

TO 36A10-3-29-32

---

TECHNICAL MANUAL

MAINTENANCE/OVERHAUL  
INSTRUCTIONS

FLIGHTLINE  
TOW TRACTOR  
MODEL NO. 3

NSN 1740-01-173-0520YW

PSI MOBILE PRODUCTS, INC.  
F09603-84-C-0306  
F09603-92-C-0751  
(ATOS)

BASIC AND ALL CHANGES HAVE BEEN MERGED  
TO MAKE THIS A COMPLETE PUBLICATION

**DISTRIBUTION STATEMENT** - Distribution authorized to US Government agencies and their contractors (Administrative or Operational Use) (15 August 1984). Other requests for this document should be referred to WR-ALC/LEET, Robins AFB GA 31098. Questions concerning technical content should be referred to WR-ALC/LESV.

**WARNING** - This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec 2751 et seq.) or the Export Administration Act of 1979, as amended (Title 50, U.S.C., App. 2401 et seq.). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with provisions of DoD Directive 5230.25.

**HANDLING AND DESTRUCTION NOTICE** - Comply with distribution statement and destroy by any method that will prevent disclosure of the contents or reconstruction of the document.

---

Published under authority of the Secretary of the Air Force

15 AUGUST 1984  
CHANGE 5 - 1 NOVEMBER 2004

**LIST OF EFFECTIVE PAGES**

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

**Dates of issue for original and changed pages are:**

Original ..... 0 ..... 15 August 1984    Change ..... 3 ..... 1 January 1994  
 Change ..... 1 ..... 15 February 1989    Change ..... 4 ..... 5 June 2001  
 Change ..... 2 ..... 15 April 1992    Change ..... 5 ..... 1 November 2004

**TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 350, CONSISTING OF THE FOLLOWING:**

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
<b>Title</b> .....	<b>5</b>	5-10 - 5-31 .....	0		
<b>A</b> .....	<b>5</b>	5-32 - 5-33 .....	1		
i .....	1	5-34 - 5-59 .....	0		
ii .....	2	5-60 .....	2		
iv .....	1	5-60.1 Added .....	2		
v .....	0	5-60.2 Blank Added .....	2		
vi Blank .....	1	5-61 - 5-63 .....	2		
vii .....	0	5-64 - 5-143 .....	0		
ix .....	1	5-144 - 5-145 .....	1		
x .....	0	5-146 - 5-218 .....	0		
xi .....	1	5-219 .....	1		
xii Blank .....	0	5-220 - 5-240 .....	0		
xiii - xvii .....	0	5-241 .....	1		
xviii Blank .....	0	5-242 - 5-256 Added .....	1		
xix .....	0	6-1 - 6-4 .....	0		
xx Blank .....	0	<b>6-5 - 6-6</b> .....	<b>5</b>		
1-1 - 1-2 .....	0	6-7 - 6-8 .....	0		
1-3 - 1-4 .....	1	FP-1 .....	0		
2-1 - 2-9 .....	0	FP-2 Blank .....	0		
2-10 Blank .....	0	FP-3 .....	0		
3-1 .....	0	FP-4 Blank .....	0		
3-2 .....	1	FP-5 .....	0		
4-1 - 4-14 .....	0	FP-6 Blank .....	0		
4-15 .....	1				
4-16 .....	0				
4-17 - 4-18 .....	1				
4-18.1 Added .....	1				
4-18.2 Blank Added .....	1				
4-19 - 4-20 .....	0				
4-20.1 Blank .....	1				
4-20.2 Blank Added .....	1				
4-21 - 4-22 .....	1				
4-23 - 4-29 .....	0				
4-30 .....	1				
4-30.1 Added .....	1				
4-30.2 Blank Added .....	1				
4-31 - 4-33 .....	0				
4-34 Blank .....	0				
5-1 - 5-2 .....	0				
5-3 .....	1				
5-4 - 5-7 .....	0				
5-8 - 5-9 .....	1				

\*Zero in this column indicates an original page

# TABLE OF CONTENTS

Chapter		Page
	LIST OF ILLUSTRATIONS .....	vii
	LIST OF TABLES .....	xi
	SAFETY SUMMARY .....	xiii
	INTRODUCTION .....	xix
1	GENERAL INFORMATION .....	1-1
1-1	Purpose of Equipment .....	1-1
1-2	General Description .....	1-1
1-3	Detailed Description .....	1-1
1-3.1	Frame .....	1-1
1-3.2	Engine .....	1-1
1-3.3	Transmission .....	1-2
1-3.4	Brakes .....	1-2
1-3.5	Steering System .....	1-2
1-3.6	Electrical System .....	1-3
1-3.7	Cooling System .....	1-3
1-3.8	Fuel System .....	1-3
1-3.9	Exhaust System .....	1-3
1-3.10	Air System .....	1-4
1-3.11	Winterization System .....	1-4
2	SPECIAL TOOLS AND TEST EQUIPMENT .....	2-1
2-1	General .....	2-1
3	PREPARATION FOR USE .....	3-1
3-1	General .....	3-1
3-2	Preliminary Inspection .....	3-1
3-2.1	Visual Inspection .....	3-1
3-2.2	Item Check .....	3-1
3-3	Switches, Gauges and Lights .....	3-2
3-4	Operational Check .....	3-2
3-5	Lubrication .....	3-2
4	IN-USE INSPECTION, MAINTENANCE AND LUBRICATION .....	4-1
4-1	Introduction .....	4-1
4-2	Malfunction Analysis and Remedial Action .....	4-1
4-3	Scheduled Inspection .....	4-1
4-4	Periodic Maintenance and Adjustments .....	4-1
4-4.1	Fuel System Service .....	4-21
4-4.2	Cooling System Service .....	4-21
4-4.3	Belt Service .....	4-22
4-4.4	Engine Oil and Oil Filter Change .....	4-22
4-4.5	Brake System Service .....	4-22
4-4.6	Battery and Cable Service .....	4-25
4-4.7	Engine Performance Checks .....	4-25
4-4.8	Engine Tune-Up .....	4-25
4-4.9	Exhaust System Service .....	4-25
4-4.10	Transmission Service .....	4-25
4-4.11	Transfer Case Service .....	4-27
4-4.12	Propeller Shaft Service .....	4-27
4-4.13	Steering System Service .....	4-28
4-4.14	Differential Service .....	4-28
4-4.15	Wheels and Tires Service .....	4-28



