

L-1710A

Autolite®

Aviation Spark Plugs

Installation and Maintenance Manual

Technical Aspects
FAA Approved

SCOPE

This manual provides complete details about the installation and maintenance of Autolite® Aviation Spark Plugs from Unison Industries.

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LOG OF REVISIONS

<u>Revision</u>	<u>Description</u>	<u>Pages Revised</u>	<u>Date</u>
Basic	Initial Issue	Not Applicable	03/31/03
A	Added XL Premium Spark Plugs	All	01/15/05

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0.0 INTRODUCTION

0.1 COPYRIGHT STATEMENT

The information and designs contained in this document are proprietary to Unison Industries, and will not, in whole or in part, be duplicated, disclosed, or used without the written consent of Unison Industries. This document is protected as an unpublished work under the U.S. Copyright Act of 1976, as well as under all other pertinent domestic and international intellectual property provisions. All rights reserved.

0.2 NOTICES

WARNING: IMPROPER OR UNAUTHORIZED APPLICATIONS OF THE INFORMATION CONTAINED IN THIS MANUAL MAY RESULT IN LOSSES OR DAMAGES TO THE USER.

No liability will be assumed by Unison Industries for actual, consequential, or other types of damages directly or indirectly resulting from the unauthorized use of this manual for other than its stated purposes.

The accuracy and applicability of this manual has not been verified for any assembly, component, or part not manufactured by Unison Industries. Any use of this manual for other than its intended purpose, or for performing any installation, maintenance, replacement, adjustment, inspection, or overhaul of any assembly, component, or part not manufactured by Unison Industries is not approved, endorsed, or sanctioned by Unison Industries.

When performing installation, maintenance, replacement, adjustment, inspection, or overhaul of any Unison assembly, component, or part, it is imperative that the latest revision of the appropriate manual or product support document be referenced. Contact Unison Industries to be sure you have the latest manual or support document revision before performing any work. This manual is subject to change without notice.

Use of non-approved repair parts and tools may result in unit malfunction and/or affect equipment safety, and may be considered a violation of FAA repair guidelines.

All reasonable attempts were made to make this manual as complete and accurate as possible. If you have any questions, comments, or corrections, or require clarification of any information contained herein, please write Unison Industries Customer Service Department at:

Piston Product Support
7575 Baymeadows Way
Jacksonville FL 32250
Internet: www.unisonindustries.com

Or call or email Unison's Piston Products Support Department at:

Phone: 904-739-4081
Fax: 904-739-4006
Email: pistonhelp@unisonindustries.com

0.3 HOW TO USE THIS MANUAL

This document contains all necessary information relating to the ownership of Autolite® Aviation Spark Plugs manufactured by Unison Industries.

Section 1 describes the Autolite® Aviation Spark Plugs.

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Section 2 includes detailed procedures for installation.

Sections 3 and 4 describe operation and maintenance procedures respectively.

Section 5 describes the procedures used to preserve and store Autolite® Aviation Spark Plugs.

Section 6 describes the Autolite® Aviation Spark Plugs warranty and procedures.

0.4 RELEVANT PUBLICATIONS

F-1100 Master Service Manual

L-1318 Consolidated Application Data

0.5 SLICK IGNITION SYSTEM OVERVIEW

Unison Industries is an innovative leader in the design and manufacture of aircraft ignition systems. Unison manufactures, not merely assembles, a superior FAA-PMA approved product consistently specified by quality-conscious OEMs.

A. Worldwide Network

Unison Products are available through an international network of aircraft parts distributors that offer outstanding product support, prompt delivery, and friendly customer service. See Unison Industries' Authorized Distributor List form L-1051, or visit the Unison web site at www.unisonindustries.com for a complete listing of Unison distributors.

B. AOG and Emergency Orders

Authorized distributors of Unison products are required to carry inventory sufficient to satisfy market requirements including AOG needs. Please refer to Unison Industries' Authorized Distributor List, form L-1051, for the Unison distributor nearest you.

C. A Complete Offering

Unison Ignition Components are available in the following configurations:

- **Slick Ignition Upgrade Kits:** Cost saving kits including Slick Magnetos, a complete Slick Ignition Harness (now with five color choices), Autolite® Aviation Spark Plugs, and all mounting hardware and installation instructions.
- **Slick Magnetos:** Timing pins are included for easy installation.
- **Slick Harnesses:** Both complete and half harnesses are available.
- **Slick Dual Harnesses:** Economical choice for TCM/Bendix dual magnetos.
- **Universal Slick Harness Kits:** For those who prefer to build their own assemblies.
- **Individual Slick Leads:** For single ignition lead replacement.
- **Slick Service Parts:** For all Slick Magnetos and Harnesses.

