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Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10001

AEROSPACE INFORMATION REPORT

AIR 786 A

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ELASTOMER COMPATIBILITY CONSIDERATIONS RELATIVE TO O-RING AND SEALANT SELECTION

1. PURPOSE

This AIR is intended to disseminate data relative to the compatibility of elastomers in order to aid in O-ring and sealant selection. A secondary purpose relates to the selection of solvents and cleaning agents for components and systems containing elastomeric sealants.

2. SCOPE

This document contains data relative to the chemical nature of aerospace fluids and relates each to its effect upon elastomeric components. Since the compatibilities of elastomers are determined by the compounding as well as the nature of the base polymer, the elastomers considered are limited to finished compounds for which material or performance specifications could be referenced.

3. REQUIREMENTS

An acceptable classification indicates only that no excessive swelling, shrinking or major tensile strength change should occur over the temperature range of -40 to +160 F; exceptions to this rule are specifically indicated. Users of this AIR are urged to consult with elastomer specialists before reaching any final conclusions relative to elastomer selection.

4. BASE FLUID CLASSIFICATIONS

The fluids (Note 1) and greases have been assigned a number of classifications. These classifications indicate the predominant characteristic of the base fluid (Note 2). These classifications, their codes or abbreviations, and typical examples are shown in Table I.

The various fluids and greases are listed in Table II. Military specification products are presented first, followed by Federal specifications, commercial specifications and miscellaneous items. Where necessary, the characteristics of the base fluid from which the classification was derived are shown in the last column.

Note 1: The term "fluid" includes aerospace hydraulic fluids, lubricants, solvents, fuels, oxidizers, vector control fluids, corrosion preventives, damping fluids, calibration fluids, anti-icing etc.

Note 2: The base fluid is defined as fluid media before incorporation of thickeners or additives (provided they do not affect elastomer compatibilities).

5. ELASTOMER SELECTION

Sixteen elastomer specifications are presented in Table III, together with the 37 fluid classifications. Once the fluid classification has been found in Table II, the suitability of these elastomers can be determined by referring to Table III. Conversely, when a compatible solvent must be found for a component or system containing elastomeric seals, Table III will indicate which solvent classes are compatible with it.

In certain cases, notably with fuels, the elastomer choice is governed by other government documents. Users of this AIR are cautioned to investigate the possibility of such a conflict.

6. OTHER DOCUMENTS

The following SAE documents are listed for reference as they relate to information contained in this AIR:

AIR 63	O-Ring Size & Part Number Cross-Reference Chart
AS 568	Uniform Dash Numbering System for O-Rings
AIR 740A	Suggested Physical & Performance Test for Type II (-65 to +275 F) O-Ring Packings, 3000 psi Pneumatic Service
AIR 851	O-Ring Tension Testing Calculations

Table I

Description of Classifications

The various fluids and greases have been placed in a number of classifications in order that the elastomer section can be simplified. The symbols indicate the predominant characteristic of the base fluid. Their meanings are as follows (typical products are shown):

Aromatics: The base fluid is highly aromatic. Typical: toluene.

ABF: Alcohol base fluid; usually contains castor oil or polyglycol as lubricant portion. Typical: VV-H-910.

C-H: Chlorinated hydrocarbon. Typical: Trichloroethylene

E-A: Ester Aryl. Typical: MIL-H-19457

E-N: Ester, Normal. Historically, the first fluids meeting these specifications were di-esters of dibasic acids, such as dioctyl sebacate, dioctyl azelate, octyl-decyl adipate, etc. However, some formulations contain esters of diethylene glycol or trimethylol propane (with a low molecular weight mono basic acid). Typical: MIL-L-7808D.

E-ELT: Ester, extreme low temperature. Usually diisoamyl adipate. Typical: MIL-L-6387A.

E-TS: Ester, thermally stable. Esters of pentaerythritol or trimethylol propane (higher molecular weight than E-N). Typical: MIL-L-9236B.

E-S: Ester, Silicate. Silicate esters, alkoxy siloxanes, hexaalkoxy-disiloxanes. Typical: MLO-8200.

