MIL-HDBK-275A
29 June 1976
SUPERSEDING
MIL-HDBK-275(ASG)
1 MAY 1969

MILITARY HANDBOOK

GUIDE FOR SELECTION OF LUBRICANT FLUIDS AND COMPOUNDS FOR USE IN FLIGHT VEHICLES AND COMPONENTS

FSC 15GP

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

MIL-HDBK-275A
Guide For Selection Of Lubricant Fluids And Compounds For Use In Flight Vehicles And Components.
29 June 1976

1. This standardization handbook was developed for the Department of Defense in accordance with established procedure.

2. This publication was approved on 29 June 1976 for printing and inclusion in the military standardization handbook series.

3. This handbook provides a guide for the selection of lubricant fluids and compounds for use in flight vehicles and components. This handbook is not intended to be referenced in purchase specifications except for informational purposes, nor shall it supersede any specification requirements.

4. Every effort has been made to reflect the latest information on lubricant fluids and compounds for use in flight vehicles and components.

5. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, N.J. 08733 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

		PAGE
CHAPTER I -	SCOPE	1
CHAPTER II -	GENERAL APPLICATIONS AND LIMITATIONS	1
1.	LUBRICATING GREASES	1
1.1	MIL-G-4343 Grease, pneumatic system	1
1.2	MIL-G-6032 Grease, plug valve, gasoline and oil resistant	1
1.3	MIL-L-19701 Lubricant, all-weather, semi-fluid, for aircraft ordnance	2
1.4	MIL-G-21164 Grease, molybdenum disulfide (for low and high temperatures)	2
1.5	MIL-G-23549 Grease, general purpose	2
1.6	MIL-G-23827 Grease; aircraft and instrument, gear and actuator screw	2
1.7	MIL-G-25013 Grease, aircraft, ball and roller bearings	3
1.8	MIL-G-25537 Grease, aircraft, helicopter oscillating bearings	3
1.9	MIL-G-27617 Grease, aircraft, fuel and oil resistant	3
1.10	MIL-G-38220 Grease, aircraft, high speed, ball and roller bearing	4
1.11	MIL-G-38277 Grease, aircraft, high speed, ball and roller bearing, 600°F	4
1.12	MIL-G-46006 Grease, aircraft	4
1.13	MIL-G-81322 Grease, aircraft, general purpose, wide temperature range	4
1.14	MIL-G-81827 Grease, aircraft, high load capacity, wide temperature range	4
1.15	MIL-G-81937 Grease, instrument, ultra clean	5
1.16	MIL-G-83261 Grease, aircraft, extreme pressure, anti-wear	5
1.17	MIL-G-83363 Grease, transmission, helicopter	5
1.18	MIL-G-83414 Grease, gunmount, aircraft	5
2.	LUBRICATING OILS	5
2.1	VV-L-800 Lubricating oil, general purpose, preservative (water-displacing, low temperature)	5
2.2	MIL-L-3572 Lubricant, colloidal graphite in oil	6
2.3	MIL-L-3918 Lubricating oil, instrument, jewel bearing, non-spreading, low temperature	6
2.4	MIL-L-6081 Lubricating oil, jet engine	6
2.5	MIL-L-6082 Lubricating oil, aircraft reciprocating engine (piston)	6

CONTENTS (Continued)

		PAGE
2.6	MIL-L-6085 Lubricating oil, instrument, aircraft, low volatility	7
2.7	MIL-L-6086 Lubricating oil, gear, petroleum base	7
2.8	MIL-L-7808 Lubricating oil, aircraft turbine engine, synthetic base	7
2.9	MIL-L-9000 Lubricating oil, internal combustion engine, diesel	7
2.10	MIL-L-21260 Lubricating oil, internal combustion engine, preservative	7
2.11	MIL-L-22851 Lubricating oil, aircraft piston engine (ashless dispersant)	8
2.12	MIL-L-23699 Lubricating oil, aircraft turbine engines, synthetic base	8
2.13	MIL-L-25681 Lubricant, molybdenum disulfide, silicone base, high temperature	8
2.14	MIL-L-27502 Lubricating oil, aircraft turbine engine, ester base	8
2.15	MIL-L-27694 Lubricating oil, instrument, -65°F to +400°F	9
2.16	MIL-L-81846 Lubricating oil, instrument, ball bearing, high flash point	9
2.17	MIL-L-83176 Lubricant, instrument bearing, petroleum base	9
3.	HYDRAULIC FLUIDS	9
3.1	MIL-H-5606 Hydraulic fluid, petroleum base; aircraft, missile, and ordnance	9
3.2	MIL-H-6083 Hydraulic fluid, petroleum base, for preservation and operation	9
3.3	MIL-H-8446 Hydraulic fluid, nonpetroleum base, aircraft	10
3.4	MIL-H-27601 Hydraulic fluid, petroleum base, high temperature, flight vehicle	10
3.5	MIL-H-46004 Hydraulic fluid, petroleum base, missile	10
3.6	MIL-H-46170 Hydraulic fluid, rust inhibited, fire resistant, synthetic base	10
3.7	MIL-H-81019 Hydraulic fluid, petroleum base, ultra-low temperature	11
3.8	MIL-H-83282 Hydraulic fluid, fire resistant, synthetic, hydrocarbon base, aircraft	11
3.9	MIL-H-83306 Hydraulic fluid, fire resistant, phosphate ester base, aircraft	11
4.	DAMPING FLUIDS	11
4.1	VV-D-1078 Damping fluid, silicone base (dimethyl polysiloxane)	11
4.2	MIL-S-81087 Silicone fluid, chlorinated phenyl, methyl polysiloxane	12

ardness as with distilled, feed or fresh water containing less than 50 b/m n

CONTENTS (Continued)

		PAGE
4.3	MIL-D-83799 Damping fluid, silicone (specially blended) .	12
5.	COMPOUNDS	12
5.1	VV-P-236 Petrolatum, technical	12
5.2	TT-S-1732 Sealing compound, pipe joint and thread, lead free, general purpose (for threaded fittings)	13
5.3	MIL-A-907 Anti-seize compound, high temperature	13
5.4	MIL-C-5024 Compound, lubricating, inner tube, aircraft tire	13
5.5	MIL-T-5544 Thread compound; anti-seize, graphite-petrolatum	13
5.6	MIL-C-6529 Corrosion-preventive, aircraft engine	13
5.7	MIL-L-8362 Lubricant, tire and rim, demounting	14
5.8	MIL-S-8660 Silicone compound	14
5.9	MIL-T-27730 Tape, anti-seize, polytetrafluoroethylene, with dispenser	14
5.10	MIL-L-47022 Lubricating compound, fluorosilicone	14
6.	SOLID LUBRICANTS	15
6.1	SS-G-659 Graphite, dry lubricating	15
6.2	MIL-M-7866 Molybdenum disulfide, technical, lubrication grade	15
6.3	MIL-L-8937 Lubricant, solid film, heat cured, corrosion inhibiting	15
6.4	MIL-L-23398 Lubricant, solid film, air drying	15
6.5	MIL-L-46010 Lubricant, solid film, heat cured, corrosion inhibiting	16
6.6	MIL-L-46147 Lubricant, solid film, air-cured, corrosion inhibiting	16
6.7	MIL-L-81329 Lubricant, solid film, extreme environment. .	17

TABLES

Table I.	List of properties for more generally used lubricating greases	18
Table II.	List of important properties for more generally used engine oils	27
Table III.	List of important properties of more generally used miscellaneous oils	33
Table IV.	List of important properties for more generally used hydraulic fluids	35
Table V.	List of approved lubricants	43

FIGURES

Figure 1.	Viscosity-temperature characteristics of aircraft oils	47
Figure 2.	Viscosity-temperature characteristics of aircraft engine oils	48

CHAPTER I

SCOPE

This handbook establishes design guides for selection of suitable lubricant fluids and compounds, which conform to approved specifications, as required by MIL-STD-838. It includes descriptive material relative to application and limitations of the materials, a list of material specifications together with specific requirements (table I), and a list of the more important specification characteristics (tables II and III). (See pages 18 through 43.) Viscosity-temperatures characteristics of aircraft and aircraft engine oils are shown in figures 1 and 2 (see pages 47 and 48).

Lubricant fluids and compounds containing graphite are not preferred for application in new designs and all efforts should be made to select lubricants not containing graphite.

CHAPTER II

GENERAL APPLICATIONS AND LIMITATIONS

1. LUBRICATING GREASES

1.1 MIL-G-4343 Grease, pneumatic system.-

(a) Uses: This grease is intended for use in pneumatic systems as a lubricant between rubber seals and metal parts (under dynamic conditions). Specification performance tests show that it may be used at pressures up to 1600 pounds per square inch (psi) however, MIL-G-4343 greases have proven satisfactory in service at pressures to 2000 pounds per square inch (psi).

(b) Limitations: This material is suitable for use on MIL-P-5516 rubber. It should not be used with other types of rubber without determining the compatibility between the rubber and grease.

1.2 MIL-G-6032 Grease, plug valve, gasoline and oil resistant.-

(a) Uses: This grease is intended for use as a lubricant on tapered plug valves, gaskets, and other applications in fuel and oil systems where resistance to alcohol, oil, or water is required.

(b) Limitations: This material is not suitable for use with strong acids, alkalis, or with hydrogen peroxide.

1.3 MIL-L-19701 Lubricant, all-weather, semi-fluid, for aircraft ordnance.-

(a) Uses: This grease is intended for the lubrication of aircraft machine guns, ammunition, and accessory equipment between -65° and +160°F and chill-sweat-chill cycling conditions.

(b) Limitations: This material is a semi-fluid grease and should not be used except on machine gun applications without prior service evaluation.

1.4 MIL-G-21164 Grease, molybdenum disulfide (for low and high temperatures.-

(a) Uses: This grease is intended for use as a lubricant for accessory splines, heavily loaded sliding steel surfaces, or for anti-friction bearings carrying high unit loads and operating through wide temperature ranges where molybdenum disulfide will prevent or delay seizure in the event of inadequate lubrication.

(b) Limitations: This grease shall not be used for other than steel surfaces without prior performance evaluation.

1.5 MIL-G-23549 Grease, general purpose.-

(a) Uses: This material is intended for use on steam catapult footpads, automotive, and ground support equipment. It is intended for use under conditions of high temperature, high load, salt water, and contact with live steam.

(b) Limitations: This grease should not be used at temperatures below 0°F without prior performance evaluation.

1.6 MIL-G-23827 Grease; aircraft and instrument, gear and actuator screw.-

(a) Uses: This grease is intended for use in ball, roller, and needle bearings, gears, and on sliding and rolling surfaces of such equipment as instruments, cameras, electronic gear, and aircraft control systems. It is particularly suitable for equipment which must operate at both low and high temperatures. Its extremely low volatility is of advantage in preventing oil fogging in optical instruments. This grease is also intended for general use on aircraft gears, actuator screws and other equipment requiring a lubricant with high load-carrying capacity over a temperature range of -100°F (-73°C) to +250°F (+121°C) and for short periods up to +300°F (149°C). This material replaces greases conforming to MIL-G-3278, MIL-G-7118, and MIL-G-15793.