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- **LASAR®:** A microprocessor-based electronic engine control system, LASAR® can be installed on the most popular Textron-Lycoming engines in service today. With LASAR® your engine starts quicker, runs smoother, climbs faster, and consumes less fuel (under cruise conditions).
- **SlickSTART™ Solid-State Magneto Start Boosters:** An excellent compliment to Slick impulse-coupled and retard-breaker magnetos, SlickSTART™ delivers up to 340% more energy for reliable starts every time. SlickSTART™ can also be used in conjunction with most TCM/Bendix magnetos and offers greater reliability and performance than original TCM/Bendix starting vibrators.
- **Autolite® Aviation Spark Plugs:** Unison manufactures massive electrode as well as Autolite® XL fine wire plugs for almost every General Aviation aircraft and engine. Autolite® Aviation Spark Plugs can be conveniently purchased in boxes of 12, 4, or individually (check with a Unison distributor). For maximum savings, purchase Autolite® Spark Plugs as part of a Slick Ignition Upgrade Kit. Autolite® part numbering is easy. Part numbers for Autolite® Aviation Spark Plugs look similar to the part numbers that some aviation consumers have memorized due to a lack of choice. For Autolite® Aviation Spark Plugs, just add a "U" to the front of the competing brand's part number (for instance, one of Unison's most popular Autolite® Aviation Spark Plugs is UREM40E, which, from a part number perspective, looks very similar to REM40E, a competing part number). Refer to Unison's L-1318 Consolidated Application Data publication for the approved Autolite® Aviation Spark Plug part number for a particular application. All Autolite® Aviation Spark Plugs are FAA-PMA approved.
- **Tools:** To support all of the aforementioned products, Unison also offers Unison designed, manufactured, and marketed tools. To support Unison's new Autolite® Aviation Spark Plug line, Unison and Aircraft Tool Supply Company (ATS) have entered into a joint marketing agreement for some of the tools referenced in this manual. ATS is a company which deals solely in tools and equipment for the aircraft industry. For more information on ATS, call them at 1.800.248.0638 or visit their web site, www.aircraft-tool.com.

0.6 MAINTENANCE PERSONNEL

Current FAA regulations (Part 43) allow qualified owners and operators of aircraft to perform certain types of preventative maintenance, including spark plug inspection, rotation, and service. Consult the FAR's for details.

In addition, if in doubt as to your qualifications, an experienced aircraft technician with an A&P license is an excellent choice for conducting spark plug related maintenance.

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1.0 TECHNICAL REFERENCE

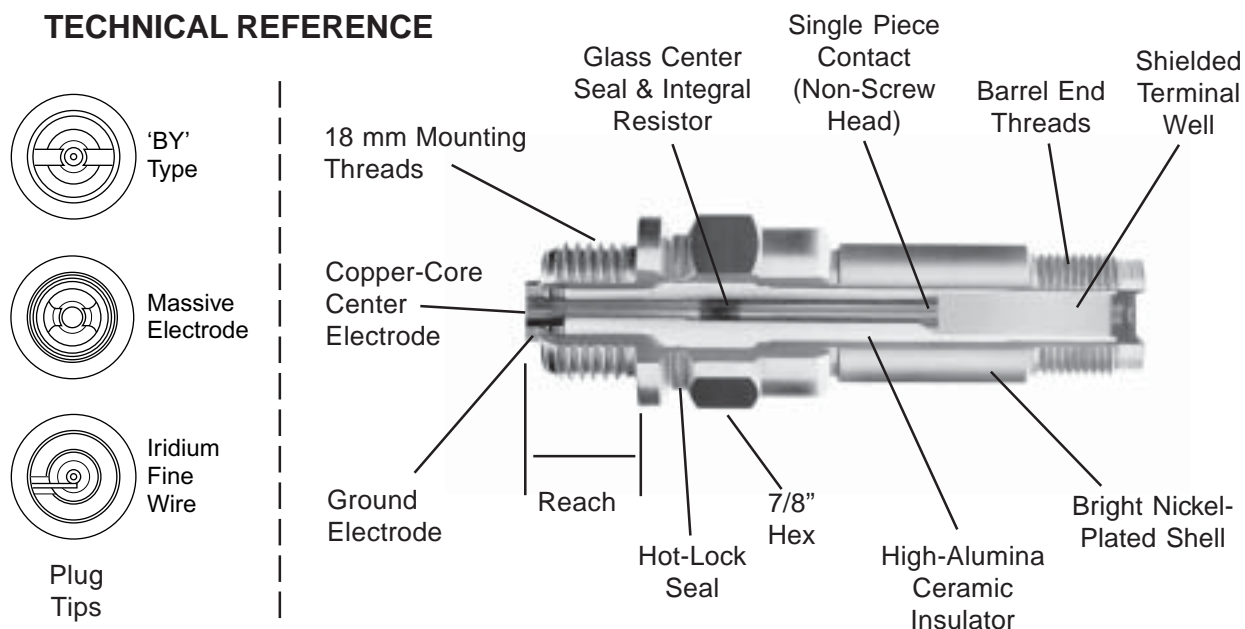


Figure 1-1

1.1 DESCRIPTION AND OPERATION

The spark plug is the last component in the ignition circuit. It converts the magneto output voltage via the ignition harness and produces a high voltage spark that ignites the compressed air-fuel mixture within each cylinder of a GA piston engine.