## TABLE OF CONTENTS-Continued

Chapter		Page
4-4.16	Frame Service .....	4-30
4-4.17	Windshield Wiper Service .....	4-30
4-4.18	Air System Service .....	4-30
4-4.19	Winterization System Service .....	4-30.1
4-5	Lubrication .....	4-30.1
5	OVERHAUL PROCEDURES .....	5-1
5-1	General .....	5-1
5-2	Scope .....	5-1
5-2.1	General Maintenance Procedures .....	5-1
5-2.2	Overhaul Procedures .....	5-1
5-3	Consumable Materials .....	5-1
5-4	General Maintenance Procedures .....	5-3
5-4.1	General Removal Instructions .....	5-3
5-4.2	General Disassembly Instructions .....	5-3
5-4.3	General Cleaning Instructions .....	5-4
5-4.4	General Inspection Instructions .....	5-5
5-4.5	General Repair Instructions .....	5-7
5-4.6	General Reassembly and Installation Instructions .....	5-8
5-5	Overhaul Procedures .....	5-9
5-5.1	Engine .....	5-10
5-5.1.1	Air Filter Assembly and Duct Group .....	5-10
5-5.1.2	Positive Crankcase Ventilation System .....	5-11
5-5.1.3	Venturi and Dashpot Assembly Group .....	5-12
5-5.1.4	Intake and Exhaust Manifolds Group .....	5-13
5-5.1.5	Exhaust System .....	5-14
5-5.1.6	Alternator, Starter and Vacuum Pump Mounting Parts Group .....	5-16
5-5.1.7	Starting Motor Assembly .....	5-18
5-5.1.8	Alternator and Vacuum Pump Group .....	5-24
5-5.1.9	Battery and Mounting Group .....	5-29
5-5.1.10	Belts Group .....	5-32
5-5.1.11	Water Pump and Fan Group .....	5-33
5-5.1.12	Radiator, Hose and Coolant Recovery Group .....	5-35
5-5.1.13	Fuel Lines Group .....	5-37
5-5.1.14	Fuel Pump and Fuel Filter Assembly Group .....	5-39
5-5.1.15	Injector Nozzles and Tubes Group .....	5-41
5-5.1.16	Oil Cooler and Filter Group .....	5-43
5-5.1.17	Engine Front Cover Group .....	5-45
5-5.1.18	Governor Assembly Installation .....	5-46
5-5.1.19	Governor Assembly .....	5-48
5-5.1.20	Injection Pump Assembly .....	5-50
5-5.1.21	Rocker Cover and Cylinder Head Group .....	5-55
5-5.1.22	Camshaft and Valve Train Group .....	5-57
5-5.1.23	Diesel Pre-Heating Group .....	5-60.1
5-5.1.24	Crankshaft Pulley and Flywheel Group .....	5-63
5-5.1.25	Engine Oil Pan Group .....	5-64
5-5.1.26	Oil Pump Group .....	5-65
5-5.1.27	Piston, Connecting Rod and Crankshaft Group .....	5-68
5-5.1.28	Engine Block Group .....	5-73
5-5.1.29	Front Engine Mounts Group .....	5-77
5-5.1.30	Rear Engine Mounts Group .....	5-78
5-5.1.31	Fuel Tank Assembly .....	5-80
5-5.2	Transmission .....	5-82

## TABLE OF CONTENTS-Continued

Chapter		Page
5-5.2.1	Shifting With Automatic Transmission on Column .....	5-82
5-5.2.2	Throttle Valve Linkage Group .....	5-83
5-5.2.3	Transmission Cooling Lines Group .....	5-83
5-5.2.4	Transmission Assembly and Case Assembly Group .....	5-85
5-5.2.5	Torque Converter Group .....	5-88
5-5.2.6	Servo and Valve Body Group .....	5-90
5-5.2.7	Governor Control Group .....	5-93
5-5.2.8	Clutches Group .....	5-95
5-5.2.9	Gears and Shafts Group .....	5-99
5-5.3	Transfer Case and Propeller Shaft .....	5-102
5-5.3.1	Rear Propeller Shaft Group .....	5-102
5-5.3.2	Transfer Case Assembly and Transfer Case Housing Group .....	5-104
5-5.3.3	Transfer Case Gear and Shafts .....	5-107
5-5.3.4	Transfer Case Shift Forks Group .....	5-113
5-5.3.5	Deleted .....	
5-5.4	Steering .....	5-114
5-5.4.1	Steering Wheel Group .....	5-114
5-5.4.2	Steering Column Assembly and Upper Housing Group .....	5-115
5-5.4.3	Steering Column Lower Housing and Shafts Group .....	5-119
5-5.4.4	Steering Gear Components Group .....	5-121
5-5.4.5	Steering Linkage Group .....	5-129
5-5.4.6	Steering Damper Group .....	5-131
5-5.4.7	Power Steering Pump Mounting Group .....	5-132
5-5.4.8	Power Steering Hydraulic Pump Assembly .....	5-134
5-5.5	Front Axle and Suspension .....	5-137
5-5.5.1	Front Shock Absorber Group .....	5-137
5-5.5.2	Front Stabilizer Bar Group .....	5-138
5-5.5.3	Front Spring Group .....	5-140
5-5.5.4	Front Axle Housing Group .....	5-143
5-5.6	Rear Axle and Suspension .....	5-145
5-5.6.1	Rear Shock Absorber Group .....	5-145
5-5.6.2	Rear Spring Group .....	5-146
5-5.6.3	Rear Axle Assembly and Rear Differential Group .....	5-150
5-5.6.4	Rear Axle Housing Group .....	5-155
5-5.6.5	Rear Axle Shafts Group .....	5-156
5-5.7	Brakes and Wheels .....	5-158
5-5.7.1	Brake Pedal and Linkage Group .....	5-158
5-5.7.2	Wheel and Weights Group .....	5-159
5-5.7.3	Power Brake Booster and Master Cylinder Group .....	5-160
5-5.7.4	Brake Proportioning Valve Group .....	5-162
5-5.7.5	Brake Lines Group .....	5-164
5-5.7.6	Front Brake Caliper Group .....	5-166
5-5.7.7	Front Brake Disc .....	5-168
5-5.7.8	Parking Brake Group .....	5-168
5-5.7.9	Rear Brake and Cylinder Group .....	5-170
5-5.8	Frame .....	5-172
5-5.8.1	Frame Assembly and Frame Components Group .....	5-172
5-5.9	Body .....	5-175
5-5.9.1	Running Board Group .....	5-175
5-5.9.2	Body Holddowns Group .....	5-176