E-S, E-N Blend: A blend of E-S and E-N. Typical: MIL-H-8446B.

E-P: Ester, phosphate. Typical: Skydrol.

E-PLD: Ester, phosphate, low density. Typical: Skydrol LD.

F-A: Fuel, Aliphatic. Typical: MIL-S-3136B, Type I.

F-B: Fuel, blended. 40% or less aromatics. Typical: JP-4.

Fluorocarbons: Polychlorotrifluoroethylene. Typical: Kel-F.

HCS: Hydrocarbon, Synthetic. Typical: MIL-H-83282 (USAF)

IPA: Isopropyl alcohol.

P-E: Phenyl ethers. Such as mixed o, m, and p biphenoxy phenyl ethers.

P-L: Petroleum base, low aniline point. Typical: MIL-H-5606A.

P-M: Petroleum base, medium aniline point. Typical: MIL-L-6082, grade 1065.

P-H: Petroleum base, high aniline point. Typical: MIL-L-6082, grade 1100.

Silicone: Those classes of fluids normally called silicones, such as dimethyl silicone (polydimethyl siloxane), methyl-phenyl silicones, etc. Typical: DC-200.

Hydrazine: Hydrazine, unsymetrical dimethyl hydrazine and similar fluids.

W-G: Water-Glycol fluids. Sometimes called "Hydrolubes". Typical: MIL-H-7083.

Special: Certain "one of a kind" items.

Table II
Base Fluid Classifications

Specification	Title	Classification	Characteristics of Base Fluid (1)
MIL-L-644B (See VV-L-800)	Lubricating Oil, General Purpose, Preservative	P-L	12 cs @ 100°F
MIL-L-2104B	Lubricating Oil, Internal-Combustion Engine		
	Grade 10 (SAE 10W-20)	P-M	6 cs @ 210
	Grade 30 (SAE 30)	P-M	10 cs @ 210
	Grade 50 (SAE 50)	P-H	17 cs @ 210
MIL-L-2105B	Lubricant, Gear, Universal		
	Grade 80	P-M	9 cs @ 210
	Grade 90	P-H	17 cs @ 210
	Grade 140	P-H	26 cs @ 210
MIL-G-2108 (See MIL-G-10924B)	Grease, General Purpose, No. 2	P-M	75-100 SUS @ 210
MIL-S-3136B (See TT-S-735)	Standard Test Fluids Hydrocarbon and Iso-Octane		
	Type I Iso-octane	F-A	Non-aromatic
	Type II Iso-octane & aromatic mixture	F-B	40% Aromatic
	Type III Iso-octane & toluene mixture	F-B	30% Aromatic
	Type IV Petroleum base oil, low swell characteristics	P-M	255° Aniline pt.
	Type V Petroleum base oil, medium swell characteristics	P-L	199° Aniline pt.
	Type VI Petroleum base oil, high swell characteristics	P-L	157° Aniline pt.
	Type VII Cyclohexane & aromatic mixture (mercaptan added)	F-B	30% aromatic
MIL-L-3150A	Lubricating Oil, Preservative, Medium	P-M	185-255 SUS @ 130
MIL-G-3278A (See MIL-G-23827A)	Grease; Aircraft & Instruments (for low and high temperature)	E-N	
MIL-L-3503 (1)	Lubricating Oil, Preservative, Light	P-L	18 cs @ 100
MIL-L-3545 C (See MIL-G-81322A)	Lubricating Grease: High Temperature	P-H	107 SUS @ 210*
MIL-C-4339C (USAF)	Corrosion Preventive, Soluble Oil	P-M	100-400 SUS @ 100
MIL-L-4343B (1)	Lubricating Grease, Pneumatic System	Special	
MIL-L-5020A (ASG) (1)	Liquid, Compass, Aircraft	F-A	Non-fluorescing
MIL-J-5161G (ASG)	Jet Fuel, Referee, Grade I for JP-4; Grade II for JP-5 & 6	F-B	Moderate aromatic
MIL-C-5545B (1)	Compound, Corrosion Preventive, Aircraft Engine, Heavy Oil Type	P-H	115-150 SUS @ 210
MIL-H-5559A	Hydraulic Fluid, Arresting Gear	WG	Ethylene Glycol
MIL-F-5566 (See TT-I-735B)	Fluid, Anti-Icing (Isopropyl Alcohol)	IPA	98% IPA
MIL-G-5572D	Gasoline, Aviation		
	Grades 80/87, 91/96, 100/130, 115/145	F-B	Aromatics allowed
MIL-F-5602	Fluid, Reference, Shear Stability	P-L	4.5 cs @ 100*
MIL-H-5606B	Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance	P-L	4.5 cs @ 100*
MIL-J-5624G	Jet Fuel		
	Grade JP-3	F-B	Aromatics allowed
	Grade JP-4	F-B	Aromatics allowed
	Grade JP-5	F-B	Aromatics allowed