(b) Limitations: Grease conforming to MIL-G-23827 contains a relatively low-viscosity oil in order to obtain adequate low-temperature properties. The low oil viscosity results in a generally higher rate of storage separation or service "bleeding" of the oil components than is generally experienced with high-temperature greases.

The special synthetic oils used in this grease may soften paint, natural rubber, neoprene, and electrical insulating materials. Generally, this grease will allow equipment to operate at -100°F. However, the increase in torque at -100°F, may amount to as much as tenfold over the torque at normal temperatures. This factor must be taken into consideration in the design of equipment.

1.7 MIL-G-25013 Grease, aircraft, ball and roller bearings.-

(a) Uses: This grease is intended for use in ball and roller bearings over the temperature range of -100° to +450°F. It is particularly designed for those high temperature ball and roller bearing applications where soap-type thickeners may not be applicable. It will permit operation of equipment at -100°F and will lubricate anti-friction bearings continuously at temperatures as high as +450°F when the speed factor or DN value of the bearing does not exceed 200,000. This grease replaces that conforming to MIL-G-27343.

(b) Limitations: This grease should not be specified for applications in which the main action involves the sliding of metal-on-metal as in journal bearings, spiral gears, gear trains, and similar applications unless performance evaluation tests have proven it satisfactory.

1.8 MIL-G-25537 Grease, aircraft, helicopter oscillating bearings -

(a) Uses: This grease is intended for use in bearings having oscillating motion of small amplitude, such as helicopter rotor head bearings. It is suitable for use in equipment which must operate at ambient temperatures of -65° to +160°F.

(b) Limitations: This grease should not be used for ball or roller bearings operating at high speeds or high temperatures.

1.9 MIL-G-27617 Grease, aircraft, fuel and oil resistant.-

(a) Uses: This grease is intended for use in lubrication of taper plug valves, gaskets, and bearings in fuel and oil systems of aircraft and ground support equipment over a temperature range of -30° to +400°F. It is also suitable for use in the presence of liquid oxygen as a lubricant for threads, as well as bearings in aerospace vehicles and supporting equipment.

(b) Limitations: This grease is not recommended for general anti-friction bearing lubrication. This material may not be suitable for aluminum or magnesium dynamic bearing lubrication because of possible ignition hazards.

1.10 MIL-C-38220 Grease, aircraft, high speed, ball and roller bearing.-

(a) Uses: This grease is intended for use in ball and roller bearings over a temperature range of -40° to +400°F and DN values up to 400,000.

(b) Limitations: Use in such applications as aircraft actuators, gear boxes, and similar equipment is not recommended without prior performance evaluation.

1.11 MIL-G-38277 Grease, aircraft, high speed, ball and roller bearing, 600°F.-

(a) Uses: The grease is intended for use in ball and roller bearings over the temperature range of -25° to +600°F (-4° to +315°C). It is particularly designed for applications in the temperature range where, normally, soap-type petroleum oil or soap-type synthetic oil greases are not applicable.

(b) Limitations: Use in such applications as aircraft actuators, gear boxes, and similar equipment is recommended only after performance evaluation tests have proved the lubricant satisfactory.

1.12 MIL-G-46006 Grease, aircraft -

(a) Uses: The grease covered by this specification is intended for use in the driveshaft coupling of the Bell HU-IA/HU-IB helicopter. The grease is also satisfactory for the lubrication of plain and antifriction bearings operated in the temperature range of +32° to +275°F, under heavy loads, and in the presence of water.

(b) Limitations: The grease is not to be used at an operation temperature exceeding +275°F.

1.13 MIL-G-81322 Grease, aircraft, general purpose, wide temperature range.-

(a) Uses: The grease covered by this specification is intended to be used as a general purpose grease in application where operation at temperatures as low as -80°F (-62°C) and as high as +350°F (+177°) may be required. It is specifically designed for wheel bearings in internal brake wheel assemblies, anti-friction bearings, gear boxes and plain bearings.

(b) Limitations: This grease should not be specified in lieu of MIL-G-21164 or MIL-G-23549 without prior performance evaluation. This material replaces greases conforming to MIL-G-25760, MIL-G-3545, and MIL-G-7711.

1.14 MIL-G-81827 Grease, aircraft, high load capacity, wide temperature range.-

(a) Uses: This grease is intended for use as a lubricant for heavily loaded accessory splines, sliding surfaces and antifriction bearings

operating through a wide temperature range of -80°F (-62°C) to +350°F (+177°C) where molybdenum disulfide will delay or prevent seizure in the event of inadequate lubrication. This grease is compatible with elastomeric seals.

(b) Limitations: This grease shall not be used for other than steel surfaces without prior performance evaluation.

1.15 MIL-G-81937 Grease, instrument, ultra clean.-

(a) Uses: The grease covered by this specification is intended to be used for the lubrication of bearings in instruments and related components such as synchros and gyros. It is ideally suited for bearings having small tolerances with respect to clearance.

1.16 MIL-G-83261 Grease, aircraft, extreme pressure, anti-wear.-

(a) Uses: This grease is intended for use in aircraft actuators, gear boxes, gimbal rings, oscillation bearings and other applications involving heavy loads and elevated temperatures. It is particularly designed for operation in the temperature range of -100°F to +450°F.

(b) Limitations: This grease should not be used at temperatures in excess of +450°F.

1.17 MIL-G-83363 Grease, transmission, helicopter.-

(a) Uses: This grease is intended for use in helicopter tail rotor and intermediate transmissions and gear boxes.

(b) Limitations: This grease is intended for use in helicopters only.

1.18 MIL-G-83414 Grease, gunmount, aircraft.-

(a) Uses: This grease is intended for use in aircraft gunmount shoulder bearings and gunmount base and mating yokes.

(b) Limitations: This grease is not intended for other uses without prior performance evaluation.

2. LUBRICATING OILS -

2.1 VV-L-800 Lubricating oil, general purpose, preservative, (water-displacing, low temperature.-

(a) Uses: This material is intended for use in the lubrication and protection against corrosion of small arms, in the lubrication of fuze mechanisms, general squirt-can aircraft applications, and whenever a general-purpose, water-displacing, low-temperature, lubricating oil is required. This oil is being used in place of MIL-L-7870.

(b) Limitations: This oil should not be used on aircraft equipment such as guns when operation at -65°F is necessary.

2.2 MIL-L-3572 Lubricant, colloidal graphite in oil.-

(a) Uses: Grade A oil is suitable for machine gun housing guides, windshield wipers, and other lightly loaded, sliding members exposed to weather. Grade B oil is suitable for gear trains of hot running torpedoes. Grade C oil is suitable for the lubrication of medium or heavy-duty gun slides without causing excessive resistance to counter-recoil at ambient temperatures down to -10°F. It should retain sufficient lubricating properties to permit free recoil and counter-recoil when the gun is heated as a result of sustained fire.

(b) Limitations: It is not recommended for use in electrical equipment or for extremes of temperature.

2.3 MIL-L-3918 Lubricating oil, instrument, jewel bearing, non-spreading, low temperature.-

(a) Uses: The oil covered by this specification is intended for the lubrication of steel pivot and jewel bearing combinations in timepieces and other fine instruments. It does not spread on highly polished clean metal or jewel surfaces but may tend to spread when used on unpolished surfaces, especially when it is contaminated with dust or other foreign materials. It will allow operation of most instrument mechanisms at temperatures as low as -40°F (-40°C).

(b) Limitations: This oil should not be used on instrument-type ball bearings because of the non-spreading properties of the material.

2.4 MIL-L-6081 Lubricating oil, jet engine.-

(a) Uses: This oil is intended for lubrication of specific models of aircraft turbine engines.

(b) Limitations: This oil shall not be used in aircraft turbine engines for which other lubricants are specified.

2.5 MIL-L-6082 Lubricating oil, aircraft reciprocating engine (piston).-

(a) Uses: The lubricating oil, covered by this specification is intended for use in aircraft reciprocating engines and for blending type IIa and type IIIa oils under MIL-L-22851.

(b) Limitations: The flash point for Grade 1065 oil shall not be lower than +420°F (+216°C), and the flash point for Grade 1100 oil shall not be lower than +470°F (+243°C).

2.6 MIL-L-6085 Lubricating oil, instrument, aircraft, low volatility.-

(a) Uses: This material is a low-temperature oil, containing a synthetic oil component, in'.ibited against oxidation and possessing rust-preventive properties. Primary applications are for aircraft instruments and electronic -quipment.

(b) Limitations: The special synthetic components used in this instrument oil may soften paint, natural rubber, neoprene, and electrical insulating materials.

2.7 MIL-L-6086 Lubricating oil, gear, petroleum, base.-

(a) Uses: This oil is intended for use in gear boxes where extreme pressure properties are required.

(b) Limitations: This oil contains extreme pressure additives and is not suitable for lubrication of internal combustion engines.

2.8 MIL-L-7808 Lubricating oil, aircraft turbine engine, synthetic base.-

(a) Uses: The lubricating oil procurable to this specification is intended for use in specific models of aircraft turbine engines, helicopter transmissions, accessory and auxiliary equipment, auxiliary power units and other types of equipment requiring a synthetic base oil.

(b) Limitations: This lubricant should not be used in systems designed solely for petroleum lubricants, as serious deterioration of rubber parts, coatings, and other organic materials may result.

2.9 MIL-L-9000 Lubricating oil, internal combustion engine, diesel.-

(a) Uses: The lubricating oil covered by this specification is intended for use in advanced design high-output shipboard main propulsion and auxiliary diesel engines using fuel conforming to MIL-F-16884.

(b) Limitations: It is not suitable for crankcase lubrication of gasoline engines. This lubricant is intended only for use in the V-32-D2 power unit.

2.10 MIL-L-21260 Lubricating oil, internal combustion engine, preservative.-

(a) Uses: The engine oils covered by this specification are intended for preservative and break-in use in reciprocating spark-ignition and compression ignition engines, in all types of ground equipment, at ambient temperatures above -20°F (-29°C). As preservative media, the oils are intended to protect engine parts from deterioration during shipment and storage.

The oils should be used as factory-fill and break-in oils for all new and rebuilt engines. The oils are also completely operational and need not be drained until the first scheduled oil change as specified by appropriate lubrication orders. Type I oils are intended for use in all spark-ignition and compression-ignition engines operating at output levels up to 150 psi, BMEP. Type II oils are intended only for use in supercharged compression-ignition engines operating at output levels of approximately 160 psi, BMEP, and above and are not to be used in spark-ignition engines.

(b) Limitations: It is not generally suitable for gearbox applications.

2.11 MIL-L-22851 Lubricating oil, aircraft piston engine (ashless dispersant).-

(a) Uses: This oil is used for the lubrication of aircraft piston engines. It contains additives to impart oxidation and dispersant properties to the oil.

2.12 MIL-L-23699 Lubricating oil, aircraft turbine engines, synthetic base.-

(a) Uses: This oil has a higher viscosity than MIL-L-7808 and is intended for use in specific aircraft turbine engines, helicopter transmissions and gear boxes, and can be used where MIL-L-7808 oil has been used previously.