## TABLE OF CONTENTS-Continued

Chapter	Page
5-5.9.3	Body Side and Rear Panels Group . . . . . 5-177
5-5.9.4	Front Fender Group . . . . . 5-178
5-5.9.5	Door Group . . . . . 5-179
5-5.9.6	Door Hinges Group . . . . . 5-180
5-5.9.7	Door Seals Group . . . . . 5-182
5-5.9.8	Door Latch Group . . . . . 5-183
5-5.9.9	Door Handles and Lock Rod Group . . . . . 5-183
5-5.9.10	Locks and Keys Group . . . . . 5-184
5-5.9.11	Hood and Hinges Group . . . . . 5-187
5-5.9.12	Hood Latch, Prop Rod and Holddowns Group . . . . . 5-188
5-5.9.13	Hard Top Enclosure . . . . . 5-189
5-5.9.14	Windshield Frame Group . . . . . 5-190
5-5.9.15	Window Seals Group . . . . . 5-191
5-5.9.16	Glass Group . . . . . 5-192
5-5.9.17	Grille Group . . . . . 5-194
5-5.9.18	Outside Mirrors Group . . . . . 5-196
5-5.9.19	Windshield Washer Group . . . . . 5-196
5-5.9.20	Windshield Wiper and Motor Group . . . . . 5-197
5-5.9.21	Horn Group . . . . . 5-200
5-5.9.22	Headlamps Group . . . . . 5-200
5-5.9.23	Parking and Front Turn Lamps Group . . . . . 5-201
5-5.9.24	Harnesses Group . . . . . 5-202
5-5.9.25	Extendable Hitch Connection Assembly . . . . . 5-203
5-5.9.26	Chassis Conversion Assembly . . . . . 5-205
5-5.10	Cab Interior . . . . . 5-207
5-5.10.1	Front Seat Frame and Pad Group . . . . . 5-207
5-5.10.2	Front Seat Track Group . . . . . 5-208
5-5.10.3	Front Seat Upholstery Group . . . . . 5-209
5-5.10.4	Seat and Shoulder Belts Group . . . . . 5-210
5-5.10.5	Dome Lamp Group . . . . . 5-211
5-5.10.6	Headliner and Molding Group . . . . . 5-212
5-5.10.7	Window Mechanism Group . . . . . 5-213
5-5.10.8	Door Trim Panels and Arm Rest Group . . . . . 5-214
5-5.10.9	Inside Rear View Mirror Assembly . . . . . 5-215
5-5.10.10	Sun Visor Group . . . . . 5-217
5-5.10.11	Speedometer Cable Group . . . . . 5-218
5-5.10.12	Heater Hose Group . . . . . 5-219
5-5.10.13	Heater Group . . . . . 5-219
5-5.10.14	Heater Controls . . . . . 5-221
5-5.10.15	Defroster Duct Group . . . . . 5-222
5-5.10.16	Fresh Air Intake Group . . . . . 5-223
5-5.10.17	Instrument Panel Group . . . . . 5-225
5-5.10.18	Instrument Cluster Group . . . . . 5-226
5-5.10.19	Instruments Including Hourmeter Group . . . . . 5-228
5-5.10.20	Instrument Panel Switch Group . . . . . 5-229
5-5.10.21	Miscellaneous Switches Group . . . . . 5-230
5-5.10.22	Fuse Panel and Parts Group . . . . . 5-231
5-5.10.23	Directional, Ignition and Hazard Switches Group . . . . . 5-232
5-5.10.24	Ignition Switch Lock Cylinder Group . . . . . 5-234
5-5.10.25	Floor Pan, Cowl and Dash Panel Group . . . . . 5-235

## TABLE OF CONTENTS-Continued

Chapter		Page
5-5.10.26	Accelerator Pedal and Linkage Group .....	5-236
5-5.10.27	Floor Mat Group .....	5-237
5-5.10.28	Electrical Assembly Installation .....	5-238
5-5.11	Air System Installation .....	5-241
5-5.12	Winterization Kit .....	5-254
5-6	Storage .....	5-256
5-7	Workmanship and Handling .....	5-256
5-8	Painting .....	5-256
6	TABLE OF LIMITS .....	6-1
6-1	Introduction .....	6-1
6-2	Specific Torque Values .....	6-6
6-3	General Torque Values .....	6-8





