench—Filler Cap—Wing Fuel Cell
87-03-531	Stud Assembly—Panel—Jacking

Drawing No.

Description

A 5585	Alemite Hydraulic Gun
A 7393	High Pressure Hand Pump (Cleveland Pneumatic Tool Company)

c. All countersunk, recessed head screws originally used on this airplane are of the Reed and Prince type. The use of any screw driver other than the Reed and Prince type will result in mutilations of the screw head and is therefore not recommended.

2. DISMANTLING.

a. General.—General instructions for removing major assemblies are given in section IV, T.O. No. 01-25CK-2 as follows:

- (1) Wing—Section IV, paragraph 2.b.
- (2) Empennage—Section IV, paragraph 3.b.
- (3) Landing Gear—Section IV, paragraph 7.d.
- (4) Tail Wheel—Section IV, paragraph 8.b.
- (5) Engine—Section IV, paragraph 9.c.

b. Precautions and Instructions.

(1) Precautions.—Remove battery and battery box, then tape battery cable terminals. The cautions and warnings contained in the Service Manual T.O. No. 01-25CK-2 will be observed.

(2) Instructions.

(a) The landing gear and wing flaps should be extended before disconnecting the hydraulic system lines for removal of the wing, unless an auxiliary hydraulic system is available which may be attached to the wing as shown in figure 2. The unit shown in figure

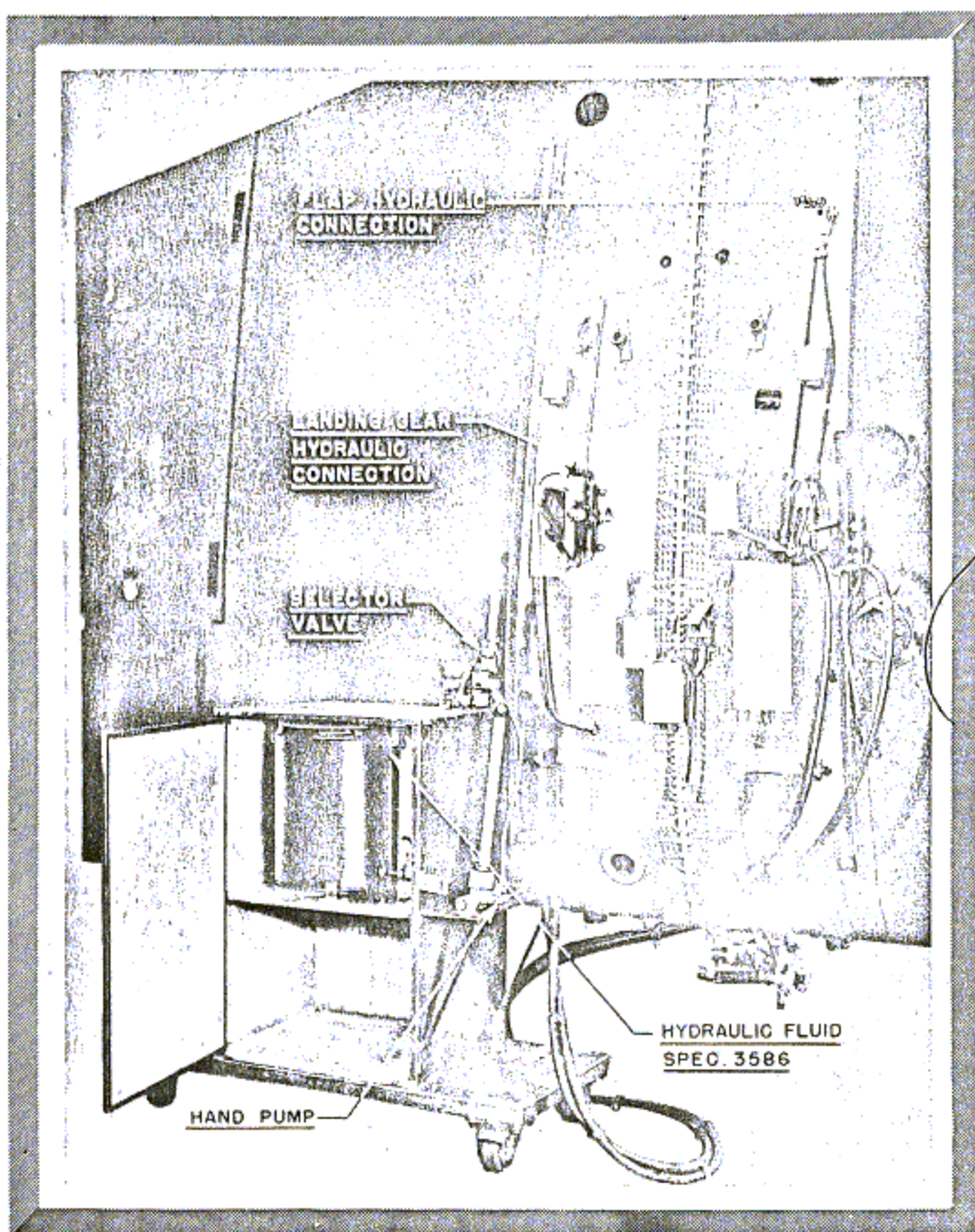


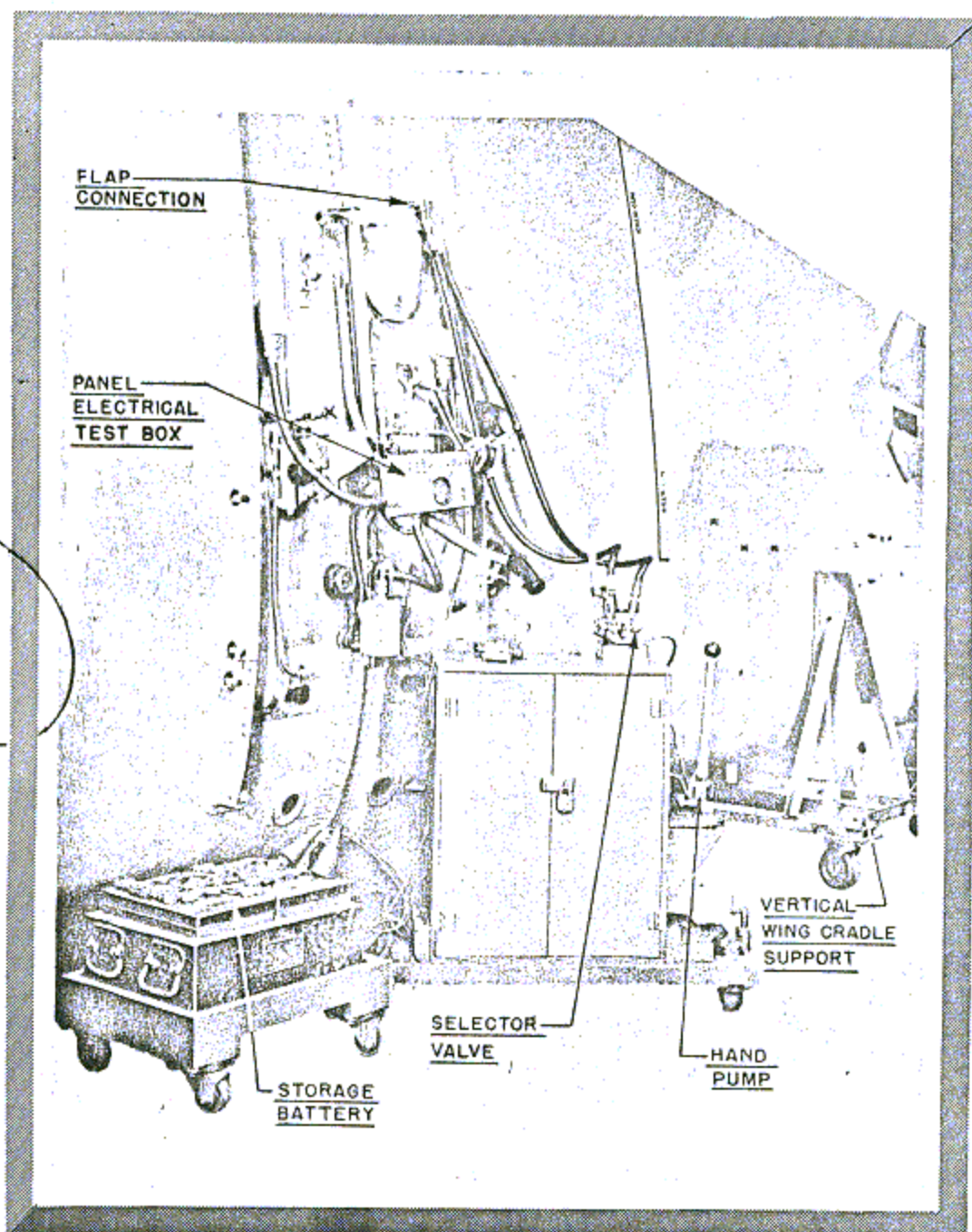
Figure 2—
Auxiliary Hydraulic
Test Equipment

2 is a cabinet mounted on a four wheel truck with an attachment which screws down to the floor and serves as a brake. The cabinet contains a five gallon can of Lockheed No. 5 Hydraulic Fluid (Specification No. 3586) which is connected to a hydraulic hand pump mounted on the right-hand end. A line from the pump connects to a control valve attached to the top of the cabinet. Flexible lines connect the control valve to the hydraulic connections in the wing. All ports, in the

control valve, not used are plugged. A portable unit of this type may be used to operate all units of the hydraulic system contained in the wing and will assist in the dismantling and final assembly of the landing gear and flaps.

(b) A portable electrical and hydraulic test equipment unit similar to the one shown in figure 3 can be made by the air depot personnel to facilitate and expedite assembly and disassembly of the various

Figure 3—
Portable Electrical
and Hydraulic
Test Equipment



components attached to the wing. This unit is similar to the one described in the preceding paragraph and consists of a wooden cabinet mounted on a four wheel truck with a brake to the floor. The cabinet contains the electric storage battery and a five gallon can of hydraulic fluid Lockheed No. 5 (Specification No. 3586). The hydraulic hand pump is mounted on the right-hand side of the cabinet with the control valve mounted immediately above it on the top of the cabi-

net. The hydraulic system on the cabinet is hooked up in a manner similar to that explained in the preceding paragraph.

The electrical system test equipment consists of a battery and a small test equipment control box which is connected into the electrical system and remains on the wing during the testing period. The control box has disconnect connections to both the

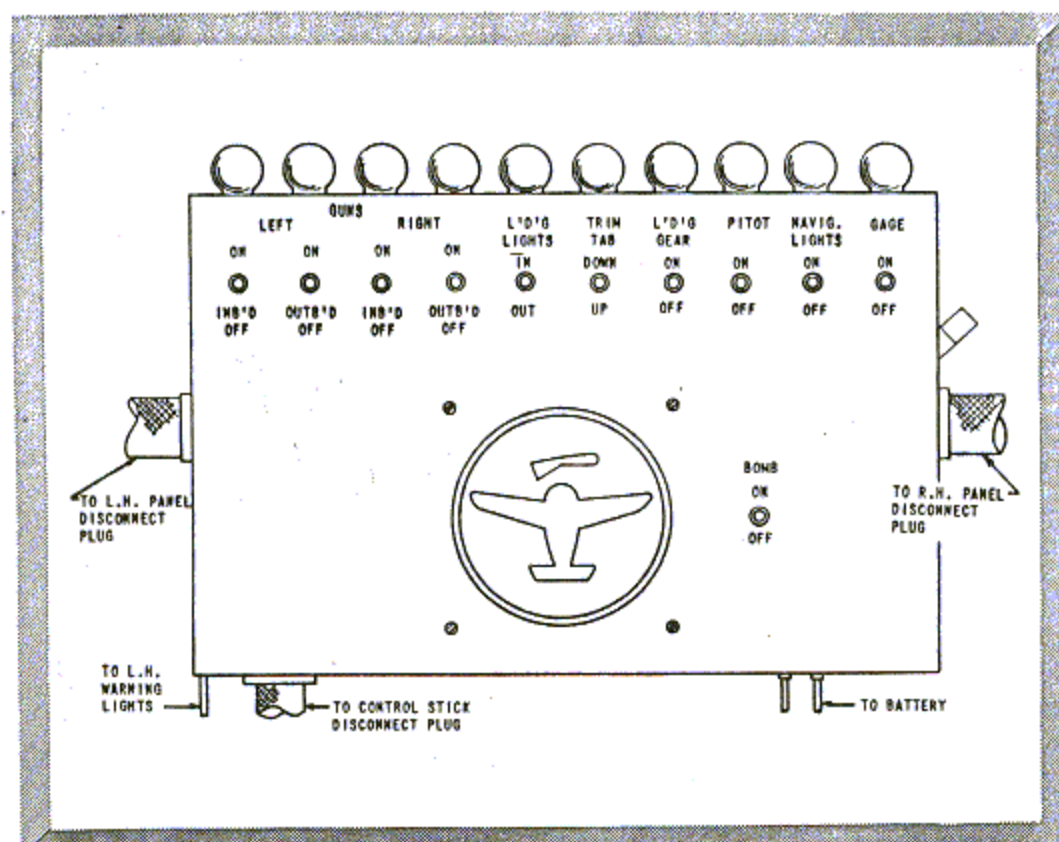


Figure 4—Portable Electrical Test Box—Panel

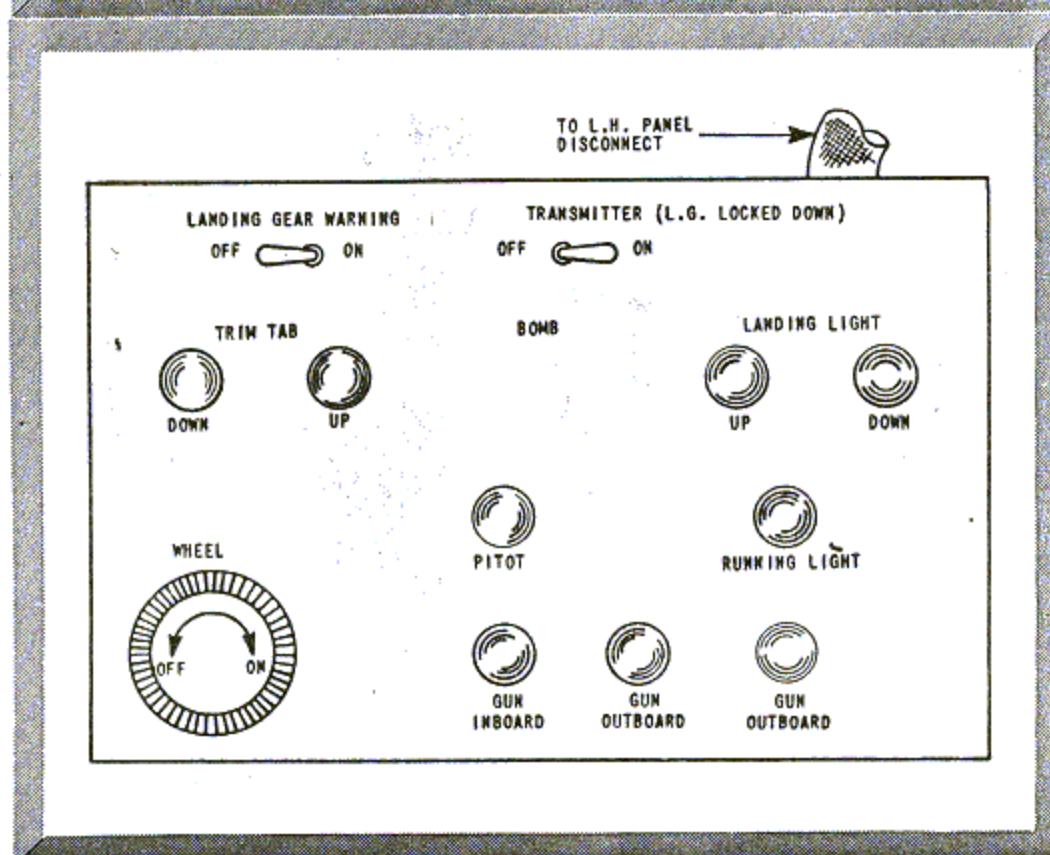


Figure 5—Portable Electrical Test Box—Fuselage—Left-Hand



Figure 6—Portable
Electrical Test
Box—Fuselage—
Right-Hand

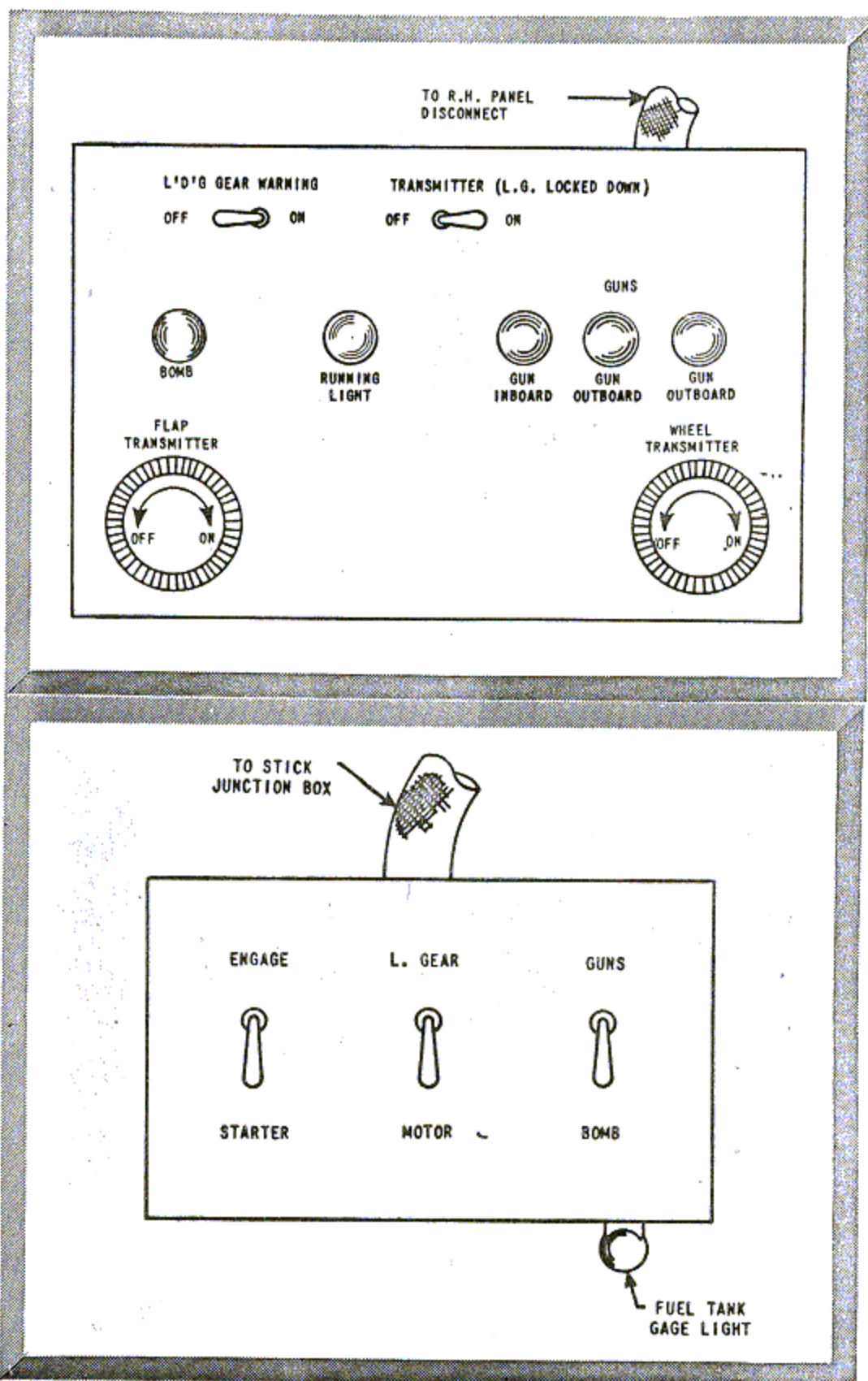


Figure 7—Auxiliary
Test Box—Control
Stick



right- and left-hand panel disconnect plugs and the control stick disconnect plug; connecting wires run from the control box to the battery in the cabinet on the portable test unit. A test bulb on the control box indicates whether there is a short circuit in the landing gear transmitter by burning brightly. Under normal conditions the lamp merely glows. Switches operate the retractable landing light, the transmitter test bulb, the navigation lights, and the electric trim tab. Light bulbs indicate whether the wing gun solenoids, pitot heater, wing bomb solenoid, landing gear switch (on control stick) and the left-hand and right-hand landing gear warning switches (which operate the warning horn when the landing gear is not locked down) are in proper working condition and are not shorted or installed incorrectly. A flap and wheel indicator shows the position of the flaps and main wheels only when being tested. For additional information see figure 4.

(c) After removing the wing from the airplane, hoist the wing by the sling shown in figure 9 and place in a vertical cradle as shown in figure 3. To retain the wing in the vertical position after separation into individual panels, cradles should be placed under each panel similar to those shown in figure 3.

(d) The fuselage should be mounted on a cradle similar to the one shown in figure 12; it can be left on this cradle during subsequent overhaul work.

(e) Removal of the landing gear for overhaul shall include the landing gear, position transmitter and linkage.

(f) Removal of the tail wheel for overhaul shall include the tail wheel assembly, retracting strut piston bearing and "V" strut at station No. 12, the strut leading forward to station No. 11, and the tail wheel position transmitter and linkage.

(g) A fixture which will support the complete engine section in a manner similar to that in which it is supported by the fuselage will aid detail disassembly and subsequent assembly of the complete engine section. See figure 40.

(h) The serial number of the airplane should be marked with crayon on the inside of all cowling as soon as it is removed from the airplane. This will facilitate assembly in the event that cowlings from more than one airplane are not kept separate.

3. CLEANING.

To facilitate dismantling, and inspection during dismantling, the airplane should be generally cleaned to remove dirt, oil and grease before the dismantling

procedure begins. This general cleaning will enable the overhaul personnel to give the airplane a visual inspection during the cleaning process.

4. INSPECTION—GENERAL.

a. As soon as possible after cleaning, the entire airplane should be checked for corrosion. Some spots may be noted by a discoloration of the paint together with a blister effect. At the same time, a general check should be made for worn or damaged parts, as indicated by elongated bolt holes, bent bolts, sheared or loose rivets, cracks, buckled members, skin abrasions, wrinkled skin and deteriorated rubber.

b. To aid the inspection of supports, brackets and other parts which are not to be removed from the remainder of the structure, the paint may be removed from areas surrounding bolt holes by using brush wash in accordance with paragraphs 2.a. and 2.b. of section II of this Handbook.

c. All fibre lock nuts and fasteners should be inspected for condition of the fibre locking device; the fibre should prevent rotation of the nut or bolt under vibration.

d. The rubber in all rubber lined clamps should be inspected for deterioration and excessive wear. Check condition of bonding strips.

e. All rubber grommets should be removed and inspected for cuts and areas which bear against skin cut-outs, and for deterioration.

5. DISPOSITION OF EQUIPMENT SUBMERGED IN WATER.

Technical Order No. 01-1-6 is applicable to this airplane, except as follows: After flushing all parts of the hydraulic system and air-oil shock absorber struts with warm, fresh water, these parts will be immersed in warm Lockheed Hydraulic Fluid No. 5 (Specification No. 3586). Do not, under any circumstances, use a mineral oil for this purpose.



SECTION IV

DISASSEMBLY, INSPECTION, REPAIR AND ASSEMBLY

1. GENERAL.

a. General Instructions.—This section contains the general instructions for restoring the airplane, as nearly as possible, to its condition when new, such work being the normal function of the air depots.

b. Disassembly.—Removal and installation instructions, also the major portion of disassembly and assembly instructions, are contained in T.O. No. 01-25CK-2. To facilitate reference, the paragraph sequence in this section is the same as that used in section IV of T.O. No. 01-25CK-2.

c. Special Airplane Tools.—Refer to section III, paragraph 1.b for list of special airplane tools furnished by the contractor for use in connection with the work prescribed in this section.

d. Major Repair.

(1) General.

(a) Tubing.—For instructions covering the use of fusible alloy for bending tubing, see T.O. No. 23-1-1. Also, see T.O. No. 23-5-3 for instructions covering welding, machining, and forming corrosion resistant steel and Inconel.

(b) Fasteners.—All defective fibre lock nuts and fasteners, rubber in all rubber lined clamps and engine mount vibration absorbers should be replaced. Care must be exercised to replace synthetic rubber grommets, washers, and gaskets with the same material.

(c) Bushings.—Replaceable bushings are provided in plain bearings, or sufficient metal is available to permit boring for the installation of a reasonable thick bushing at overhaul.

Clearance.—Diametrical clearance between aluminum alloy journals and steel shafts shall be not less than 0.002 inches per inch of the shaft diameter in order to prevent seizing at low temperatures. End clearances of joints which require relative rotation of the parts connected shall be obtained with the aid of spacers or shoulder bolts in order to preclude the possibility of clamping by overtightening the assembly nut. Refer to the bushing chart, figure 13, for the locations and dimensions of the bushings used on the airplane.

Reaming.—Drawings of renewable bushings are contained in the Army and Navy standard parts

book. These are designed primarily to be used with Army and Navy standard bolts, and in most cases do not require re-reaming after installation. If used with a shaft where special tolerance between the shaft and the bushing must be held, it will be necessary to control the shaft diameter to suit the design requirement.

NOTES: 1. Oilite bushings cannot be reamed after installation; however, the hole may be burnished for close control of the ID when the condition warrants.

2. In hand reaming, for diameters up to 1 inch, a tolerance of 0.001 inch may be maintained; for diameters above 1 inch, 0.002 inch.

For machine reaming, the tolerance of diameters up to 1/2 inch may be as much as 0.0005 inch; for diameters of from 1/2 to 1 inch from 0.00075 to 0.001 inch, and for diameters above 1 inch, 0.0015 inch.

3. A rule to use for circular fits, such as shafts, in bearings, or bushings in fittings is as follows: Compare the maximum dimension of the hole with the minimum dimension of the shaft and the minimum dimension of the hole with the maximum dimension of the shaft.