Autolite® Aviation Spark Plugs, available in both massive electrode and XL fine wire designs, offer superior heat transfer and leakage protection, advanced reliability, long life, and maximum cost-effectiveness with the following design features:

- **High-conductivity copper core electrode** - is co-extruded inside a special nickel alloy for optimum heat transfer and resistance to combustion gases.
- **High-alumina ceramic insulator** - is enhanced with a proprietary glaze material to ensure the high mechanical strength and superior dielectric quality needed to survive the severe engine environment.
- **Iridium Fine Wire Electrode** - made from a high performance precious metal. The center electrode is welded in place using a robotically controlled electron beam to ensure extra long life and superior performance. When combined with the Autolite® proprietary resistor material, the Autolite® XL fine wire plugs easily achieve longer service life than any other brand.
- **Vacuum-cemented center electrode (Massive Electrode Only)** - protects the nickel alloy from corrosion and oxidation, and provides consistent and evenly distributed heat dissipation from the center electrode to the insulator.
- **Hot-lock assembly procedure** - resists the high pressure of combustion gases, and creates a zero-leakage seal between the insulator and outer shell.
- **Proprietary glass center seal and integral resistor** - bonds the insulator, center electrode, and terminal into a single, zero-leakage structure for maximum durability and improved spark gap life.

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- **Bright nickel plating** - provides corrosion protection in the severe environments of GA. Autolite® XL fine wire plugs are also painted for additional protection.
- **Non-screw head contact** - offers a smooth and uninterrupted contact surface, more resistant to arcing and the resultant loss in energy transfer.
- **Projected Gap Design** - A projected gap design (massive electrode spark plug number UREM37BY and Autolite® XL fine wire Aviation Spark Plugs) and a large shell bore provide maximum circulation of combustion gases to scavenge lead deposits and burn off carbon deposits, resulting in better performance and longer life.

1.2 SPECIFICATIONS

Unison Part Number	Reach	Connector Thread	Electrode Type
UREM38E	1/2"	5/8" - 24	Massive
URHM38E	1/2"	3/4" - 20	Massive
UREM40E	1/2"	5/8" - 24	Massive
URHM40E	1/2"	3/4" - 20	Massive
URHB32E	13/16"	3/4" - 20	Massive
UREB37E	13/16"	5/8" - 24	Massive
URHB37E	13/16"	3/4" - 20	Massive
UREM37BY	1/2"	5/8" - 24	Projected Nose
UREM38S	1/2"	5/8" - 24	Fine Wire
UREB36S	13/16"	5/8" - 24	Fine Wire
URHB32S	13/16"	3/4" - 20	Fine Wire
URHM38S	1/2"	3/4" - 20	Fine Wire
URHB36S	13/16"	3/4" - 20	Fine Wire

NOTE: All Autolite® Aviation Spark Plugs are available in an 18 mm mounting thread size. The Autolite® massive electrode gap is .016" to .021". Autolite® XL fine wire plug gaps are .017" to .021".

1.3 SELECTION CRITERIA

Spark plugs are available in different thread sizes and heat ranges. The various sizes and heat ranges are required to match engine requirements.

All Autolite® Aviation Spark Plugs meet the necessary requirements for military and commercial applications. All plugs are designed to meet specifications for heat rating, reach, thread size, terminal connectors, and shielding.

For information on which Autolite® Aviation Spark Plug is designed for your needs, refer to:

Master Service Manual (F-1100): Application Data: Consolidated Application Guide (L-1318)

Master Service Manual (F-1100): Advertising/Promotion: Autolite® Aviation Spark Plug Brochure (JP00753-1)

Unison Web Site: www.unisonindustries.com

1.3.1 REACH

The reach of a spark plug is measured from the shell gasket seat to the end of the threads. Correct reach is necessary to ensure the electrodes are positioned properly to ignite the fuel-air mixture and ensure consistent firings.

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1.3.2 HEAT RATING

The heat rating of a plug measures the ability of a spark plug to optimally transfer heat from the spark electrodes and insulator nose to the cylinder and engine cooling system, while resisting carbon fouling. Autolite® Aviation Spark Plugs are available in a range of heat ratings to meet all engine and operational requirements. The use of terms “hot” or “cold” in reference to spark plugs is often a source of confusion when selecting the proper spark plug for an application. For a given engine series, hot plugs are usually specified for the lower horsepower engines and cold plugs for the higher horsepower engines. The terms actually refer to the plug’s ability to dissipate heat. By definition, a cold heat range plug dissipates heat more rapidly. Likewise, a hot heat range plug has a slower rate of heat dissipation. The primary factor in whether a plug is hot or cold is the length of the insulator assembly core nose. Hot plugs have relatively long insulator noses and therefore, a long heat transfer path. Cold plugs have relatively short noses and thus transfer heat more quickly. All other parts of a part number being equal, you can tell if an Autolite® Aviation Spark Plug is hotter or colder heat range by the numbers in the middle of the part number. For instance, comparing a UREM40E with a UREM38E, the UREM40E is a hotter plug because “40” is larger than “38”.