* Typical
(1) All temperatures in °F

Specification	Title	Classification	Characteristics of Base Fluid (1)
MIL-O-6081C (ASG) (4)	Oil Lubricating, Jet Engine		
	Grade 1005	P-L	5 cs @ 100
	Grade 1010	P-L	10 cs @ 100
MIL-L-6082C	Lubricating Oil; Aircraft Reciprocating (Piston) Engine		
	Grade 1065	P-M	65 SUS @ 210
	Grade 1100	P-H	100 SUS @ 210
MIL-H-6083C	Hydraulic Fluid, Petroleum Base, Preservative		
	Type I Ready Mix	P-L	4.5 cs @ 100*
	Type II Concentrate	P-L	4.5 cs @ 100*
MIL-L-6085A (2)	Lubricating Oil; Aircraft Instrument, Low volatility	E-N	
MIL-L-6086B	Lubricating Oil, Gear, Petroleum Base		
	Grade L Light	P-M or L	23-34 cs @ 100
	Grade M Medium	P-M	60-82 cs @ 100
MIL-L-6387A	Lubricating Oil, Synthetic Base	E-ELT	
MIL-C-6529C (2)	Corrosion-Preventive, Aircraft Engine		
	Type I Concentrate Material	P-H	100 SUS @ 210
	Type II Ready-Mixed Material for Reciprocating Aircraft Engines	P-H	100 SUS @ 210
	Type III Ready-Mixed Material for Turbojet Aircraft Engines Which Use Specification MIL-O-6081 Lubricating Oil	P-L or M	96 SUS @ 100*
MIL-F-7024B (2)	Fluids, Calibrating, for Aircraft Fuel System Components		
	Type I Normal Heptane	F-A	Non-aromatic
	Type II Special Run Stoddard Solvent	F-B	2-4% Aromatic
MIL-H-7083A (Aer)	Hydraulic Fluid, Nonflammable, Aircraft, Hydrolube	W. G.	
MIL-G-7118A (See MIL-G-23827A)	Grease, Aircraft Gear & Actuator Screw, for Low and High Temperatures	E-N	
MIL-G-7187 (1) (See MIL-G-21164 & MIL-G-23549)	Grease, Graphite, Aircraft Lubricating	P-M	168 SUS @ 100*
MIL-G-7421A	Grease; Extreme Low Temperature	E-ELT	
MIL-H-7644 (USAF)	Hydraulic Fluid (Castor Oil Base)		
	Grade A Heavy	ABF	
	Grade C Light	ABF	
MIL-L-7645 (USAF)	Lubricating Grease; Lead Soap & Mineral Oil Base	P-H	140-220 SUS @ 210
MIL-G-7711A	Grease, Aircraft, General Purpose	P-M	168 SUS @ 100*
MIL-L-7808G	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	E-N	
MIL-L-7870A	Lubricating Oil (General Purpose, Low Temperature)	P-L	10 cs @ 100
MIL-F-7946	Fluid, De-icing	Special	LiCl Brine
MIL-C-8188C	Corrosion Preventive Oil, Gas Turbine, Aircraft	E-N	