## LIST OF ILLUSTRATIONS

Number	Title	Page
1-1	Major Components .....	1-1
2-1	Special Tools .....	2-1
4-1	Caliper Inspection Port .....	4-24
4-2	U-Joint Lubrication Point .....	4-28
4-3	Tire Wear Patterns .....	4-29
4-4	Tire Rotation .....	4-30
4-5	Lubrication Chart .....	4-31
5-1	Flightline Tow Tractor, Model No. 3 .....	5-9
5-2	Air Filter Assembly and Duct Group .....	5-10
5-3	Positive Crankcase Ventilation System .....	5-11
5-4	Venturi and Dashpot Assembly Group .....	5-12
5-5	Intake and Exhaust Manifolds Group .....	5-14
5-6	Exhaust System .....	5-15
5-7	Alternator, Starter and Vacuum Pumps Mounting Parts Group .....	5-16
5-8	Starting Motor Assembly .....	5-18
5-9	Coil Short Circuit Test .....	5-20
5-10	Coil Open Circuit Test .....	5-20
5-11	Coil Insulation Test .....	5-20
5-12	Shaft-to-Bushing Clearance Check .....	5-21
5-13	Armature Shaft Alignment Check .....	5-21
5-14	Commutator Wear Test .....	5-21
5-15	Commutator Insulation Test .....	5-21
5-16	Field Coil-to-Coil Continuity Test .....	5-22
5-17	Coil-to-Frame Continuity Test .....	5-22
5-18	Brush Holder Insulation Test .....	5-23
5-19	Brush Wear Test .....	5-23
5-20	Brush Spring Tension Test .....	5-23
5-21	Shunt Coil Continuity Test .....	5-23
5-22	Commutator Insulation Repair .....	5-23
5-23	Alternator and Vacuum Pump Group .....	5-24
5-24	Slip Ring Out-of-Round Measurement .....	5-25
5-25	Slip Rear Wear Measurement .....	5-26
5-26	Stator Coil Continuity Test .....	5-26
5-27	Diode Locations .....	5-27
5-28	Current Flow of Diode Test .....	5-27
5-29	IC Regulator Test Circuit Diagram .....	5-27
5-30	Alternator Voltage Regulation Test Circuit Diagram .....	5-28
5-31	Battery and Mounting Group .....	5-30
5-32	Heavy Load Test .....	5-32
5-33	Belts Group .....	5-33
5-34	Water Pump and Fan Group .....	5-34
5-35	Radiator, Hose and Coolant Recovery Group .....	5-36
5-36	Fuel Lines Group .....	5-38
5-37	Fuel Filter and Fuel Pump Assembly Group .....	5-39
5-38	Injector Nozzles and Tubes Group .....	5-42
5-39	Pressure Test Setup .....	5-42
5-40	Fuel Spray Patterns .....	5-42
5-41	Oil Cooler and Filter Group .....	5-44
5-42	Engine Front Cover Group .....	5-46

## LIST OF ILLUSTRATIONS-Continued

Number	Title	Page
5-43	Governor Assembly Installation.....	5-47
5-44	Governor Assembly .....	5-49
5-45	Injection Pump Assembly .....	5-51
5-46	Rocker Cover and Cylinder Head Group.....	5-55
5-47	Cylinder Head Torque Sequence .....	5-57
5-48	Camshaft and Valve Train Group .....	5-58
5-49	Rocker Arm, Assembled.....	5-60
5-50	Diesel Preheating Group .....	5-61
5-51	Control Unit Test Connectors .....	5-62
5-52	Crankshaft Pulley and Flywheel Group.....	5-63
5-53	Engine Oil Pan Group .....	5-65
5-54	Oil Pump Group .....	5-66
5-55	Oil Pump Cover-to-Gear Measurement .....	5-67
5-56	Piston, Connecting Rod and Crankshaft Group.....	5-68
5-57	Piston Measurement.....	5-69
5-58	Ring Clearance Measurement .....	5-70
5-59	Ring End Gap Measurement .....	5-70
5-60	Piston Pin Bore Measurement .....	5-70
5-61	Piston Pin Measurement .....	5-70
5-62	Main Bearing Journal Measurement .....	5-71
5-63	Connecting Rod Journal Measurement .....	5-71
5-64	Crankshaft Bend Measurement .....	5-71
5-65	Proper Radius Dimension .....	5-71
5-66	Piston and Ring Markings .....	5-72
5-67	Piston and Connecting Rod Installation .....	5-72
5-68	Engine Block Group.....	5-74
5-69	Cylinder Liner Measurement .....	5-76
5-70	Cylinder Liner Protrusion Measurement .....	5-76
5-71	Camshaft Bushing Dimension .....	5-76
5-72	Front Engine Mounts Group .....	5-78
5-73	Rear Engine Mounts Group .....	5-79
5-74	Fuel Tank Assembly .....	5-81
5-75	Shifting With Automatic Transmission on Column.....	5-82
5-76	Throttle Valve Linkage Group .....	5-83
5-77	Transmission Cooling Lines Group .....	5-84
5-78	Transmission Assembly and Case Assembly Group .....	5-86
5-79	Torque Converter Group.....	5-89
5-80	Servo and Valve Body Group.....	5-91
5-81	Governor Control Group .....	5-94
5-82	Clutches Group.....	5-96
5-83	Gears and Shafts Group .....	5-100
5-84	Rear Propeller Shaft Group .....	5-103
5-85	Transfer Case Assembly and Transfer Case Housing Group.....	5-105
5-86	Transfer Case Gears and Shafts .....	5-108
5-87	Mainshaft Pilot Bearing Removal .....	5-109
5-88	Front Output Shaft Front Bearing Removal.....	5-109
5-89	Front Output Shaft Rear Bearing Removal .....	5-109
5-90	Input Gear Bearing Removal .....	5-110
5-91	Mainshaft Pilot Bearing Installation .....	5-110
5-92	Input Gear Bearing Installation .....	5-110