For example:

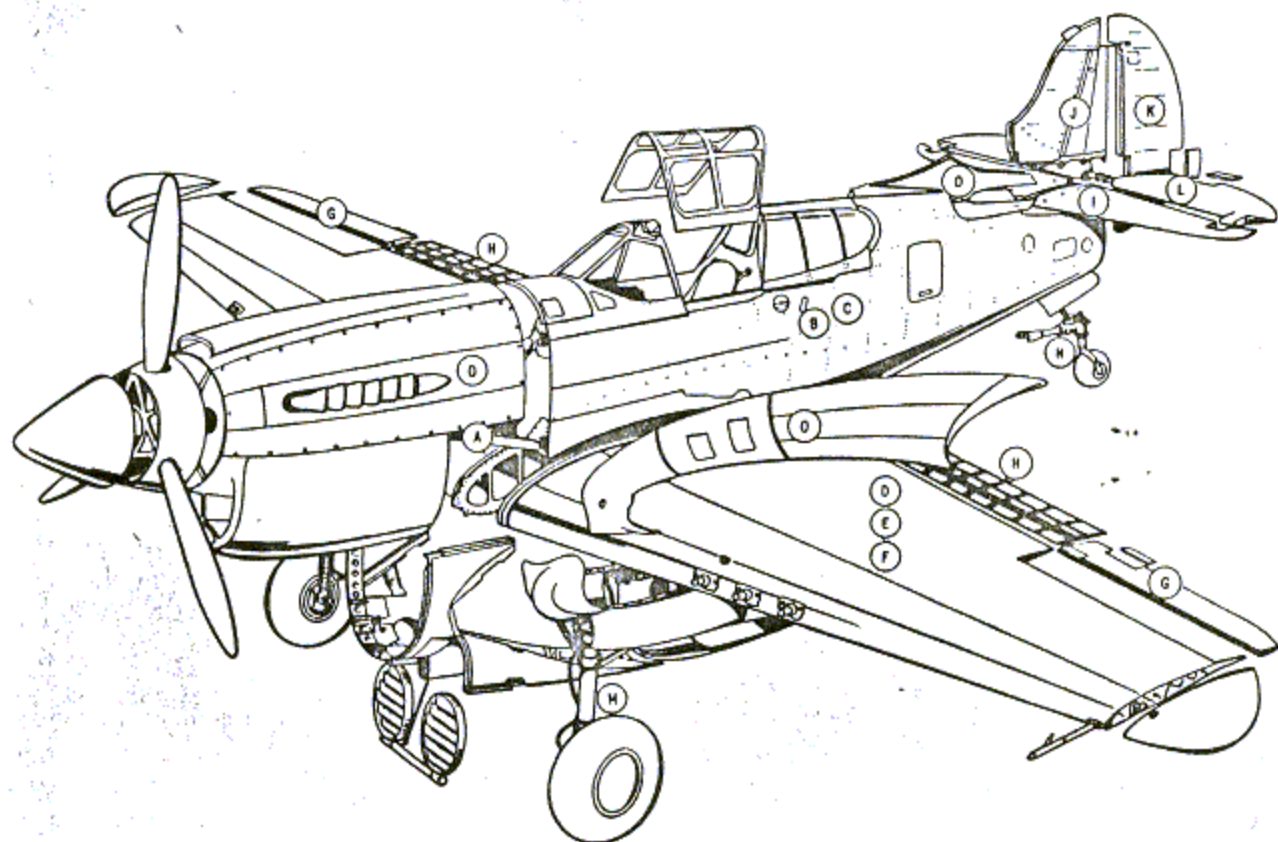
Hole	Shaft
+.0015	+.000
.875 —.001 dia	.873 —.002 dia
.8765 —.871 =	.0055 clearance, max
.874 —.873 =	.001 clearance, min

(2) Structural.

(a) General.

1. The major structural material used in this airplane is aluminum alloy 24ST Army Specification No. 57-159-6 type II and 24SO Army Specification No. 57-152-6 type I.

2. All rivets are made of aluminum alloy, A-17ST, Army Air Forces material type AD, with few exceptions. Unless specifically noted in the following information or specifically called for on an airplane drawing, the type AD rivet is satisfactory for all repair work; the type D (17S) or type DD (24S) rivets may be used if desired, due to their superior strength



LETTER	ASSEMBLY	LETTER	ASSEMBLY
A	ENGINE MOUNT	H	FLAP ASSEMBLY
B	FUSELAGE SKELETON	I	TAIL PLANE ASSEMBLY
C	FUSELAGE SKIN	J	FIN ASSEMBLY
D	WING SKELETON	K	RUDDER ASSEMBLY
E	WING SKIN - UPPER	L	ELEVATOR ASSEMBLY
F	WING SKIN - LOWER	M	LANDING GEAR ASSEMBLY
G	AILERON ASSEMBLY	N	TAIL WHEEL ASSEMBLY
	O		COWLING AND FAIRING

Figure 8—Major Disassembly

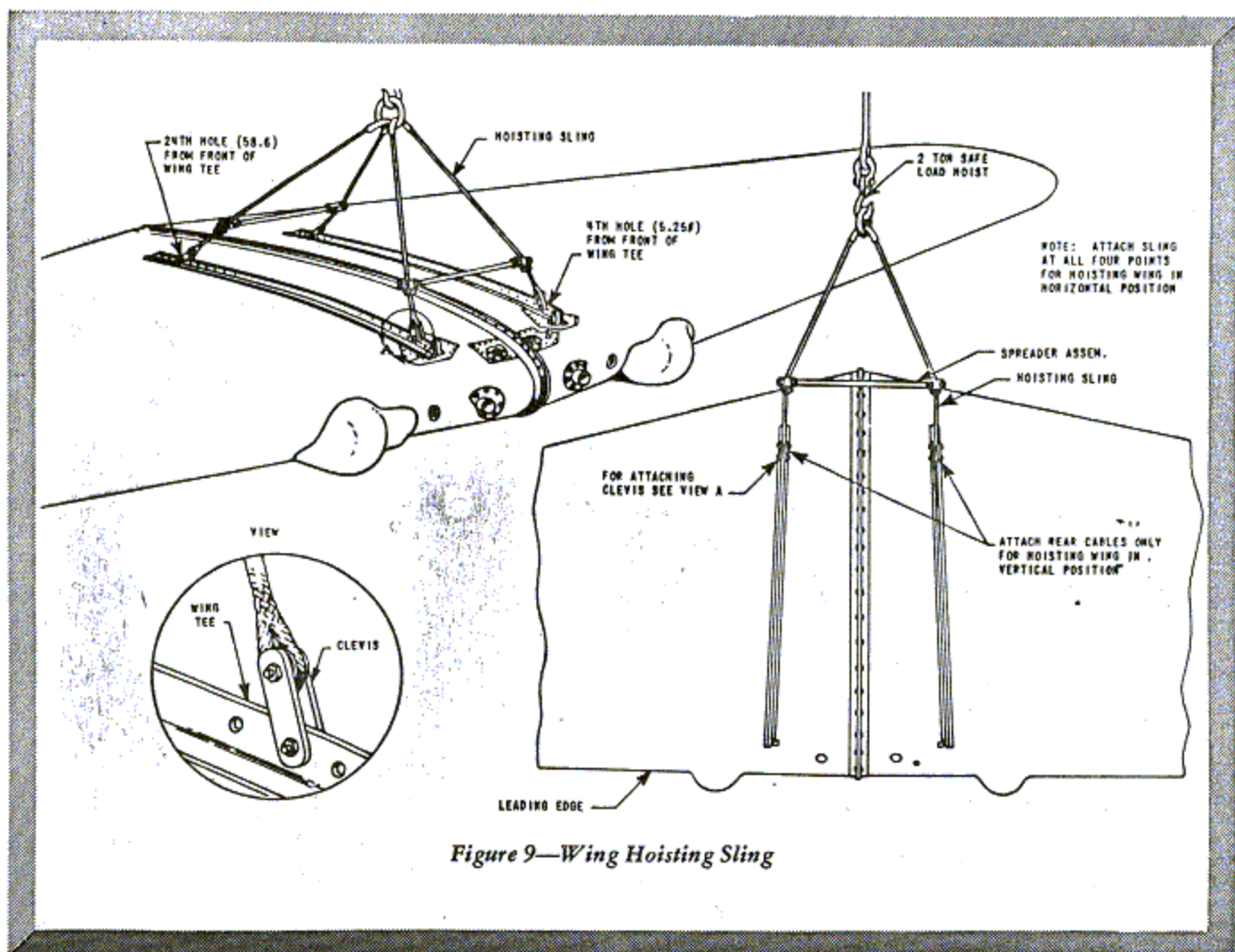


Figure 9—Wing Hoisting Sling

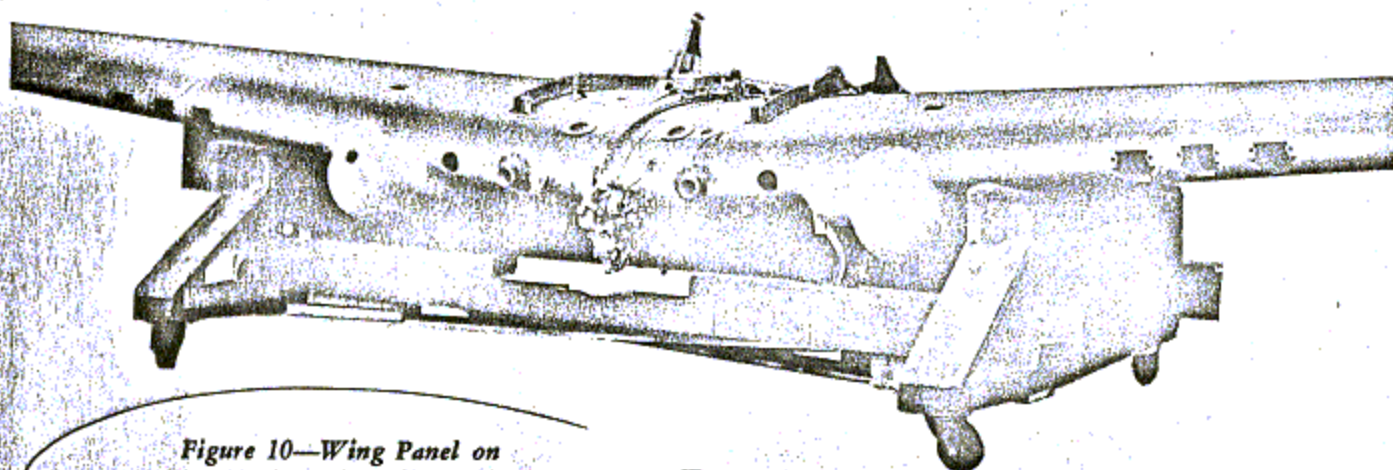


Figure 10—Wing Panel on Horizontal Cradles

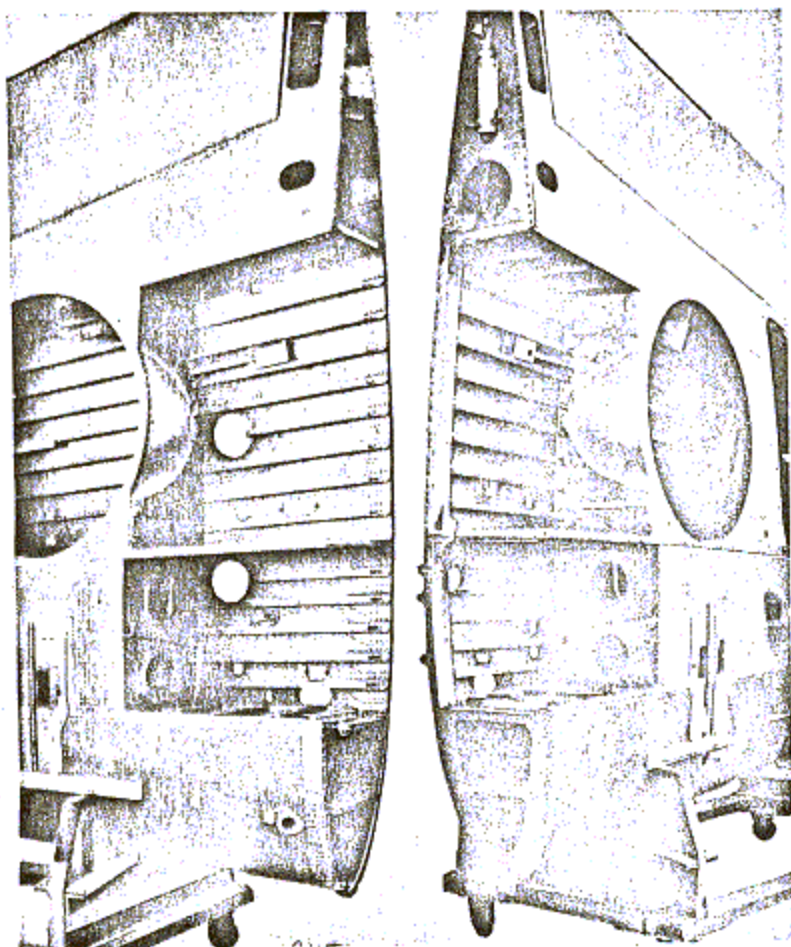


Figure 11—Wing
Panel Separated at
Center Line Bulkhead



Figure 12—Fuselage
on Cradle

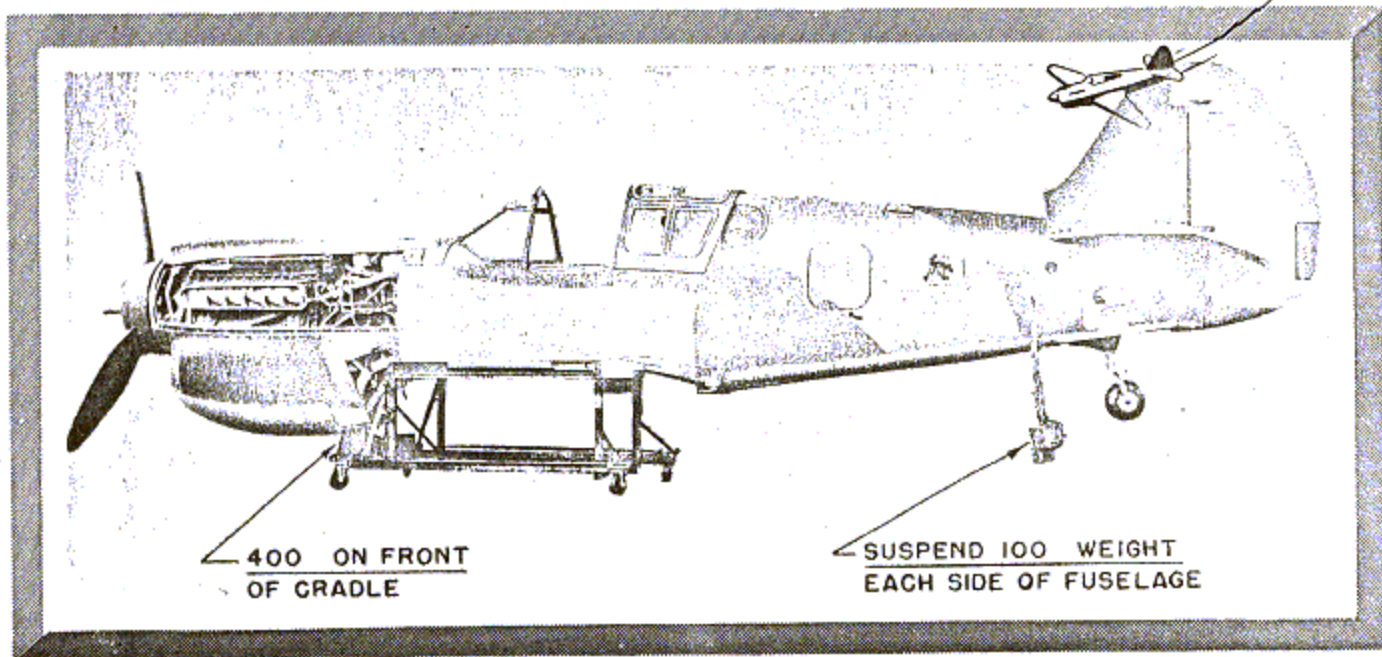


FIGURE 13 — BUSHING CHART

Location of Bushing	Dimension To Ream Before Bushing	Bushing Part Number	Dimension To Ream After Bushing
ARMAMENT			
Bell Crank—Bomb rack cocking		87-70-544	.249 + .000 — .002
Feed Chute—Roller-Axle	.506 + .003 — .000	1025D-500-6,000	
Wing Gun Adapter—Front	.6875 + .0007 — .0000	87-69-566	.5625 + .001 — .000
COWLING AND COVERING ASSEMBLY			
Control Lever Assem—Cowl flap control	.4375 ± .0005	1001D-5-1.5000	.3125 + .0005 — .0010
Control Lever Assem—Cowl flap control	.3125 ± .0005	1001D-3-.594	.1900 + .0005 — .0010
Flap Assem—Engine cowl—Lower	.3750 ± .0005	1007D-4-.594	.2500 + .0005 — .0010
Flap Control—Push rod link	.374 + .000 — .003	75-64-059	.250 ± .001
Frame—Coolant system shutter	.2500 ± .0005	1002D-2-.218	*
Shutter—Frame—Coolant system	.2500 ± .0005	1002D-2-.156	*
FLIGHT CONTROLS			
Base—Tab Control Cockpit	.3125 ± .0005	87-64-064-1	.1910 + .000 — .001
Base Tab Control—Cockpit	.4375 ± .0005	87-64-064-2	.3135 + .000 — .001
Base Tab Control—Cockpit	.4375 ± .0005	87-64-064-3	.3135 + .000 — .001
Bell Crank Elevator Push-Pull Station No. 5	.4724 + .000 — .004	58191	.312 + .003 — .000
Control Stick Assembly	1.5615 ± .0005	0166510-2	1.4365 + .000 — .001
Control Stick Stop	.7094 + .006 — .0032	75-64-102	.5625 ± .002
Elevator Jackshaft Support	.623 ± .001	75-64-098	.375 + .002 — .000
Horn Assembly—Rudder flap	.3750 ± .0005	1001-D-4-.250	*
Indicator—Tabs, rudder & elevator control assembly	.4375 ± .0005	87-64-064-4	.3135 + .002 — .000
Jackshaft—Rear assembly elevator control	.375 ± .0005	EX38392-S4-.203	.250 + .001 — .0005
Rudder and Brake Pedal	.3750 ± .0005	1001D-4-.218	*
FUSELAGE ASSEMBLY			
Bearer Tube to Fire Wall	.500 ± .0005	1001D-6-.374	.375 + .0005 — .0000
Bearer Tube to Fire Wall	.875 ± .0005	1001D-12-.525	.750 + .0005 — .0000
Cabin Assembly	.3750 ± .0005	1002D-4-.250	.2500 + .0005 — .0010
Clevis—Engine mount—Diagonal tube	.5000 ± .0005	1001D-6-187	*
Engine Vibration Absorber Unit—Housing	1.4375 ± .0005	87-22-528	1.312 + .002 — .000
Fitting—Engine mount bearer tube	.8750 ± .0005	1001D-12-.874	.750 + .0005 — .0000
Fitting—Fuselage—Lower center	.5000 ± .0005	1001D-6-.495	.3750 + .0005 — .0000

* Need not be reamed after bushing.

FIGURE 13 — BUSHING CHART (Continued)

Location of Bushing	Dimension To Ream Before Bushing	Bushing Part Number	Dimension To Ream After Bushing
Fitting—Fuselage—Station No. 1—Lower	.8750 ± .0005	1001D-12-1.060	.7500 + .0005 — .0000
Fitting—Tail wheel Station No. 13—Lower fuselage	.625 ± .0005	75-21-167	.375 ± .001
Fitting—Fuselage to engine mount	.8750 ± .0005	1001D-12-.870	.7500 + .0005 — .0000
Link—Lower truss to fire wall—Central	.5000 ± .0005	1001D-6-.250	.375 + .0005 — .0000
Truss—Engine mount—Lower	.5000 ± .0005	1001D-6-.370	.3750 + .0005 — .0000
Truss—Engine mount—Lower	.5000 ± .0005	1001D-6-.495	.375 + .0005 — .0000
Truss—Engine mount—Lower	.8750 ± .0005	1001D-12-.625	.7500 + .0005 — .0000
LANDING GEAR			
Arm—Landing gear retracting mechanism	.750 ± .0005	75-31-060	.625 + .0005 — .0000
Arm—Landing gear retracting mechanism	.750 ± .0005	1004D-10-.500	.625 + .0005 — .0000
Block—Landing gear side strut hinge	.750 ± .0005	1004D-10-.622	.625 + .0005 — .0000
End—Landing gear retracting cylinder piston	1.0625 ± .0005	75-33-028	.875 + .001 — .000
Fitting—Inner strut hinge—Landing gear	.750 ± .0005	EX38392-S10-1.875	.625 + .001 — .000
Link—Landing gear—Lower	.750 ± .0005	1004D-10-.250	.625 + .0005 — .0000
Link—Landing gear—Oleo strut	.7500 ± .0005	1004D-10-1.999	.6250 + .0005 — .0000
Link—Landing gear—Oleo strut	.8750 ± .0005	1004D-12-2.874	.7500 + .0005 — .0000
Landing Gear Link—Retracting mechanism	.750 ± .0005	1004D-10-.250	.625 + .0005 — .0000
Landing Gear Link—Retracting mechanism	1.125 ± .0005	1004D-16-.875	1.000 + .0005 — .0000
Landing Gear Link—Upper	1.0000 ± .0005	1004D-14-.750	.875 + .0005 — .0000
Landing Gear—Oleo strut—Upper trunnion	1.375 + .0005 — .0000	75-31-040	1.25 + .001 — .000
Link—Landing gear—Upper	.7500 ± .0005	1004D-10-.250	.625 + .0005 — .0000
Link—Upper landing gear oleo scissors	.7500 ± .0005	1004D-10-.562	.6250 + .0005 — .0000
Strut Assembly—Landing gear oleo—Side	.750 ± .0005	1004D-10-.312	.625 + .0005 — .0000
Support—Landing gear retracting mechanism	.814 + .0000 — .0005	75-33-017	.625 + .001 — .000
Trunnion Assem Landing Gear Oleo Strut—Lower	.750 ± .0005	1004D-10-.622	.625 + .0005 — .0000
Trunnion—Landing gear oleo strut—Upper	1.375 + .0005 — .0000	75-31-041	1.25 + .001 — .000
Bearing—Trunnion—Upper—Landing gear	3.6265 ± .0005	75-31-042	3.376 + .000 — .015
POWER PLANT—FUEL SYSTEM INSTALLATION			
Gear Housing—Fuel cock control	.5000 ± .0005	75-44-046-6.438	.375 + .0005 — .0000

FIGURE 13 — BUSHING CHART (Continued)

<i>Location of Bushing</i>	<i>Dimension To Ream Before Bushing</i>	<i>Bushing Part Number</i>	<i>Dimension To Ream After Bushing</i>
POWER PLANT—STARTER INSTALLATION			
Support—Starter crank extension	1.500 + .000 — .001	70036	1.280 + .005 — .000
TAIL ERECTION—ELEVATOR ASSEMBLY			
Elevator—Flap	.312 + .001 — .000	75-13-037	.190 + .002 — .000
Lever—Flap Elevator	.3125 ± .0005	1001D-3-.100	.190 ± .001
Lever—Flap Elevator	.3750 ± .0005	1001D-4-.1875	.253 + .000 — .001
TAIL WHEEL INSTALLATION			
Fitting—Drag truss—Front retracting tail wheel	.5000 ± .0005	1001D-6-.500	.375 + .0005 — .0010
Fitting—Drag truss—Rear tail wheel	.5625 ± .0005	1007D-7-.334	.4375 + .0005 — .0010
Plate—Tail wheel door	.3750 ± .0005	1001D-4-.312	* —
Spacer—Tail wheel—Assembly	.325 + .001 — .000	87-37-035	.188 + .000 — .001
Tail Wheel Retracting Strut Cylinder	1.000 + .0000 — .0098	75-37-020	.75 + .001 — .000
Tail Wheel Retracting Strut Extension	.7500 + .0000 — .0005	75-37-066	.6406 + .005 — .000
Universal—Tail wheel oleo—Lower joint	.5625 ± .0005	1011D-7-.750-.375	.4375 + .0005 — .0010
WING ERECTION—PANEL ASSEMBLY—AILERON LEFT HAND			
Arm Assembly—Aileron control—Left hand	.875 + .0000 — .0005	87-05-011-1	.7490 + .0005 — .0000
Arm Assembly—Aileron control—Left hand	.875 + .0000 — .0005	87-05-011-2	.7490 + .0005 — .0000
Trim Tab—Aileron—Left hand panel	.375 ± .0005	1001D-4-.102	.253 + .000 — .001
WING ERECTION—PANEL ASSEMBLY—AILERON RIGHT HAND			
Arm Assembly—Aileron control—Right hand	.875 + .0000 — .0005	87-05-011-1	.7490 + .0005 — .0000
Arm Assembly—Aileron control—Right hand	.875 + .0000 — .0005	87-05-011-2	.7490 + .0005 — .0000

* Need not be reamed after bushing.

characteristics over the type AD rivet. Modified brazier-head rivets (Curtiss 671-D) or flat head rivets (AN-442) are used throughout the airplane except on exterior surfaces exposed to the airstream, where the countersunk-head (Curtiss 673-D) type is employed for a smoother finish. The substitution of the flat-faced rivet (AN-442) simplifies repair and overhaul procedure since it can be set with the use of a simple flat-faced riveting gun and bucking bar. The use of AN-430 and AN-455 rivets as substitutes for the Curtiss 671-D

rivet may cause interferences in some cases; also note that the AN-425 rivet is not interchangeable with the Curtiss 673-D rivet due to the differences in the shape of the countersunk head. Spare or replacement parts furnished by the airplane manufacturer which have been processed for flush riveting are dimpled and countersunk to take a Curtiss 673-D rivet; consequently this rivet must be used in such cases.

3. Refer to T.O. No. 23-15-1 for general information on "Aluminum Alloys—Repair and Manufacturing Practices."

4. The following notes illustrate the general procedure in repairing monocoque structure. Refer to subsequent headings for detail information:

a. In removing old rivets the following precautions should be observed:

(1) Use No. 30 (.128 inch) drill for $\frac{1}{8}$ rivets, $\frac{5}{32}$ inch drill for $\frac{5}{32}$ rivets and $\frac{3}{16}$ inch drill for $\frac{3}{16}$ rivets.

(2) Drill to a depth equal to the depth of the head only. Then carefully knock off the rivet head with a cold chisel, and drive the rivet out with a punch; if the rivet will not come out, the drill may be run partly into the shank provided the drill hole is centered in the rivet. Care should be exercised not to elongate the rivet hole; in all cases where the original rivet hole is damaged or elongated the next larger size rivet must be used. After the rivet has been removed inspect the hole to see that particles of metal are not lodged between the sheets holding them apart.

b. Space the rivets not closer than four diameters apart and not closer than two diameters to the edge of the sheet.

c. Where "Rivnuts" are used in repair work, the $\frac{3}{16}$ tubular rivet manufactured by B. F. Goodrich is to be used with an insert consisting of a 6-32 cadmium plated, steel screw (AN505-): this insert is necessary to obtain the required shear strength in the rivet; see T.O. No. 23-15-1, paragraph 10.c., for restriction on the use of "Rivnuts."

d. Where "basket anchor nuts" in blind locations have fallen out, the "Lok-Skru" fastener may be substituted; this particular type of blind rivet is manufactured by the Dill Manufacturing Company, Cleveland, Ohio. The No. 8-32 countersunk "Lok-Skru" is used for this repair. Drill out original screw hole in skin, if necessary, to a minimum diameter of .265, using a 17/64 drill; insert "Lok-Skru" fastener assembly (consisting of rivet screw and rivet sleeve) through hole, and set up on fastener assembly by use of special application tool. The regular No. 8-32 screws for attachment of fairing will screw into the inside of the "Lok-Skru."