* Typical

(1) All temperatures in °F

Specification	Title	Classification	Characteristics of Base Fluid (1)
MIL-A-8243B (USAF) (1)	Anti-Icing and De-Icing - Defrosting Fluid	W. G.	88% 1, 2 Glycols
MIL-L-8383B (USAF) (1)	Lubricating Oil, Internal Combustion Engine	P-M	6 cs @ 210
MIL-H-8446B	Hydraulic Fluid, Non-petroleum Base, Aircraft	E-S, E-N blend	15% E-N in E-S
MIL-I-8660B	Insulating and Sealing Compound, Electrical	Silicone	
MIL-L-9000F	Lubricating Oil, Internal Combustion Engine, Diesel	P-M, P-H	SAE 10-50
MIL-T-9188B	Aryl Phosphate, for use as an Aviation Gasoline Additive	E-A	
MIL-L-9236B (USAF)	Lubricating Oil, Aircraft Gas Turbine, High Temperature	E-TS	
MIL-L-10295B	Lubricating Oil, Internal-Combustion Engine, Sub-Zero	P-L	1-3 cs @ 210*
MIL-L-10324A	Lubricating Oil, Gear, Sub-Zero	P-L	2-3 cs @ 210*
MIL-G-10924B	Grease, Automotive & Artillery	P-L	60-70 SUS @100
MIL-L-11734B	Lubricating Oil, Synthetic (for Mechanical Time Fuses)	E-N	
MIL-O-11773 (Ord)	Oil; Lubricating, Synthetic (for Impregnating Powder Metal Sleeve Bearings)	E-N	
MIL-P-12098 (Ord)	Preservative, Hydraulic Brake Systems and Components	ABF	
MIL-H-13862 (Ord)	Hydraulic Fluid, Petroleum Base, Artillery Recoil, Light	P-L	2-4 cs @ 100*
MIL-H-13866B (Ord)	Hydraulic Fluid, Petroleum Base, Artillery Recoil, Special	P-L	5-8 cs @ 100*
MIL-H-13910B (Ord)	Hydraulic Fluid, Non-Petroleum Base, Automotive Brake, Arctic	ABF	3-6 cs @ 100
MIL-H-13919B (Ord)	Hydraulic Fluid, Petroleum Base, Fire Control	P-L	6-10 cs @ 100*
MIL-L-14107B	Lubricating Oil, for Aircraft Weapons	E-S	
MIL-L-15017 & Am. #3	Lubricating Oil, Hydraulic		
	Symbol 2075H	P-M	13-18 cs @ 130
	Symbol 2110H	P-M	18-25 cs @ 130
	Symbol 2135H	P-M	25-31 cs @ 130
MIL-L-15018B	Lubricating Oil, Mineral, Cylinder	P-M	
MIL-L-15019C	Lubricating Oil, Compounded	P-M	
MIL-L-15719A & Am. #1	Lubricating Grease (High-Temperature, Electric Motor, Ball and Roller Bearings)	Silicone	
MIL-G-15793 (BuOrd) & Am. #2 (See MIL-G-23827A)	Grease, Instrument	E-N	
MIL-F-16929A	Fluid, Damping, Ester Base	E-N	
MIL-L-16958A	Lubricating Oil, Mineral Oil Composition, for Torpedo Gyro	P-L	
MIL-F-17111 (NOrd)	Fluid, Power Transmission	P-L	8-15 cs @ 100
MIL-L-17331B (SHIPS) & Am. #1	Lubricating Oil, Stream Turbine (Non-corrosive) Symbol 2190-TEP	P-M	82-110 cs @ 100
MIL-L-17353A (NOrd)	Lubricating Oil, Low Temperature, Special	E-ELT	
MIL-L-17672B	Lubricating Oil, Hydraulic and Light Turbine, Non-corrosive		
	Symbol 2110 T-H	P-M	5.12 cs @ 210
	Symbol 2135 T-H	P-M	7.29 cs @ 210

* Typical

(1) All temperatures in °F.