## LIST OF ILLUSTRATIONS-Continued

Number	Title	Page
5-93	Front Output Shaft Rear Bearing Installation .....	5-111
5-94	Front Output Shaft Front Bearing Installation .....	5-111
5-95	Rear Output Bearing Installation .....	5-111
5-96	Rear Seal Installation .....	5-112
5-97	Transfer Case Shift Forks Group .....	5-113
5-98	Not Used	
5-99	Not Used	
5-100	Not Used	
5-101	Steering Wheel Group .....	5-114
5-102	Steering Column and Upper Housing Group .....	5-116
5-103	Metric Steering Shaft Identification .....	5-118
5-104	Steering Column Lower Housing and Shafts Group .....	5-120
5-105	Steering Gear Components Group .....	5-122
5-106	Valve Assembly Components .....	5-125
5-107	Adjuster Plug Components .....	5-126
5-108	Valve Body - Wormshaft Installation .....	5-127
5-109	Seating Valve Body .....	5-127
5-110	Stub Shaft Position With Gear Centered .....	5-128
5-111	Pitman Shaft Master Spline Position With Gear Centered .....	5-129
5-112	Steering Linkage Group .....	5-130
5-113	Steering Damper Group .....	5-132
5-114	Power Steering Pump Mounting Group .....	5-133
5-115	Pump Pulley Removal .....	5-134
5-116	Pump Pulley Installation .....	5-134
5-117	Power Steering Hydraulic Pump Assembly .....	5-135
5-118	Front Shock Absorber Group .....	5-138
5-119	Front Stabilizer Bar Group .....	5-139
5-120	Front Spring Group .....	5-140
5-121	Bushing Replacement Tools - Small Bushing .....	5-141
5-122	Bushing Replacement Tools - Large Bushing .....	5-141
5-123	Front Axle Housing Group .....	5-144
5-124	Rear Shock Absorber Group .....	5-146
5-125	Rear Spring Group .....	5-147
5-126	Bushing Replacement Tools - Small Bushing .....	5-147
5-127	Bushing Replacement Tools - Large Bushing .....	5-148
5-128	Rear Axle Assembly and Rear Differential Group .....	5-150
5-129	Spreading Axle Housing .....	5-151
5-130	Pinion Yoke Removal .....	5-151
5-131	Installing Pinion Depth Gauge Tools .....	5-153
5-132	Measuring Gauge Block .....	5-153
5-133	Rear Axle Housing Group .....	5-155
5-134	Rear Axle Shafts Group .....	5-157
5-135	Brake Pedal and Linkage Group .....	5-158
5-136	Wheel and Weights Group .....	5-159
5-137	Power Brake Booster and Master Cylinder Group .....	5-161
5-138	Brake Proportioning Valve Group .....	5-162
5-139	Brake Lines Group .....	5-163
5-140	Front Brake Caliper Group .....	5-165
5-141	Front Brake Disc .....	5-167
5-142	Checking Lateral Runout .....	5-167



## LIST OF ILLUSTRATIONS-Continued

Number	Title	Page
5-143	Checking Disc Thickness Variation .....	5-168
5-144	Parking Brake Group .....	5-169
5-145	Rear Brake and Cylinder Group .....	5-171
5-146	Frame Assembly and Frame Components Group .....	5-173
5-147	Running Board Group .....	5-175
5-148	Body Holddowns Group .....	5-176
5-149	Body Side and Rear Panels Group .....	5-177
5-150	Front Fender Group .....	5-178
5-151	Door Group .....	5-180
5-152	Door Hinges Group .....	5-181
5-153	Door Seals Group .....	5-182
5-154	Door Latch Group .....	5-184
5-155	Door Handles and Lock Rod Group .....	5-185
5-156	Locks and Keys Group .....	5-186
5-157	Hood and Hinges Group .....	5-187
5-158	Hood Latch, Prop Rod and Holddown Group .....	5-188
5-159	Hard Top Enclosure .....	5-189
5-160	Windshield Frame Group .....	5-190
5-161	Window Seals Group .....	5-192
5-162	Glass Group .....	5-193
5-163	Grille Group .....	5-195
5-164	Outside Mirrors Group .....	5-196
5-165	Windshield Wiper Group .....	5-197
5-166	Windshield Wiper and Motor Group .....	5-198
5-167	Continuity Test for Wiper Switch .....	5-199
5-168	Horn Group .....	5-200
5-169	Headlamps Group .....	5-201
5-170	Parking and Front Turn Lamps Group .....	5-202
5-171	Harnesses Group .....	5-203
5-172	Extendable Hitch Connection Assembly .....	5-204
5-173	Chassis Conversion Assembly .....	5-206
5-174	Front Seat Frame and Pad Group .....	5-208
5-175	Front Seat Track Group .....	5-209
5-176	Front Seat Upholstery Group .....	5-210
5-177	Seat and Shoulder Belts Group .....	5-211
5-178	Dome Lamp Group .....	5-212
5-179	Headliner and Molding Group .....	5-213
5-180	Window Mechanism Group .....	5-214
5-181	Door Trim Panels and Arm Rest Group .....	5-215
5-182	Inside Rear View Mirror Assembly .....	5-216
5-183	Windshield Mounted Rear View Mirror Bracket Location .....	5-217
5-184	Sun Visor Group .....	5-217
5-185	Speedometer Cable Group .....	5-218
5-186	Heater Hose Group .....	5-219
5-187	Heater Group .....	5-220
5-188	Heater Controls .....	5-222
5-189	Defroster Duct Group .....	5-223
5-190	Fresh Air Intake Group .....	5-224
5-191	Instrument Panel Group .....	5-226
5-192	Instrument Cluster Group .....	5-227

## LIST OF ILLUSTRATIONS-Continued

Number	Title	Page
5-193	Instruments Including Hourmeter Group .....	5-228
5-194	Instrument Panel Switch Group .....	5-229
5-195	Miscellaneous Switches Group .....	5-230
5-196	Fuse Panel and Parts Group .....	5-232
5-197	Directional, Ignition and Hazard Switches Group .....	5-233
5-198	Ignition Switch Lock Cylinder Group .....	5-234
5-199	Floor Pan, Cowl and Dash Panel Group .....	5-236
5-200	Accelerator Pedal and Linkage Group .....	5-237
5-201	Floor Mat Group .....	5-238
5-202	Electrical Assembly .....	5-239
5-203	Air System Installation .....	5-242
5-204	Idler Pulley Mounting .....	5-245
5-205	Air Compressor Installation .....	5-246
5-206	Air Compressor Assembly .....	5-249
5-207	Alcohol Injector Assembly .....	5-251
5-208	Governor Assembly .....	5-252
5-209	Winterization Kit .....	5-255
FO-1	Electrical Diagram .....	FP-1