(b) Limitations: Because of the higher viscosity, this oil may not be suitable below $-40^{\circ}F$ ($-40^{\circ}C$). Certain types of silicone materials may not be compatible (oil forming, material softening) with this oil at temperatures varying with the type of silicone material used.

2.13 MIL-L-25681 Lubricant, molybdenum disulfide, silicone base, high temperature.-

(a) Uses: This material is intended for use on slow speed sliding surfaces operating at temperatures up to $+750^{\circ}F$ and for use as an anti-seize compound on threaded parts which operate at temperatures up to $+1400^{\circ}F$.

(b) Limitations: This material should not be used on anti-friction bearings under any circumstances.

2.14 MIL-L-27502 Lubricating oil, aircraft turbine engine, ester base.-

(a) Uses: This lubricating oil is intended for use in special aircraft turbine engine applications requiring a synthetic ester base oil with an approximate temperature range capability of -40° to $+428^{\circ}F$ (-40° to $+220^{\circ}C$).

(b) Limitations: This oil should not be used below -40°F (-40°C).

2.15 MIL-L-27694 Lubricating oil, instrument, -65° to +400°F.-

(a) Uses: This oil is intended for use in aircraft instruments, such as tachometers, generators, gyromotors, gyro gimbals, and other applications involving light to moderate loads, small oscillatory motions, and relatively high speeds, (up to 24,000 revolutions per minute (rpm)).

(b) Limitations: The synthetic oil component may soften paint, natural rubber, and some electrical insulating materials.

2.16 MIL-L-81846 Lubricating oil, instrument, ball bearing, high flash point.-

(a) Uses: This oil is intended for use in precision instrument and miniature ball bearings, for the temperature range of -67°F (-55°C) to +302°F (+150°C).

2.17 MIL-L-83176 Lubricant, instrument bearing, petroleum base.-

(a) Uses: The lubricant covered by this specification is intended for use in the spin axis bearings of inertial guidance gyros, accelerometers and other suitable instrument applications.

3. HYDRAULIC FLUIDS

3.1 MIL-H-5606 Hydraulic fluid, petroleum base; aircraft, missile and ordnance.-

(a) Uses: This hydraulic fluid consists of light-petroleum fractions, a viscosity-index improver, an oxidation inhibitor, and an anti-wear agent. It is dyed red for identification purposes. It is intended for use in automatic pilots, shock absorbers, brakes, flap-control mechanisms, missile hydraulic servo-controlled systems, and other hydraulic systems using synthetic sealing material. The oil is also used in some self-contained, hydraulic propeller feathering mechanisms. This oil may be used in open systems at temperatures from -65°F to +160°F and up to +275°F in closed airless systems.

(b) Limitations: Since this product is subject to a rather high rate of evaporation, it should not be used as a general purpose low-or high-temperature lubricant. It is not interchangeable with any other type or grade of hydraulic fluid.

3.2 MIL-H-6083 Hydraulic fluid, petroleum base, for preservation and operation.-

(a) Uses: The hydraulic fluid is intended primarily for use as a preservative medium for aircraft hydraulic systems and components and

as an operational preservative fluid for ordnance equipment, such as recoil mechanisms and hydraulic systems for rotating weapons or aiming devices. It may be used in wide temperature -65° to +275°F (-54° to +135°C) applications depending upon the operational parameters of the system.

(b) Limitations: The rust-preventive additive increases the low-temperature viscosity of this oil and consequently is not generally suitable as an operating fluid in aircraft hydraulic systems unless equipment was designed for this fluid or the design encompassed this fluid. This fluid is not interchangeable with any other type or grade of hydraulic fluid.

3.3 MIL-H-8446 Hydraulic fluid, nonpetroleum base, aircraft.-

(a) Uses: This hydraulic fluid is intended for use in high-temperature aircraft hydraulic systems as defined in specification MIL-H-5440.

(b) Limitations: This hydraulic fluid is limited to temperatures of -65° to +400°F. This fluid is not interchangeable with hydraulic fluid, castor oil base, specification MIL-H-7644; nor hydraulic fluid, petroleum base; aircraft, missile, and ordnance, specification MIL-H-5606.

3.4 MIL-H-27601 Hydraulic fluid, petroleum base, high temperature, flight vehicle.-

(a) Uses: The hydraulic fluid covered by this specification is intended for use in hydraulic systems of flight vehicles over the temperature range of -40°F to +55°F (-40°C to +285°C).

(b) Limitations: This fluid is not interchangeable with any other aircraft hydraulic fluid.

3.5 MIL-H-46004 Hydraulic fluid, petroleum base, missile.-

(a) Uses: The hydraulic fluid covered by this specification is intended for use in guided missile hydraulic systems at temperatures below 20°F.

(b) Limitations: This fluid is not interchangeable with hydraulic fluid, castor oil base, specification MIL-H-7844. This fluid may be substituted for hydraulic fluid, petroleum base, meeting the requirements of MIL-H-5606, for low operation as specified.

3.6 MIL-H-46170 Hydraulic fluid, rust inhibited, fire resistant, synthetic hydrocarbon base.-

(a) Uses: This hydraulic fluid is a rust inhibited version of MIL-H-83282 and is intended for use in recoil mechanisms and tank hydraulic systems. The fluid is rust inhibited and may be used as a preservative medium for hydraulic systems and components.

(b) Limitations: If used in any combat vehicles, a study should be made to determine compatibility and low temperature operability.

3.7 MIL-H-81019 Hydraulic fluid, petroleum base, ultra-low temperature.-

(a) Uses: This hydraulic fluid is intended for use in automatic pilots, shock absorbers, brakes, flap-control mechanisms, missile hydraulic servo-controller systems, and other hydraulic systems using synthetic sealing material, in the -68° to +99°C temperature range.

(b) Limitations: This fluid is not interchangeable with any type or grade of hydraulic fluid other than MIL-H-5606 fluid which is to be substituted only in emergencies.

3.8 MIL-H-83282 Hydraulic fluid, fire resistant synthetic hydrocarbon base, aircraft.-

(a) Uses: The hydraulic fluid covered by this specification is intended for use from -50° to 400°F (-45° to +204.4°C) in automatic pilots, shock absorbers, air compressor gear boxes, brakes, flap-control mechanisms, missile hydraulic servo-controlled systems and other hydraulic systems using synthetic sealing material.

(b) Limitations: This hydraulic fluid is limited to temperatures of -50° to +400°F.

3.9 MIL-H-83306 Hydraulic fluid, fire resistant, phosphate ester base, aircraft.-

(a) Uses: The fire resistant hydraulic fluid covered by this specification is intended for use from -65°F (-54°C) to +225°F (106°C) in the hydraulic systems of aircraft.

(b) Limitations: This fluid is not miscible nor compatible with MIL-H-5606 hydraulic fluid, nor with the synthetic (Buna N) rubber seals used in hydraulic systems designed to operate on MIL-H-5606 fluid.

4. DAMPING FLUIDS

4.1 VV-D-1078 Damping fluid, silicone base (dimethyl polysiloxane).-

(a) Uses: These fluids are intended for use as damping fluids, transducer fluids, lubricants, heat transfer fluids, dielectric fluids, mold release agents, water repellants, hydraulic fluids, and protective dressings and impregnants.

(b) Limitations: These fluids, particularly in the lower viscosities, tend to cause certain elastomers to shrink and harden. Consideration should be given to the type of elastomer used when in contact with these fluids. The lubricant properties of these fluids are limited due to poor steel-on-steel sliding characteristics.

4.2 MIL-S-81087 Silicone fluid, chlorinated phenyl, methyl polysiloxane.-

(a) Uses: This fluid is for lubricating, hydraulic, damping, and related applications over the temperature range of -100° to +500°F, including hydraulic systems and servo-mechanisms; crankcases and gear boxes for mechanical drives and compressors, engines and pumps; ball, sleeve and pivot bearings in instruments, electronic equipment, electric motors, etc.; clocks and timing devices; fluid transmissions. Type I fluid is not oxidation inhibited, and in applications where it is exposed to air, the temperature range is -100° to +425°F. The Type II fluid is inhibited and is suitable for use in oxidative environments over the -100° to +500°F temperature range.

(b) Limitations: Because of the tendency for the oxidation inhibitor in type II fluid to separate when exposed to high temperatures in a non-oxidative environment, this fluid should be reserved for severe and rather continuous oxidizing conditions. This fluid should not be mixed with any other lubricating oil or hydraulic fluid. Other oils or the additives they contain may be insoluble or immiscible with this special silicone fluid.

4.3 MIL-D-83799 Damping fluid, silicone (specially blended).-

(a) Uses: This fluid is intended for use in liquid spring applications of aircraft. The material may also be used as a damping fluid, transducer fluid, heat transfer fluid, or as a lubricant. This fluid tends to cause certain elastomers to shrink and harden.

(b) Limitations: Consideration should be given to the type elastomer used when in contact with this fluid.

5. COMPOUNDS

5.1 VV-P-236 Petrolatum technical.-

(a) Uses: This material is for use as a light grade of lubricating greases. It may also be used as a constituent in certain types of corrosion or rust preventive compounds.

(b) Limitations: It should not be used as a lubricant in heavily loaded or hot running bearings.

5.2 TT-S-1732 Sealing compound, pipe joint and thread, lead free, general purpose (for threaded fittings).-

(a) Uses: The compound is intended as a general purpose thread, joint, and anti-seize compound for threaded fittings for steam and water at pressures up to 150 pounds per square inch and temperatures up to 350°F. This material may also be used on flared or cone-type fittings in gaseous systems above 150 psi when such a requirement exists and there is compatibility between the system media and the compound.

(b) Limitations: This compound is not intended for use in joints and threaded parts on high-pressure steam and water lines.

5.3 MIL-A-907 Anti-seize compound, high temperature.-

(a) Uses: This anti-seize compound is for use on threads of steel nuts and bolts of super-heated steam installation at temperatures up to 1050°F.

(b) Limitations: This material is not intended for use with austenitic steels.

5.4 MIL-C-5024 Compound, lubricating, inner tube, aircraft tire.-

(a) Uses: This material is for use as an inner tube lubricant in mounting aircraft tires.

(b) Limitations: It should not be specified in lieu of MIL-L-8362 without performance evaluation.

5.5 MIL-T-5544 Thread compound; anti-seize, graphite-petrolatum.-

(a) Uses: This is an anti-seize compound developed primarily for spark-plug threads. This compound is also suitable for other high-temperature applications up to 900°F, such as stainless steel bolts on jet engine mountings.

(b) Limitations: This material is primarily an anti-seize compound and will not be generally suitable where sealing properties are required. Since it contains graphite, a conducting material, it should be used with discretion in electrical equipment.

5.6 MIL-C-6529 Corrosion-preventive, aircraft engine.-

(a) Uses: These corrosion preventives are to be used as engine preservatives and operational oils for those aircraft engines utilizing mineral base oils. This material should be used as required by MIL-E-6058, MIL-E-6059, MIL-E-5595, and MIL-E-5607.

(b) Limitations: Operation of engines with this material is limited to a maximum of 50 hours.

5.7 MIL-L-8362 Lubricant, tire and rim, demounting. -

(a) Uses: This material is for effective easier tire demounting by lubricating the interface of the tire bead and the tire rim and in effecting more satisfactory bead, tube, and flap positioning during mounting of tires.