1.3.3 SHIELDED TERMINAL DESIGN

A shielded terminal design is used to prevent radio interference from the engine ignition system. Unison Autolite® Aviation Spark Plugs are manufactured with either the 3/4” - 20 thread design or the 5/8” - 24 thread design.

1.3.4 PLUG LENGTH

Unison has shortened the overall length of some Autolite® Aviation Spark Plugs to provide greater clearance between the spark plug terminal well and engine cowling (check with Unison or a Unison distributor for part numbers available in the new shorter length). The new shorter design does not adversely impact spark plug performance. All Autolite® Aviation Spark Plugs not modified to the shorter configuration meet industry standards for length and are equivalent in length to competing brands.

1.4 SPARK PLUG TOOLS

Unison offers the following line of tools to support aviation spark plug maintenance activities:

Part Number	Description
T240	Spark Plug Tray
T245	Spark Plug Erosion Gage
T550-10	Spark Plug Cleaning Tool (bag of 10)
T551	Spark Plug Cleaner and Tester Unit (115 VAC)
T552	Spark Plug Cleaner and Tester Unit (220 VAC)
T554	Aircraft Spark Plug Feeler Gage
T555	Spark Plug Hole Thread Chaser
T556	Spark Plug Thread Lubricant (anti-seize)
T557	Spark Plug Deep-Socket (3/8” Drive) 7/8” Hex Socket, 3 1/2” Overall Length, No Magnet
T557-1	Spark Plug Deep-Socket (3/8” Drive) 7/8” Hex Socket, 3 1/2” Overall Length, With Magnet
T558	Spark Plug Deep-Socket (1/2” Drive) 7/8” Hex Socket, 3 1/2” Overall Length, No Magnet
T559	Spark Plug Vibrator Cleaner
T560	Spark Plug Cleaner
T570	Spark Plug Tool Kit (contains T240, T245, T550-10, T554, T555, T557, T559, T560, at a discount)
T571	Time Rite Kit (18 mm)
T572	Time Rite Kit (14 mm)

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1.5 SPARK PLUG SPARE PARTS

Unison currently offers copper mounting gaskets in bags of 100 (Unison part number P-1003-100) for Autolite® Aviation Spark Plugs or competing brands. Always use a new spark plug gasket (P-1003) when installing a new plug or re-installing a reconditioned plug.

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2.0 INSTALLATION PROCEDURES

2.1 PREINSTALLATION

CAUTION: ENSURE THAT THE SPARK PLUG BEING INSTALLED IS APPROVED FOR YOUR ENGINE APPLICATION. LONG REACH PLUGS SHOULD ONLY BE INSTALLED IN CYLINDERS DESIGNED FOR LONG REACH PLUGS. SHORT REACH PLUGS SHOULD ONLY BE INSTALLED IN CYLINDERS DESIGNED FOR SHORT REACH PLUGS.

CAUTION: NEVER INSTALL A SPARK PLUG THAT HAS BEEN DROPPED (EVEN IF THERE IS NO VISIBLE SIGN OF DAMAGE). **DISPOSE OF THE DROPPED SPARK PLUG AND REPLACE IT WITH A NEW AUTOLITE® AVIATION SPARK PLUG.**

NOTE: All Autolite® Aviation Spark Plugs have been pregapped at the factory. However, it is good practice to check gap settings.

Visually inspect all spark plugs prior to installation. Check firing and terminal end for insulator cracks, deposits, and contamination.

2.1.1 COPPER GASKETS

Always install a new Autolite® Aviation Spark Plug with a new copper mounting gasket (Unison part number P-1003). The gasket provides a seal between the spark plug and the engine mounting surface. Each new Autolite® Aviation Spark Plug comes with one copper mounting gasket.

NOTE: Unison recommends replacing the copper mounting gasket every time the spark plug is removed from the engine. Only one copper mounting gasket per spark plug should be installed. If a thermocouple gasket is used, do not install a copper mounting gasket.

2.1.2 ANTI-SEIZE COMPOUND

NOTE: A clean, dry connection is recommended. However, if the use of a lubricant is desired, use an anti-seize compound recommended by the engine manufacturer or spark plug manufacturer.

Apply a thin coating of Unison's T556 or commercial equivalent compound on the firing end threads, using care to keep the first thread free of lubricant. If the compound is on the first thread it may run to the electrodes and cause a short-circuit of the gap.

NEVER APPLY ANTI-SEIZE COMPOUND TO THE CONNECTOR THREADS.

2.2 INSTALLATION

2.2.1 CORRECT TOOLS

CAUTION: USE THE PROPER TOOLS FOR SPARK PLUG INSTALLATION TO PREVENT THREAD DAMAGE, CRACKED INSULATORS, AND MISFIRES.