(3) Wing.

(a) Stringers.

1. Damaged sections of stringers are to be cut out and replaced by a new section as shown in figure 14, and 15. In the case of extruded stringers where no replacement stock is available, a section may be formed out of aluminum alloy sheet stock (Specification No. 11067) provided the formed stringer is dimen-

sionally similar to the extruded section and has at least the same area; to simulate the bulb on bulb angle sections when bulb angle stock is not available, a $\frac{5}{16}$ flange must be formed on the splice plate. Figures 16 and 17, also refer to "Z" section splices.

2. It is suggested that stringer splices be located between bulkheads to eliminate possibility of interferences where stringer passes through bulkhead cut-outs.

3. Where rivets have deformed stringer clips the clip shall be cut off and a new individual clip riveted to the bulkhead and to the stringer.

4. Refer to figure 18 for data on the repair of wing spars.

(b) Skin.

1. It is of paramount importance that repairs on all areas of wing skin which will be exposed to the air stream be as smooth as possible, therefore flush-type doors and patches should be employed exclusively under such circumstances.

2. Figures 25 and 26 show the type of flush patch used for repairing holes or severe dents in the skin. Cut out the damaged skin, leaving a smooth contoured hole; be sure to cut beyond the ends of all cracks associated with the particular hole.

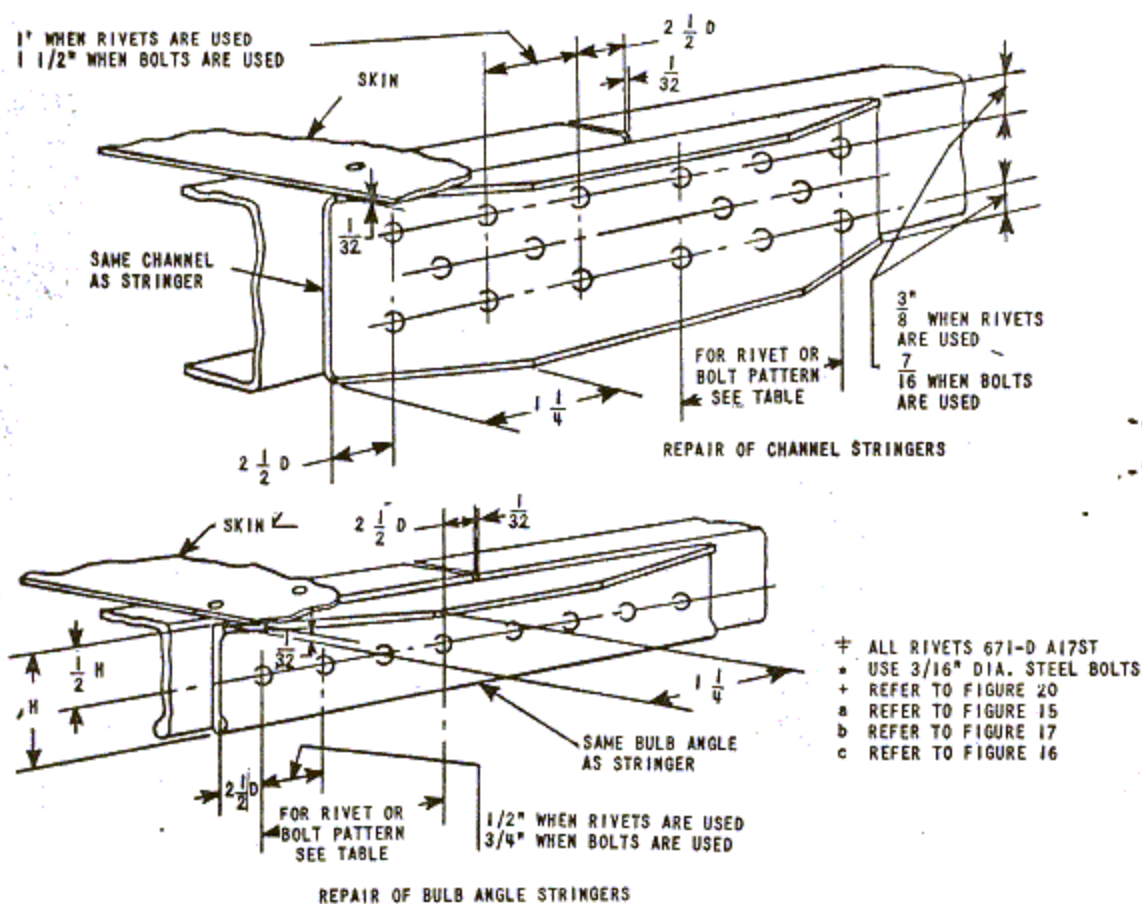
3. Figure 26 shows the type of patch used at an overlap.

4. It is recommended that skin repairs be made on the inner surface where possible to aid the appearance of the repair.

5. Repairs to cap strips are shown in figures 19, 20, and 21.

(c) Outboard Bulkhead.—Damages occurring to the wing tip are sometimes transmitted to the outboard bulkhead of the wing panel necessitating repair. It is recommended that spare bulkheads (87-03-705 L/R) be kept on hand at depots and bases for quick repair as these bulkheads also contain the aileron supports.

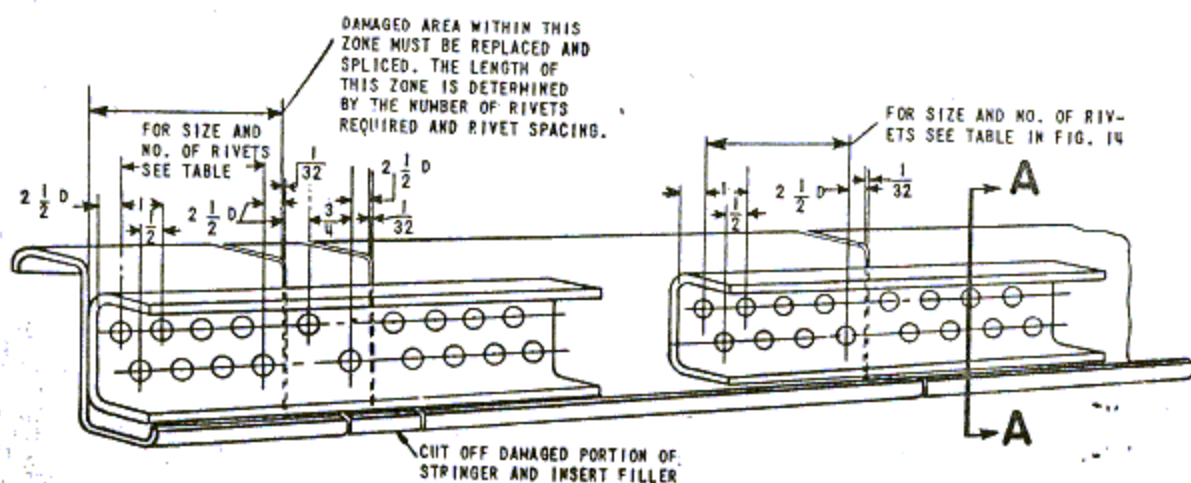
If the bulkhead is only slightly damaged at the trailing end it is possible to make a repair by drilling out the rivets in the damaged section, rolling back the wing skin and cutting off the damaged trailing end of the bulkhead. A splice channel .032 in. thick conforming to the original shape of the bulkhead in that area can be riveted between the bulkhead and the salvaged, damaged end of the bulkhead. Rivet with $\frac{5}{32}$ in. diameter rivets spaced $\frac{5}{16}$ of an inch between center lines. It may be necessary to remove bulkhead attachments and replace them after repairs to the bulkhead have been completed.



RIVETS REQUIRED EACH SIDE OF CUT †

EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.	EXTRUSION NO.	RIVET NO. REQ.
1 85550	1/8 5					18 85464	3/16 10	78077-4	1/8 5				
2 78077-1	1/8 6					19 c	c c						
3 85550	5/32 9	78077-1	1/8 5			20 85464	5/32 8						
4 81-03-026	3/16 14					21 85550	3/16 13	78077-1	5/32 10				
5 81-03-026	3/16 16	85464	3/16 10		b b	22 81-03-026	a 12	b b b					
6 81-03-026	a 10					23 b	b b						
7 81-03-026	a 10	c c c				24 85464	a 11	b b b					
8 81-03-026	a 11	85464	3/16 13	b b b		25 81-03-026	a 13	b b b					
9 81-03-026	a 11	c c c				26 85464	a 11						
10 81-03-026	a 11					27 a	a a	a a a	b b b				
11 81-03-026	a 11	75-03-030	a + 9			28							
12 81-03-026	a 11	b b b				29		a a a					
13 81-03-026	a 10					30 78077-4	1/8 6						
14 81-03-026	a 10	a a a	c c c			31 a	a a a	b b b					
15 81-03-026	3/16 16	75-03-028	a + 8			32 a	a a a						
16 85464	3/16 11	78077-4	1/8 5			33 c	c c c						
17 85464	3/16 11					34 85464	3/16 13						

Figure 14—Wing Stringers Angle and Channel—Splice

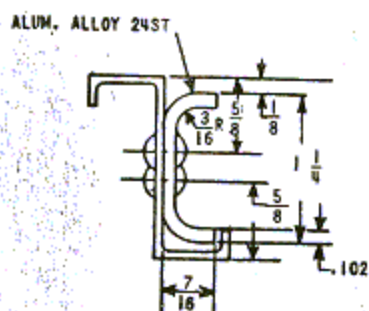


USE METHOD OF PATCHING FILLER AS SHOWN AT LEFT END OF STRINGER PROVIDING THE LENGTH OF DAMAGE AFTER CLEAN UP DOES NOT EXCEED THE LENGTH OF SPLICE (SEE ABOVE TABLE). OTHERWISE SPLICE INSERTION AS SHOWN AT RIGHT END OF STRINGER.

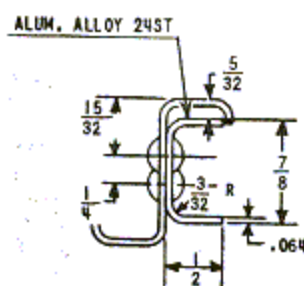
RIVETS REQUIRED FOR EACH SIDE OF CUT *

STRINGER	PART NO.	RIVETS		LENGTH OF SPLICE
		SIZE	NO.	
14	84016	3/16	13	13 29/32
27a	75-03-043	5/32	8	8 19/32
29a	84016	5/32	11	11 19/32
31	75-03-043	5/32	7	7 19/32
32	75-03-043	5/32	6	6 19/32

* ALL RIVETS 671-D A17ST



REPAIR OF 84016 STRINGER



REPAIR OF 75-03-043 STRINGER

SECTION A-A

Figure 15—Wing Stringers—"Z"—84016 and 75-03-043—Splice

Figure 16—Wing Stringer—"Z"—87-03-691-Splice *Pages 31 and 32*

Figure 17—Wing Stringer—"Z"—87-03-178A-Splice *Pages 33 and 34*

Figure 18—Wing Spar Repair Data *Pages 35 and 36*

Figure 19—Cap-strip—Jay Section Splice *Pages 37 and 38*

Figure 20—Cap-strip—Angle—Splice—Spars No. 2, 3, and 4 *Pages 39 and 40*

Figure 21—Cap-strip—Angle—Splice—Spar No. 1 *Pages 41 and 42*





PICK UP REQUIRED NUMBER OF EXISTING RIVETS. SEE TABLE B

SEE TABLE C FOR RIVET PATTERN

.051

.051 GAGE
ALUM. ALLOY 24ST

CUT ON $\frac{1}{2}$ OF RIVET HOLE

EXAMPLE ABOVE IS THE REPAIR OF SPAR NO. 3 AT STATION NO. 168.

NOTE: ALL RIVETS ARE 671-D-AD

A. ATTACHMENT OF PATCHES TO SPAR BETWEEN CAPSTRIPS - RIVET DIAMETER, NUMBER OF ROWS AND SPACING IN ROWS TO USE AROUND DAMAGE. FOR SPACING OF ROWS USE MINIMUM RIVET SPACING GIVEN BELOW

STATION	SPAR NO. 1	SPAR NO. 2	SPAR NO. 3	SPAR NO. 4	SPAR NO. 5	AUX. BEAMS
18	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	5/8	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	
18-45	3/16-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	
45-64	1/8-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	5/8	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	
64-90	1/8-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	
90-205	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	5/32-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	1/8-2 $\frac{1}{4}$	

B. ATTACHMENT OF PATCHES OR SPLICE PLATES TO CAPSTRIPS - NUMBER OF RIVETS REQUIRED AT EACH END OF DAMAGE. USE SAME SPACING AND RIVET DIAMETER AS IN CAPSTRIP OR SPAR FLANGE

STATION	SPAR NO. 1	SPAR NO. 2	SPAR NO. 3	SPAR NO. 4	SPAR NO. 5	AUX. BEAMS
90	8	6	11	6	7	6
90-205	6	4	6	6	6	6

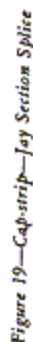
C. ATTACHMENT OF SPLICE PLATES TO SPAR BETWEEN CAPSTRIPS - MINIMUM NUMBER OF RIVETS REQUIRED EACH SIDE OF CUT. DO NOT COUNT RIVETS IN CAPSTRIPS.

SPAR NO.	1	2	3	4	5	AUX. FRONT	AUX. REAR
RIV. DIA.	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16
18	20	13	9	24	17	9	4
18-45	20	14	10	24	17	9	4
45-80	8	6	21	14	10	28	13
80-100	7	6	20	13	9	23	15
100-122	6	6	15	10	7	23	15
122-143	3	3	13	9	19	12	9
143-164	3	3	8	6	17	11	8
164-185	3	3	7	5	13	8	3
185-205	3	3	6	4	12	7	3

D. REQUIRED MINIMUM SPACING OF RIVETS AND RIVET ROWS TO PREVENT FAILURE OF SHEET BETWEEN RIVETS AND FAILURE OF RIVETS DUE TO ECCENTRIC LOADS ON RIVET PATTERNS. SPACING IS MEASURED BETWEEN RIVET CENTERS. SHEET GAGE REFERS TO GAGE OF THINNESS SHEET IN ATTACHMENT.

SHEET GAGE	.032	.040	.051	.102
RIV. DIA.	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16	1/8 5/32 3/16
1 ROW	1/2 3/8 7/8	3/8 1/2 7/8	3/8 1/2 7/8	3/8 1/2 7/8
2 ROWS	3/4 1 1-7/8	5/8 7/8 1-3/4	1/2 3/4 1-1/4	3/8 1/2 3/4
3 ROWS	1 1-3/8 1-3/4	7/8 1-1/4 1-3/4	5/8 1 1-1/4	3/8 5/8 1
4 ROWS	1-3/8 1-3/4	1-1/8 1-1/4 1-3/4	7/8 1-1/4 2	1/2 3/4 1-1/4