5.8 MIL-S-8660 Silicone compound. -

(a) Uses: This material is used as a sealant to prevent galvanic corrosion due to moisture penetration in areas of dissimilar metal contact, for sealing high-tension electrical connections of aircraft and automotive engines; sealing and insulating electronic equipment where material must remain in soft state to allow easy disassembly, as a lubricant and sealant for rubber "O" rings and gaskets; when mixed with molybdenum disulfide, for threaded connections on piping and valves that come in contact with corrosive liquids and gases. This compound is suitable for use between -65° and +400°F (-54° and +204°C).

(b) Limitations: It is not to be used on electrical connectors having natural rubber inserts, as noted in applicable technical orders or specifications for connectors.

5.9 MIL-T-27730 Tape, anti-seize, polytetrafluoroethylene, with dispenser. -

(a) Uses: This tape is intended for use as an anti-seize and sealant of pipe threads of liquid and gaseous oxygen systems of 2000 psi and less.

(b) Limitations: This material should not be used at temperatures in excess of 500°F.

5.10 MIL-L-47022 Lubricating compound, fluorosilicone. -

(a) Uses: The fluorosilicone lubricating compound is intended to be used for installing elastomeric preformed packings in a liquid propellant rocket engine which utilizes inhibited red fuming nitric acid and unsymmetrical dimethylhydrazine propellants.

(b) Limitations: This compound should not be used at temperatures in excess of +155°F (+68°C).

6. SOLID LUBRICANTS

6.1 SS-G-659 Graphite, dry lubricating. -

(a) Uses: This material is a 200-mesh, high-grade, powdered graphite for use either as a dry lubricant or mixed with a suitable proven specification oil. Molybdenum disulfide conforming to MIL-M-7866 shall be used in preference to this material, if possible.

(b) Limitations: This material is not intended for blending with oils or greases by service or materials units.

6.2 MIL-M-7866 Molybdenum disulfide, technical, lubrication grade. -

(a) Uses: This material is intended for use as a dry lubricant or as a component with a suitable specification oil or grease for special applications where no other specification lubricant is satisfactory. It is used for thread anti-seize, for light loaded applications where a fluid lubricant is objectionable, and occasionally with approved oil or grease for highly loaded gears where the specification oil or grease is inadequate by itself.

(b) Limitations: The bonded lubricant does not give corrosion protection. This lubricant must be bonded to surface to utilize maximum lubrication potential. Mixtures of this powder with specification oils or greases should not be prepared in the field or for applications where performance data has not been established.

6.3 MIL-L-8937 Lubricant, solid film, heat cured, corrosion inhibiting.-

(a) Uses: This solid film lubricant is intended for sliding motion types of applications, such as plain spherical bearings, flap tracks, hinges, cam surfaces, gears, etc.

(b) Limitations: This material should not be used with oils or greases unless field use indicates otherwise. Since this lubricant requires curing at 300°F for 1 hour, it should not be applied to alloys whose properties are adversely affected by exposure to these conditions.

6.4 MIL-L-23398 Lubricant, solid film, air drying. -

(a) Uses: This dry solid film lubricant is intended for bonding on steel, titanium, aluminum, and aluminum alloys where conventional lubricants are difficult to apply. This is an air dried material which can be applied to parts of complete assemblies where curing by heating is not possible, such as plain spherical bearings, flap tracks, hinge pins, and cam surfaces. This material will provide a low friction surface to reduce wear and prevent galling and seizing of rubbing parts.

(b) Limitations: This material should not be used with oils or greases unless field use indicates otherwise. Spraying should be

used only with adequate ventilation. Caution must be exercised to prevent over-heating of spray cans, or use in areas where potential ignition sources exist.

6.5 MIL-L-46010 Lubricant, solid film, heat cured, corrosion inhibiting.-

(a) Uses: This solid film lubricant is intended for use on aluminum, aluminum alloys, copper and copper alloys, steel, stainless steel, titanium, and chromium and nickel bearing surfaces. This material is useful where temperatures may range from -90° to +400°F (-68° to +204°C). It is useful in mechanisms that are lubricated for life, and also in mechanisms operated at infrequent intervals. It is useful in operations consisting of reciprocating motion, loaded to 15 psi or less, where contamination with conventional fluid lubricants is probable. It is generally suitable for sliding motion applications such as plain and spherical bearings, flap tracks, hinges, threads, and cam surfaces.

(b) Limitation: This lubricant should not be used on materials which will be adversely affected by the curing temperature. It should not be used in operations consisting of rotary motion above 100 rpm under heavy loads where the possibility of conventional fluid lubricant contamination exists. The cured lubricant film is highly resistant to conventional fluid lubricants, but the high fluid pressures developed in heavily loaded sleeve type bearings drastically reduces the wear life provided by the solid film lubricant. It should not be used on bearings containing rolling elements.

6.6 MIL-L-46147 Lubricant, solid film, air-cured, corrosion inhibiting. -

(a) Uses: This solid film lubricant is intended for use on aluminum, aluminum alloys, copper and copper alloys, steel, stainless steel, titanium, and chromium and nickel bearing surfaces. This material is useful where temperatures may range from -90° to +200°F (-67° to +93°C). It is useful in mechanisms that are lubricated for life, and also in mechanisms operated at infrequent intervals. It is useful in operations consisting of reciprocating motion, loaded to 15 psi or less, where contamination with conventional fluid lubricants is probable. It is useful to touch up worn surfaces originally coated with lubricants conforming to MIL-L-46010. It is useful for sliding motion applications such as plain and spherical bearings, flap tracks, hinges, threads, and cam surfaces.

(b) Limitations: This lubricant should not be used in operations consisting of rotary motion above 100 rpm under heavy loads where the possibility of conventional fluid lubricants contamination exists. The cured lubricant film is highly resistant to conventional fluid lubricants, but the high fluid pressures developed in heavily loaded sleeve type bearings drastically reduces the wear life provided by the solid film lubricant. It should not be used on bearings containing rolling elements.

6.7 MIL-L-81329 Lubricant, solid film, extreme environment. -

(a) Uses: This material is intended for use in liquid oxygen systems, space vehicles, bearing assemblies, actuators, and other equipment where environments of extreme temperatures, nuclear radiation, and vacuum preclude the use of conventional lubricants and organic solid film lubricants.

(b) Limitations: This material is not to be used on materials that may be adversely affected by exposure to the specific cure temperature of +300°F (+149°C). It should not be used with oils or greases unless performance evaluation has shown satisfactory performance.

Table I. List of properties for more generally used lubricating greases

Specification Requirements	MIL-G-4343	MIL-G-6032 Type I	MIL-G-6032 Type II	MIL-L-19701
Dropping Point, °F Min.	325	260	260	---
Penetration at +77°F				
Unworked, Min.	---	100	23	---
Worked	260-300	100-310	20-42	---
After 4 Mo. Storage				
Unworked, Min.	---	---	---	---
Worked, % Change	±30	±30	±30	---
Work Stability (100,000 Strokes), Max.	---	---	---	---
Evaporation in 22 Hours				
Test Temp., °F	+210	---	---	---
Loss, % Wt., Max.	2.5	---	---	---
Bomb Oxid PSI Drop at +210°F				
100 Hrs., Max.	5.0	---		5.0
500 Hrs., Max.	---	---		---
Corrosion				
Copper Strip, 24 Hrs., at +212°F	Pass	---		---
Bomb Copper Corrosion PSI Drop at 210°F				
20 Hrs, Max.	---	---		---
Discoloration of Copper	---	Pass		---
Rust Preventive Properties	Pass	---		Pass
Oil Separation, 30 Hrs.				
Temp., °F	+212	---		---
% Weight, Max.	5.0	---		---
Low Temperature Properties				
Torque				
Temp., °F	---	---		---
Starting, g-cm, Max.	---	---		---
Running, g-cm, Max.	---	---		---
Apparent Viscosity				
Temp., °F	-65	---		---
20 Sec-1 Shear Rate, - Poises, Max.				
Rubber Swell				
7 Days at +158°F, % Swell Max.	29	---		---

Table I. List of properties for more generally used lubricating greases (Cont'd)

Specification Requirements	MIL-G-4343	MIL-G-6032 Type I Type II	MIL-L-19701
Other Pass	Cycling Performance	Resistance to Fuel and Aqueous Solutions, Film Stability	Rubber Compatibilty Emulsification Resistance, Machine Gun Performance

Specification Requirements	MIL-G-21164	MIL-G-23549	MIL-G-23827	MIL-C-25013
Dropping Point, °F Min.	325	450	325	450
Penetration at +77°F				
Unworked, Min.	200	---	200	---
Worked	260-310	270-315	270-310	260-330
After 6 Mo. Storage				
Unworked, Min.	200	---	200	200
Worked, % Change	±30	±30	+30	±30
Worked Stability				
(100,000 Strokes), Max.	375	---	375	375
Evaporation in 22 Hours				
Test Temp., °F	+210	+350	+210	+400
Loss, % Wt., Max.	2.0	7.0	2.0	4.0
Bomb Oxid. PSI Drop at +210°F				
100 Hrs., Max.	10.0	---	10.0	5.0 (+250°F)
500 Hrs., Max.	15.0	---	15.0	---
Corrosion				
Copper Strip, 24 Hrs. at +212°F	Pass	Pass (+350°F)	---	Pass
Bomb Copper Corrosion PSI Drop at +210°F				
20 Hrs., Max.	---	---	1.0	---
Discoloration of Copper	---	---	Pass	---
Rust Preventive Properties	Pass	---	Pass	Pass
Anti-Friction Bearing Performance				
Temp., °F	250	---	250	450
Time, Hours, Min.	1000	---	1000	500
Load Wear Index (Mean Hertz Load), Min.	50	50	30	---

Table I. List of properties for more generally used lubricating grease (Cont'd)

Specification Requirements	MIL-G-21164	MIL-G-23549	MIL-G-23827	MIL-G-25013
Oil Separation, 30 Hours				
Temp., °F	+212	+350	+212	+450
%Weight, Max	5.0	6.0	5.0	7.5
Low Temperature Properties				
Torque				
Temp., °F	-100	---	-100	-100
Starting, g-cm, Max.	10,000	---	10,000	2,000
Running, g-cm, Max.	1,000	---	1,000	500
Apparent Viscosity				
Temp., °F	---	---	---	---
20 Sec-1 Shear Rate, - Poises, Max.	---	---	---	---
Rubber Swell				
7 Days at +150°F, % Swell Max.	---	---	---	---
Other	5% MoS_2	Salt Spray	Gear Wear	---
Pass			Water Wash Out	

allow the development or procurement of an item on the

Table I. List of properties for more generally used lubricating greases

Specification Requirements	MIL-G-25537	MIL-G-27617	MIL-G-38220	MIL-G-38277
Dropping Point, °F Min.	+280	---	+400	+650
Penetration at +77°F				
Unworked, Min.	200	200	270	350
Worked	265-305	280-340	270-340	350-400
After 6 Mo. Storage				
Unworked, Min.	200	200	---	---
Worked	265-305	±30% Change	---	---
Worked Stability (100,000 Stokes), Max.	375	---	375	---
Evaporation in 22 Hours				
Test Temp., °F	+210	+400	+400	+600
Loss, % Wt., Max.	7.0	7.0	10.0	28.0
Bomb Oxid PSI Drop at +210°				
100 Hrs., Max.	5	---	---	---
500 Hrs., Max.	20(400 hrs)	---	---	---
Corrosion				
Copper Strip, 24 Hrs. at +212°F	Pass	Pass	---	---
Bomb Copper Corrosion			---	---
PSI Drop at +210°F			---	---
20 Hrs. Max.	---	---		
Discoloration of Copper	Sl.Brown Max.	---		
Rust Preventive Properties	Pass	---	---	---
Anti-Friction Bearing Performance				
Temp., °F	---	+400	---	---
Time, Hours, Min.	---	400	---	---
Load Wear Index (Mean Hertz Load), Min.	---	---	---	---
Oil Separation, 30 Hours				
Temp., °F	+212	+400	+400	+600
% Weight, Max.	5.0	15.0	10.0	20.0