A six point socket (Unison part number T557, T557-1, or T558) should be used for proper installation. A twelve point socket may contact the connector threads and cause damage.

2.2.2 INSTALLATION PROCEDURES

NOTE: Make sure the spark plug and cylinder head threads are clean.

Hand-turn the spark plug to within one or two threads of the copper mounting gasket (Unison part number P-1003).

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If the plug doesn't turn easily, it may need to be cleaned. Use a T555 (or equivalent) spark plug thread cleaning tool to remove deposits from the cylinder head threads until hand-tightening is possible to within one or two threads.

CAUTION: MAKE SURE SIDE-LOADS ARE NOT APPLIED TO THE SPARK PLUG. SIDE-LOADING CAN CRACK THE SPARK PLUG INSULATOR.

Use a T557, T557-1, or T558 (or equivalent) deep-socket wrench with a torque indicator handle to tighten the plugs to the torque limits specified by the engine manufacturer.

Avoid overtightening.

Engine Manufacturer	Torque Reference		
	Foot Pounds	Inch Pounds	Newton Meters
Textron Lycoming	30 - 35	360 - 420	41 - 47
TCM	25 - 30	300 - 360	34 - 41
Pratt & Whitney	25 - 30	300 - 360	34 - 41
Wright Aeronautical	35 - 40	420 - 480	47 - 54
Franklin Engine Company	25 - 30	300 - 360	34 - 41

NOTE: The table above applies to 18 mm spark plugs and is provided as a general guideline only. Follow the engine manufacturer's recommendations for specific engine models.

2.2.3 SPARK PLUG AND IGNITION HARNESS CONNECTOR INSTALLATION

NOTE: Keep all parts clean and dry. Always handle terminal sleeves with clean, dry hands.

Wipe the connector clean with a lint-free cloth moistened with a quick evaporating solution such as acetone, unleaded gasoline, wood alcohol, or naphtha.

Inspect the terminal assembly and replace those with any signs of mechanical failure.

Visually inspect the inside of the spark shielding barrel. It should be clean and dry and no cracks should be evident.

CAUTION: BE CAREFUL NOT TO TOUCH THE SPARK PLUG CONNECTOR OR HARNESS SPRING WITH YOUR FINGERS. RESIDUAL CONTAMINATION COULD CAUSE ARCING IN THE TERMINAL WELL AND A RESULTING MISFIRE.

Insert the assembly in a straight line with the spark plug.

Finger-tighten the connector nut.

CAUTION: TO AVOID DAMAGED THREADS OR CRACKED BARRELS, AVOID EXCESSIVE SIDE-LOADING AND DO NOT OVERTIGHTEN.

Use an open-end wrench to hold the small hex nut (do not allow to turn), while tightening the lead terminal nut an additional 1/8 turn with an appropriately sized open-end or crowfoot wrench. For proper torque, refer to the harness manufacturer's recommendations. For instance, in the case of Slick harnesses, refer to Unison's L-1499 manual.

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3.0 OPERATING SITUATIONS

3.1 OPERATING PERIOD

One of the most economical ways to maintain an efficient engine and avoid wasting fuel is to change spark plugs at regular intervals. As spark plug electrodes wear, the voltage required to jump the gap increases. Under heavy loads, misfires can occur, resulting in higher fuel consumption. Also, a rich fuel mixture or poor oil control can foul or coat the ceramic insulator on the spark plug tip. Fouling, like excessive wear, will promote misfires and can eventually cause the spark plug to stop functioning. Inspecting spark plug gaps and deposit conditions prevents engine misfires and ensures optimum performance. It is recommended that the internal resistance of the center electrode be checked during regular maintenance. If the resistance exceeds 5000 ohms, the spark plug should be replaced.

Since operating periods are dependent upon engine manufacturer's gap width recommendations, operating conditions, and deterioration of magneto components and ignition harnesses, service intervals may vary. The individual operator should determine the inspection and service interval, based on past engine model experience, engine manufacturer guidelines, and FAA requirements.

3.2 PREIGNITION

Preignition is caused when the combustion charge is ignited prior to the normal, timed spark. This may be caused by a hot spot due to an overheated spark plug.

Serious damage to the engine may result.

Indicators include a rapid rise in the cylinder head temperature or engine roughness.

If preignition is suspected, remove all spark plugs and inspect for damage. Also inspect parts such as pistons, rings, valves, and guides in the combustion chamber and follow the engine manufacturer recommendations for correction procedures.

3.3 DETONATION

Detonation is an explosion of the unburned combustion charge prior to the normal flame front.

This condition may damage the spark plug electrodes or crack the insulator core nose.

Indication is from a mildly rough engine, coupled with a knocking sound. If detonation is suspected, remove and inspect the spark plugs and follow the engine manufacturer recommendations for correction procedures.