Figure 18-Wing Spar Repair Data



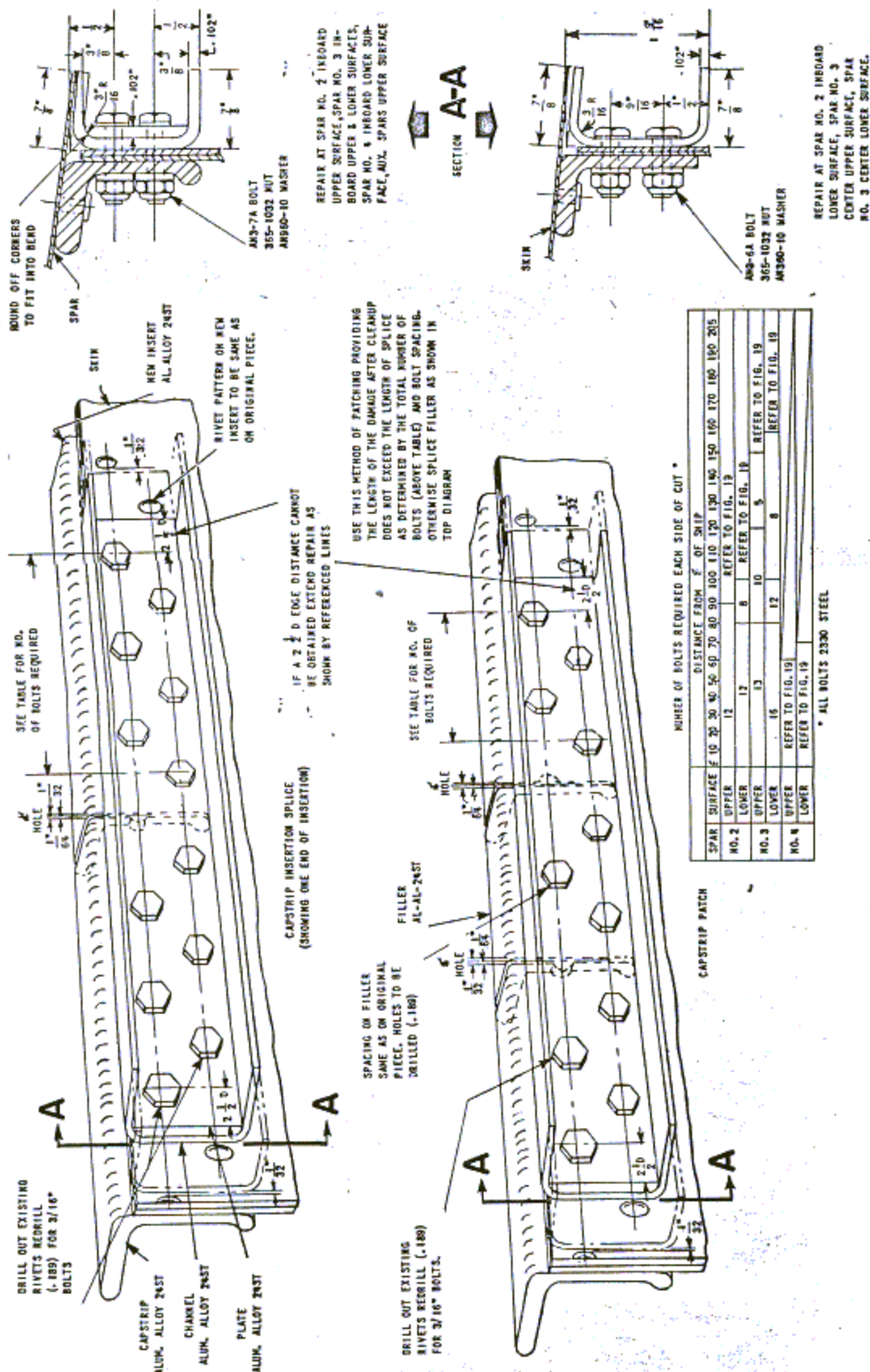


Figure 20—Cap-strip—Angle—Splice—Spars No. 2, 3 and 4

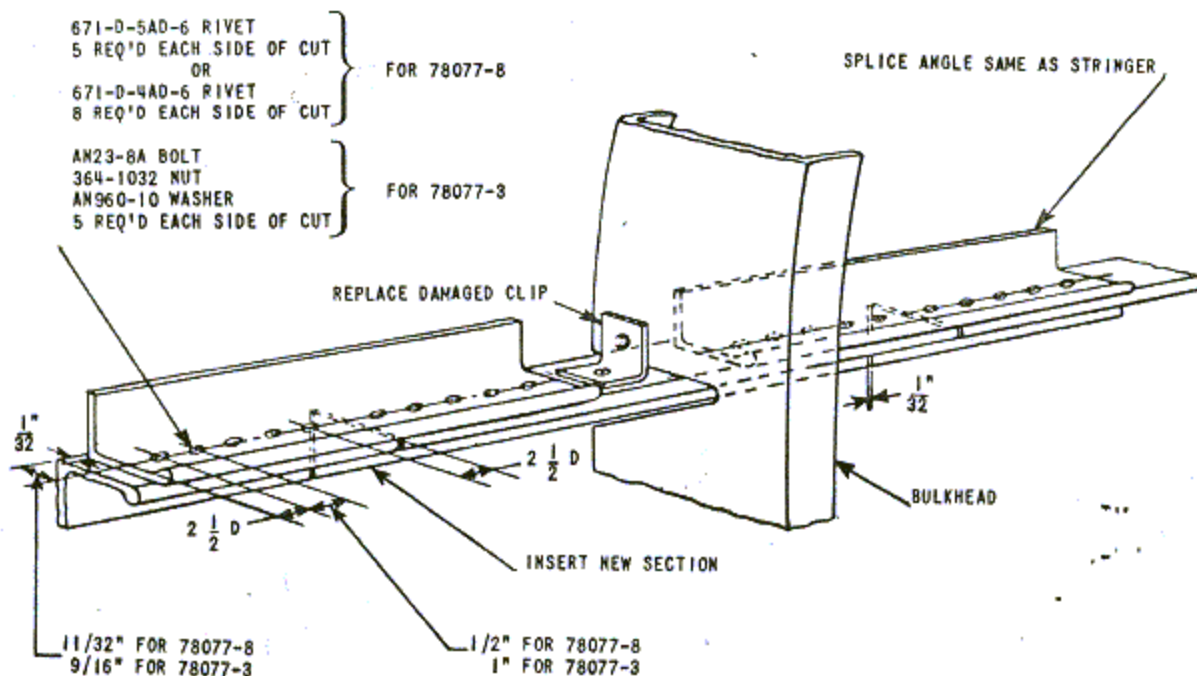


Figure 22—Fuselage—Stringer Insert at Bulkhead

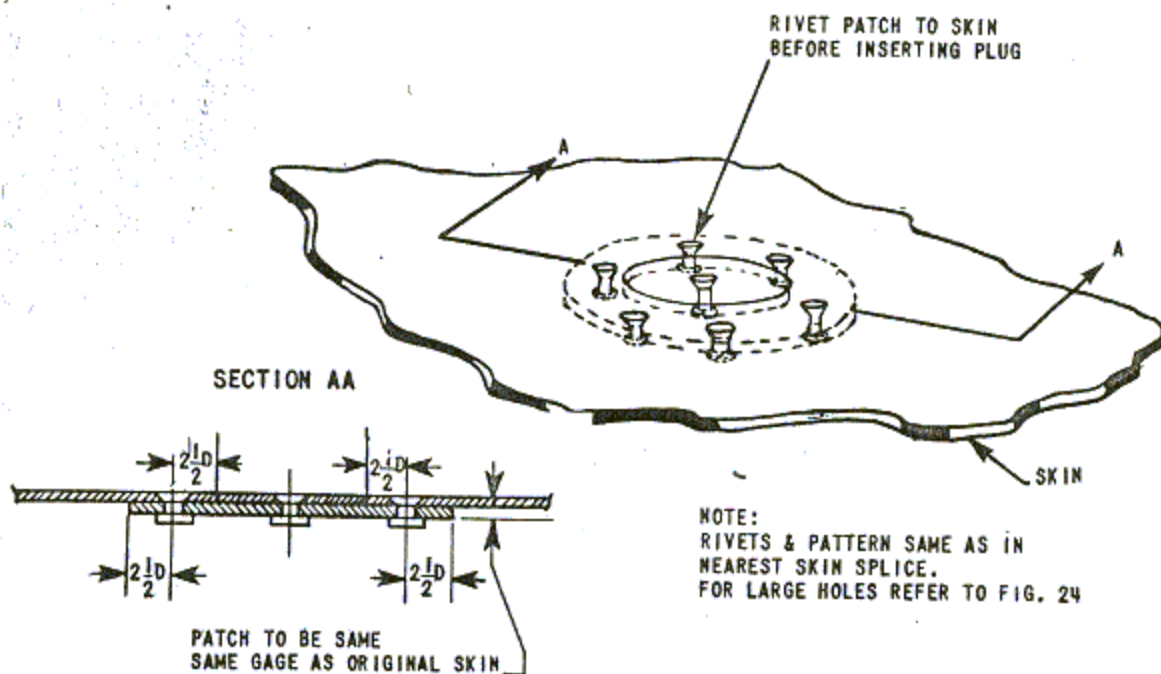


Figure 23—Fuselage Skin—Small Patch

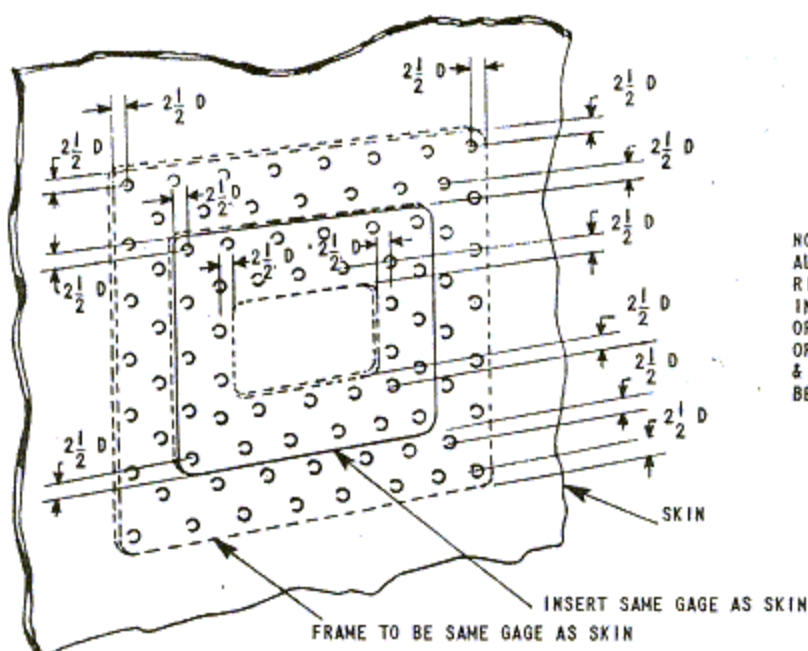


Figure 24—Fuselage Skin Insert

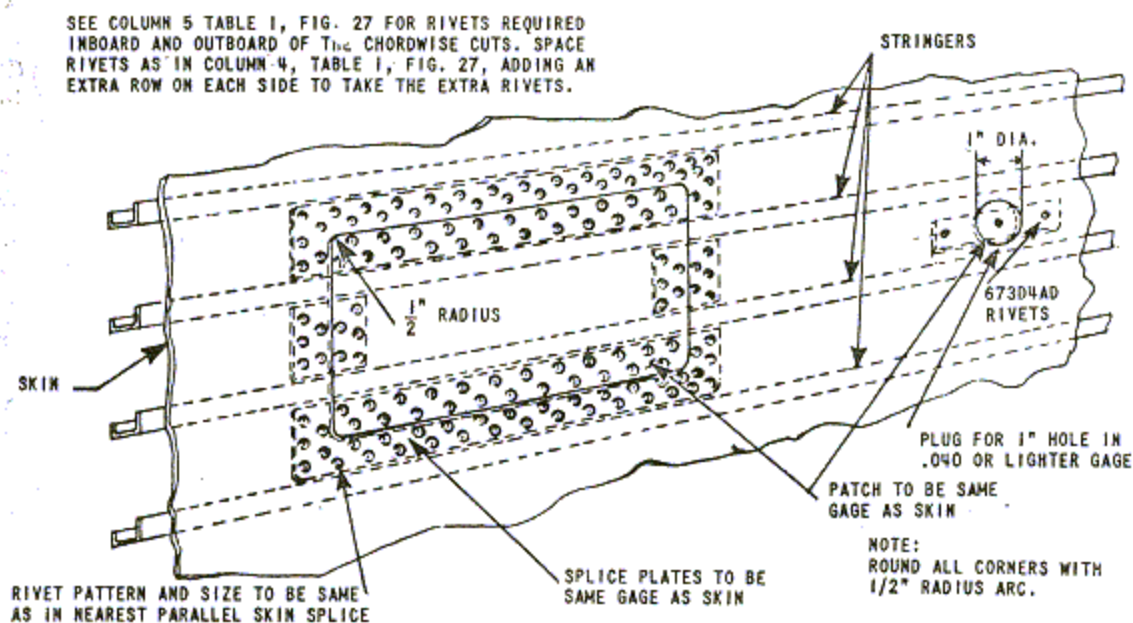


Figure 25—Wing—Flush Skin Patch

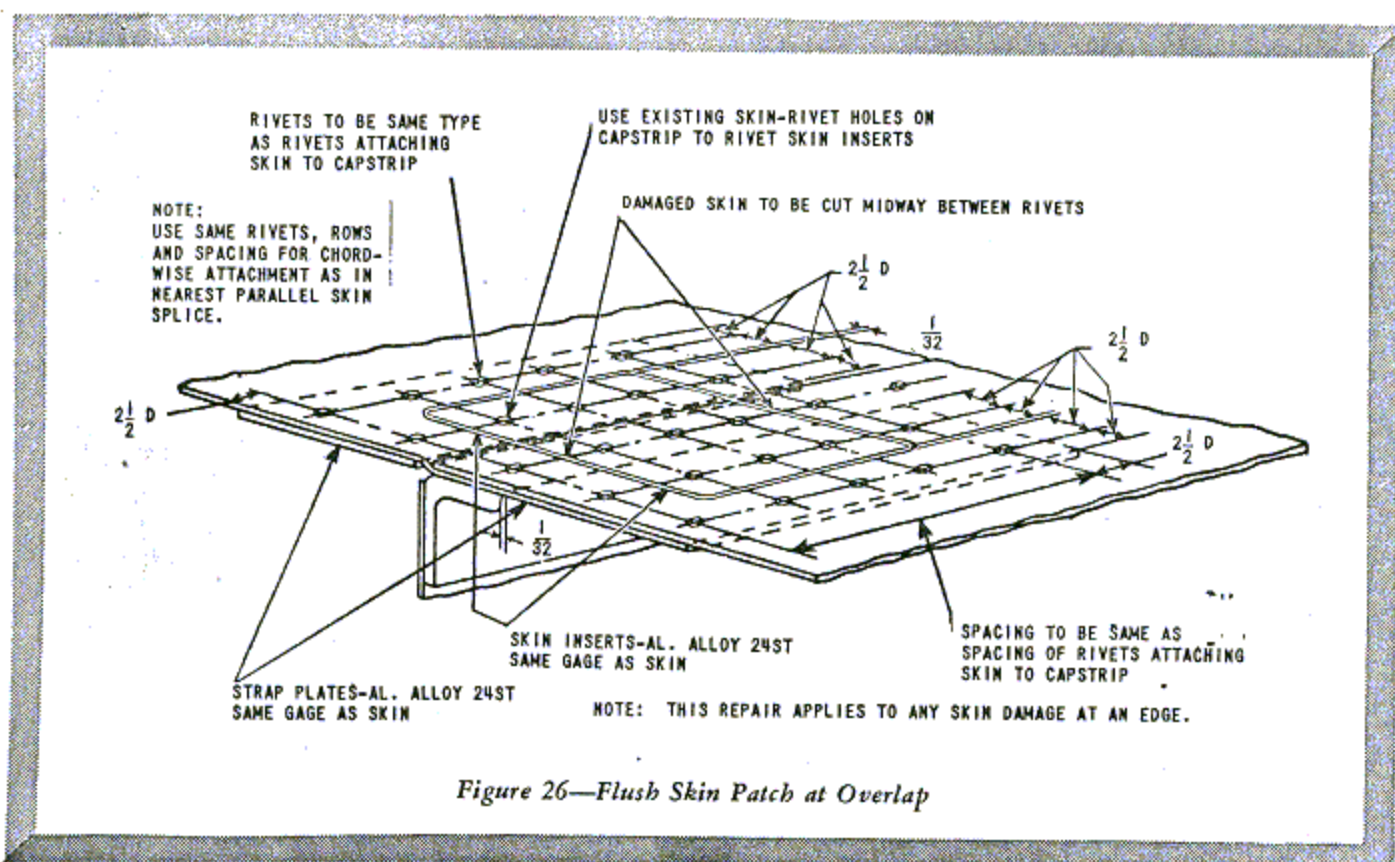


Figure 26—Flush Skin Patch at Overlap

Care must be taken that the repaired bulkhead retains the same length and shape and that aileron attachment fittings are in the same relative position as on the original bulkhead. A method of locating the aileron fittings in the same relative position on the bulkhead is as follows:

Install the aileron on the wing panel, leaving the outboard bearing support free on the aileron; install the replacement or repaired bulkhead in its approximate position on the wing panel. *Do not rivet in place.* When the bulkhead is in its correct position, bolt the aileron bearing support to it, using the aileron as a guide. Clamp bulkhead firmly in place and proceed with the riveting.

(d) *Wing Tip.*—Damage to the trailing end of the wing tip may be repaired by cutting the skin aft of web No. 5 (trailing web) leaving a $\frac{3}{8}$ -inch edge distance overhang for rivets to attach the new skin for the repair. If the trailing edge casting (75-03-148) is cracked or broken, it must be removed and replaced. The replacement should be spliced to the leading edge strip (87-03-532-16) in the same manner as the original splice. Skin replacement from web No.

5 (trailing web) to the trailing edge must be kept tight as "oil canning" is likely to occur at this point. Repair to the remaining portion of the wing tip will be similar to repair of the outboard end of the wing panel.

(4) Fuselage.

(a) *Stringers.*—General repair practice on fuselage stringers is similar to that employed for wing structures; refer to figure 22 for specific information.

(b) *Bulkheads.*—All fuselage bulkheads are built in sections and are joined by splices on the vertical and horizontal center lines. It is recommended that the damaged section of a bulkhead be replaced and spliced to the remaining bulkhead sections as in the original construction.

(c) *Skin.*—General repair practice on fuselage skin is similar to that employed on the wing skin. Refer to figures 23 and 24 for methods of repairing cracks and holes in skin.

(5) Empennage.

(a) Repairs to horizontal and vertical stabilizer skins shall follow repair method specified for No. .025 gage wing skin.

(6) *Application of Dope to Fabric Surfaces.*

(a) *Materials.*

Dope, Nitrocellulose Clear.
Dope, Nitrocellulose Pigmented.
Aluminum Powder—325 Mesh or Finer.
Thinner, Nitrocellulose Dopes.

All material should be of high quality. Because of the fire hazard involved, dope should be stored under conditions approved by the fire prevention and safety authorities concerned. Dope when stored for extended periods in a warm place, is subject to serious deterioration. Storage temperatures should not exceed 60 degrees F for long periods, and may approximate, but should not exceed 80 degrees F for short periods.

(b) *Workshop Conditions.*

1. *Room.*—The room in which doping is performed should be completely enclosed and should not be used for any purpose other than doping or painting. The room should be maintained in a neat and clean condition consistent with the best practice for obtaining dust free finishes. Doping performed in any place outside the doping room should constitute emergency work.

2. *Temperature and Humidity.*—Every effort should be made to maintain the temperature and humidity of the doping room at the best relative adjustment. The most desirable condition is a temperature of 70 degrees—80 degrees F (21.1 degrees—26.7 degrees C), with a relative humidity below 75 percent. At low temperatures the viscosity of dope increases to a point where it is impossible to apply without addition of excess thinner. This high viscosity also prevents proper penetration of the priming coats and produces a finish having defective adhesion. The relative humidity will vary directly as the temperature within the limits specified, that is, the lower the temperature, the lower the relative humidity should be, and the higher the temperature the higher the relative humidity allowed. When no humidity control is available, the relative humidity may be lowered by raising the temperature. Doping may be permitted up to a dry bulb temperature of 90 degrees F (32.2 degrees C), with a wet bulb depression of not less than 4 degrees F (—15.6 degrees C), but it is recommended that work be stopped if conditions become worse. Work on which blushing has developed shall be treated as detailed in paragraph on blushing. The wet and dry bulb temperatures in the doping room should be checked hourly.

3. *Ventilation.*—The doping room should be ventilated by forced draft, which is capable of effecting at least 15 complete air changes per hour. The air should be cleaned before entering the room by covering all inlet openings with cheese cloth or extra fine mesh screen.

4. *Conditioning of Fabric Surfaces Before Doping.*—It is most essential that fabric surfaces be as dry as possible at the time of doping. Fabric surfaces after being covered and before being doped shall be exposed to an atmosphere as described under "Temperature and Humidity" for a sufficient period, (approximately 4 hours), to achieve this condition.

(c) *Preparation of Materials.*

1. *Thinning.*—Dopes should be thinned as specified by the manufacturer. When thinning directions are not supplied with the dope, it shall be thinned until suitable brushing and flowing properties are obtained. The thinning of dopes influences the drying time, tautening properties and the blushing tendency and it is highly essential that it be properly done.

2. *Aluminum Pigmented Dope.*—Aluminum dope can be prepared by adding aluminum powder to clear dope. One pound per gallon is about the right proportion, although this can be varied to suit the materials used. The mixture can then be thinned the same as clear dope.

3. *Brushes.*—It is recommended that brushes used for applying dope be of the flat style, 5 or 6 inches wide, with the bristles set in rubber and bound in metal. Brushes shall be cleaned after each day's use.

4. *Dope Dispensing Cans.*—Cans for applying dope should be of approximately one gallon capacity, and shall be maintained in a clean condition.

5. *Spray Guns.*—Spray guns shall be of a type which will provide the proper spray distribution for satisfactory coverage, and otherwise be suitable for the purpose intended.

(d) *Application of Dope.*

1. *General.*—The finishing scheme consists of base coats of clear dope with protective coats of pigmented dope, and the outside surfaces of all fabric covered parts should be finished in accordance with the following methods:

Four coats of clear nitrocellulose dope and two coats of pigmented nitrocellulose dope.

Under no circumstances should any airplane fabric surface be finished with clear dope only. The

dope shall be applied in such a manner as to produce a uniform and smooth finish over the surface of the fabric. Finished surfaces shall be taut and shall ring with a drum-like effect when struck.

2. *Position of Panels During Doping.*—Panels should be horizontal during application, if practicable. If a vertical position is necessary, care shall be taken to apply the dope in a continuous film and to prevent the dope from running along the bottom edge.

3. *Tautening of Fabric Surfaces.*—The tautening property of dope is a function of both the volatiles and plasticizer. Insufficient thinning will cause a loss in tautness. The speed of tautening may be greatly increased by blowing air inside the confined spaces to remove the heavy solvent vapors which accumulate during the drying period.

4. *Drying Time Between Successive Coats.*—Drying time will vary with temperature and humidity. Under good atmospheric conditions not less than 30 minutes should be allowed between coats, and under unfavorable conditions this time must be extended. Under all conditions sufficient time should elapse between coats to allow the surface to become dry to touch. Unless the dope is properly thinned, drying time will be unduly retarded.

5. *First Coat.*—The first coat shall be applied with a brush. It should be spread on the surface as uniformly as possible, and thoroughly worked into the fabric. Care should be taken not to work the dope through the fabric to the extent that an excessive film is formed on the reverse side. In effect, the first coat should be nothing more than a thorough and uniform wetting of the fabric. This coat should be applied, but not hastily.

6. *Surface Tape.*—Finishing tape shall be applied over all lacing, over all seams, both machine and hand sewn, and over corners, edges and covered structural members where hard wear occurs. Tape shall not be applied until the first coat of dope has dried. A second coat of dope shall be brushed locally over that portion of the fabric which is to be covered by the finishing tape and the tape laid in position over the freshly doped surface. A coat of dope shall be applied over the tape immediately.

7. *Reinforcing Patches.*—All portions of fabric pierced by wires, bolts, or any projections shall be reinforced by ample patches, except that patches may be omitted where other means of reinforcing are specified. The patch shall be doped on after the first coat of dope has dried. Where fittings protrude

through the cover, filler blocks shall be fitted about them so that the fabric can be tacked to the blocks. A reinforcing patch shall be doped on closely around the fitting for protection against the possible entrance of moisture.

8. *Second Coat.*—The second coat shall be applied with a brush, and should be laid on smoothly and worked only enough to secure an even spread.

9. *Rubbing.*—If roughness appears after the second or any succeeding coats, the surface may be smoothed by very light rubbing with No. 0000000 sandpaper or with doped canvas rubbing pads. These pads are made by applying one coat of dope to clean canvas, allowing it to dry, and cutting the fabric to proper size. No other rubbing materials should be used for this purpose.

10. *Third and Fourth Coats.*—These coats may be applied by either brush or spray gun. When a gun is employed, the correct nozzle setting and spray consistency shall be obtained before starting the actual work.

11. *Pigmented Dope.*—Pigmented dope of the proper color shall be applied to the various surfaces. The number of coats shall be not less than two, and shall provide sufficient opacity to effectively shield the clear dope. Pigmented dope shall be applied with a spray gun.

12. *Blushing.*—Blushing has the effect of reducing the tensile strength of the dope film and is caused by a precipitation of cellulose ester, under certain favorable relationships of the rate of evaporation of the volatile portion of dope to the relative humidity of the surrounding atmosphere. High evaporation rates and high humidity promote blushing. The rate of evaporation is governed principally by the volatile composition, the atmospheric temperature, and the barometric pressure. High temperatures and low pressures produce high evaporation rates. When conditions produce too rapid drying, corrective measures are necessary to reduce the rate of evaporation and blush tendency. Work which has developed only a light blush may be treated by dampening the surface with a light spray of the applicable thinner.

(e) *Precautions.*

Dope should never be poured on the fabric.

Dope should not be allowed to stand in open containers exposed to the air for more than one hour. When not in use, dope dispensing cans or other containers should be carefully covered to prevent unnecessary evaporation.

(f) Patching Torn Areas.

Clean off all dirt, grease or wax around torn area. If tear is not more than 2 or 3 inches long, a sandwich patch should be used. Cut the cloth at right angles to the tear and for the same distance. Prepare a patch that extends at least one inch beyond the tear. Wet the patch thoroughly with clear dope and insert under the flap formed by the tear and cut. Stick the patch down well to the cloth and the flap to the patch. Prepare another patch that will extend over the first one at least an inch on all sides, wet it with dope and apply over the first patch. After dope is dry apply three more coats of clear dope and two coats of pigmented dope in the usual manner.

If the tear is more than four inches long, the edges should be sewn together with a baseball stitch. A patch that extends at least 1-1/2 inches beyond the tear in all directions should be prepared and doped over the tear as described above.

(7) Refinishing Metal Surfaces.—The following procedure should be used after making any repair to the metal structure of the airplane.

(a) Clean the area to be refinished with Varnoline or Toluene. Rub the surface thoroughly with a cloth wet with the cleaner.

(b) Sand the area with fine sandpaper, "Cut-rite" or "Wet-o-dry," grade 280 to 400.

(c) Wipe the surface with a cloth saturated with "Metal Prep" or dip the part in a chromic dip solution.

(d) After the surface has dried, spray on one coat of Zinc Chromate primer, P-27-B.

(e) Allow the prime coat to become hard and dry before applying the last two coats of pigmented lacquer. The same color lacquer should be used as on the surrounding areas. Allow the lacquer to dry thoroughly between coats. If any laps or dust particles cause an uneven surface, they may be smoothed out with the 280 or 400 grade sandpaper mentioned above.

(f) If cracks are too wide or uneven, they may be filled with a thick seam compound, which will harden in a few hours. The final coats of lacquer are applied over the seam compound.

2. WING. (DRAWING NO. 87-03-901)

a. Disassembly.—Instructions covering the disassembly of the wing panels and center line bulkhead and the removal of the wing tips, ailerons and wing flaps are contained in T.O. No. 01-25CK-2.

*b. Inspection.**(1) Wing Panels.*

(a) Inspect the wing fillets and fillet bulkheads for cracks, elongated bolt holes, skin abrasions, and wrinkled skin.

(b) Inspect the center line bulkhead for cracks, elongated bolt holes, and abrasions, where the match angles and stringers bear against it.

(c) Inspect the match angles and wing-fuselage joint angles for cracks, elongated bolt holes, and security of attaching rivets.

(d) Inspect the root sections of both panels for cracks, loose or sheared rivets, and buckled members.

(e) Inspect the fibre locking devices in the nut plate fasteners on the outboard wing bulkhead used for attachment of the wing tip.

(f) Inspect the rubber grommets in the bulkhead at the outboard end of the wing.

(g) Remove the inboard and outboard aileron bearing supports and inspect the supports and portions of the wing adjacent to them for cracks, loose or sheared rivets, elongated bolt holes, and misalignment.

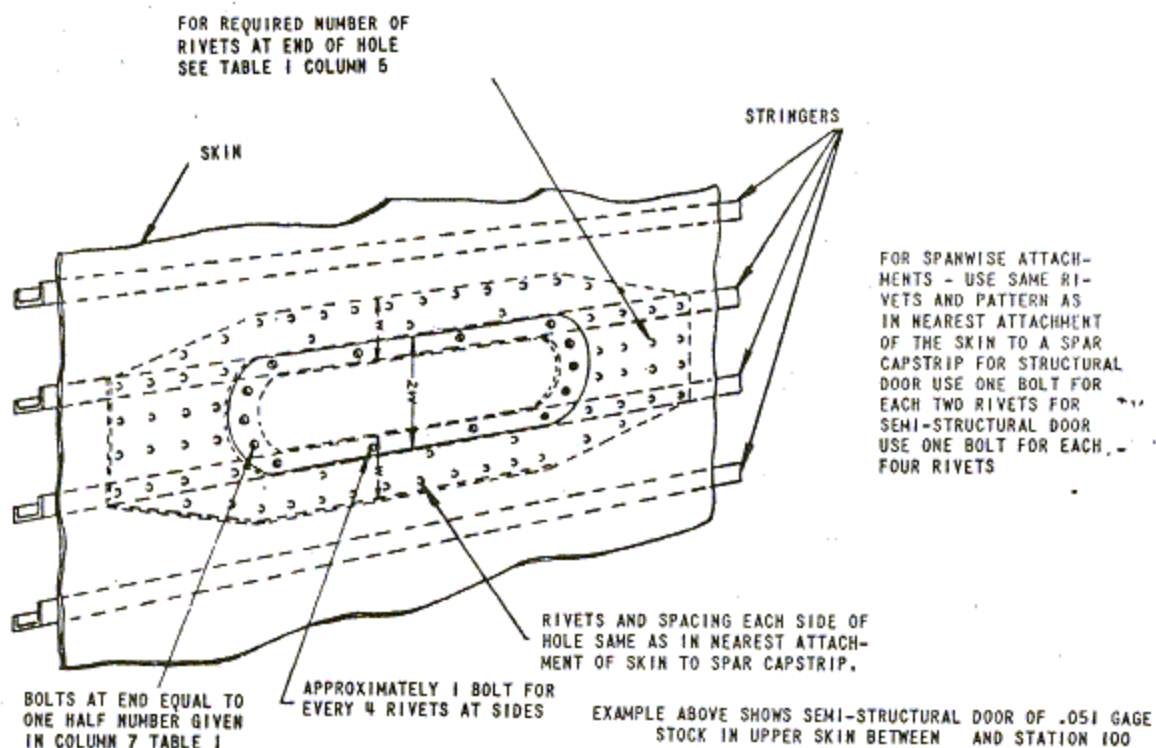
(h) Inspect the wing structure adjacent to the attachment of the aileron cable guides and pulley supports, for cracks, loose or sheared rivets, and elongated bolt holes.

(i) Inspect the flap hinge, trailing edge bulkheads where roller units are supported, and the flap bell crank supports for cracks, loose or sheared rivets, elongated bolt holes, and misalignment.

(j) Remove the landing gear fittings; which were not removed during dismantling of the landing gear, and inspect the fittings still attached to the wing panels for cracks, sheared or loose rivets, elongated bolt holes, and misalignment; these instructions apply, as well, to supports for the retracting struts and mechanism. The bearings for the remote pivot points in the retracting arms should also be checked for excessive wear.

(k) Inspect the entire wing for cracks, especially around the skin cut-outs and adjacent to fittings, loose or sheared rivets, elongated bolt holes, buckled members, and skin abrasions.

(l) Inspect the mooring ring and support for cracks and sheared or loose rivets. Check the strength of the retracting spring. Inspect the mooring ring hinge pin for excessive wear.



FOR CHORDWISE ATTACHMENTS-USE FOLLOWING DATA:

TABLE 1
SKIN REPAIR

SKIN	STATION	GAGE	RIVET DIAM. NO. OF ROWS & SPACING			MINIMUM NO. PER INCH OF CUTOUT	* 1100-D BOLTS (C'S'X) OR 525-10 BOLTS (WASHER)	
			D	ROWS	S		ROWS AND MAX. SPACING	MINIMUM NO. PER IN. CUTOUT
1	2	3		4		5	6	7
	TO 81 1/2	.051	3/16	3	3/4	4	3 AT 3/4	4
		.064	3/16	3	5/8	5	3 AT 5/8	5
	81 1/2 TO 100	.040	1/8	3	5/8	5	2 AT 7/8	2 1/2
		.051	5/32	3	3/4	4	2 AT 5/8	3
		.064	3/16	3	3/4	4	3 AT 3/4	4
	100 TO 164	.040	1/8	3	5/8	5	2 AT 7/8	2 1/2
		.051	5/32	3	7/8	4	2 AT 3/4	3
		.064	3/16	3	3/4	4	3 AT 3/4	4
	164 TO 205	.040	1/8	2	3/4	3	1 AT 3/4	1 1/2
	TO 81 1/2	.040	5/32	3	7/8	4	2 AT 3/4	3
		.051	3/16	3	3/4	4	3 AT 3/4	4
	81 1/2 TO 100	.032	5/32	3	7/8	4	2 AT 3/4	3
		.051	3/16	3	5/8	5	3 AT 5/8	5
	100 TO 164	.020	1/8	2	1	2	1 AT 3/4	1 1/2
		.032	1/8	2	5/8	4	2 AT 1 1/8	2
		.040	1/8	3	3/4	4	2 AT 1	2
		.051	5/32	3	5/8	4	2 AT 5/8	3 1/2
	164 TO 205	.020	1/8	1	3/4	2	1 AT 1 1/4	1
		.032	1/8	2	1 1/8	2	1 AT 1	1
		.040	1/8	2	1	2	1 AT 1	1

*USE ELASTIC STOP NUT PLATES NO. 659-D-2 WITH BOLTS. EACH NUT PLATE IS ATTACHED WITH TWO 673-D-440 FLUSH RIVETS. TO ATTACH NUT PLATES TO .051 OR .064 GAGE STOCK, MACHINE COUNTER-SINK SHEET FOR RIVETS. TO ATTACH NUT PLATE TO .040 GAGE OR LIGHTER STOCK PRESS COUNTER-SINK AND USE COUNTER-SINK PLATE NO. 1066-D-1 FOR RIVETS. USE NO. 1101-D BOLTS FOR STRUCTURAL DOORS AND NEAR LEADING EDGE OF WING.