## LIST OF TABLES

Number	Title	Page
2-1	Special Tools and Test Equipment .....	2-1
4-1	Troubleshooting .....	4-1
4-2	Scheduled Inspection .....	4-19
4-3	Engine Component Performance Specifications .....	4-26
5-1	Consumable Materials .....	5-1
5-2	Diode Continuity Chart .....	5-26
5-3	Specific Gravity Chart .....	5-31
5-4	Test Amperages .....	5-32
5-5	Glow Relay Assembly Lamp Test Chart .....	5-62
5-6	Bearing and Journal Re grind Chart .....	5-72
5-7	Crankshaft Thrust Washer Chart .....	5-72
5-8	Pinion Variance Chart .....	5-152
6-1	Table of Limits .....	6-1
6-2	Specific Torque Values .....	6-6
6-3	General Torque Values .....	6-8





## SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operations and maintenance.

Personnel must at all times observe all safety regulations. Some equipment and chemicals have inherent hazards that cannot be mechanically safe-guarded. Personnel must perform these functions with caution.

**RESUSCITATION:** Personnel working with or near highly toxic chemicals should be familiar with modern methods of resuscitation. Such training may be obtained from Base Medical Services.

The word "shall" expresses that a provision is binding. "Should" or "may" express that a provision is non-mandatory. "Will" expresses either a declaration of purpose or simple futurity; i.e., "Power for the starter will be provided by the battery."

The following warnings and cautions appear in the text of this volume and are repeated here for emphasis.

### WARNING

Battery fluid contains sulphuric acid. When servicing batteries, wear eye protection (face shield), acid resistant rubber apron and gloves. Keep flames/sparks away from the unit and filter cap openings.

Do not remove radiator draincock or block drain plug when engine has been running for any length of time as burns to personnel may result.

Ethylene glycol is toxic to the eyes, skin and respiratory tract. Eye and skin protection is required. Ethylene glycol should only be used in a well-ventilated area.

Whenever disconnecting battery terminals, always disconnect GROUND (negative) terminal first to avoid sparking and danger of explosion.

When connecting battery terminals, always connect NEGATIVE terminal last to avoid sparking and danger of explosion.

Stay clear of fan and drive belts when engine is running or injury may result.

### WARNING

At normal operating temperature, the gauge end of the transmission dipstick will be too hot to hold comfortably. Injury to personnel may result.

Spray booth operations must be approved by local bioenvironmental engineer prior to operating.

Compressed air used for cleaning can create airborne particles that may enter the eyes. Pressure shall not exceed 30 psi and goggles are required.

Solvent P-D-680 Type II is toxic to the skin, eyes and respiratory tract. Avoid skin and eye contact. Good general ventilation is normally adequate.

1,1,1-Trichloroethane is toxic to skin, eyes, and respiratory tract. Avoid prolonged or repeated skin contact. Assure adequate ventilation.

Aircraft cleaning compound (MIL-C-25769) is toxic to the skin, eyes and respiratory tract. Avoid skin and eye contact. Good general ventilation is normally adequate.

Rust preventative (MIL-C-16173) is flammable and toxic to the skin, eyes and respiratory tract. Keep away from open flame and other ignition sources. Avoid skin and eye contact. Good general ventilation is usually adequate.

Make sure that spray cleaning operations have been evaluated or reviewed by the local bioenvironmental engineer.

Steam or vapor pressure cleaning creates hazardous noise levels and severe burn potential. Eye, skin and hearing protection are required.

Fluorescent penetrant may cause personal injury. Avoid skin contact. In case of skin contact, wash with warm water and soap.

Paint thinner is flammable and toxic to the skin, eyes and respiratory tract. Keep away from open flame or other ignition sources. Avoid skin and eye contact. Good general ventilation is usually adequate.



**WARNING**

Welding and brazing operations produce heat, toxic fumes, radiation, metal slag and carbon particles. Welding and brazing goggles with the proper tinted lenses, gloves, apron or jacket, and welder's boots are required to protect the welder.

Drilling operations are hazardous to the eyes. Eye protection is required.

Do not work under raised vehicle without first supporting vehicle with safety jack stands.

Avoid breathing fumes generated by soldering or unsoldering as injury to personnel may result.

Isopropyl alcohol is flammable and toxic to the skin, eyes and respiratory tract. Keep away from open flame and other ignition sources. Avoid skin and eye contact. Good general ventilation is normally adequate.

Do not remove cylinder block drain plugs or loosen radiator draincock with system hot and under pressure because serious burns from coolant may occur.

Diesel fuel is combustible and an irritant. Skin and eye protection are required. Good general ventilation is normally adequate. Keep away from open flame and other ignition sources.

The fuel spray from an injector can penetrate the skin. Fuel oil that penetrates the skin can cause a serious infection or death.

Dry ice will cause low temperature burns (-80°C). Temperature resistant gloves are required.

When removing flywheel capscrews, hold flywheel tightly against crankshaft by hand to prevent it slipping off the crankshaft. The flywheel is not dowelled to the crankshaft. Serious injury to personnel or damage to equipment may occur.

When installing hex head flywheel capscrews, hold flywheel firmly by hand to prevent it from slipping off the end of the crankshaft. The flywheel is not dowelled to the crankshaft. Serious injury to personnel or damage to equipment may occur.

When oil pump relief valve is disassembled, removing cotter pin allows springs to expand

**WARNING**

with considerable force. Always keep valve facing downward and release slowly to avoid injury. Remove spreader tool immediately after removing differential case kit to avoid the possibility of distorting the axle housing.