Specification	Title	Classification	Characteristics of Base Fluid (1)
MIL-L-18486A	Lubricating Oil, Worm Gear	P-M	
MIL-G-18709A	Grease, Ball and Roller Bearing	P-M	
MIL-H-19457B (SHIPS) & Am. #2	Hydraulic Fluid, Fire Resistant	E-A	
MIL-F-19605 (SHIPS)	Fuel, Ballistic Missile	F-B E-N (2)	5% Max. Aromatic 55% Silicone, 40% E-N
MIL-L-19701A (NOrd)	Lubricant, All-Weather, Semi-Fluid, for Aircraft Ordnance		
MIL-L-21260A	Lubricating Oil, Internal Combustion Engine, Preservative		
	Grade 10 (SAE 10W-20)	PM	6 cs @ 210
	Grade 30 (SAE 30)	PM	10 cs @ 210
	Grade 50 (SAE 50)	P-H	17 cs @ 210
MIL-F-21568A (NOrd)	Fluids, Silicone, Dimethyl Polysiloxane	Silicone	
MIL-H-22072A (Aer)	Hydraulic Fluid, Catapult	W. G.	
MIL-L-23699A	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	E-N	
MIL-G-23827A	Grease, Aircraft & Instrument, Gear & Actuator Screw	E-N	
MIL-G-25013D	Grease, Ball & Roller Bearing, Extreme High Temperature	Silicone	
MIL-F-25172 (USAF) & Am. #1	Fuel, Aircraft Reciprocating Engine, Tricresyl Phosphate Blend, Grades 91/96, 100/130, 115/145		
MIL-L-25336B (ASG) & Am. #1	Lubricating Oil, Aircraft Turbine Engine, High Film Strength, Synthetic Base	F-B	Aromatics Allowed
MIL-F-25524A (USAF) & Am. #1	Fuel, Aircraft Turbine & Jet Engine Thermally Stable	E-N	
MIL-G-25537A (USAF) & Am. #1	Grease, Aircraft; Helicopter Oscillating Bearing	F-B	25% Max. Aromatic
MIL-F-25558B (USAF) & Am. #1	Fuel, Ramjet, Engine, Grade RJ-1	P-L	40-45 SUS @ 100
MIL-F-25576C	Rocket Fuel, Grade RP-1	P-L	3 cs @ 100*
MIL-H-25598 (proposed)	Hydraulic Fluid, Low Temperature, Servo Mechanism	F-B	Aromatics Allowed
MIL-F-25656B (USAF) & Am. #1	Fuel, Aircraft Turbine and Jet Engine, Grade JP-6	P-L	3 cs @ 100
MIL-L-25681C (USAF)	Lubricating Oil, Molybdenum Disulfide, Silicone Base, High Temperature	F-B	Aromatics Allowed
MIL-G-25760A (See MIL-G-81322A)	Grease, Aircraft; Ball & Roller Bearing, Wide Temperature Range	Silicone	
MIL-L-25968 (USAF)	Lubricating Oil, Aircraft Turbine Engine, Medium Temperature	E-TS	
MIL-L-26087B (USAF)	Lubricating Oil, Reciprocating Compressor, Ground Support	E-N	(Cancelled)
MIL-G-27343 (USAF)	Grease, Ball & Roller Bearing, for Temperature Ranging from -100° to +400°F	P-M	105-135 cs @ 100
MIL-H-27601A (USAF)	Hydraulic Fluid, Petroleum Base, High Temperature, Flight Vehicle	Silicone	
MIL-G-27617A	Grease, Aircraft Fuel & Oil Resistant	P-H	Deep Dewaxed
MIL-I-27686	Inhibitor, Anti-Icing, Fuel Soluble	Fluorocarbons	
MIL-L-27694A	Lubricating Oil, Instrument, -65° to +400°F	W. G.	87.3% cellosolve 12.7% glycerol
MIL-G-38277	Grease, Aircraft, High Speed, Ball & Roller Bearing, 600°F	Silicone	
		No recommendation	

* Typical

(1) All temperatures in °F.