Table I. List of properties for more generally used lubricating greases (Cont'd)

Specification Requirements	MIL-G-25537	MIL-G-27617	MIL-G-38220	MIL-G-38277
Low Temperature Properties				
Torque				
Temp., °F	-65	-30	---	---
Starting, g-cm, Max.	15,000	7,000	5,000	2,500
Running, g-cm, Max.	2,000	2,000	500	---
Apparent Viscosity				
Temp., °F	---	---	-40	---
20 Sec-1 Shear Rate - Poises, Max.	---	---	120,000	---
Rubber Swell				
7 Days at 158°F, % Swell Max.	---	---	---	---
Other Pass	Oscillation	Shock Sensitivity with liquid oxygen, resistance to fuel.	Water Resistance	Water Resistance

Table I. List of properties for more generally used lubricating greases (Cont'd)

Specification Requirements	MIL-G-46006	MIL-G-81322	MIL-G-81827	MIL-G-83261
Dropping Point, °F Min.	350	450	450	450
Penetration at +77°F				
Unworked, Min.	---	---	200	---
Worked	265-295	265-320	265-320	270-340
After 6 Mo. Storage				
Unworked	---	200	---	---
Worked, % Change	±30	±30	---	---
Worked Stability (100,000 Strokes), Max.	---	350	---	375
Evaporation in 22 Hours				
Test Temp., °F	---	+350	+350	+450
Loss, %Wt., Max	--	10.0	10.0	12.5
Bomb Oxid PSI Drop at +210°F				
100 Hrs., Max.	10.0	---	---	---
500 Hrs., Max.	---	25.0	25.0	---
Corrosion				
Copper Strip, 24 Hrs, at +212°F	Pass	Pass	Pass	---
Bomb Copper Corrosion PSI Drop at +210°F 20 Hrs. Max.	---	---	---	---
Discoloration of Copper	Pass	---	Pass	---
Rust Preventive Properties	---	Pass	---	---
Anti-Friction Bearing Performance				
Temp., °F	---	+350	---	---
Time, Hours, Min.	---	400	---	---
Load Wear Index (Mean Hertz Load), Min.	32	30	50	90
Oil Separation, 30 Hours				
Temp., °F	---	+350	+350	+450
%Weight, Max.	---	10.0	7.5	20.0

Table I. List of properties for more generally used lubricating grease (Cont'd)

Specification Requirements	MIL-G-46006	MIL-G-81322	MIL-G-81827	MIL-G-83261
Low Temperature Properties Torque				
Temp., °F	---	-80	-80	---
Starting, g-cm, Max.	---	10,000	10,000	5000
Running, g-cm, Max.	---	2,500 (1hr)	2,500 (1hr)	1000
Apparent Viscosity Temp., °F	77	---	---	---
20 Sec-1 Shear Rate, - Poises, Max.	500	---	---	---
Rubber Swell 7 Days at 158°F, %Swell Max.	---	15.0	15.0	---
Other	Extracted Mineral Oil, Viscosity, flash point, pour point	Steel on Steel gear wear, Oscillation	MOS_2 Content, Salt spray, boiling water immersion	Oscillation, Steel on Steel wear
Pass				

Table I. List of properties for more generally used lubricating greases

Specification Requirements	MIL-G-83363	MIL-G-83414
Dropping Point, °F Min.	---	---
Penetration at +77°F		
Unworked, Min.	280	280
Worked, Max.	315	315
After 6 Mo. Storage		
Unworked, Min.	---	---
Worked	---	---
Worked Stability (100,000 Strokes), Max.	375	375
Evaporation in 22 Hours		
Test Temp., °F	+300	---
Loss, % Wt., Max.	5.0	---
Bomb Oxid. PSI Drop at +210°F		
100 Hrs., Max.	---	---
500 Hrs., Max.	---	---
Corrosion		
Copper Strip,	---	---
24 Hr. at +210°F	---	---
Bomb Copper Corrosion		
PSI Drop at +210°F		
20 Hrs. Max		
Discoloration of Copper	---	---
Rust Preventive Properties	---	---
Anti-Friction Bearing		
Performance	---	---
Temp., °F	---	---
Time, Hours, Min.		
Load Wear Index (Mean Hertz Load), Min.	90	60
Oil Separation, 30 Hours		
Temp., °F	+300	+350
% Weight, Max.	10	5

Table I. List of properties for more generally used lubricating grease (Cont'd)

Specification Requirements	MIL-G-83363	MIL-G-83414
Low Temperature Properties		
Torque		
Temp., °F	---	---
Starting, g-cm, Max.	3,000	2,000
Running, g-cm, Max.	1,000	750
Apparent Viscosity		
Temp., °F	---	---
20 Sec-1 Shear Rate, - Poises, Max.	---	---
Rubber Swell		
7 Days at 158°F, % Swell Max.	---	---
Other		
Pass	Steel on Steel wear	Steel on Steel wear

Table II. List of important properties for more generally used engine oils

Specification Requirements	MIL-L-23699	MIL-L-27502
Precipitation No.	---	---
Color ASTM. Max.	---	---
Total Acid No. Max.	0.50	0.50
Viscosity Index (Min.)	---	---
Viscosity in Centistokes		
+210°F	5.0 to 5.5	Report
+100°F	25.0 (Min.)	Report
Viscosity Stability (Test Temp.)	-40°F (40°C)	-40°F(40°C)
Initial Viscosity cs Max.	13000	Report
Viscosity after 72 Hrs. % Change, Max.	6	(17,000 Max.)
Flash Point °F Min.	+475	+475
Pour Point °F Max.	-65	-65
Corrosion and Oxidation Stability (Temp. & Time)	72 Hrs. @	48 Hrs. @
	+347°F / +400°F / +425°F	+428°F / +464°F
Change in Weight MG/cm — Copper	±0.4 / ±0.4 / ---	--- / R
Steel	±0.2 / ±0.2 / ±0.2	±0.2 / E
Aluminum	±0.2 / ±0.2 / ±0.2	±0.2 / P
Silver	±0.2 / ±0.2 / ±0.2	±0.2 / O
Magnesium	±0.2 / ±0.2 / ---	±0.2 / R
Titanium	--- / --- / ±0.2	--- / ---
Viscosity @ 100°F, % Change	(-5 to +15) / (-5 to +25) / Report	(25) / (100)
Total Acid No., Change, Max.	2.0 / 3.0 / Report	--- / ---
Foaming Characteristics		
@ 75°F 5 Min. Aeration, Vol.	25 ml	25 ml
Settling, Vol.	None (1 Min.)	None (60 Sec.)
@ 200°F 5 Min. Aeration, Vol.	25 ml	25 ml
Settling, Vol.	None (1 Min.)	None (60 Sec.)
@ 75°F 5 Min. Aeration, Vol.	25 ml	25 ml
Settling, Vol.	None (1 Min.)	None (60 Sec.)
Rubber Swell (Type)		
% Vol. Change @ 150°F(70°C), 72 Hrs. Std. H	5 - 25	12 - 35
@ 400°F(204°C), 72 Hrs. Std. F	5 - 25	5 - 25
Evaporation (Time & Temp.)	6-½ Hrs. @+400°F	6-½ Hrs. @+400°F
% Max.	10	5.0

Table II. List of important properties for more generally used engine oils (Cont'd)

Specification Requirements	MIL-L-23699	MIL-L-27502
Engine Endurance Test (Hrs.)	Report	100
Load-Carrying Ability % of Hercolube A Reference Oil (Min.)	102	---
Storage Stability, Lead Corrosion After		
2 Days, Lead Wt. Loss (Max.)	---	---
7 Days, Lead Wt. Loss (Max.)	---	---
Deposition Number (Max.)	---	---
Extended Storage Stability	Must Pass	Must Pass

ble II. List of important properties for more generally used engine oils (Cont'd)

Specificati	quirement	MIL-L-6081		MIL-L-6082		MIL-L-7808
		Grade 1005	Grade 1010	Grade 1065	Grade 1100	
Precipitation		---	---	---	---	---
Color ASTM. Ma		No. 5.5	No. 5.5	---	---	---
Total Acid No.		0.10	0.10	---	---	0.30
Viscosity Inde	e Oil)(Min)	---	---	100	95	---
Viscosity in C	okes					
+210°F		---	---	62-68(SUS)	93-103(SUS)	3.0 (Min.)
+100°F		5.0(Min.)	10.0 (Min.)	---	---	11.0 (Min.)
Viscosity Stab (Test Temp.)		---	---	---	---	-65°F
Initial and	cs Max.	---	---	---	---	13000
7	cs Max.	---	---	---	---	17000
Flash Point °F		+225	+270	+420	+470	+400
Pour Point °F		---	-70	0 (Undltd.) -65 (Dltd.)	+10 (Undltd.) -65 (Dltd.)	-75
Corrosion and	ion					
Stability (T	Time)	250°F 168 Hrs.		---		+347°F 72 Hrs.
C		±0.2		---		±0.4
Change S		±0.2		---		±0.2
in A	m	±0.2		---		±0.2
Weight S		---		---		±0.2
MG/cm^2 M	um	±0.2		---		±0.2
Viscosity @+	% Change	-5 to +20		---		-5 to +15
Total Acid N	ange, Max.	0.20		---		2.0
Foaming Charact	ics					
@+75°F 5 Min.	tion, Vol.	---		---		25 ml
	ling, Vol.	---		---		None (60 Sec.)

(Continued on page.)