3.4 CONNECTOR WELL ARCING AND FLASHOVER

When the terminal well of a spark plug becomes dirty with moisture or foreign matter, terminal arcing and flashover may occur. Flashover is the unintended arc of the ignition discharge along the dirty terminal well, or lead insulator to the shell. Flashover may lead to erratic misfiring, causing difficult engine starts.

The best practice to avoid flashover is preventive maintenance. Spark plugs with dirty terminal wells should be replaced with new or reconditioned spark plugs.

Also, clean and inspect ignition harness connector terminals and seal grommets to prevent moisture entry.

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3.5 IMPROPER GASKETS AND PROPER SELECTION OF SPARK PLUGS

Copper mounting gaskets (Unison part number P-1003) are engineered to ensure proper sealing and firing tip location of an Autolite® Aviation Spark Plug. Unison recommends that a new copper gasket be used every time a spark plug is removed or replaced. Only one gasket should be used.

With correct installation, the firing end of the plug is flush with the combustion chamber wall. This prevents threads from being exposed to combustion gases and developing hot spots which may lead to preignition. To ensure the firing end of the spark plug is flush with the combustion chamber wall, always install a long reach plug in a cylinder designed for long reach plugs and a short reach plug in a cylinder designed for short reach plugs.

A gas leak at the gasket interface may cause higher-than-normal operating temperatures, again possibly leading to preignition. Prevent this possibility by using a new copper mounting gasket (Unison part number P-1003) each time the spark plug is removed.

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4.0 MAINTENANCE

Proper maintenance is essential to extending spark plug life. Careful reconditioning allows spark plugs to be reused at a far lower cost than replacement. Adhere to a scheduled service interval as recommended by the engine manufacturer, FAA requirements, or more stringent intervals based on operating conditions and personal experience with engine type.

NOTE: Spark plug gap and deposit conditions should be closely monitored for optimum performance.

4.1 REMOVAL PROCEDURES

Prior to removing spark plugs for inspection and servicing, examine the area surrounding each spark plug. Parts that are damaged, or may be missing, can deteriorate ignition leads and overheat the spark plugs. Repair or replace whatever parts need attention.

4.1.1 TERMINAL CONNECTORS

Use an open-end wrench to hold the small hex nut (do not allow to turn), while loosening the lead terminal nut with an appropriately sized open-end or crowfoot wrench.

To avoid twisting the lead, continue to use an open-end wrench to hold the small hex nut (do not allow to turn), while unscrewing the lead terminal nut by hand.

Carefully pull the lead connector straight out. Avoid side pressure, which may damage the terminal sleeve or the barrel insulator.

Examine the terminal well insulator and replace if cracked, arc tracked, or otherwise damaged. Also, visually inspect the contact and ignition lead termination for evidence of arcing or other damage.

4.1.2 SPARK PLUG HANDLING

Remove each spark plug with an appropriately sized six point deep socket wrench (Unison part number T557, T557-1, or T558 or equivalent). Carefully seat the wrench securely on the plug to avoid damage to the threads or barrel. Be sure to remove the gasket with each spark plug.

Identify each spark plug by engine cylinder and position (top or bottom) and place in the spark plug tray (Unison part number T240). This pre-numbered system will make it easier to troubleshoot engine conditions when examining the firing ends of the plugs. This system will also assist with plug rotation if reinstalling.

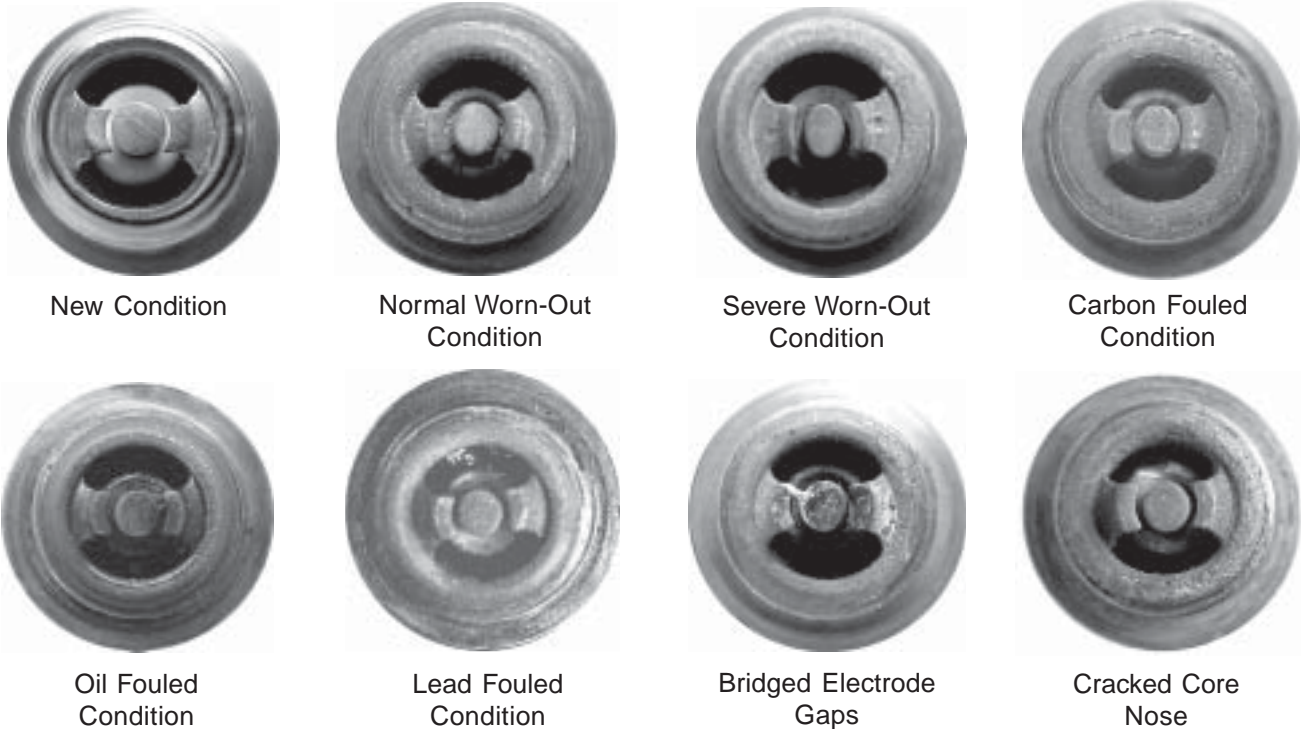
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4.2 TROUBLESHOOTING -- ELECTRODE CONDITIONS