Figure 27—Wing—Skin Repair Data

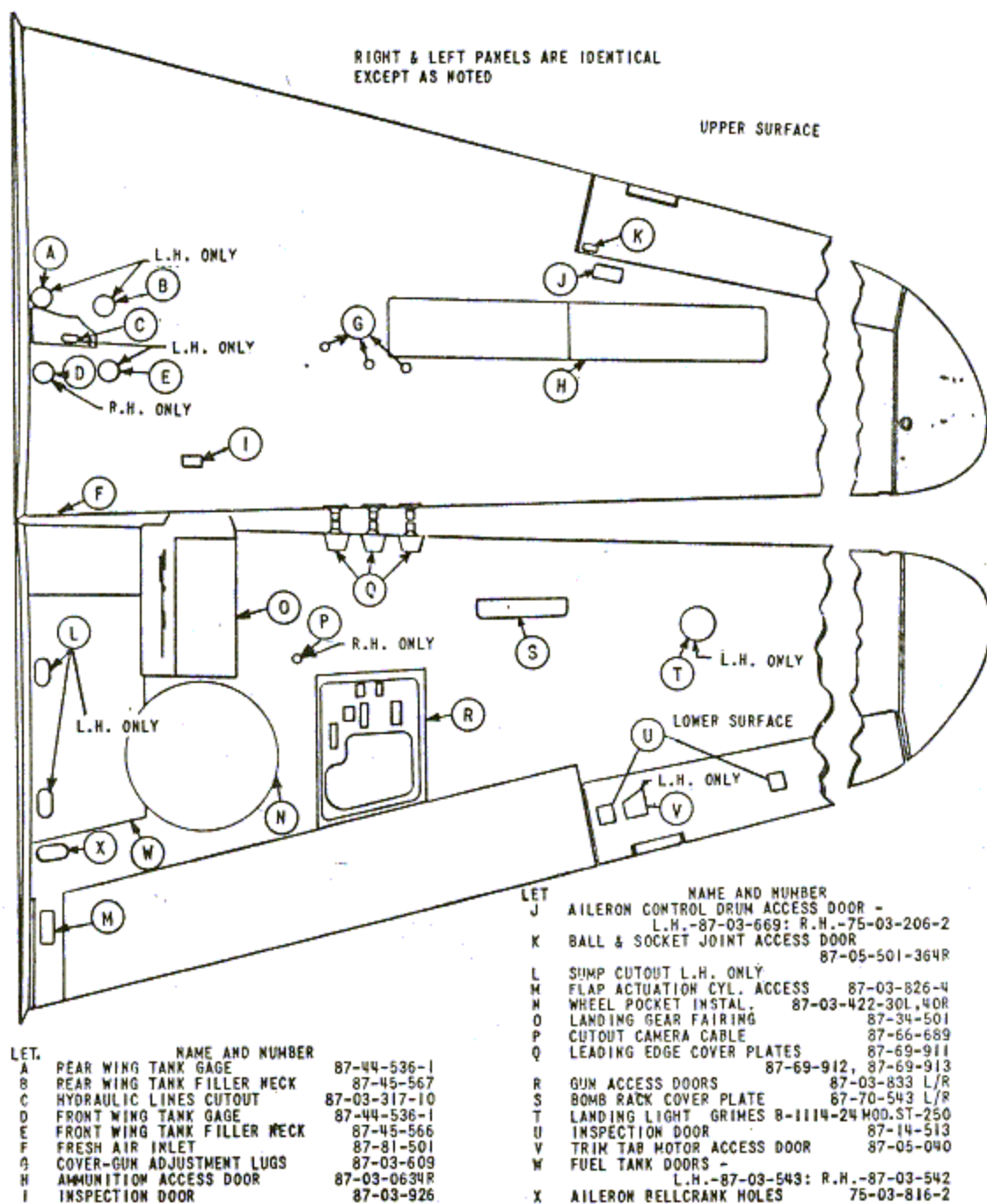


Figure 28—Inspection and Access Doors—Wing

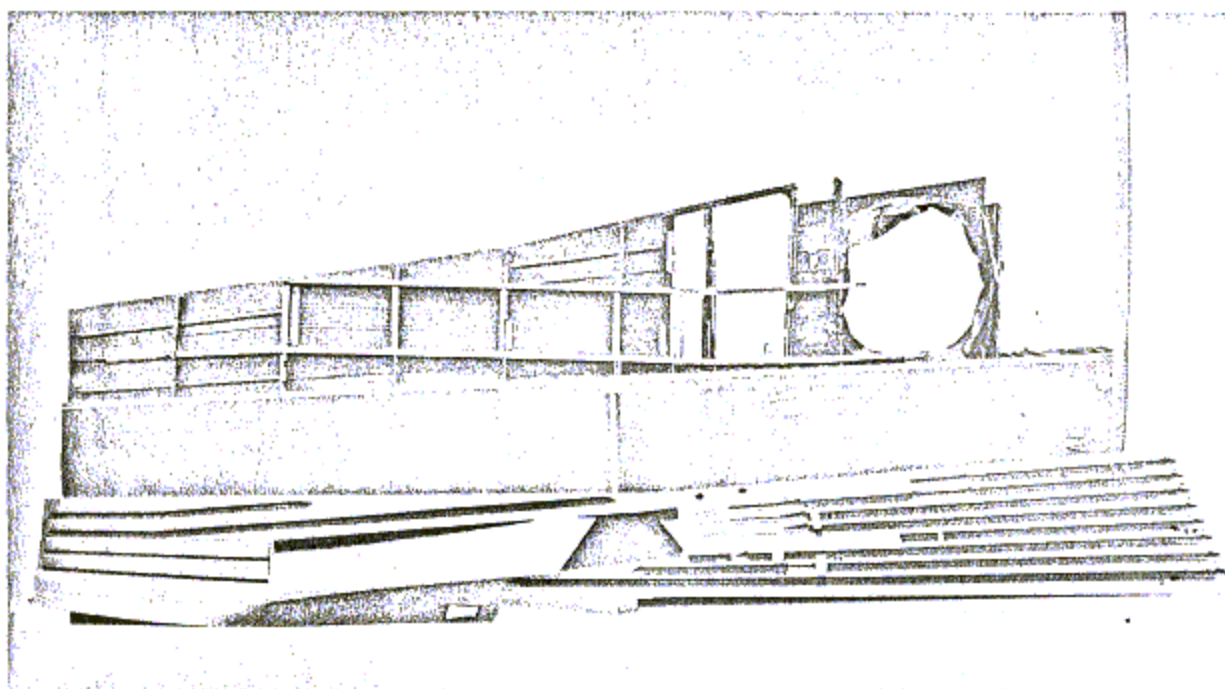


Figure 29—Wing Showing Construction

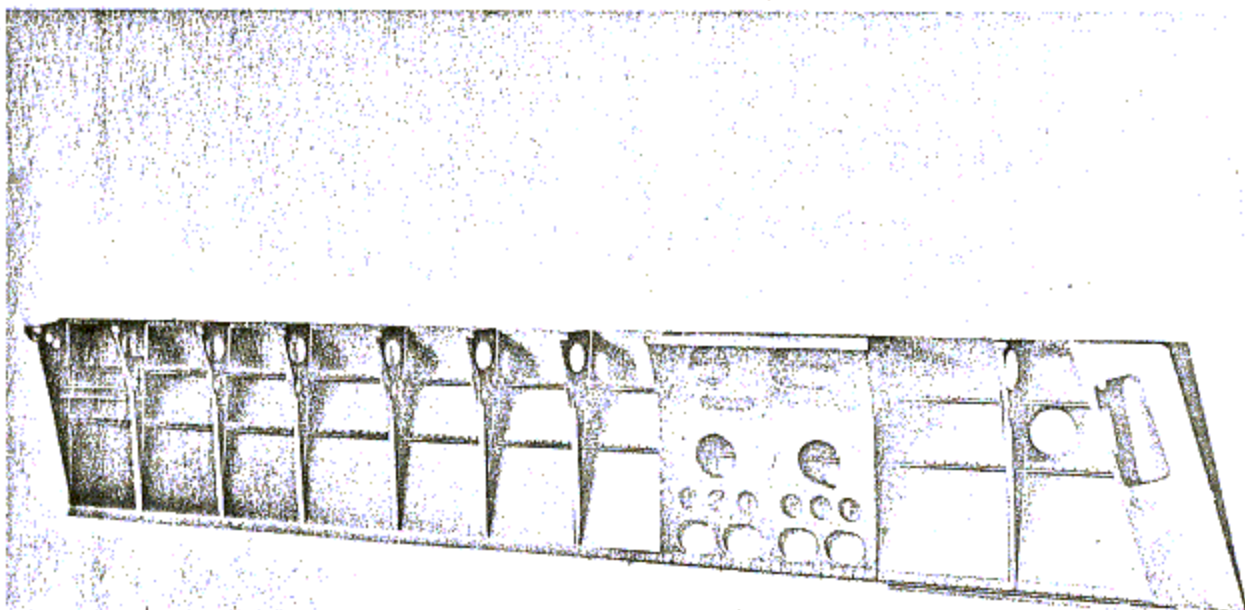


Figure 30—Trailing Edge of Wing—Bottom View

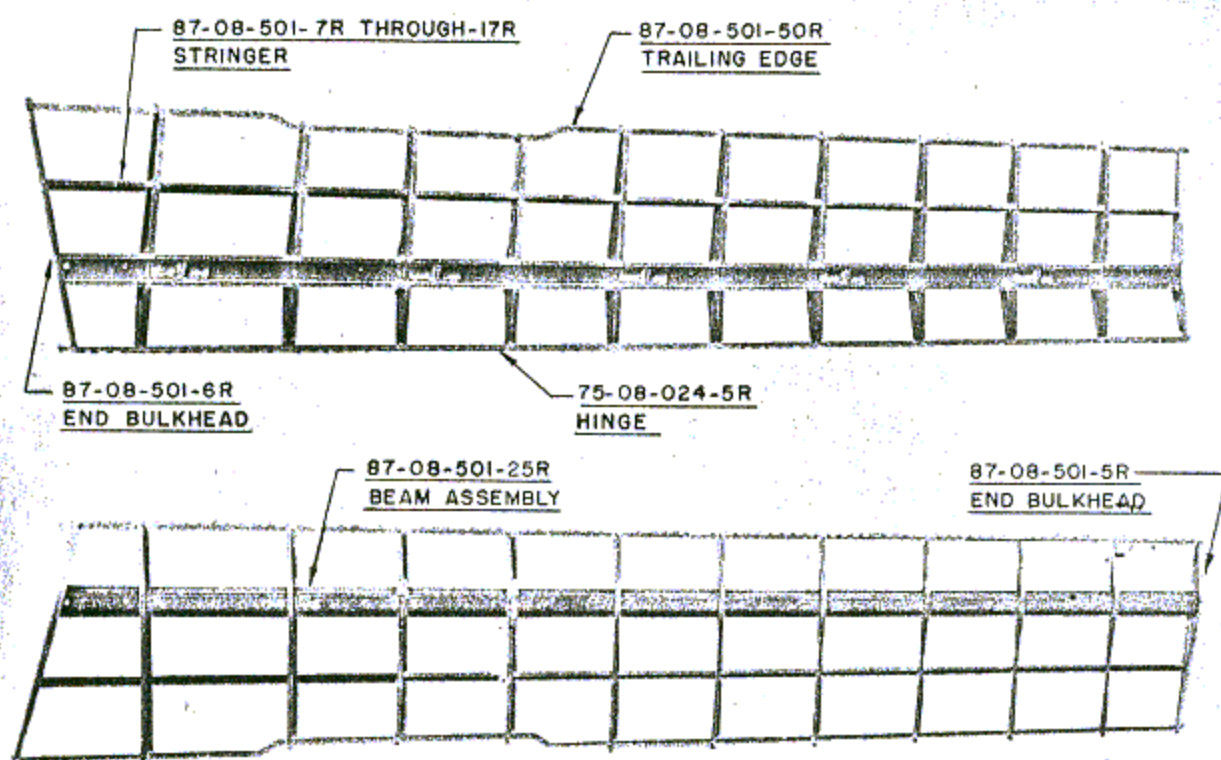


Figure 31—Right-Hand Wing Flap Skeleton—Top and Bottom Views

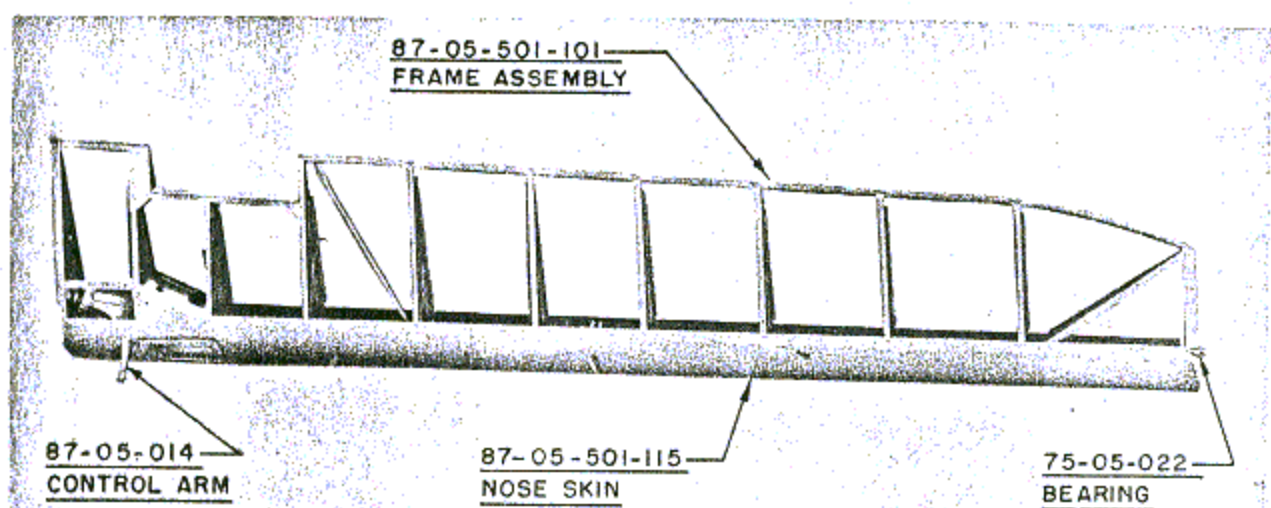


Figure 32—Left-Hand Aileron Skeleton

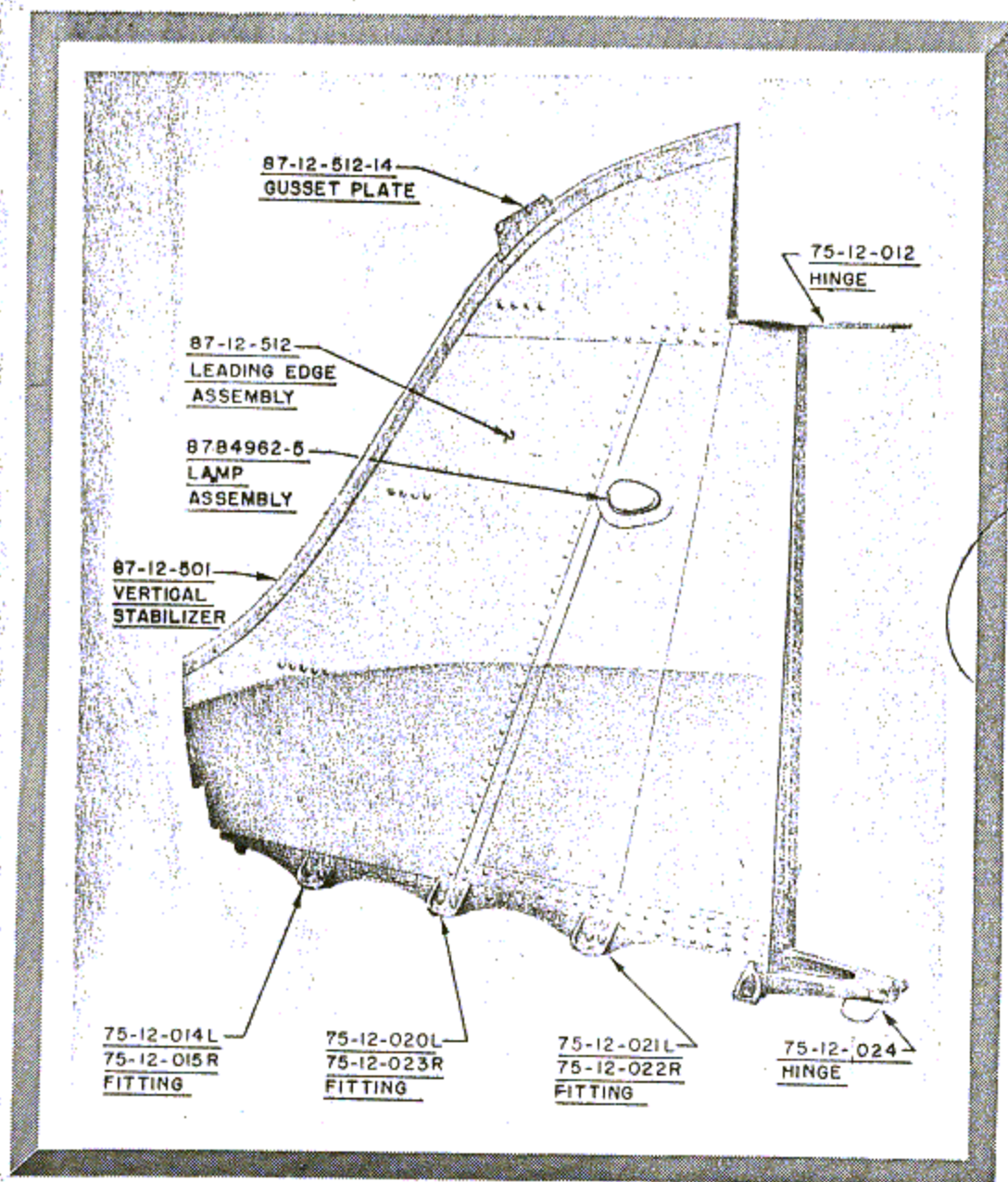


Figure 33—
Vertical
Stabilizer

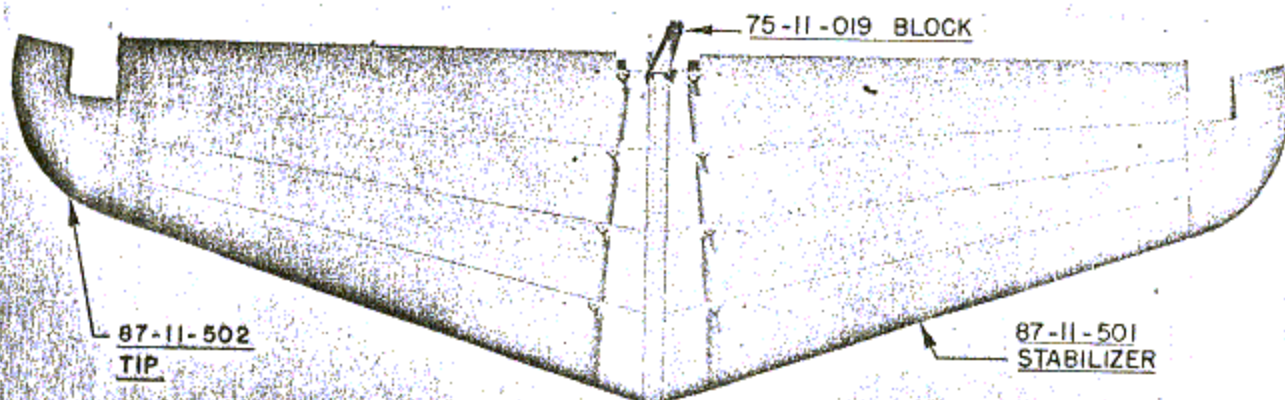


Figure 33—Horizontal Stabilizer

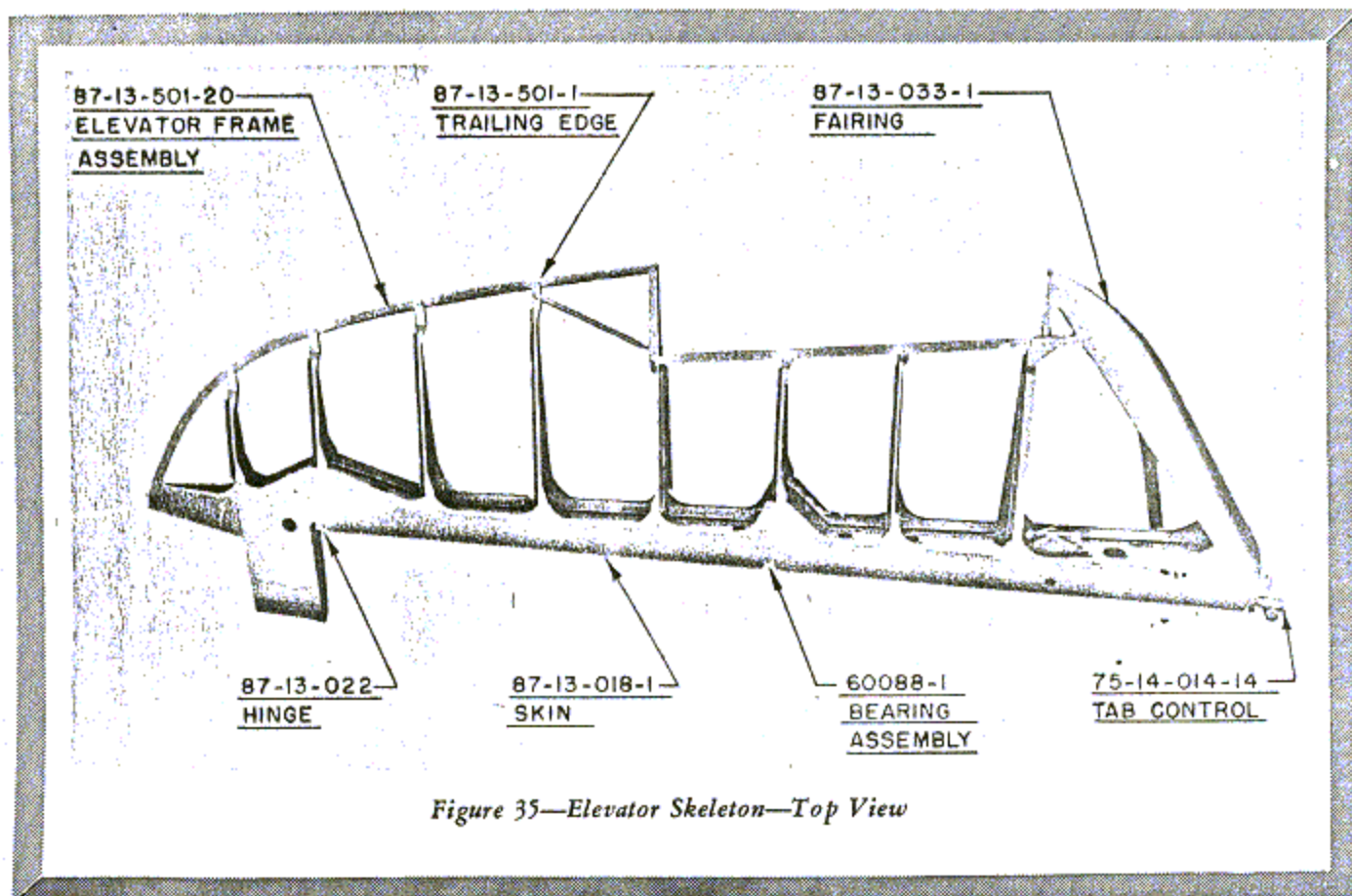


Figure 35—Elevator Skeleton—Top View

(m) Before assembling the wing it is advisable to shake the wing vigorously to determine if there are any foreign parts or loose fittings inside the wing. At least 20 men will be needed for this operation.

(2) *Wing Tips.*—Inspect the wing tips for cracks, loose or sheared rivets, elongated bolt holes, and buckled members.

(3) *Aileron.*—The aileron replacements should be inspected per T.O. No. 01-1-12.

(4) *Wing Flaps.*

(a) Inspect the skin for local abrasions, dents and cracks or tears.

(b) Inspect for loose rivets.

(c) Inspect for bent ribs, spars or trailing edge.

(d) Inspect for condition of the hinge.

c. *Repair.*

(1) For structural repairs, refer to paragraph 1.d.(2), this section.

(2) For bulkhead repair, see paragraph 1.d.(3), (c), of this section.

(3) Replace the rubber grommets in the bulkhead at the outboard end of the wing, if necessary.

(4) Replace the felt flap bumpers which are attached to the underside of the wing panel trailing edge with formica cement; coat these bumpers with rust preventive compound, Specification No. 2-82, after installation to prevent corrosion of the flap surfaces in contact with the bumpers.

d. *Assembly.*—Instructions covering the assembly of the wing panels and center line bulkhead, wing tips, ailerons, and wing flaps are contained in T.O. No. 01-25CK-2.

3. EMPENNAGE. (DRAWING NO. 87-15-501)

a. *Disassembly.*—Instructions covering the disassembly of the empennage are contained in T.O. No. 01-25CK-2.

b. *Inspection.*

(1) *Stabilizers.*

(a) Inspect the empennage fillets for cracks, elongated bolt holes, skin abrasions, and wrinkled skin.

Inspect the horizontal and vertical stabilizers for cracks, dents, loose or sheared rivets, skin abrasions, and misalignment.

(b) Remove the stud nuts holding the vertical stabilizer to the horizontal stabilizer and inspect the fittings and mating holes in both stabilizers for cracks and elongated bolt holes.

(c) Inspect the elevator hinge bearing supports on the horizontal stabilizer for cracks and misalignment; inspect the antifriction bearings as instructed in T.O. No. 29-1-3.

(d) Remove the center rudder hinge bearing support from the vertical stabilizer and inspect the fittings for cracks and elongated bolt holes.

(2) Elevators and Rudder.

(a) Remove all fabric covering from the elevators and rudder and inspect the structures for cracks, dents, misalignment, and loose or sheared rivets.

(b) Inspect the tab control bell crank fittings for cracks, elongated bolt holes, and misalignment.

(c) Inspect the tab ball bearings in accordance with instructions in T.O. No. 29-1-3.

(d) Remove the elevator and rudder torque tubes by withdrawing the clevis bolts which attach the movable sections to the sections welded to the elevator or rudder structure; the bearings can now be removed.