Table II. List of important properties for more generally used engine oils (Cont'd)

Specification Requirement	MIL-L-6081	MIL-L-6082	MIL-L-7808
@+20°F 5 Min. Aeration, Vol.	---	---	25 ml
Settling, Vol.	---	---	None (60 Sec.)
@+75°F 5 Min. Aeration, Vol.	---	---	25 ml
Settling, Vol.	---	---	None (60 Sec.)
Rubber Swell (Type)	---	---	Standard H
% Vol. Change	---	---	12-35
Evaporation (Time & Temp.)	---	---	6½ Hrs. @+400°F
% Max.	---	---	35
Engine Endurance Test (Hrs.)	---	---	100
Load-Carrying Ability			
% of Reference Oil (Min.)	---	---	68
Storage Stability, Lead Corrosion After			
2 Days, Lead Wt. Loss (Max.)	---	---	25 MG/IN^2
7 Days, Lead Wt. Loss (Max.)	---	---	150 MG/IN^2
Deposition Number (max.)	---	---	2.5
Entended Storage Stability	---	---	Must Pass

Table II. List of important properties for more generally used engine oils

Specification Requirement	MIL-L-9000	MIL-L-21260			MIL-L-22851	
		Grade 10	Grade 30	Grade 50	Type II	Type III
Precipitation No.	---	---	---	---	---	---
Color ASTM. Max.	---	---	---	---	---	---
Total Acid No. Max.	---	---	---	---	---	---
Viscosity Index (Min.)	---	---	75	85	95	100
Viscosity in Centistokes						
+210°F	11.9 to 14.5	5.7 (Min.)	9.6 (Min.)	16.8 (Min.)	18.7-26.1	10.8-16.5
+100°F	---	---	---	---	---	---
+ 77°F	---	---	---	---	---	---
Viscosity Stability (Test Temp.)						
Initial and 3 Hrs cs Max.	---	---	---	---	---	---
72 Hrs cs Max.	---	---	---	---	---	---
Flash Point °F Min.	+390	+400	+425	+450	+470	+420
Pour Point °F Max.	+10	-25	0	+15	0	-10
Corrosion and Oxidation						
Stability (Temp. & Time)	---		---		---	
Change in Weight MG/cm² Copper	---		---		---	
Steel	---		---		---	
Aluminum	---		---		---	
Silver	---		---		---	
Magnesium	---		---		---	
Viscosity @ 100°F, % Change	---		---		---	
Total Acid No., Change, Max.	---		---		---	
Foaming Characteristics						
@+75°F 5 Min. Aeration, Vol.	---		25 ml		No Limit	
Settling, Vol.	---		None (10 Min.)		300 ml (10 Min.)	

Table II. List of important properties for more generally used engine oils (Cont'd)

Specification Requirement	MIL-L-9000	MIL-L-21260	MIL-L-22851
@+200°F 5 Min. Aeration, Vol.	---	150 ml	No Limit
Settling, Vol.	---	None (10 Min.)	25 ml (10 Min.)
@+ 75°F 5 Min. Aeration, Vol.	---	25 ml	No Limit
Settling, Vol.	---	None (10 Min.)	300 ml (10 Min.)
Rubber Swell (Type)	---	---	---
% Vol. Change	---	---	---
Evaporation (Time & Temp.)	---	---	---
% Max.	---	---	---
Engine Endurance Test (Hrs.)	---	---	Pass
Load-Carrying Ability % of Reference Oil (Min.)	---	---	---
Storage Stability, Lead Corrosion After			
2 Days, Lead Wt. Loss (Max.)	---	---	---
7 Days, Lead Wt. Loss (Max.)	---	---	---
Deposition Number (Max.)	---	---	---
Extended Storage Stability	---	---	Pass

Table III. List of important properties of more generally used miscellaneous oils

Specification Requirement	VV-L-800	MIL-L-3918	MIL-L-6085	MIL-L-6086 L(Grade)M	
Color ASTM, Max.	7	---	5	---	---
Pour Point °F Max.	-70	---	-70	-40	-20
Flash Point °F Min.	+275	---	+365	+280	+310
Neutralization No., Max.	---	0.60	---	1.0	1.0
Viscosity @+210°F Min.	---	3.5	3.5	4.9	8.5
CS @+130°F Min.	---	8.5	8.5	---	---
@+100°F Min.	12	9.5	---	23	60
@ 0°F Min.	---	---	---	---	---
@ -40°F Max.	7,000	1600	1580	---	
@ -65°F Max.	60,000	---	10,000	---	
Viscosity Index Min.	---	---	---	80	
Precipitation No. Max.	0.05	---	0	0.10	
Corrosion & Oxidation Stability (Time & Temp.)	168 Hrs.@250°F	---	168 Hrs.@250°F	---	
Change in Wt. MG/cm^2 Copper	±0.2	±0.5	±0.2	---	
Steel	±0.2	±0.5	±0.2	---	
Aluminum	±0.2	---	±0.2	---	
Silver	±0.2	---	Cadmium-Plated Steel ±0.2	---	
Magnesium	±0.2	---	±0.2	---	
% Change in Visc. @ +100°F	-5 to +20	±5	±5 @+130°F	---	
Change in Total Acid No.	0.20	0.15	0.5	---	
Low Temp. Stability No Crystallization, Separation or Precipitation	Must Pass 72 Hrs. -65°F	Must Pass 48 Hrs. -40°F	Must Pass 72 Hrs. -65°F	---	---
Evaporation (Time & Temp.)	---	22 Hrs.@+210°F	---	---	
% Evap. Max.	---	2.0	1.0	---	
Corrosivity Test No Corrosion or Pitting	---	---	2 of 5 Panels Must Pass	---	
Protection 100 Hours	---	---	4 of 5 Panels Must Pass	---	
Copper Corrosion Time & Temp.	---	3 Hrs.@+212°F	---	3 Hrs.@+212°F	
Max. Corrosion	---	No discoloration of strip	---	ASTM No. 2	

ability of parts at assembly (t)

Table III. List of important properties of more generally used miscellaneous oils

Specification Requirements	MIL-L-27694	VV-P-236
Color ASTM, Max.	---	No. 8
Pour Point ^{o}F Max.	-80	---
Flash Point ^{o}F Max.	+500	395 (Min.)
Neutralization No., Max.	---	0.1
Viscosity @+210^{o}F Min.	14	70
CS @+130^{o}F Min.	---	---
@+100^{o}F Min.	41	---
@ 0^{o}F Min.	---	---
@ -40^{o}F Max.	---	---
@ -65^{o}F Max.	1000	---
Viscosity Index Min.	---	---
Precipitation No. Max.	---	0.10
Corrosion & Oxidation Stability (Time & Temp.)	72 Hrs. @+400^{o}F	---
Change in Wt. Mg/cm^2 Copper	---	
Steel	±0.2	
Aluminum	---	
Silver	±0.2	
Magnesium	---	
% Change in Visc. @+100^{o}F	±5	
Change in Total Acid No.	0.5	
Low Temp. Stability No Crystallization, Separation or Precipitation	Must Pass 72 Hrs. -65^{o}F	---
Evaporation (Time & Temp.)	22 Hrs. @+400^{o}F	1 hr @ 225^{o}F
% Evap. Max.	1.5	2.0
Corrosivity Test(No Corrosion or Pitting)	2 of 3 Discs Must Pass	---
Protection 100 Hours	---	---
Copper Corrosion Time & Temp.	---	24 hrs @ 210^{o}F
Max. Corrosion	---	no green color

Table IV. List of important properties for more generally used hydraulic fluids

Specification Requirements	MIL-H-5606	MIL-H-6083
Color, Max. Part Dye to Oil (Type)	1 to 10,000 (Red)	1 to 10,000 (Red)
Pour Point °F Max.	-75	-75
Flash Point °F Min.	+200	+200
Neutralization No. Max.	0.20	Report
Viscosity in Centistokes		
@+130°F Min.	10.0	10.0
@ -40°F Max.	500	800
@ -65°F Max.	3000	3500
Corrosion & Oxidation Stability @+250°F for 168 Hrs.		
Change in Wt. Mg/cm^2 Steel	±0.2	±0.2
Aluminum	±0.2	±0.2
Magnesium	±0.2	±0.2
Cadium-Plated Steel	±0.2	±0.2
Copper	±0.6	±0.6
Corrosion Max. ASTM	3	---
% Change in Visc. @+130°F	-5 to +20	-5 to +20
Increase in Neut. No. Max.	0.20	0.30
Low Temp. Stability 72 Hours @ -65°F	Must Pass	Must Pass
Shear Stability % Viscosity Decrease Max. No Greater @ 130°F	Must Pass	Must Pass
@ -40 °F	Must Pass	Must Pass
Increase in Neut. No. Max.	0.20	0.20
Rubber Swell (Standard L) Volume Change % Max.	19.0 to 30.0	19.0 to 28.0
Copper Corrosion, Max. ASTM	2	2
Evaporation, Max. @+150°F	Oily but not hard or tacky	Oily but not hard or tacky
Foaming Characteristics @+75°F 5 Min. Aeration, Vol.	65ml	65ml
Settling, Vol.	None (10 Min.)	None (10 Min.)

(Continued on next page)

Table IV. List of important properties for more generally used hydraulic fluids .

Specification Requirements	MIL-H-5606	MIL-H-6083
@+200°F 5 Min. Aeration, Vol.	---	65ml
Settling, Vol.	---	None (10 Min.)
@ +75°F 5 Min. Aeration, Vol.	---	65ml
Settling, Vol.	---	None (10 Min.)
(After 10 Min. Test)		
Solid Particle Contamination		
Allowable 5-15 Microns	2500	2500
Number 16-25 Microns	1000	1000
(Max.) 26-50 Microns	250	250
51-100 Microns	25	25
Over 100 Microns	None	None
Precipitation No.	---	0

Table IV. List of important properties for more generally used hydraulic fluids

Specification Requirements	MIL-H-8446	MIL-H-27601	MIL-H-46004
Color, Max. Part Dye to Oil (Type)	---	---	1 to 10,000(Yellow)
Pour Point °F Min.	-75	-65	-75
Flash Point °F Min.	+395	+360	+200
Neutralization No. Max.	0.20	0.20	0.20
Viscosity in Centistokes			
@+130°F Min.	---	---	---
@ -40°F Max.	---	4000	75
@ -65°F Max.	2500	Report	300
Corrosion & Oxidation Stability @ 250°F for 168 Hrs.			
Change in Wt. Mg/cm2 Steel	---	---	±0.2
Change in Wt. Mg/cm2 Aluminum	---	---	±0.2
Change in Wt. Mg/cm2 Magnesium	---	---	±0.2
Change in Wt. Mg/cm2 Cadium-Plated Steel	---	---	±0.2
Change in Wt. Mg/cm2 Copper	---	---	±0.6
Corrosion Max. ASTM	1	---	---
% Change in Visc. @+130°F	---	-5 to +20	-5 to +20
Increase in Neut, No. Max.	0.50	---	0.20
Low Temp. Stability 72 Hours @ -65°F	Must Pass	Must Pass	Must Pass
Shear Stability			
% Viscosity Decrease Max.	---	---	---
No Greater @+130°F	---	---	---
Than Ref. Fluid @ -40°F	---	---	---
Increase in Neut. No. Max.	0.5	---	---
Rubber Swell (Standard L)			
Volume Change, %, Max.	15.0 to 25.0	10.0	19.0 to 26.5
Copper Corrosion, Max. ASTM	---	---	---
Evaporation, Max. @+150°F	---	---	Oily but not hard or tacky

(Continued on next page)

Table IV. List of important properties for more generally used hydraulic fluids (Cont'd) -