(2) Due to the unusual nature of this blend, use E-N recommendations with caution.

Specification	Title	Classification	Characteristics of Base Fluid (1)
MIL-L-46000A (ORD)	Lubricating Oil, Semi-Fluid Automatic Weapons	E-N	
MIL-H-46001A	Hydraulic Fluid, Petroleum Base, for Machine Tools	P-M	
MIL-L-46002	Lubricating Oil, Contact & Volatile Corrosion Inhibited	P-M	
MIL-H-46004	Hydraulic Fluid, Petroleum Base, Missile	P-L	3 cs @ 100*
MIL-H-46046A	Hydraulic Fluid, Non-Petroleum Base, Automotive (Preservative & Limited Operational)	ABF	Castor-glycol ether
MIL-H-81019C	Hydraulic Fluid, Petroleum Base, Ultra Low Temperature	P-L	3 cs @ 100°F
MIL-S-81087	Silicone Fluid, Chlorinated Methylphenyl-Polysiloxane	Silicone	
MIL-H-83282 (USAF)	Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft	H-C-S	16.5 cs @ 100°F
MIL-G-81322A	(Title? Replaces MIL-G-3545C & MIL-G-25760A)		
	Federal Specifications		
O-A-548A	Antifreeze, Ethylene Glycol, Inhibited	W. G.	
O-T-634B	Tricholroethylene, technical	C. H.	
P-D-680	Solvent, Dry Cleaning		
	Type I 100°F Solvent (Stoddard Solvent)	F-B	Low Aromatic
	Type II 140°F Solvent	F-B	Low Aromatic
P-S-661B (See P-D-680)	Solvent, Dry Cleaning		
	Type I 100°F Solvent (Stoddard Solvent)	F-B	Low Aromatic
	Type II 140°F Solvent	F-B	Low Aromatic
TT-N-95A	Naptha; Aliphatic	F-B	Low Aromatic
TT-N-97B & Am. #2	Naptha; Petroleum, Aromatic	Aromatic	
TT-T-266B	Thinner; Dope and Lacquer	Special	(33% Ketones & Esters 17% Alcohols; 49% Hydrocarbons 25% Aromatic)
TT-I-735B	Isopropyl Alcohol	IPA	
TT-S-735	Standard Test Fluids Hydrocarbon & Iso-Octane		
	Type I Iso-Octane	F-A	Non-aromatic
	Type II Iso-Octane & Aromatic Mixture	F-B	40% Aromatic
	Type III Iso-Octane & Toluene Mixture	F-B	30% Aromatic
	Type IV Petroleum Base Oil, Low Swell Characteristics	P-M	255° Aniline pt.
	Type V Petroleum Base Oil, Medium Swell Characteristics	P-L	190° Aniline pt.
	Type VI Petroleum Base Oil, High Swell Characteristics	P-L	157° Aniline pt.
	Type VII Cyclohexane & Aromatic Mixture (mercaptan added)	F-B	30% Aromatic
TT-T-656B	Aryl Phosphate	E-A	
VV-G-632	Grease; Lubricating, Automotive & Industrial		
	Type A - Intended Primarily for Automotive Use.		
	Grade 1 - Chassis	P-M	750 SUS @ 100
	Grade 2 - Wheel Bearing	P-M or L	75-100 SUS @ 100

* Typical
(1) All temperatures in °F.