Poor engine performance may be due to worn rings or cylinders, improper fuel-air mixture, a worn ignition harness, or a number of other conditions. The appearance of the firing end of a spark plug is a good indicator of conditions that may exist within the engine.

NOTE: The conditions shown below are representative of both massive electrode and fine wire plugs even though only the massive electrodes are shown.



4.2.1 WORN ELECTRODES

Normal

Indicated by a grey or brownish color on the firing end with few deposits. Electrodes are slightly worn, but not eroded or burned.

Clean, regap, test, and reinstall plugs using a new copper mounting gasket (Unison part number P-1003).

Normally Worn-Out and Severe

Indicated by excessively worn electrodes.

Discard plugs that are worn to beyond service limits per Gap Setting Procedure in paragraph 4.3.8. Replace with new Autolite® Aviation Spark Plugs of proper part number for the application.

Besides normal operation, other conditions that can cause electrode erosion are constant magneto-polarity firing and capacitance after-firing. By properly rotating spark plugs, these conditions can be prevented from causing severe erosion.

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Constant polarity occurs with even-numbered cylinder magnetos. One plug fires with positive polarity causing excessive ground-electrode wear. Then, the next plug fires with negative polarity causing excessive center-electrode wear.

Capacitance after-firing is caused by the stored energy in the ignition-shielded lead releasing after a normal-timed ignition.

To even out the wear, place spark plugs in the spark plug tray (Unison part number T-240), identified by cylinder locations, then rotate according to Figure 4-1. Keep plugs in engine sets.

UREM37BY Electrode Wear

Due to their projected gap design, which helps prevent lead fouling, the Autolite® UREM37BY spark plugs do not wear exactly the same as the other Autolite® Aviation Spark Plugs with “massive” type ground electrodes. A severely worn UREM37BY spark plug displays bottle-necking of the center electrode and knife-edged type erosion of the ground electrodes.



New UREM37BY



Worn UREM37BY

Autolite® XL Fine Wire Electrode Wear

The outstanding wear characteristics of the Autolite® XL fine wire plugs will allow continued use long after other types of plugs have worn out. The main limitation of these spark plugs is the internal resistor condition. As long as the resistance through the center electrode is below 5000 ohms, the resistor is good. However, the electrode erodes so slowly that as long as there is at least half of the width of the ground electrode remaining, the spark plug is serviceable.

4.2.2 CARBON FOULING

Dry, fluffy, sooty deposits indicate the plug is operating too cold to burn off combustion deposits. Causes may be fuel related or ignition related.

Fuel related causes include rich fuel mixture, faulty carburetor adjustment, excessive idling, or improper idle mixture.

Ignition related causes include a failed plug, a failed lead, improper magneto timing, or improper plug type (too cold).

After eliminating the cause, replace the faulty plugs with new Autolite® Aviation Spark Plugs. Complete a magneto check by slowly increasing engine power to magneto check level and then idle for one minute before making the check. After a satisfactory check, idle the engine and check the idle mixture.

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4.2.3 OIL FOULING

Indicated by oily, wet deposits and frequent misfires.

Causes include damaged pistons, worn or broken piston rings, worn valve guides, sticking valves, faulty ignition supply, or engine in break-in period.

Diagnose and repair engine problem. Clean, regap, test, and reinstall plugs using a new copper mounting gasket (Unison part number P-1003).

4.2.4 LEAD FOULING

Indicated by hard ash-type deposits of lead.