Specification Requirements	MIL-H-8446	MIL-H-27601	MIL-H-46004
Foaming Characteristics			
@+75°F 5 Min. Aeration, Vol.	---	75ml	---
Settling, Vol.	---	None (3 Min.)	---
@+200°F 5 Min. Aeration, Vol.	---	75ml	---
Settling, Vol.	---	None (3 Min.)	---
@+75°F 5 Min. Aeration, Vol.	---	75ml	---
Settling, Vol. (After 10 Min. Test)	---	None (3 Min.)	---
Solid Particle Contamination			
Allowable Number (Max.) 5-15 Microns	---	2500	2500
16-25 Microns	---	1000	1000
26-50 Microns	---	250	250
51-100 Microns	---	25	25
Over 100 Microns	---	None	None
Precipitation No.	---	---	0

Table IV. List of important properties for more generally used hydraulic fluids

Specification Requirements	MIL-H-46170	MIL-H-81019	MIL-H-83282
Color, Max. Part Dye to Oil (Type)	---	---	---
Pour Point °F	-65	-90	-65
Flash Point °F Min.	+427.9	+200	+400
Neutralization No. Max.	0.20	0.20	0.10
Viscosity in Centistokes			
@+130°F Min.	3.5(98.9°C)	5	Report
@-40°F Max.	2600	200	2200
@-65°F Max.	---	800	---
Corrosion & Oxidation Stability @+250°F for 168 Hrs.			
Change in Wt. Mg/cm² Steel	±0.20	±0.20	±0.20
Change in Wt. Mg/cm² Aluminum	±0.20	±0.20	±0.20
Change in Wt. Mg/cm² Magnesium	±0.20	±0.20	±0.20
Change in Wt. Mg/cm² Cadmium-Plated Steel	±0.20	±0.20	±0.20
Change in Wt. Mg/cm² Copper	±0.60	±0.60	±0.60
Corrosion Max. ASTM	---	3	2
% Change in Visc. @+130°F	±10(37.8°C)	-5 to +20	-10 to +10
Increase in Neut. No. Max.	0.30	0.20	0.20
Low Temp Stability 72 Hours @ -65°F	Must Pass	Must Pass	Must Pass
Shear Stability % Viscosity Decrease Max. No Greater Than Ref. Fluid @ +130°F	---	Must Pass	---
Shear Stability % Viscosity Decrease Max. No Greater Than Ref. Fluid @ -40°F	---	Must Pass	---
Rubber Swell (Standard L) Volume Change % Max.	15-25	19.0 to 28.0	18.0 to 30.0
Copper Corrosion, Max. ASTM	2	2	---
Evaporation, Max. @ 150°F	5%	Oily but not hard or tacky	---
Foaming Characteristics @+75°F 5 Min. Aeration, Vol.	65ml	65ml	65ml
Foaming Characteristics @+75°F 5 Min. Settling, Vol.	None (10 Min.)	None (10 Min.)	None (10 Min.)
Foaming Characteristics @+200°F 5 Min. Aeration, Vol.	65ml	---	---
Foaming Characteristics @+200°F 5 Min. Settling, Vol.	None (10 Min.)	---	---
Foaming Characteristics @+75°F 5 Min. Aeration, Vol. (After 10 Min. Test)	65ml	---	---
Foaming Characteristics @+75°F 5 Min. Settling, Vol. (After 10 Min. Test)	None (10 Min.)	---	---

Table IV. List of important properties for more generally used hydraulic fluids (Cont'd)

Specification Requirements		MIL-H-46170	MIL-H-81019	MIL-H-83282
Solid Particle Contamination				
Allowable Number (Max.)	5-15 Microns	5000	2500	5000
	16-25 Microns	1000	1000	1000
	26-50 Microns	250	250	250
	51-100 Microns	50	None	50
	Over 100 Microns	10	None	10
Precipitation No.		---	---	---

Table IV. List of important properties for more generaly used hydraulic fluids (Cont'd)

Specification Requirements	MIL-H-83306
Color, Max. Part Dye to Oil (Type)	---
Pour Point ^{o}F Max.	-80
Flash Point ^{o}F Min.	+320
Neutralization No. Max.	0.20
Viscosity in Centistokes	
@ +130^{o}F Min.	---
@ -40^{o}F Max.	---
@ -65^{o}F Max.	2000
Corrosion & Oxidation Stability @ +250^{o}F for 168 Hrs.	
Change in Wt, Mg/cm^{2} Steel	±0.20
Change in Wt, Mg/cm^{2} Aluminum	±0.20
Change in Wt, Mg/cm^{2} Magnesium	±0.20
Change in Wt, Mg/cm^{2} Cadmium-Plated Steel	±0.20
Change in Wt, Mg/cm^{2} Copper	±0.60
Corrosion Max. ASTM	---
% Change in Visc. @ +130^{o}F	-1.0 to +1.0
Increase in Neut. No. Max.	0.20
Low Temp Stability 72 Hours @ -65^{o}F	Must Pass
Shear Stability	
% Viscosity Decrease Max. No Greater @ +130^{o}F	Must Pass
Than Ref. Fluid @ -40^{o}F	Must Pass
Rubber Swell (Standard L) Volume Change % Max.	---
Copper Corrosion, Max. ASTM	---
Evaporation, Max. @ 150^{o}F	---

Table IV. List of important properties for more generally used hydraulic fluids (Cont'd

Specification Requirements		MIL-H-83306
Foaming Characteristics		
@ +75°F 5 Min.	Aeration, Vol.	100ml
	Settling, Vol.	None (10 Min.)
@ +200°F 5 Min.	Aeration, Vol.	75ml
	Settling, Vol.	None (10 Min.)
@ +75°F 5 Min.	Aeration, Vol.	100ml
	Settling, Vol.	None (10 Min.)
(After 10 Min. Test)		
Solid Particle Contamination		
Allowable	5-15 Microns	30000
Number	16-25 Microns	2500
(Max.)	26-50 Microns	1500
	51-100 Microns	1500
	Over 100 Microns	1500
Precipitation No.		---

Table V. List of approved lubricants 1/

Product	Lubrication Symbol 2/	Specification and Grades	NATO 3/ No.
Lubricating Greases			
Grease, Pneumatic System	GPS	MIL-G-4343	G-392
Grease, Plug Valve, Gasoline and Oil Resistant	GRG	MIL-G-6032	G-363
Lubricant, All-Weather, Semi-Fluid, for Aircraft Ordnance	LAS	MIL-L-19701	---
Grease, Molybdenum Disulfide (for Low and High Temperatures)	GMD	MIL-G-21164	G-353
Grease, General Purpose	GGP	MIL-G-23549	---
Grease; Aircraft and Instrument, Gear and Actuator Screw	GIA	MIL-G-23827	G-354
Grease, Aircraft, Ball and Roller Bearings	BRH	MIL-G-25013	G-372
Grease, Aircraft, Helicopter Oscillating Bearings	GOB	MIL-G-25537	G-366
Grease, Aircraft, Fuel and Oil Resistant	---	MIL-G-27617	---
Grease, Aircraft, High Speed, Ball and Roller Bearing	---	MIL-G-38220	---
Grease, Aircraft, High Speed, Ball and Roller Bearing, +600°F	---	MIL-G-38277	---
Grease, Aircraft	---	MIL-G-46006	---
Grease, Aircraft, General Purpose, Wide Temperature Range	WTR	MIL-G-81322	G-395
Grease, Aircraft, High Load Capacity, Wide Temperature Range	---	MIL-G-81827	---
Grease, Aircraft, Extreme Pressure, Anti-Wear	---	MIL-G-83261	---
Grease, Transmission, Helicopter	---	MIL-G-83363	---
Grease, Gun Mount, Aircraft	---	MIL-G-83414	---
Lubricating Oils			
Lubricating Oil, General Purpose, Preservative (Water-Displacing, Low Temperature)	PL-Special	VV-L-800	O-190
Lubricant, Colloidal, Graphite in Oil	LCG	MIL-L-3572	---
Lubricating Oil, Instrument, Jewel Bearing, Non-Spreading, Low Temperature	OCW	MIL-L-3918	---
Lubricating Oil, Jet Engine		MIL-L-6081	
	---	Grade 1005	O-132
	---	Grade 1010	O-133

(SEE FOOTNOTES AT END OF TABLE)

Table V. List of approved lubricants 1/ (Cont'd)

Product	Lubrication Symbol 2/	Specification and Grades	NATO 3/ No.
Lubricating Oils (Cont'd)			
Lubricating Oil, Aircraft Reciprocating Engine (Piston)	---	MIL-L-6082 Grade 1100 Grade 1065	 O-117 O-113
Lubricating Oil, Instrument, Aircraft, Low Volatility	OAI	MIL-L-6085	O-147
Lubricating Oil, Gear, Petroleum Base	OGR	MIL-L-6086 Grade M Grade L	 O-155 O-153
Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	LTG	MIL-L-7808	O-148
Lubricating Oil, Internal Combustion Engine, Diesel	9110 9170 9250 9500	MIL-L-9000	O-272 O-273 O-274 O-276
Lubricating Oil, Internal Combustion Engine, Preservative	PE-1 PE-2 PE-3	MIL-L-21260	C-640 C-642 C-644
Lubricating Oil, Aircraft Piston Engine (Ashless Dispersant)	LAD	MIL-L-22851 Type II Type III	 O-128 O-123
Lubricating Oil, Aircraft Turbine Engine, Synthetic Base	---	MIL-L-23699	O-156
Lubricant, Molybdenum Disulfide, Silicone Base, High Temperature	---	MIL-L-25681	S-1735
Lubricating Oil, Aircraft Turbine Engine, Ester Base	---	MIL-L-27502	---
Lubricating Oil, Instrument, -65° to +400°F	---	MIL-L-27694	---
Hydraulic Fluids			
Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance	---	MIL-H-5606	H-515
Hydraulic Fluid, Petroleum Base, for Preservation and Operation	---	MIL-H-6083	C-635
Hydraulic Fluid, Nonpetroleum Base, Aircraft	---	MIL-H-8446	---
Hydraulic Fluid, Petroleum Base, High Temperature, Flight Vehicle	---	MIL-H-27601	---
Hydraulic Fluid, Petroleum Base, Missile	---	MIL-H-46004	---
Hydraulic Fluid, Rust Inhibited, Fire Resistant, Synthetic Base	---	MIL-H-46170	---
Hydraulic Fluid, Petroleum Base, Ultra-low Temperature	---	MIL-H-81019	---
Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft	---	MIL-H-83282	---
Hydraulic Fluid, Fire Resistant, Phosphate Ester Base, Aircraft	---	MIL-H-83306	---

(SEE FOOTNOTES AT END OF TABLE)

Table V. List of approved lubricants 1/ (Cont'd)

Product	Lubrication Symbol 2/	Specification and Grades	NATO 3/ NO.
Damping Fluids			
Damping Fluid, Silicone Base (Dimethyl Polysiloxane)	---	VV-D-1078	See 3/
Silicone Fluid, Chlorinated Phenyl Methyl Polysiloxane	---	MIL-S-81087	H-536
Damping Fluid, Silicone (Specially Blended)	---	MIL-D-83799	---
Compounds			
Petrolatum Technical	PET	VV-P-236	S-743
Sealing Compound; Pipe Joint and Thread, Lead Free General Purpose (for Threaded Fittings)	---	TT-S-1732	---
Anti-Seize Compound, High Temperature	---	MIL-A-907	---
Compound, Lubricating, Inner Tube, Aircraft Tire	---	MIL-C-5024	---
Thread Compound; Anti-Seize, Graphite-Petrolatum	---	MIL-T-5544	S-720
Corrosion-Preventive, Aircraft Engine	CPN-2	MIL-C-6529	See 3/
Lubricant, Tire and Rim, Demounting	---	MIL-L-8362	---
Silicone Compound	---	MIL-S-8660	S-736
Tape, Anti-Seize, Polytetrafluoro-ethylene, With Dispenser	---	MIL-T-27730	S-1736
Lubricating Compound, Fluorosilicone	---	MIL-L-47022	---
Solid Film Lubricants			
Graphite, Dry Lubricating	---	SS-G-659	S-732
Molybdenum Disulfide, Technical, Lubrication Grade	MDS	MIL-M-7866	S-740
Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting	---	MIL-L-8937	S-1738
Lubricant, Solid Film, Air Drying	---	MIL-L-23398	S-749
Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting	---	MIL-L-46010	---
Lubricant, Solid Film, Air-Cured, Corrosion Inhibiting	---	MIL-L-46147	---
Lubricant, Solid Film, Extreme Environment	---	MIL-L-81329	S-1737

(SEE FOOTNOTES ON NEXT PAGE)

1/ This table contains a list of lubricants which have engineering approval for use on Navy and Air Force aircraft when procured under the latest effective issue of the specification indicated herein.