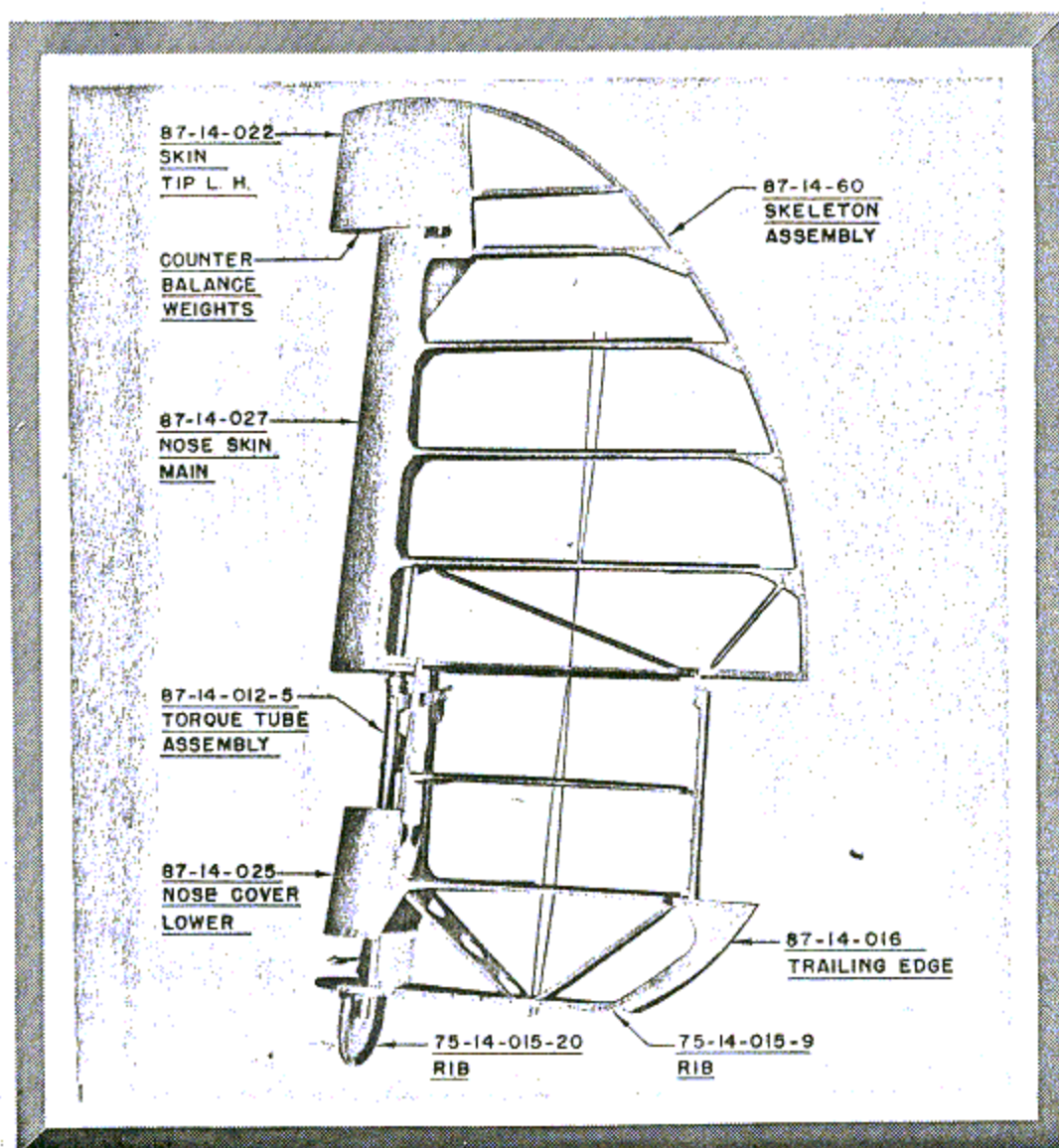
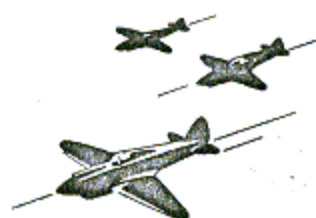
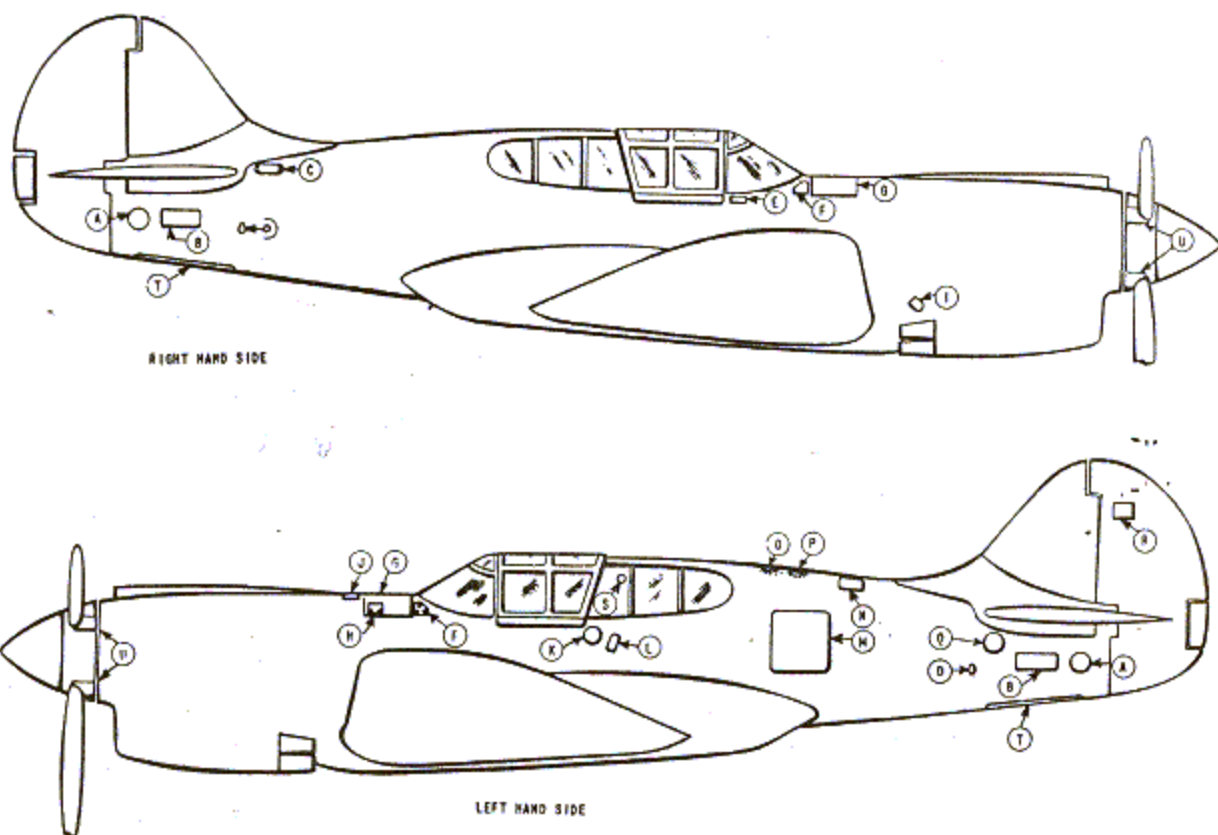


Figure 36—Rudder Skeleton





LET	PART AND NUMBER	LET	PART AND NUMBER
A	INSPECTION DOOR 75-21-318-2	K	FUEL TANK FILLER NECK CUTOUT
B	TAIL WHEEL ACCESS DOOR 87-21-201-2	L	HANDHOLD REINFORCEMENT 87-21-566
C	POSITION TRANSM. ACCESS 87-21-522	M	FUSELAGE ACCESS DOOR 87-21-526
D	LIFT TUBE 75-21-160	N	HYDRAULIC TANK ACCESS DOOR 87-21-650
E	CABIN CRANK ACCESS DOOR 87-21-545	O	IDENTIFICA'N LIGHT-GRIMES A2232
F	BRAKE CYL. ACCESS DOOR 87-21-549 L/R	P	AUTO.RECOG. DEVICE EXIT 87-67-607
G	FUSELAGE FORWARD COVER PLATE 87-21-514-1	Q	INSPECTION DOOR 87-21-647
H	OIL TANK FIL.ACCESS DOOR 87-21-515-1	R	RUDDER HINGE ACCESS DOOR 87-14-513
I	STARTER PULL ACCESS DOOR 87-29-715-15	S	KLAXON HORN (LG WARN.) TYPE E-2
J	COOLANT TANK ACCESS DOOR 87-29-554	T	TAIL WHEEL DOOR 87-21-5244R
		U	PROPELLER BLADE COVER 87-42-532-3

Figure 37—Inspection and Access Doors—Fuselage

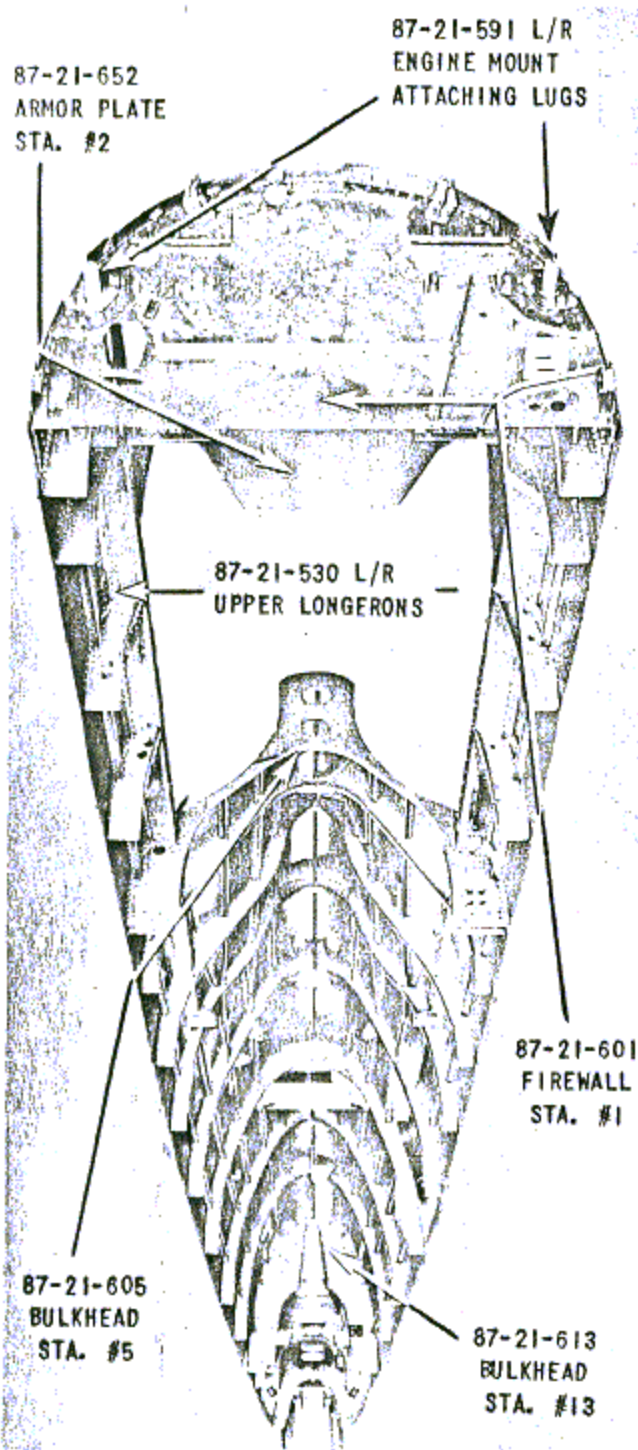


Figure 38—Fuselage—Top Section
Before Assembly

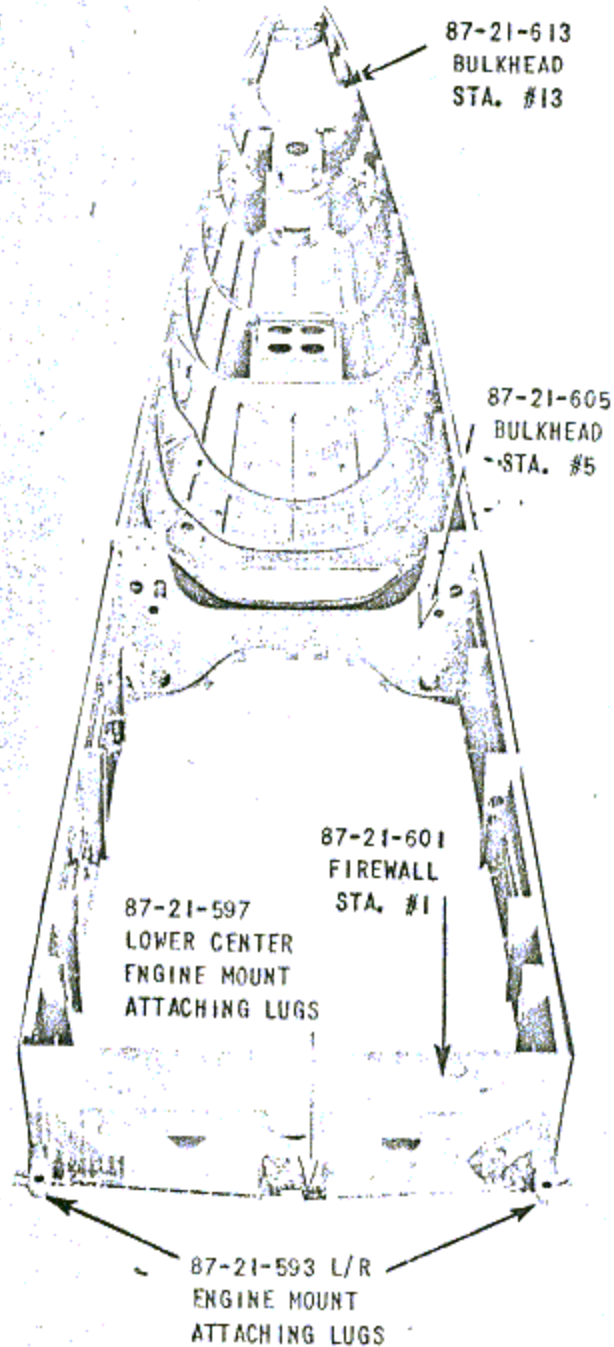


Figure 39—Fuselage—Bottom Section
Before Assembly

1. Inspect the torque tubes for cracks and elongated bolt holes; inspect sections welded to the structure for cracks around the welds.

2. Inspect the antifriction bearings as instructed in T.O. No. 29-1-3.

(c) The elevator and rudder replacements should be inspected in accordance with T.O. No. 01-1-12.

c. Repair.

(1) For structural repairs, refer to paragraph 1.d.(2) this section.

(2) Refer to drawings No. 87-13-002-20 and No. 87-14-064 for the method of covering the elevator and rudder. (See figure 40.)

d. Assembly.—Instructions covering the assembly of the empennage are contained in T.O. No. 01-25CK-2.

4. FUSELAGE AND ENGINE MOUNT.

a. Fuselage.

(1) *Disassembly.*—Disassemble from the fuselage all removable units which are accessible for removal and which have not been discussed in other installations, systems, and assemblies.

(2) *Inspection.*

(a) Inspect the fuselage structure for cracks, loose or sheared rivets, elongated bolt holes, skin abrasions, wrinkled skin, and misalignment.

(b) Inspect the wing-fuselage attachment angle for cracks, elongated bolt holes, misalignment, and security of attachment.

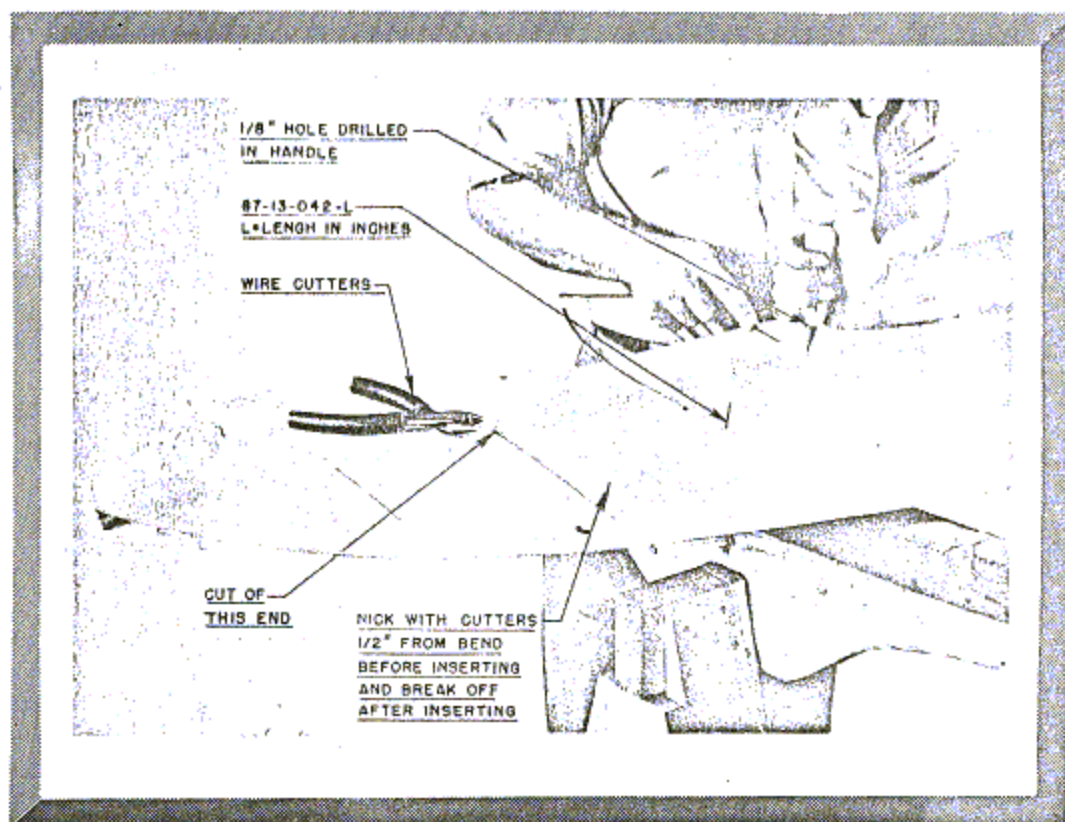
(c) Remove the horizontal stabilizer fittings on the fuselage and inspect the fittings and mating holes in the fuselage for cracks and elongation of bolt holes.

(d) Remove the lower rudder hinge bearing support from the fuselage and inspect the fitting and mating structure in the fuselage for cracks and elongated bolt holes.

(e) Inspect the tail wheel doors, and hinges for general condition. Inspect the tail wheel, drag link supports, retracting strut supports, and position transmitter supports for cracks, elongated bolt holes, loose or sheared rivets, and misalignment. Inspect the tail wheel drag link bearing surfaces in the fuselage fittings.

(3) *Repair.*—For structural repairs, refer to paragraph 1.d.(2), this section.

Figure 40—Attaching Covering to Elevator



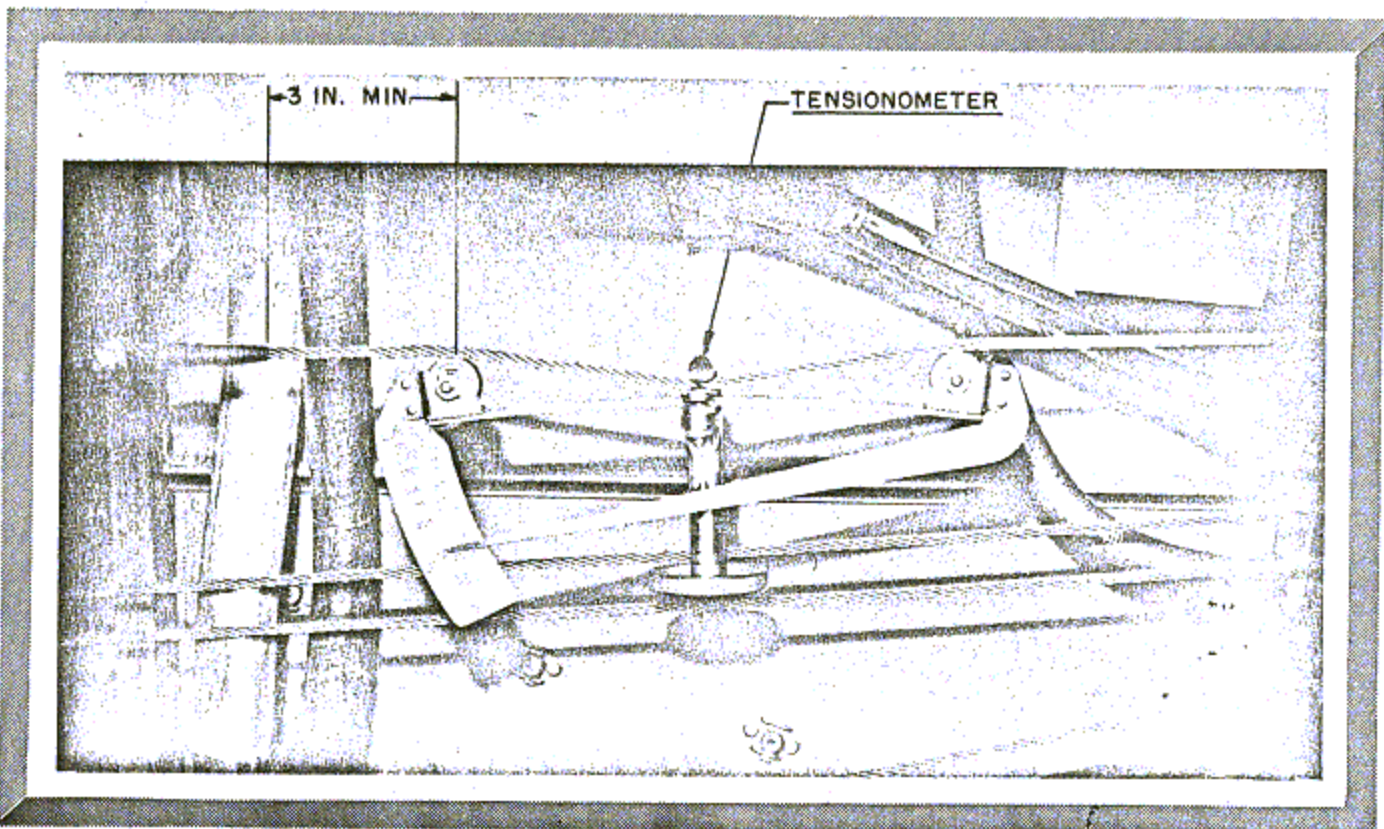


Figure 41—Tensionometer Installed on Elevator Cable

b. Engine Mount.

(1) *Disassembly.*—Instructions covering the removal of the engine mount are contained in T.O. No. 01-25CK-2.

(2) *Inspection.*

(a) Before inspection, all accessories, tubes, and clamps should be removed.

(b) Inspect the engine mount for cracks, particularly at welds.

NOTE: All welds should be thoroughly cleaned with a wire brush before inspection.

(c) Inspect the fuselage attachment fittings for condition of bearing surfaces, signs of excessive wear, cracks, and elongated bolt holes.

(3) *Repair.*

(a) The engine mount is constructed of several subassemblies bolted together to form the complete mount. All tubing assemblies are X-4130 steel tubing with steel fittings welded into the ends of the tubes to form bolt attachments. The front and rear engine mount vibration absorbers attach to the bearer tube. The engine mount is attached to the lower

fire wall lugs with two strut assemblies and to the upper fire wall lugs by fittings on the aft end of the upper tube assemblies.

(b) Due to the extremely accurate jiggling and close hole tolerances necessary to eliminate vibration, repairs to the engine mount are considered inadvisable as replacement of a subassembly or unit is easily effected. The engine mount assembly is so designed that it may be broken down into small units and subassemblies for quick replacement.

(c) Reference should be made to the engine mount drawing (87-22-702) before ordering replacement parts. Also see figure 42 and figure 43 of this section.

(4) *Assembly.*—Instructions covering the installation of the engine mount are contained in T.O. No. 01-25CK-2.

5. COWLING.

a. Inspection.

(1) *Engine Section Cowling.*

(a) Inspect the cowling, all supports, brackets, and fittings for cracks, loose or sheared rivets, loose

spot-welds, elongated bolt holes, skin abrasions, and wrinkled skin.

(b) Inspect the abrasion strips on the engine cowl formers, which bear against the cowl, for signs of excessive wear.

(c) Inspect the Dzus fasteners for signs of excessive wear in the cams and springs, and check the springs for loss of strength.

(2) *Cowl Flaps.*

(a) Inspect the flap hinges, flap bearings, supports, and control rods for cracks, dents, bends, loose or sheared rivets, elongated bolt holes, and misalignment.

(b) Inspect the cowl flap control rods and supports for cracks and signs of excessive wear. Check the control rods for misalignment.

b. Repair.

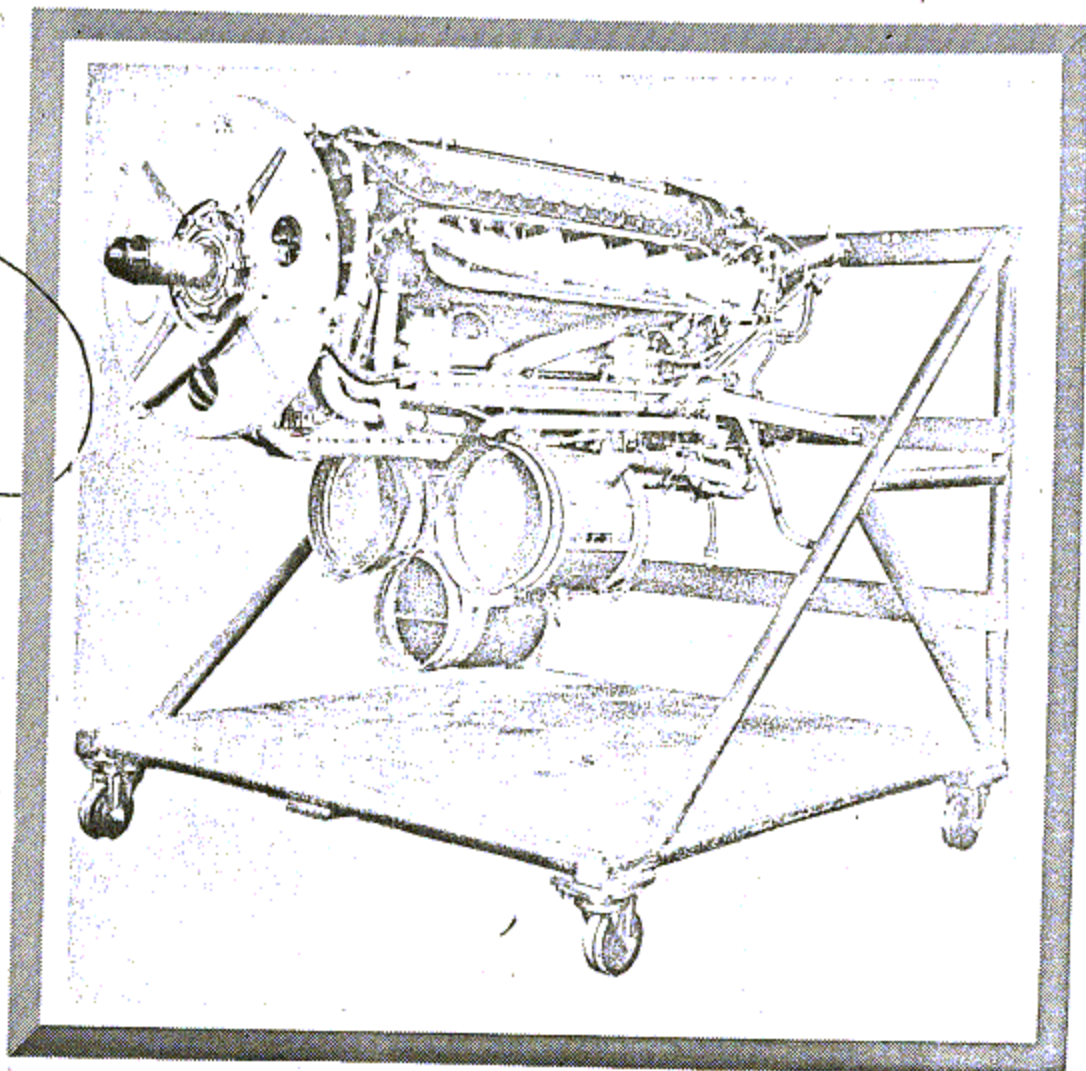
(1) Repairs to the cowl structure and skin will follow general practice on repair of the wing and fuselage, except that the number of rivets and the gage of material are not as critical. When repairing the cowl, use the same rivet spacing and gage of material as is used on surrounding areas.

(2) When repairing the cowl skin (exterior surfaces) a type of patch similar to the fuselage skin patch which is applied from the inside and uses a filler plate to give a smooth finish (see figure 23) should be employed.

(3) Replace the abrasion strips on the cowl formers if necessary.

(4) Replace the flexible mounts on the cowl's forward bulkhead if necessary.