Specification	Title	Classification	Characteristics of Base Fluid (1)
VV-G-671C	Grease, Graphite, Grades 1, 2 and 3	P-M	300-400 SUS @ 100
VV-B-680	Brake Fluid, Automotive	ABF	
VV-H-910	Hydraulic Fluid, Non-Petroleum Base, Automotive	ABF	
VV-I-530A	Insulating Oil, Electrical (for Transformers, Switches, and Circuit Breakers)	P-L or M	12 cs @ 100 Max.
VV-K-211D & Am. #1	Kerosene	F-B	Low Aromatic
VV-K-220A	Kerosene, Water-White, Deodorized (for use in insecticides)	F-A	Very Low Aromatic
VV-L-751B	Lubricants; Chain, Exposed-Gear & Wire-Rope, all grades	P-H	25-250 SSF @ 210
VV-L-800	Lubricating Oil, General Purpose, Preservative	P-L	12 cs @ 100°F
VV-L-820B	Lubricating Oil, Petroleum, Light	P-L or M	17-20 cs @ 100
VV-L-825A	Lubricating Oil, Refrigerant Compressor		
	Type I For Reciprocating Type Refrig. Compressors (SO_2)	P-M	150-170 SUS @ 100
	Type II For Reciprocating Type Refrig. Compressors (Freon-12, CH_3Cl, NH_3)	P-M	285-320 SUS @ 100
	Type III For Special Application such as Two Stage Rotary Type Compressors	P-H	105-125 SUS @ 210
VV-O-526	Oil; Lubricating, Machine		
	Grade 8	P-L	70-90 SUS @ 130
	Grade 10	P-L or M	90-120 SUS @ 130
	Grade 20	P-M	120-185 SUS @ 130
	Grade 30	P-M	185-255 SUS @ 130
VV-P-216A	Penetrating Oil (for loosening frozen metallic parts)	P-L	35-60 SUS @ 100
VV-P-236	Petrolatum	P-H	
	Navy Specifications		
51-F-23 (Ord) (See MIL-F-17111)	Fluid, Hydraulic	P-L	180° Aniline pt.*
	SAE Aerospace Material Specifications		
AMS 3002	Alcohol, Denatured Ethyl	ABF	
AMS 3004	Alcohol, Methyl	ABF	
AMS 3006	Alcohol, Water Mixtures	ABF	
AMS 3028	Aviation Fuel, Grade 91/98	F-B	Aromatics allowed
AMS 3032	Aviation Fuel, Grade 100/130	F-B	Aromatics allowed
AMS 3034	Aviation Fuel, Grade 108/135	F-B	Aromatics allowed
AMS 3036	Aviation Fuel, Grade 115/145	F-B	Aromatics allowed
AMS 3070	Oil, Carburetor Flushing	P-M	65 SUS @ 210
AMS 3150	Hydraulic Fluid, Fire Resistant	E-P	

* Typical
(1) All temperatures in °F.

Specification	Title	Classification	Characteristics of Base Fluid (1)
	Miscellaneous Specifications		
ASTM Method D471	Oil #1	P-M	255° Aniline pt.
	Oil #2	P-L	199° Aniline pt.
	Oil #3	P-L	157° Aniline pt.
	Reference Fuel A	F-A	
	Reference Fuel B	F-B	30% Aromatic
	Reference Fuel C	F-B	50% Aromatic
	Service Fluid No. 101	E-N	
Boeing Co.			
BMS 3-4	Hydraulic Fluid, Petroleum Base, High Temperature	P-M	
Douglas Aircraft			
DPM-352	Oil, Expansion Turbine	P-M	43 SUS @ 210
DPM-360	Oil, Cabin Supercharger	P-L	10 cs @ 100
Hughes Aircraft Co.			
HMS-20-1124	Hydraulic Fluid, Low Temperature, Servo Mechanism	P-L	3 cs @ 100*
Redstone Arsenal			
(See MIL-H-46004)			
MPD-2067	Oil, Hydraulic, Low Temperature, Petroleum Base	P-L	3 cs @ 100*
	OTHER PRODUCTS		
Materials Laboratory Oils			
MLO-7243		P-M	
MLO-7277		P-M	
MLO-7557		P-M	
MLO-8200		E-S	
MLO-85/15		E-S, E-N Blend	15% E-N in E-S
Silicones			
DC-200, 510, 550, 710		Silicone	
Versilube F-50, 81644, 81717		Silicone	
Fire Resistant Fluids			
Aerosafe 2300		E-PLD	
Aerosafe 2300A		E-PLD	
Hyjet		E-P	
Hyjet W		E-P	
Hyjet III		E-PLD	

* Typical
(1) All temperatures in °F.