2/ The abbreviation symbols are intended for use in lubricaton charts and Service instructions where space requirements necessitate the use of abbreviations. NATO numbers should be used if shown. Otherwise, lubrication symbols shall be used. If neither number or symbol is shown, the specification number shall be used on charts and service instructions.

3/ NATO NO. ASCC AIR STD 15/1, STANAG 1135.

Custodians:
Army - AV
Navy - AS
Air Force - 11

Reviewer Activity:
Army - ME, MI, MR, TE
Air Force - 68

Preparing Activity:
Navy - AS
Project No. 15GP-0018

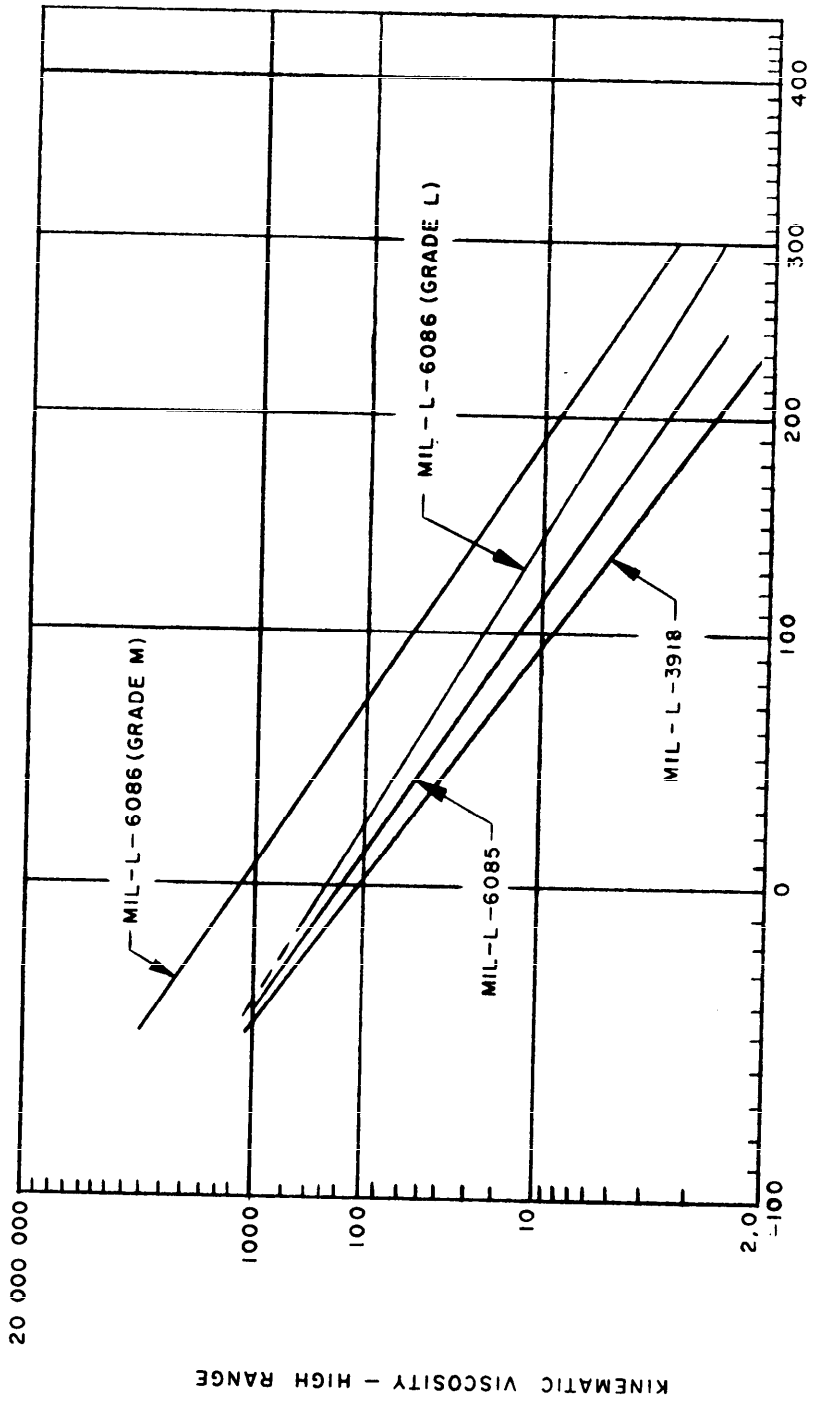

FIGURE 1. Viscosity-temperature characteristics of aircraft oils

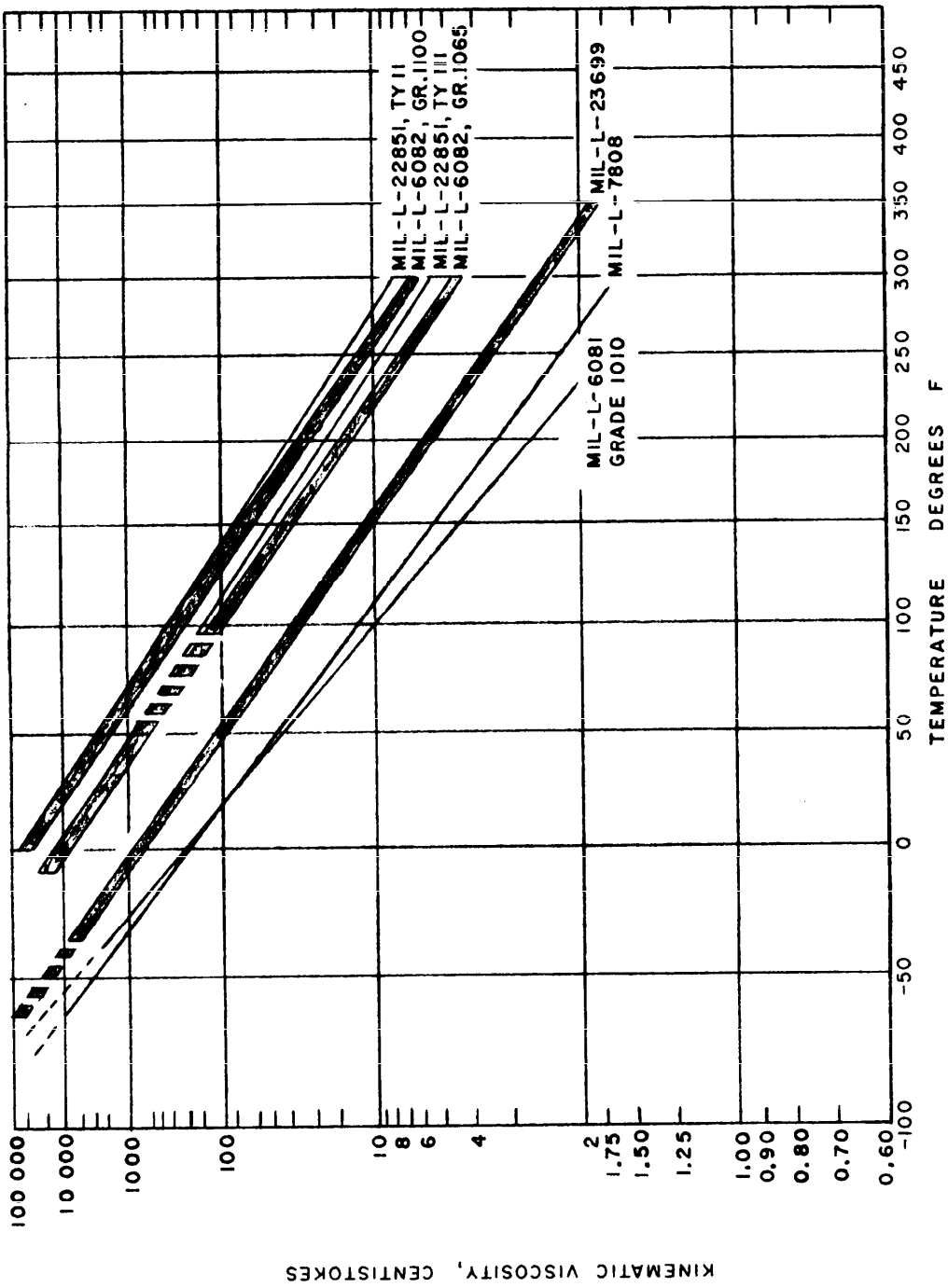

FIGURE 2. Viscosity-temperature characteristics of aircraft engine oils

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

INSTRUCTIONS: The purpose of this form is to solicit beneficial comments which will help achieve procurement of suitable products at reasonable cost and minimum delay, or will otherwise enhance use of the document. DoD contractors, government activities, or manufacturers/vendors who are prospective suppliers of the product are invited to submit comments to the government. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. Attach any pertinent data which may be of use in improving this document. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.

DOCUMENT IDENTIFIER AND TITLE: MIL-HDBK-275A — GUIDE FOR SELECTION OF LUBRICANT FLUIDS AND COMPOUNDS FOR USE IN FLIGHT VEHICLES AND COMPONENTS

NAME OF ORGANIZATION AND ADDRESS

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY DOCUMENT REQUIREMENT CONSIDERED TOO RIGID

3. IS THE DOCUMENT RESTRICTIVE?

   ☐ YES ☐ NO *(If "Yes", in what way?)*

4. REMARKS

SUBMITTED BY *(Printed or typed name and address - Optional)*

TELEPHONE NO.

DATE

DD FORM 1 JAN 72 1426 REPLACES EDITION OF 1 JAN 66 WHICH MAY BE USED

S/N 0102-014-1802

☆U.S. GOVERNMENT PRINTING OFFICE: 1976— 703-020:894

FOLD

POSTAGE AND FEES PAID

U.S. MAIL

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Engineering Specifications and Standards Department(Code 93)
Naval Air Engineering Center
Lakehurst, NJ 08733

FOLD