Figure 42—Engine
and Mount
Assembly Support
Stand



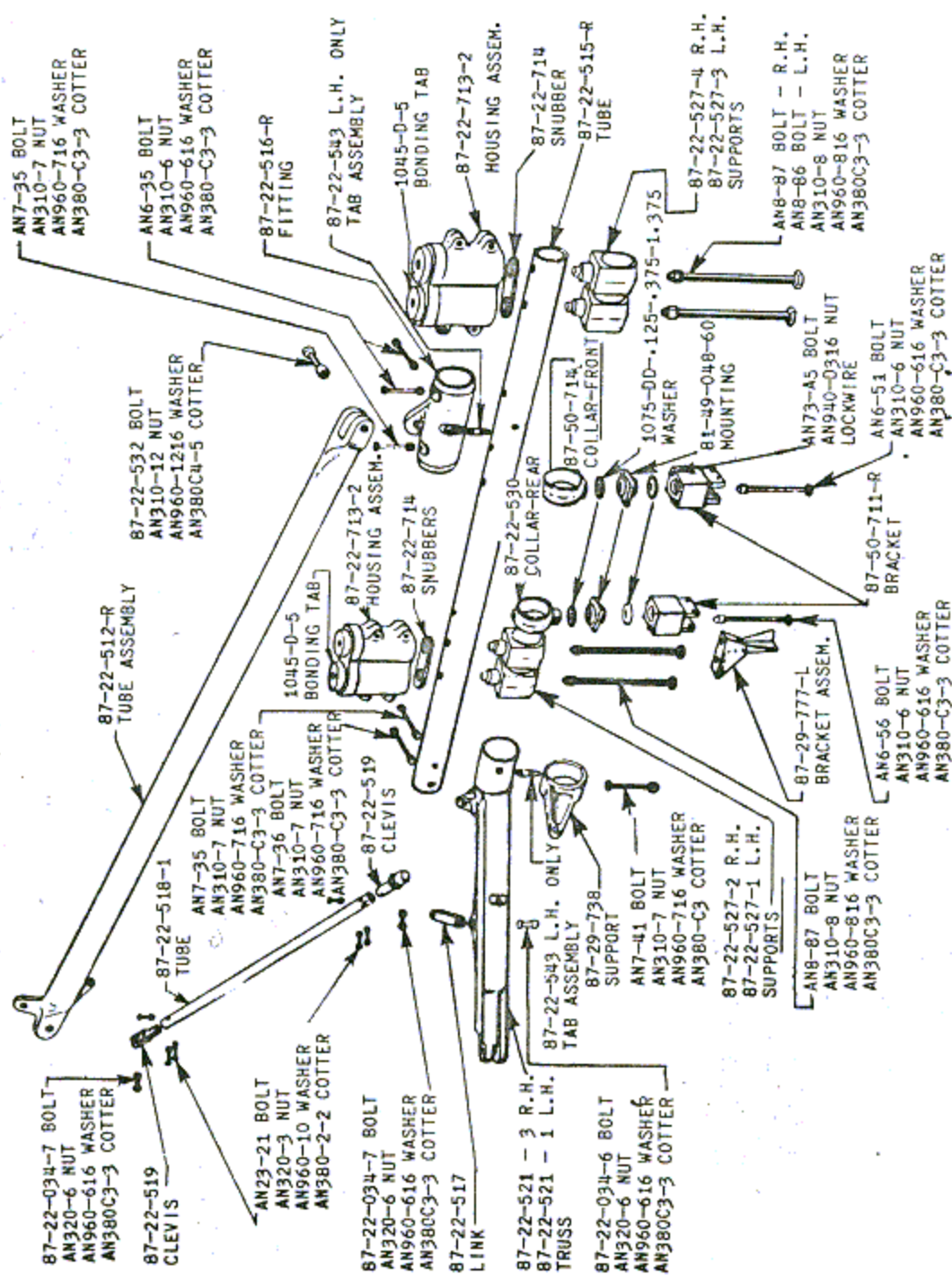


Figure 43—Engine Mount Disassembly

6. SPINNER ASSEMBLY.

As the spinner nose and spinner base are statically balanced, it is essential that they be replaced in event of any damage to them, and after replacement, the entire assembly shall be statically balanced.

7. LANDING GEAR.

a. Disassembly and Inspection.—Instructions covering the removal of the landing gear assembly from the wing are contained in T.O. No. 01-25CK-2.

(1) Strut Assemblies.

(a) Inspect the axle bearing surfaces which carry the wheel bearings for scores, uneven surfaces, or other signs of wear.

(b) Disconnect the towing ring and jack pad assembly from the axle assembly by removing the retaining bolt. Remove the towing ring and jack pad assembly and inspect for cracks or other damage.

(c) Inspect the threads on the end of the axle for general condition, especially for signs of stripping or burrs.

(d) Remove the axle housing assembly from the air-oil shock absorber strut piston by withdrawing the two clevis bolts and inspect both the piston and axle assembly for cracks and elongated bolt holes, especially around the two clevis bolts. Inspect the clevis bolts for excessive wear. Since these clevis bolts are fitted in reamed holes, any appreciable wear beyond the .0015 inch clearance specified on the drawing will cause vibration in the landing gear.

(e) Remove the oleo strut scissors links and inspect the bearing surfaces and bolts for excessive wear and check parallelism between bore center lines in the bearings on opposite ends of any link in a manner similar to that in which the bore center lines of the bearings in an engine connecting rod would be checked.

(f) Remove the split lower trunnion on the oleo cylinder by withdrawing the eight special cap screws which hold the assembly together. Inspect the bearing surfaces in the trunnion and on the oleo strut for scores and excessive wear. Inspect the tapped holes for the cap screws for stripped threads and burrs.

(g) Remove the upper trunnion by removing the large plunger nut recessed into the head of the oleo strut and pulling out the trunnion cap. Inspect the threads in the nut and on the plunger for stripping and burrs. Inspect the laminated shims for tears or breaks and replace all shims found to be faulty.

(h) Remove the bevel gear segments and inspect for cracks, elongated bolt holes, and burrs on the teeth.

(i) Refer to T.O. No. 03-25E-1 for instructions covering the air-oil shock absorber struts. Inspect for:

1. Stripping and burrs on the threads on the piston bearing and piston.

2. Condition of the chrome plate on the piston.

3. Excessive wear and scoring of the cylinder bearing (gland nut) and the cylinder walls.

4. Stripping and burrs on the threads in the cylinder and cylinder bearing.

(j) Inspect the retracting links, retracting arms, and side links for cracks, misalignment, and excessive wear in the bearings.

(2) Wheels and Brakes.

(a) *General.*—Applicable instruction for the wheels and brakes is contained in T.O. No. 03-25B-1.

WARNING: Do not operate the brakes with the wheels removed as this will result in deformation of the one-piece brake shoe, rendering it unfit for further service.

(b) *Tires and Tubes.*—Instructions covering the tires and tubes are contained in T.O. No. 04-10-1 and T.O. No. 04-10-2.

(3) *Hydraulic Brake System.*—Refer to T.O. No. 01-25CK-2 for instructions covering the master cylinder unit.

(a) Inspect the upper and lower end fittings on the master cylinder units, turnbuckle fittings, attaching lugs, brake treadle, parking handle and pulley supports for cracks, elongated holes, and misalignment.

(b) Inspect the tubing and fittings for damage.

(c) Remove the brake fittings and disassemble. Inspect the interior for scoring.

b. Repair and Assembly.

(1) In assembling the air-oil struts and packings, use Lockheed hydraulic brake fluid No. 5 (Specification No. 3586) to lubricate the parts.

(2) If worn excessively, the air-oil strut piston bearing and the cylinder bearing should be replaced; the piston bearing is locked to the piston by three flathead screws.

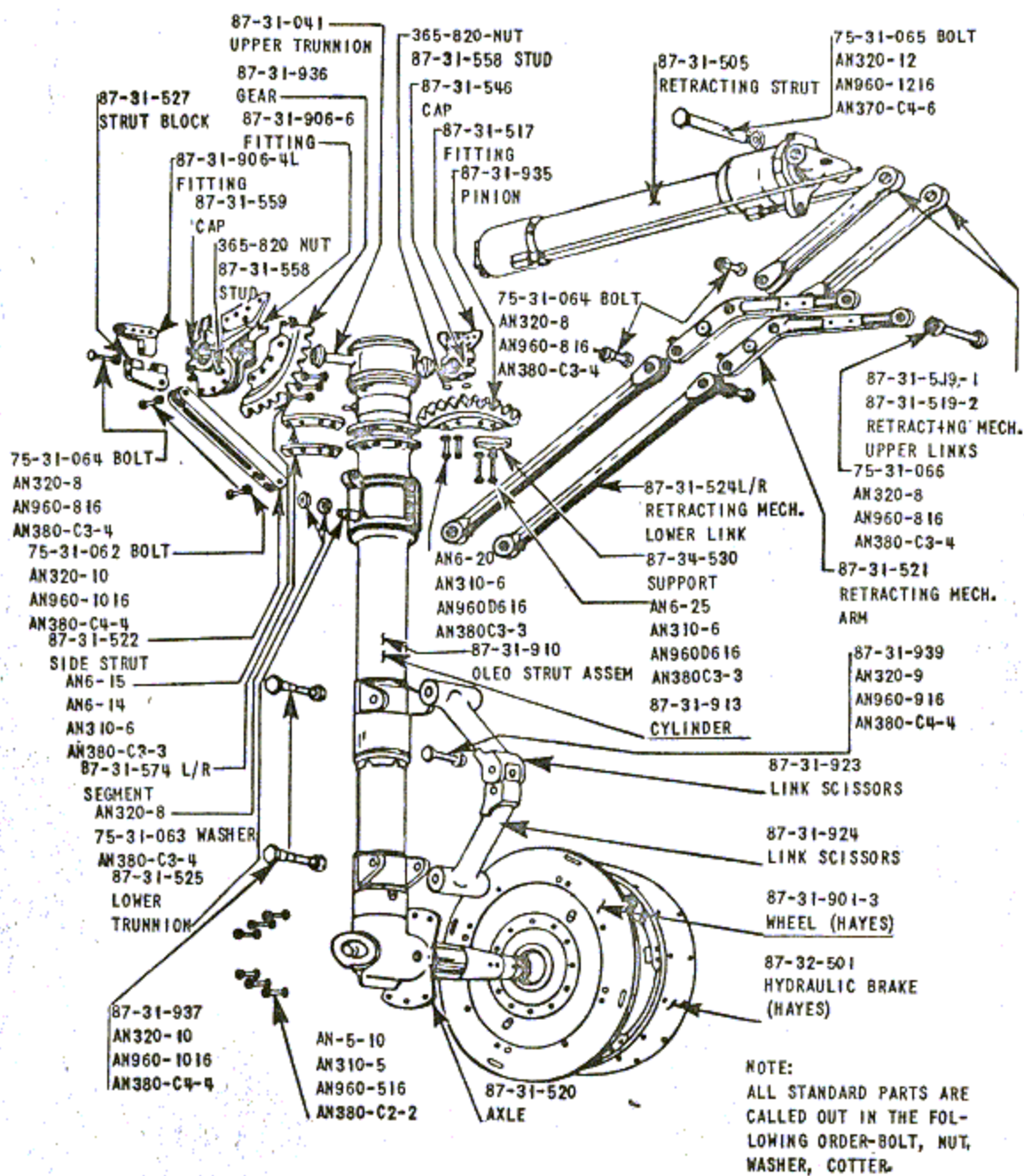


Figure 44—Landing Gear Disassembly

(3) Small scores on the bearing surfaces, and burrs on the gear teeth can frequently be removed by the careful use of a small oilstone. Burrs on threads may be removed by using the proper size tap or die.

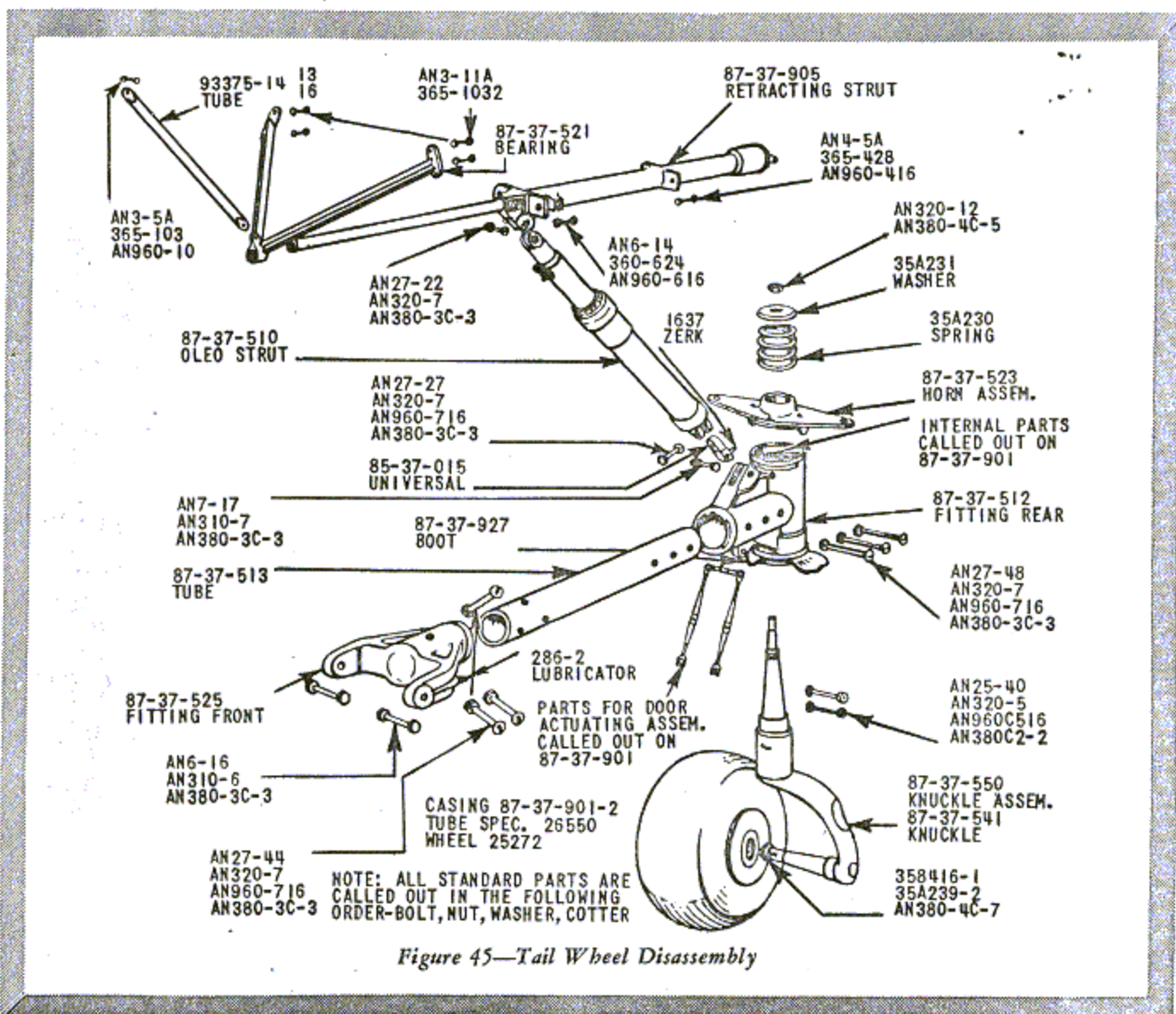
(4) If the bolt holes for the attachment of the axle housing assembly to the oleo strut piston are reamed out, and bushed to restore the original clearances, care must be taken when installing and reaming the bushings that the correct wheel toe-in is obtained.

(5) Where bearing clearances are excessive in the retracting links, retracting arms, or side links, the affected units should be rebushed and new bolts or pins installed.

(6) Replace the fibre chafing strips in the landing gear fairing; these strips are riveted and/or glued with formica cement to the fairings.

(7) When installing the pinion 87-31-935 or gear 87-31-936 it is necessary to use laminations and shims to obtain from .000 to .002 gear teeth backlash. Pinion 87-31-935 may be shimmed on both sides, while gear 87-31-936 should be shimmed on the outboard side only. Shims are sweat soldered in place.

(8) Installation of the landing gear in the wing can be accomplished by reversing the removal procedure.



8. TAIL WHEEL.—(Refer to T.O. No. 03-25A-1 and T.O. No. 04-10-2.)

a. Disassembly and Inspection.—Instructions covering the removal of the tail wheel assembly are contained in T.O. No. 01-25CK-2. For the tail wheel disassembly see figure 45.

(1) Remove the steering lever and links, and inspect for cracks and elongated bolt holes.

(2) Remove the door turnbuckles, tail wheel, and tail wheel boot. Inspect the tail wheel boot for general condition and wear. Replace if necessary.

(3) Disassemble the tail wheel post assembly and inspect for:

(a) Conditions of the knuckle bearing surfaces on which antifriction bearings are mounted.

(b) Stripping of, and burrs on, threads.

(c) Excessive wear and burrs on the steering apelines and serrations in the horn assembly.

(d) Check the spring for loss of strength.

(4) Remove the tube and front fitting from the rear fitting and inspect for:

(a) Bolt hole elongation and cracks.

(b) Cracks in both the fittings and tube.

(c) Scoring and excessive wear of the bearings in the front fitting.

(5) Remove the universal block from the rear fitting and inspect for elongated bolt holes, cracks, and scoring in bearing surfaces.

(6) Disassemble the air-oil strut by removing the gland nut with the special wrench (Curtiss No. 85781-2 or J. H. Williams No. 457 or 474) and pull the strut apart. Refer to T.O. No. 03-25E-1 for instruction covering air-oil shock absorber struts. Remove the upper end fitting from the air-oil strut piston and inspect the fittings, piston and cylinder for cracks and elongated bolt holes.

(7) Inspect the retracting strut piston guide and bearing in the V-strut for scoring and excessive wear.

(8) Inspect the V-strut and brace forward to station No. 11 for cracks, elongated bolt holes, and misalignment; inspect the position transmitter linkage in a similar manner.

b. Repair and Assembly.

(1) Scores and burrs in the bearing surfaces may be touched up with a fine oilstone.

(2) The bushing in the V-strut should be replaced if wear is excessive.

(3) Installation of the tail wheel can be accomplished by reversing the removal procedure outlined in T.O. No. 01-25CK-2.

9. ENGINE AND ACCESSORIES.

a. Disassembly.

(1) *Engine.*—Disassembly and overhaul instructions for the engine are given in T.O. No. 01-25CK-2. Instructions covering removal of the engine from the airplane are contained in T.O. No. 01-25CK-2.

(2) *Carburetor Air Intake System.*—Instructions for the removal and disassembly of the carburetor air intake are contained in T.O. No. 01-25CK-2.

(3) *Accessories.*—Overhaul accessories in accordance with their respective Technical Orders as follows:

		T. O. No.
Starter, Eclipse-Bendix	Type F-2	03-5CA-1
Generator, Eclipse	Type M-2	03-5AA-1
Fuel Pump Assembly	Type G-9	03-10EA-1
Pump, Vacuum	Type B-6	03-30AA-1

b. Inspection.

(1) *Engine.*—The engine vibration absorbers should be inspected for deterioration or excessive disintegration of rubber which may be caused by contact with gasoline or oil. See figure 46 and figure 47 for proper gap clearance of vibration absorbers.

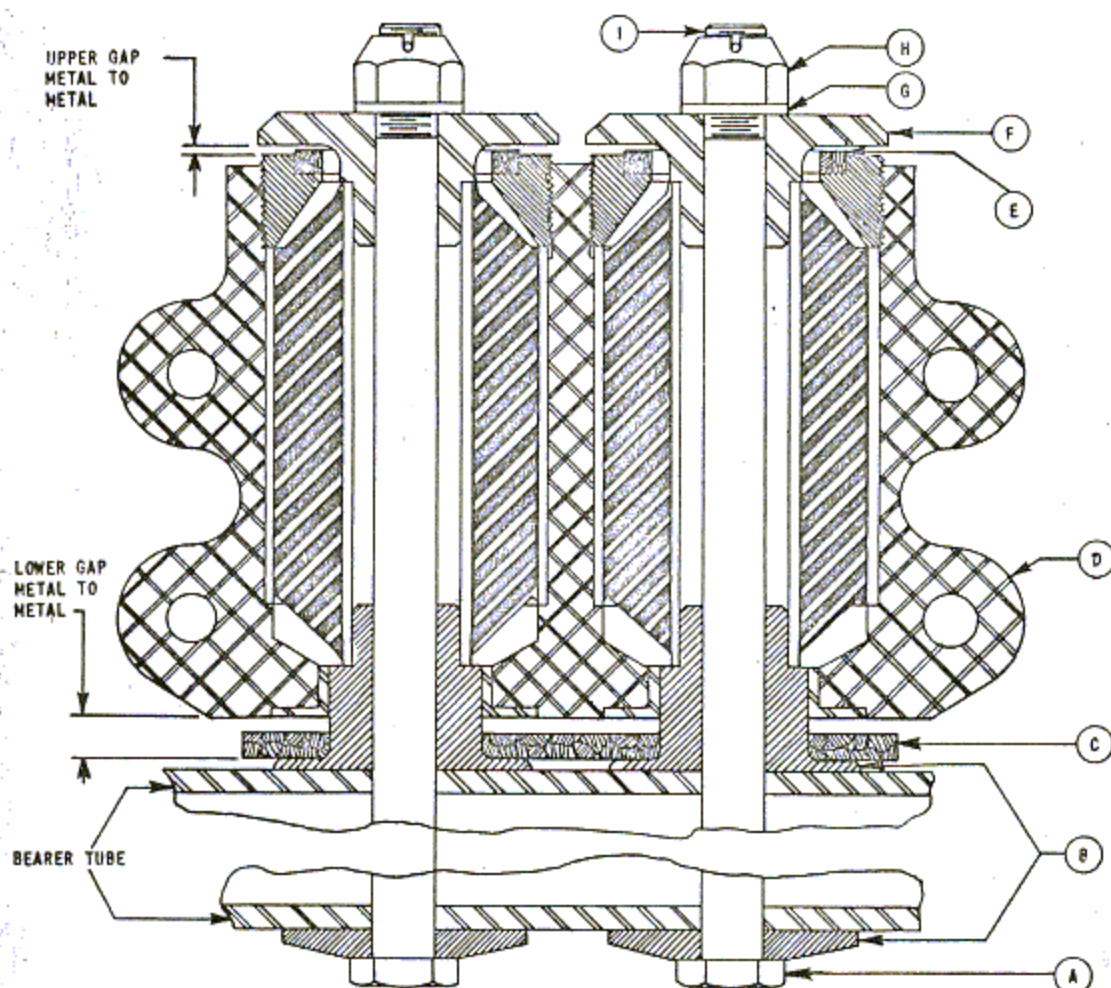
(2) *Exhaust System.*—Each stack in the exhaust system should be inspected for cracks, particularly near welds, for chafing, and for burnt spots.

(3) *Carburetor Air Intake System.*—Inspection should include a check of the casting for cracks around bolt holes, particularly near hold-down bolts. The condition of bearing surfaces in the casting and on shafts should be checked. The rubber seal at the aft end of the scoop should be replaced if it shows appreciable signs of deterioration or cuts.

c. Repairs.

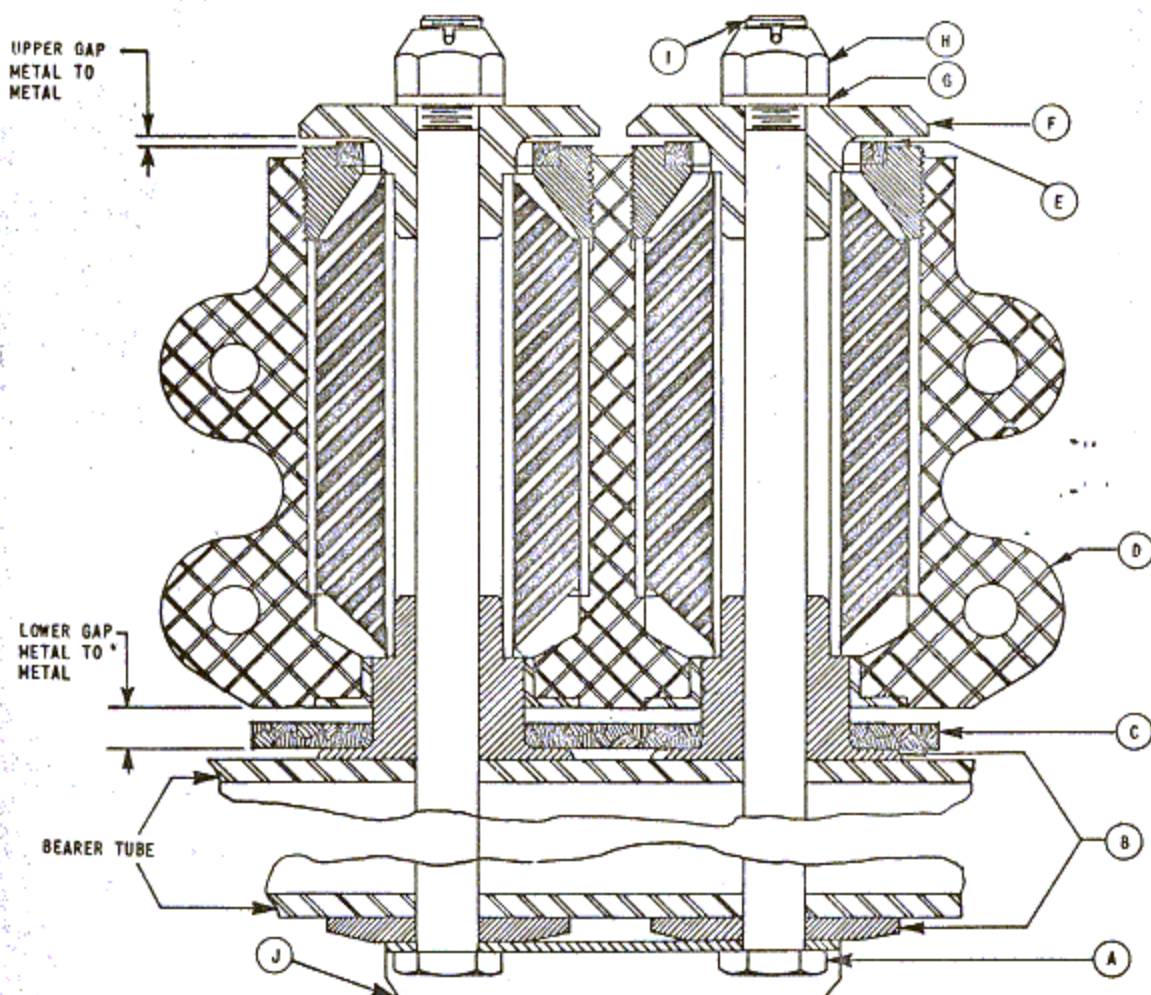
(1) *Exhaust System.*—Repairs to the exhaust stacks can be made by welding, using stainless steel sheet .049 inch thick and conforming to Specification No. 57-136-9, GR. 1-8S. Where a thin spot has been burned into the metal or a hole burned through it, a patch can be welded over the affected area; otherwise, replace the individual exhaust stack unit.

d. Assembly.—Installation may be accomplished by reversing the removal procedure.