Support rear propeller shaft assembly with safety jack stands before removing straps or injury to personnel may result.

Do not remove frame rear crossmember without adequate support under the transmission or injury to personnel may result.

When working under chassis, raise suspension and install safety jack stands or injury to personnel may occur.

Do not place fingers in front of the front brake caliper piston in an attempt to catch or protect it. Use only enough air pressure to ease the piston out of the bore. Excessive air pressure can eject the piston with enough force to cause damage or injury.

Remove brake lining residue with a cloth dampened with P-D-680 Type II solvent. Do not use compressed air. Consult local bioengineer for evaluation/review of this operation.

Adhesives are flammable and toxic. Avoid prolonged or repeated skin contact. Use only in well-ventilated areas.

**CAUTION**

Remove the radiator cap only for testing or when filling the system after service. Removing the cap unnecessarily can cause loss of coolant and allow air to enter the system, which may cause damage by corrosion.

Do not overfill transmission with transmission fluid. Overfilling can cause foaming which can lead to overheating, fluid oxidation or varnish formation. These conditions can cause interference with normal valve, clutch and servo operation. Foaming can also cause fluid to escape from the transmission vent where it may be mistaken for a leak.

Do not spill battery acid on vehicle's painted surfaces. If acid contacts any painted surface, flush immediately with water.



**CAUTION**

Do not allow supply of brake fluid in master cylinder to become exhausted. Check fluid level frequently while bleeding and refill as required. Do not bleed two wheels at a time, and do not bleed the system with the front calipers or rear drums not in place.

The automatic brake adjuster lever must be disengaged from the adjuster screw before the screw can be rotated or damage to brake components may occur. Use a thin blade screwdriver or section of 1/8 inch welding rod to unseat adjuster lever.

Do not allow brake system master cylinder cover or diaphragm to contact dirt or foreign material.

Handle the battery carefully when removing or replacing it, and avoid tipping it as battery acid is corrosive to painted surfaces.

Do not overfill the transmission with transmission fluid. This can lead to foaming which can lead to overheating, fluid oxidation or varnish formation, all of which can interfere with transmission operation.

Do not overfill wheel hub with grease. Leakage may occur, resulting in contamination of brake linings.

When adjusting front wheel bearings, the spring cup must be installed so the recessed side faces the bearing and the flat side faces the pressure spring. The pressure spring should contact the flat side of the cup only.

Do not clean tires, lubricant seals, rubber hose, or electrical components with cleaning solvent.

Do not use soap or alkalis to clean tank fuel interiors.

When resurfacing exterior surfaces using an abrasive disc, precautions should be taken to guard other parts of the vehicle from abrasive dust. Do not work near exposed parts and openings which would allow the dust to reach working parts.

When removing brushes from starter motor, do not lift brushes by their pigtailed while the brush spring is exerting pressure on the brush.

**CAUTION**

Do not wash starter motor pinion clutch or drive assembly. If these components are washed, damage may result.

Do not use emery cloth to clean the starter motor commutator. If emery cloth is used, damage to commutator could result.

Inspect the entire circumference of the flywheel gear for damage when teeth of the drive assembly pinion gear are damaged. (Normal wear pattern extends approximately 2 inches along the circumference of the flywheel gear.)

When separating front and rear covers, be careful to avoid damage to rear cover oil seal.

When disconnecting alternator stator assembly from diode assembly, use soldering gun with a high heating capacity to melt solder quickly, and use suitable pliers to group leads immediately below soldering iron or heat may damage diode assembly.

Do not clean alternator rotor with degreasing solvent or damage to rotor may result.

When using abrasive to clean alternator rotor, support the rotor while spinning to clean slip rings evenly. Cleaning slip rings without support may result in flat spots on slip rings which may cause brush noise and premature brush wear.

Make sure vent caps are tightly secured to battery before cleaning to avoid contaminating electrolyte with cleaning solution.

When removing nozzle and holder assemblies, cover injection pump with clean rag to prevent entry of dirt which may cause damage to injection pump.

When checking oil cooler element, do not use compressed air at a pressure higher than 140 psi or damage to oil cooler element may result.

When removing timing gear case, do not scratch or nick the sealing edge of the oil seal.

Perform injection pump disassembly procedure with care. Lay out parts on bench in proper order. Place serviceable plungers in proper plunger barrels and immerse in solvent.



### CAUTION

Do not allow cleaning fluid to get into injection pump delivery valve and other internal pump parts.

Do not apply excessive pressure when installing cylinder head chambers. Chambers must be even with cylinder head.

Do not use force to remove rocker brackets. Warm entire assembly to 158°F to free up brackets.

Do not apply heat to straighten rocker shaft.

If any part is replaced due to chipped teeth, replace mating part as it may have invisible fractures.

Cleanliness during disassembly and assembly is necessary to avoid a further malfunction after assembly. Before removing any of the transmission subassemblies, plug all openings and thoroughly clean the transmission exterior. Steam cleaning equipment is preferable for this purpose. During disassembly, clean all parts in a suitable solvent and dry each part using compressed air. Do not use cloth or paper towels to dry any parts after cleaning, use compressed air only.

Do not use any type of caustic cleaning solution when cleaning servo and valve body group components of the transmission as damage may result.

Do not clamp any part of the transmission reaction-shaft support assembly in a vise.

When disassembling the transfer case, use a rawhide or plastic mallet when tapping the retainer. Do not attempt to use a pry bar to remove retainer or damage to retainer or case may result.

When disassembling the transfer case, do not attempt to wedge case halves apart at any point on mating surfaces or damage to surface may result.

When assembling the transfer case, be sure front output shaft rear thrust bearing assembly is seated in the rear case before connecting case halves or damage to thrust bearings, gears and shaft may result.

When installing the transfer case, be sure it is flush against the transmission before tightening attaching bolts. Severe damage to transfer

### CAUTION

case will result if the attaching bolts are tightened while transfer case is cocked or in a bind.

The steering shaft is free in the steering column after retainer ring is removed. Do not allow the shaft to fall out of the column.

Use only the specified screws, bolts, and nuts when servicing the steering column, and tighten all fasteners to recommended torque values only to maintain the energy-absorbing (compressing) action of the column. Incorrect length screws or bolts can prevent the column from compressing under impact. The bolts and nuts that attach the column mounting bracket to the column and instrument panel must also be tightened to the proper torque so that the bracket will break away under impact.

Identify the steering shaft nut thread type before using the compressor tool. If the shaft has American threads, use the compressor tool as is. However, if the shaft has metric threads, replace the compressor tool forcing screw with metric forcing screw J-22653-4 before using the tool.

Some steering shafts have metric size steering wheel nut threads. If a replacement nut is being installed, identify the shaft thread type before installation. Metric shafts have an identifying groove in the steering wheel locating splines. American thread shafts do not have this groove.

Do not attempt to separate the lower shaft and steering column at the beginning of the disassembly procedure. If separated, the plastic connector injected into the lower shaft could be damaged.

To avoid damaging the steering column mounting bracket breakaway capsules, store the bracket in a safe place until service operations are completed.

When unseating the rack piston end plug from the steering gear, do not rotate the stub shaft any farther than necessary or the ball bearings will drop out of the rack piston circuits. This causes the rack piston and pitman shaft sector teeth to disengage, preventing removal. If disengagement should occur, remove the side cover and pitman shaft and reengage the teeth.



**CAUTION**

Do not attempt to remove the rack piston end plug from the steering gear until it has been unseated as the plug could break.

When installing double lipseal in steering gear, do not bottom seal against housing counterbore.

When assembling the steering gear, do not allow the stub shaft to disengage from the valve body pin. If disengagement occurs, the spool valve will extend too far into the valve body, allowing the preformed packing to expand into the valve body grooves and preventing valve withdrawal.

The power steering gear and pump form a closed system. Contaminants or foreign material must not be allowed to enter the system at any point. If the pump (or gear) is contaminated or damaged so as to produce debris, both the pump and gear must be disassembled, cleaned and serviced.

Inspect the exposed surface of the power steering pump shaft. Remove all traces of corrosion or nicks and scratches before disassembling the pump. This will prevent damage to the pump occurring during disassembly which might necessitate replacement of the entire pump body. Do not overtighten vise as pump body could be distorted.

Do not allow dirt to enter the power steering pump during assembly. Clean and lubricate all parts and perform assembly on a clean work surface.

When assembling power steering components, do not overspread retaining ring. Open it only enough to install it.

When assembling the power steering pump, be careful to avoid displacing or damaging any of the seals. Use a wood or plastic tool to keep the preformed packing in its groove when installing the reservoir.

Some power steering pumps have metric threaded assembly fittings which are designed for use with metric hose fittings that use an O-ring seal. If the fitting is to be replaced, be sure to install the correct threadtype fitting.

**CAUTION**

When removing the front spring bushing, press only on metal outer sleeve or damage to bushing may result.

Remove spreader tool immediately after removing differential case kit to avoid the possibility of distorting the axle housing.

When measuring differential pinion depth to avoid false reading, do not allow the gauge block anvil to contact the pinion gear at any point.

The same amount of shim thickness added or subtracted from one side of differential bearing shim packs must be added or subtracted on the opposite side.

Clean the brake system master cylinder assembly with brake fluid only. Never use solvents containing mineral oil such as gasoline, kerosene, alcohol or carbon tetrachloride. Mineral oil is very harmful to the rubber piston cups and seals.

Do not use wire to open a clogged port in the master cylinder assembly as wire may create burrs in the port and cylinder bore.

Remove brake caliper repair kit seals using a wooden or plastic tool as a metal tool could score the piston bore.

Do not attempt to clean or polish brake caliper mounting bolts with abrasives as the protective plating will be removed.

When overhauling the rear brakes, do not attempt to reduce deep ridges or grooves in the plate by grinding or improper shoe-to-drum contact may result.

When removing hard top enclosure, avoid damaging foam seals installed between the panel assembly and the rear body panel.

When installing hard top enclosure, avoid damaging foam seals installed between the panel assembly and the rear body panel.

Do not touch surfaces to which accelerator has been applied or an imperfect bond could result.





## INTRODUCTION

### PURPOSE.

This publication presents the overhaul instructions for the Flightline Tow Tractor, Model No. 3. This vehicle is supplied by PSI Mobile Products, Inc., Mt. Clemens, Michigan 48403.

### SCOPE.

This manual provides a general description of the flightline tow tractor and detailed descriptions of its major components and systems. Instructions are given for preparation of the vehicle for use and for inspection, lubrication and maintenance of its major components and systems. This manual provides both general overhaul instructions and specific procedures for overhauling all vehicle components.

Chapter 1 - General Information. Descriptive information regarding the vehicle and its major components, including explanations of the functional relationships of the major components, and theory of operation of the components and major systems.

Chapter 2 - Special Tools and Test Equipment. This chapter lists and illustrates (by reference) all special

tools and test equipment which must be employed during performance of the procedures contained within this manual.

Chapter 3 - Preparation For Use. Instructions for preparing the vehicle for transport and for use after transport.

Chapter 4 - In-Use Inspection, Maintenance and Lubrication. Instructions for periodic inspection, servicing, adjustment, and lubrication of the vehicle and accessories.

Chapter 5 - Overhaul Procedures. Covers overhaul procedures for the vehicle and accessories including removal, disassembly, cleaning, inspection, repair, replacement, reassembly, and installation.

### RELATED TECHNICAL MANUALS.

The Air Force manuals related to these overhaul instructions are listed below:

- TO 36A10-3-29-31 Operator and Maintenance Manual for the Flightline Tow Tractor, Model No. 3
- TO 36A10-3-29-34 Illustrated Parts Breakdown.