L.H. VIBRATION ABSORBER				R.H. VIBRATION ABSORBER			
REF LET	PART NO.	NAME	NO REQ	REF LET	PART NO.	NAME	NO REQ
A	AN8-86	BOLT	2	E	87-22-534	SNUBBER (UPPER)	2
B	87-22-527-3	SUPPORT	2	F	87-22-542-2	STOP	2
C	87-22-714	SNUBBER (LOWER)	2	G	AN960-816	WASHER	2
D	87-22-713-1	HOUSING ASSEM.	1	H	AN310-8	NUT	2
E	87-22-534	SNUBBER (UPPER)	2	I	AN380C3-3	COTTER	2
F	87-22-542-1	STOP	2				
G	AN960-816	WASHER	2	UNLOADED			
H	AN310-8	NUT	2	UPPER GAP		LOWER GAP	
I	AN380C3-3	COTTER	2	L.H.	.025 ± .020	L.H.	.439 ± .025
R.H. VIBRATION ABSORBER				R.H.	.089 ± .020	R.H.	.340 ± .025
A	AN8-87	BOLT	2	LOADED			
B	87-22-527-4	SUPPORT	2	UPPER GAP		LOWER GAP	
C	87-22-714	SNUBBER (LOWER)	2	L.H.	.075 ± .035	L.H.	.389 ± .040
D	87-22-713-1	HOUSING ASSEM.	1	R.H.	.139 ± .035	R.H.	.290 ± .040

Figure 46—Engine Mount Vibration Absorber Front



L.H. VIBRATION ABSORBER				R.H. VIBRATION ABSORBER			
REF LET	PART NO.	NAME	NO REQ	REF LET	PART NO.	NAME	NO REQ
A	AN8-86	BOLT	2	E	87-22-534	SNUBBER (UPPER)	2
B	87-22-527-1	SUPPORT	2	F	87-22-533-2	STOP	2
C	87-22-714	SNUBBER (LOWER)	2	G	AN960-816	WASHER	2
D	87-22-713-2	HOUSING ASSEM.	1	H	AN310-8	NUT	2
E	87-22-534	SNUBBER (UPPER)	2	I	AN380C3-3	COTTER	2
F	87-22-533-1	STOP	2	J	87-29-777-R	BRACKET	1
G	AN960-816	WASHER	2				
H	AN310-8	NUT	2	UNLOADED			
I	AN380C3-3	COTTER	2	UPPER GAP		LOWER GAP	
J	87-29-777-L	BRACKET	1	L.H.	.025 ± .020	L.H.	.439 ± .025
R.H. VIBRATION ABSORBER				R.H.	.089 ± .020	R.H.	.340 ± .025
A	AN8-87	BOLT	2	LOADED			
B	87-22-527-2	SUPPORT	2	UPPER GAP		LOWER GAP	
C	87-22-714	SNUBBER (LOWER)	2	L.H.	.075 ± .035	L.H.	.389 ± .040
D	87-22-713-2	HOUSING ASSEM.	1	R.H.	.139 ± .035	R.H.	.290 ± .040

Figure 47—Engine Mount Vibration Absorber Rear

10. ENGINE AND PROPELLER CONTROLS.

Remove all controls and fire wall guides; inspect the control rods for general condition, and inspect the fire wall guides for excessive wear. Antifriction bearings should be cleaned and lubricated in accordance with the provisions of T.O. No. 29-1-3.

11. PROPELLER AND HUB.

The propeller and hub should be overhauled in accordance with T.O. No. 03-20B-1 and T.O. No. 03-20B-2. Refer to T.O. 03-20-1 for list of propellers for service airplanes.

12. STARTING SYSTEM.

Refer to T.O. No. 03-5CA-3 and paragraph 9.(3) this section. Inspect the foot treadle in the cockpit floor for cracks and elongated bolt holes, also for proper contact with the starter operating switch.

13. COOLING SYSTEM.

a. Cowl Flaps.—Refer to paragraph 5 of this section.

b. Oil Temperature Regulator and Coolant Radiators Air Scoop.

(1) Disassembly.

(a) The oil temperature regulator and coolant radiators air scoop is made up of three sections. The forward or air intake section is fastened to the lower engine cowl and can be removed only when the lower engine cowl is off the airplane. In order to remove the lower engine cowl, it is necessary to reach into each of the three intake air ducts and disconnect the rubber seals. The two sections composing the air exit duct are removed separately to facilitate removal. The rear section of the air exit scoop and coolant radiator shutters, is fastened to the coolant radiators by a rubberized fabric seal and bolted to a bracket on the engine mount and to the aft section of the air exit scoop. By disconnecting the shutter control at the shutter torque shaft and by removing the bolts, the rear section of the air exit scoop and shutters can be removed from the airplane. The forward section of the air exit scoop can be removed from the airplane by removing the bolts which fasten it to the rubber seals at the oil temperature regulator and coolant radiators.

(b) The cowl flap control shaft is removed by first disconnecting the two cowl flap operating rods and the main control rod, from the cockpit, at their respective operating arms on the control shaft; next remove the bolts connecting the two inboard bearing

support brackets to the wing match angle; slide the control shaft inboard to release it from the outboard bearing, and remove from the airplane.

(c) To remove the bearings from the control shaft, remove the flap control arm at the end of the shaft and slide the shaft support, containing the bearings, off the end of the shaft. The outboard bearings are in a housing connected to the right-hand engine mount truss and can be taken off the airplane by removing the two bolts which hold the bearing housing to the truss.

(2) Inspection and Repair.

(a) Inspect generally for cracks, loose or sheared rivets, and misalignment. Inspect the needle bearings for signs of excessive wear. Inspect and maintain the antifriction bearings in accordance with T.O. No. 29-1-3.

(b) Inspect the radiators for signs of leaks, dented or cracked shells, and plugged tubes. For repair and cleaning of radiators and oil temperature regulators, refer to T.O. No. 01-25CK-2 and T.O. No. 03-15-4. Refer to drawing No. 87-50-015 for soldering information.

(c) Remove and test the coolant system warning thermo switch for accuracy in opening and closing the circuit. To test the switch unit connect the switch with two dry cell batteries and a flashlight bulb, leaving the switch submerged in a bath of light hydraulic oil. Heat the oil to $120 \text{ degrees C} \pm 2 \text{ degrees}$ (248 degrees F), the last few degrees of heat being applied slowly. When the temperature of the oil bath reaches $120 \text{ degrees C} \pm 2 \text{ degrees}$ (248 degrees F), the switch should close the circuit lighting the flashlight bulb. Adjustment of the thermo switch setscrew will regulate the switch to open at the desired temperature. A thermometer placed in the bath will register the correct temperature of the oil. If the switch cannot be adjusted to close the circuit at $12 \text{ degrees C} \pm 2 \text{ degrees}$ (248 degrees F), it should be replaced.

(d) Inspect the radiator rubber mounts for deterioration of the rubber and for excessive wear. Replace if necessary.

(e) Test the pressure relief valve in the filler cap assembly for proper operation. It should blow off at three pounds per square inch.

See that the vacuum relief valve, located in the filler assembly, is clear and will open at approximately $\frac{3}{4}$ pounds per square inch. This valve can be inspected by removing the large slotted screw next to the filler cap.

14. OIL SYSTEM.

To thoroughly overhaul the oil system, the oil tank, drain cock, oil temperature regulator, oil lines, vent lines, and drain lines should be removed from the airplane. Refer to T.O. No. 01-25CK-2 for tank removal instructions. Clean all parts in the system with steam and inspect and repair in the same manner as the fuel system, paragraph 15, this section. For oil temperature regulator repair information, see T.O. No. 03-15-4.

Inspect aft side of fire wall, while oil tank is removed, for dents, cracks around cut, outs, and security of all attaching fittings.

15. FUEL SYSTEM.

To thoroughly overhaul the fuel system, the fuel cell tanks, tank shells, fuel lines, drain lines and vent lines in the wing and fuselage, drain cocks, sumps and strainers should be removed from the airplane. Fuel cell and shell removal, repair and testing instructions are contained in T.O. No. 01-25CK-2; also refer to T.O. No. 03-1-12.

a. Clean all parts of the fuel system with steam, except the fuel cells and self-sealing fuel lines, before inspection.

b. Inspect the tank shells for cracks, skin abrasions, loose or sheared rivets, and condition of welds.

c. Inspect the fuel cells for abrasions, pinched places, or signs of wear caused by rubbing against the tank shell.

d. Disassemble, inspect, and test the wing tank fuel level gages in accordance with T.O. No. 01-25CK-2.

e. Disassemble, inspect, and test the fuselage fuel quantity gage unit in accordance with T.O. No. 05-55A-3.

f. Inspect the tank straps and supports, and all castings for cracks.

g. Inspect, and replace, if necessary, the rubber lining in all tank supports.

h. Renew rubber gaskets under the tank gage dials.

i. Refer to T.O. No. 01-1E-31 for instructions on annealing of vent lines.

j. Inspect the fuel cock controls in accordance with T.O. No. 03-10-13.

k. Install threaded fittings as outlined in T.O. No. 06-10-3.

l. If the tank has been sloshed, check to see that the areas where the cork fuel gage float strikes against the top and bottom of the tank are free of sloshing com-

pound. If these areas are not clean, the gage may stick against the top or bottom of the tank, causing an incorrect reading.

16. ENGINE AND AERONAUTICAL INSTRUMENTS.

a. General instrument repair instructions are contained in T.O. No. 05-1-1. The instruments should be removed from the airplane and inspected in accordance with their respective Technical Orders as follows:

	Type	T.O. No.
Rate of Climb Indicator	C-2	05-20-17
Turn Indicator	AN5735	05-20-4
Flight Indicator	AN5736	05-20-3
Bank and Turn Indicator	A-11	05-20-2
Air-Speed Indicator	F-2	05-10-2
Compass	B-16	05-15-2
Altimeter	C-12	05-30-5
Suction Gage	F-4	05-80-1
Clock	A-11	05-1-9
Manifold Pressure Gage	D-9	05-70-1
Tachometer	C-11	05-5C-1
Thermometer, Coolant	A-23	05-40-4
Engine Gage Unit	B-7	05-75-1
Ammeter	F-1	Spec. 32284

Position Indicator
(Selsyn type 8DJ-4PXAB) 05-55A-2

Fuel Quantity Indicator (Fuselage Tank)
magnetic coupling type, G.E. 8DJ-LAE 05-65A-1

b. Remove the air-speed head and lines. Refer to T.O. No. 05-50-1 for instruction covering pitot static tube (electrically heated), type D-1, Specification No. 27876.

c. Disconnect all tubing and conduits to instruments and remove the instrument board by withdrawing the ten bolts attaching it to its mountings.

d. When replacing the rubber bushing for mounting the instrument board, install the bushings (150P20) in the lower mount with load-rated sides facing each other; the upper mount washers (1075-DD-064-266-1.500) and bushings (33B5452-10) should coincide exactly with the original installation.

e. With all instruments, switches, and controls removed, inspect the instrument board for cracks, especially around screw holes and cut-outs.

f. Replace all rubber hose connections. Anneal tubing in accordance with T.O. No. 01-1E-31.

17. SURFACE CONTROLS.

a. Disassembly.—Instructions for the removal of the

jackshafts and wing flap control mechanism are contained in T.O. No. 01-25CK-2.

Antifriction bearings should be cleaned and lubricated in accordance with the provisions of T.O. No. 29-1-3.

b. Inspection.

(1) Inspect all cables as instructed in T.O. No. 01-1-26.

(2) Inspect the fiber fair-leads for excessive wear.

(3) Inspect the pulley and fair-lead supports for cracks, loose or sheared rivets, elongated bolt holes, and misalignment.

(4) Inspect the pulleys for excessive wear.

(5) Inspect the turnbuckles and links for cracks, elongated bolt holes, and stripped or burred threads.

(6) Inspect the jackshafts and supports for cracks, elongated bolt holes, loose or sheared rivets, and misalignment.

(7) Inspect the push-pull tube, control stick, and fittings for cracks and elongated bolt holes.

(8) Inspect the gear box supports and pulley supports for cracks, elongated bolt holes, loose or sheared rivets, and misalignment.

(9) Disassemble the gear boxes and inspect for:

(a) Indications of shearing of keys and slots.

(b) Inspect the bearings and shafts for scoring and excessive wear.

(c) Inspect the gear teeth and sprocket teeth for excessive wear and burrs.

(d) Inspect the gear box housing for cracks.

(10) Inspect the rudder pedal assemblies for cracks, elongated bolt holes, and misalignment.

(11) Inspect the rudder pedal stops for cracks and condition of threads.

(12) The electric trim tab controls require no adjusting.

(13) Inspect the tail wheel steering cable spring assemblies and springs for cracks and other signs of fatigue failure.

(14) Check the tab actuators for end play and adjust in accordance with instructions in T.O. No. 01-25CK-2.

(15) Inspect the tab control bell cranks for cracks, elongated bolt holes, and misalignment.

(16) Inspect the tab control rods from the bell

cranks to tabs for stripping of threads and misalignment.

(17) Flexible drive shafts for actuators should be packed with grease, Mobilgrease zero.

c. Repair and Assembly.

(1) Replace all control cables which are frayed beyond limits allowed in T.O. No. 01-1-26.

(2) Replace all fibre fair-leads which are worn excessively.

(3) Replace all pulleys which are excessively worn or have defective bearings.

(4) Assemble the tab control gear boxes, using grease, Mobilgrease zero.

(5) Assembly may be accomplished by reversing the removal procedure.

(6) Tensions of the control cables are given in T.O. No. 01-25CK-2, figure 9 and figure 10. For use of tensionmeter see figure 41.

18. HYDRAULICS.

a. System.—Inspect all hydraulic lines and fittings for cracks; inspect the fittings for stripped threads. All hydraulic system tube fittings stamped "150" are heat-treated to 150,000 pounds per square inch. When cleaning the hydraulic system parts use Lockheed hydraulic brake fluid No. 5 (Specification No. 3586).

b. Hydraulic Pump—Motor Driven.—Overhaul the motor driven hydraulic pump in accordance with T.O. No. 03-30CB-1.

c. Hydraulic Pump—Hand Operated.—Overhaul the hand operated hydraulic pumps in accordance with T.O. No. 03-30CD-1.

d. Control Valve.

(1) Disassemble the control valve in accordance with instructions in T.O. No. 03-30CB-1 and Curtiss Hydraulic Handbook. To remove the check valves from the control valve, remove the snap rings which retain the check valves and withdraw the valves; if the valves stick in housing, air pressure may be carefully applied to the inlet between valves. This will unseat one valve and will allow its removal; the second valve can then be pushed out of the housing. Remove all packings; these packings should be replaced with new ones upon assembly of the control valve.

(2) Inspect all the bearing surfaces for scoring and excessive wear, especially valves and valve seats. If the poppet valves or valve seats show signs of scoring, the high spots should be carefully removed with a fine

oilstone and the valves lapped into their respective seats. Inspect the cams and cam followers for excessive wear. Inspect the valve body and support for the control handles for cracks, elongated bolt holes, and misalignment. Inspect the poppet valve springs for general condition and check their strength; when compressed to a length of 23/32, the spring should carry 40 lb-50 lb.

e. Retracted Fittings, Check Valve, and Relief Valve.

(1) Remove the restricted fittings and check for clear passages and excessive wear.

(2) Disassemble the check valve by unscrewing the reducer and removing the snap ring; the retainer and cup can then be removed. Inspect the interior for scoring and check the threads for stripping. Reassemble, using a new cup.

(3) Disassemble the relief valve by removing the nut and gasket, then unscrewing the set screw; the spring and plunger can be removed. Inspect the conical face of the plunger for scoring and excessive wear. Due to the small seat area on this plunger, any scoring or appreciable wear will necessitate replacement, unless the entire conical surface is refinished.

f. Landing Gear Retracting Strut.

(1) Disassemble the main units of the landing gear retracting strut in accordance with instructions in T.O. No. 01-25CK-2. Remove the nuts in the cylinder cap and withdraw pins and packings. Remove the pin which locks the shaft in the cylinder cap, unscrew the shaft, and remove the pawl. Remove the cylinder bearing.

(2) Inspect the bearing surfaces on the shaft, piston and cylinder for scoring and excessive wear. Inspect the locks and square broached holes in which they operate, for burrs. Inspect the threads in the cylinder cap, cylinder bearing, cylinder and piston for stripping and burrs. Inspect the bearing surface in the piston end for scoring and excessive wear.

(3) The cylinder bearing may be replaced to restore clearance to original values.

(4) When assembling the retracting strut, slide the pawl onto the shaft and screw the shaft into the cylinder cap; install 1/8 in. locking pin and stake the ends. Screw the cylinder bearing into the cylinder. Slide the retracting piston on over the shaft as far as possible. Slide the cylinder on over piston and screw in the cylinder cap. When assembling the struts and packings, use Lockheed hydraulic brake fluid No. 5 (Specification No. 3586) to lubricate the parts.

g. Tail Wheel Retracting Strut.

(1) Disassemble the main units of the tail wheel

retracting strut in accordance with instructions in T.O. No. 01-25CK-2.

(2) Inspect the piston and cylinder for scoring and excessive wear. Inspect the actuator and locks for burrs. Inspect the lug and mating holes in the piston for cracks and elongation of bolt holes. Disassemble the actuator and inspect the threads for stripping. Remove the bushing in the forward end of the strut and inspect for scoring and excessive wear in the bearing surfaces; check the threads for stripping.

(3) The bushing in the retracting strut should be replaced if wear is excessive.

h. Wing Flap Actuating Cylinder.

(1) Disassemble the flap actuating cylinder; use the face spanner wrench 87-88-030 to remove the plug in the forward end of the cylinder; remove the piston fitting on the opposite end by withdrawing the two clevis bolts; push the piston out of the cylinder.

(2) Inspect the piston and bearing surfaces in the cylinder for scoring and excessive wear; touch up light scores with a fine oilstone. Inspect the threads on the plug and in the cylinder for stripping and burrs. Inspect the piston, cylinder, and piston fitting for cracks and elongated bolt holes. Clean and lubricate the antifriction bearings in accordance with T.O. No. 29-1-3.

(3) When assembling the cylinder use new packings lubricated with Lockheed hydraulic brake fluid No. 5 (Specification No. 3586); pressure test the complete assembly to 2500 pounds per square inch.

19. IGNITION AND ELECTRICAL SYSTEM.

a. Inspect the wiring for condition of insulation and replace where necessary; inspect the terminals for security of attachment to wires and resolder or replace, as required.

b. Inspect the binding posts in the junction boxes for security of attachment.

c. Inspect all conduits and fittings for cracks and condition of threads.

d. Inspect the junction boxes and cover attaching screws and tapped holes for cracks and condition of threads.

e. Refer to T.O. No. 03-5AA-1 and T.O. No. 03-30CB-1 for overhaul instructions covering voltage regulator, Specification No. 32276 and motor driven hydraulic (Eclipse 24 volt) pump.

20. FUSELAGE EQUIPMENT.

a. General.—Refer to T.O. No. 01-25CK-2.

b. Miscellaneous Equipment.—Refer to T.O. No. 01-25CK-2.

c. Furnishings.

(1) *Windshield.*

(a) Remove the windshield by removing the Reed and Prince head screws which attach it to fuselage skin and the hex head bolts which attach it to fuselage sill.

(b) Inspect the frame for cracks, elongated bolt holes, and misalignment. Inspect the glass for cracks; check condition of the sealing compound in joints and sealing strips in the frame.

(c) Inspect the 1-1/2-inch bullet resistant glass for proper seating in the frame.

(d) Reassemble the windshield to the fuselage and carefully fill the joint between the windshield and fuselage with sealing compound.

(2) *Cockpit Enclosure.*

(a) The cockpit enclosure may be removed by pulling the emergency release, lifting the canopy off the airplane, and leaving the roller assemblies on the tracks.

(b) Inspect the enclosure tracks on the fuselage for cracks, dents, bends, excessive wear, and security of attachment. Inspect the rollers for freedom of rotation, flat spots, and misalignment. Inspect the transparent sheet (Plexiglas) for security of mounting in the frame. Inspect the frame for cracks, loose or sheared rivets, and misalignment. Inspect and replace if necessary, the rubber seal at the leading edge of the enclosure and the rubber stop blocks at the aft end of the enclosure tracks. Inspect and check the operation of the emergency release in the left-hand panel of the enclosure.

(c) Installation of the enclosure is a reversal of removal procedure. Lock-wire the release pin mechanism as illustrated in T.O. No. 01-25CK-2, figure 133.

21. *HEATING AND VENTILATING SYSTEM.*

Inspect the controls for security of mounting and proper operation.

22. *OXYGEN EQUIPMENT.*

a. Remove the type F-1, Specification No. 40330, and type D-2, Specification No. 40355 cylinders and lines. Instructions covering removal of the oxygen cylinders are contained in T.O. 01-25CK-2.

NOTE

On Airplane AF42-10339 and subsequent, the type D-2 oxygen bottle has been deleted.

b. Inspect the strap and cradle support for cracks, elongated bolt holes, and loose or sheared rivets. Inspect the rubber mounting in the cradle assembly for deterioration.

c. For data applicable to the type A-9a Oxygen Regulator, Specification No. 40319, refer to T.O. No. 03-50A-4.

d. Check the filler and relief valves for signs of leaks and improper operation.

e. Remove the oxygen economizer and check the lines to the type A-9a Oxygen Regulator and the mouth piece. Check the attachment holes in the longeron and trim tab guard for elongation.

f. Check all lines for cracks, dents, or other damage.

g. Anneal oxygen lines in accordance with T.O. No. 01-1E-31.

b. All oxygen lines should be thoroughly blown out with steam before being installed in the fuselage. Care must be taken to keep all parts in contact with oxygen as clean as possible. Oil, grease, white lead or any other easily oxidized material, becomes *highly explosive* in the presence of oxygen.

23. *COMMUNICATIONS EQUIPMENT.*

a. Radio equipment should be inspected and repaired as outlined in applicable Technical Orders of the 08-10 series.

b. Inspect all radio equipment supports for cracks, loose or sheared rivets, and misalignment. Inspect cut-out in fuselage skin for lead-in insulator for cracks.

24. *BOMBING EQUIPMENT.*

a. Inspect the belly bomb shackle and wing bomb racks for cracks in the shackles and in the attaching fittings; check for security of attachment.

b. Inspect the turnbuckle attaching fitting to the match angle for misalignment. Replace if bent.

c. Inspect the sway brace compression members for damage.

d. Replace the rubber pads on the feet of the sway brace if deteriorated.

e. Refer to T.O. No. 01-25CK-2 for information on wing bomb rack installation.

f. Inspect all control cables and electrical release mechanism for damage caused by chafing or impact.

25. *PHOTOGRAPHIC EQUIPMENT—
GUN CAMERA.*

a. Inspect the camera mountings for security and for condition of fibre lock nuts at the lower end of the mounting bracket.

b. Inspect the window (87-34-918) in the leading edge of the landing gear fairing for scratches or nicks. Replace if damaged in any way.

c. Inspect the Dzus fasteners for security and for cracks around holes in the leading edge fairing.

26. GUNNERY EQUIPMENT.

a. Inspect ammunition boxes, supports, and ejection chutes for cracks, dents, loose or sheared spot-welds, and misalignment. Loose spot-welds may be repaired by drilling and then inserting a rivet, provided the rivet head does not destroy the smooth interior surface of the ammunition box or ejection chute. Since rivet heads

on interior surfaces may cause jamming of ammunition, cases or links, it will be necessary to make repairs in this area by spot-welding.

b. Inspect the gun mounts and adjacent structure for cracks, loose or sheared rivets, elongated bolt holes, misalignment, and condition of threads.

c. Inspect the leading edge cover plates for cracks, and condition of fasteners.

d. For data applicable to the type N-3A gun sight, see T.O. No. 11-35-5 and Curtiss Armament Handbook.

e. Inspect gun heater hose for security and chafed areas, especially at cut-outs in bulkheads.

SECTION V

FINAL ASSEMBLY

1. The instructions covering the removal and installation of the various components of this airplane have been given in the Handbook of Service Instructions, T.O. No. 01-25CK-2.

2. The following table of recommended torque loads should be adhered to when assembling any of the types of tubing listed. Care should be exercised to determine the type of tubing used in each case.

a. AN-817 Nut; Sleeve Coupling

b. AN-818 Nut; Coupling

c. AN-819 Sleeve; Coupling

The correct tightening torque and corresponding size and loading of wrenches are tabulated below.

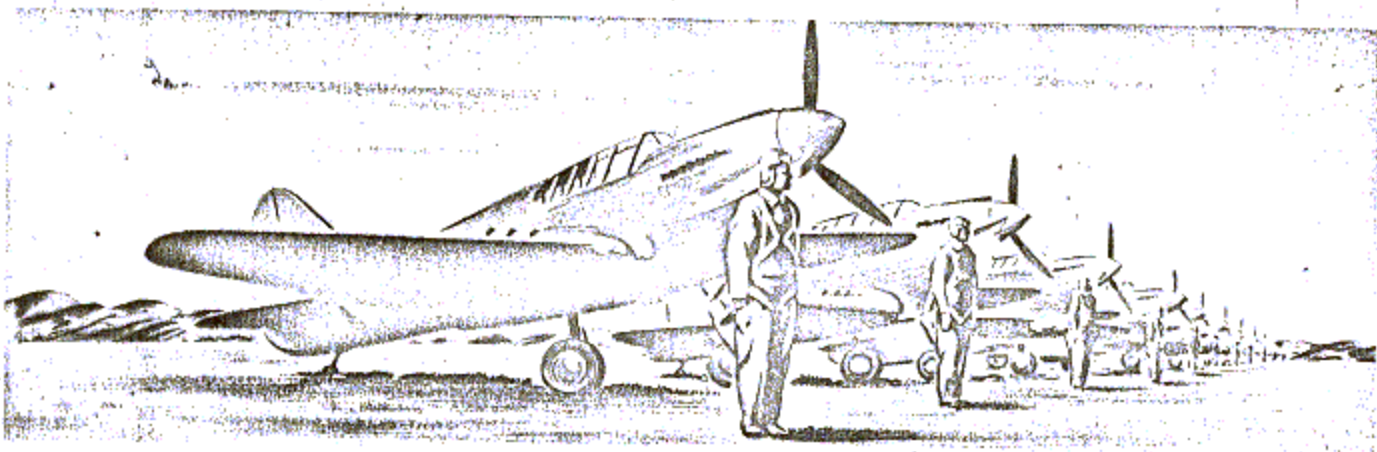
Minimum assembly torque (inch-pounds) represents the minimum which will assure pressure tightness.

Maximum assembly torque represents the maximum which will assure no damage to fittings or tube flares. Excessive torque will ruin the assembly. Extra precaution shall be taken to apply torque within the desired range.

Assembly Torque.

AN Fitting	In.-Lb		Wrench Recommended	
	Min	Max	Lengths, In.	Load, Lb
52SO Tubing				
817-4D	75	100	5	15 to 20
-5D	100	140	6	17 to 23
-6D	150	240	8	19 to 28
818,819-4D	55	65	4	14 to 16
-5D	55	80	4	14 to 20
-6D	100	150	6	17 to 25
Everdur Tubing				
817-4	135	200	8	17 to 25
-5	180	250	9	20 to 28
-6	200	300	10	20 to 30
818,819-4	85	140	6	14 to 23
-5	150	225	8	19 to 28
-6	150	250	8	19 to 31
Stainless Tubing				
817-4	120	200	8	15 to 25
-6	350	400	15	23 to 27
818,819-4	360	120	6	10 to 20
-6	250	375	15	17 to 25





SECTION VI

Additional Overhaul and Major Repair Instructions
Issued by the Air Corps.

SECTION VII STORAGE.

1. Complete information concerning the preparation of airplanes for storage is given in T.O. No. 01-1-7.