Causes include poor fuel vaporization due to cold operating temperature or high lead-content fuel.

Severely fouled plugs should be replaced with new Autolite® Aviation Spark Plugs. Lightly fouled plugs may be cleaned, regapped, tested, and reinstalled using a new copper mounting gasket (Unison model P-1003).

4.2.5 BRIDGED ELECTRODE GAPS

Various deposits may bridge the gap between the electrodes of a plug causing misfires. These deposits may include carbon, lead, or metallic particles.

Carbon particles may be cleared by slowly increasing engine power at idle speed until the misfiring stops. Plugs with lead deposits or metallic particles will need to be cleaned. Otherwise, replace with new Autolite® Aviation Spark Plugs.

4.2.6 CRACKED CORE NOSE

A crack in the core nose may be caused by abnormal engine operation or improper cleaning or gapping procedures.

Replace with new Autolite® Aviation Spark Plugs.

4.3 RECONDITIONING SERVICE

To be properly reconditioned, a plug must be mechanically and electrically sound, have clean firing and terminal barrel ends, have sufficient electrode material remaining with proper contours, and be properly gapped, tested, and handled.

4.3.1 PRELIMINARY VISUAL INSPECTION

Use a lighted magnifier (Unison part number T553) to visually inspect all plugs to be reconditioned. Dispose of all plugs with worn, damaged, or cracked parts such as shell hex, firing ends, shielding barrel, connector seat, threads, electrodes, terminals, insulators, or terminal sleeves.

4.3.2 DEGREASING

Degrease spark plugs by lightly wiping with solvents, such as Stoddard Solvent or Varsol. **Do not soak plugs in solvent and keep solvent out of the shielding barrel.**

Remove all traces of solvent with an air blast.

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4.3.3 CLEANING THE FIRING AND BARREL END

Clean the firing and barrel end of plugs with standard abrasive blast cleaning (Unison part number T560).

To remove heavy deposits, use a vibrator/cleaner (like Unison's part numbers T551, T552, T559 and T560) following the tool manufacturer recommended instructions. Unison spark plug cleaning tool (T550) fits most commercial vibrator/cleaners and can be used on Autolite® Aviation Spark Plugs or competing brands.

4.3.4 CLEANING THE TERMINAL WELL

Clean the shielding barrel insulators, using a cotton swab dipped in cleaning solvent, such as Stoddard Solvent, wood alcohol, or methylethylketone. Using a rotating motion, run the swab up and down the inside of the well to remove the stains.

If this method doesn't complete the cleaning, dip a clean swab in the solvent and then dip in a mild abrasive. Using a rotating motion, run the swab up and down the inside of the well to remove all stains.

Dip a second swab in solvent and completely clean out the abrasive residue.

4.3.5 CLEANING CONNECTOR SEATS

Use solvent to remove dirt and deposits from the connector seat. This ensures a tight seal and proper bond with the ignition lead.

If additional cleaning is needed, use fine grained sand paper to remove all remaining dirt and deposits.

Clean with the plug held in an inverted position to avoid particles falling deep into the shielding barrel.

Use an air blast to remove all traces of particles from the barrel. Carefully examine the barrel for cracks and dispose of any cracked insulator plugs and replace with new Autolite® Aviation Spark Plugs.

4.3.6 FIRING END INSPECTION

Use a lighted magnifier to thoroughly examine the firing end. Check for cleanliness, dryness, and a clean terminal well.

4.3.7 CLEANING THE THREADS

Use a lighted magnifier to inspect the threads on the shell and the shielding barrel for condition and size. Dispose of plugs with heavily damaged threads.

CAUTION: USE CARE WITH A POWER DRIVEN BRUSH. DO NOT USE A WIRE EXCEEDING 0.005" IN DIAMETER. NEVER BRUSH THE INSULATOR OR THE ELECTRODES.

Use a wire hand brush or power driven brush to thoroughly clean the threads.

Restore slightly damaged threads with a #2 three cornered file.

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4.3.8 GAP SETTING PROCEDURES

CAUTION: NEVER BEND THE CENTER ELECTRODE WHILE SETTING THE GAP. NEVER APPLY PRESSURE TO THE GROUND ELECTRODE WITH THE FEELER WIRE GAUGE. THIS MAY FRACTURE THE CERAMIC INSULATOR.

NOTE: Thoroughly clean plug before setting the gap.

Use a commercially available gap setting tool to set the gap following the tool manufacturer's instructions.

Use a GO and NO-GO round wire feeler gauge (Unison part number T554) to measure gap width. Unison recommends using the same gap settings as specified for new spark plugs.

For all massive spark plugs except UREM37BY, check for electrode erosion with the Unison T245 Erosion Gage. Gap the plug to 0.016". A properly gapped, but fully worn plug will enter the hole. If this happens, dispose of the plug and replace it with a new Autolite® Aviation Spark Plug.

UREM37BY can be gapped until the electrodes are worn to a point where it becomes difficult to properly adjust the gap.

Autolite® XL fine wire spark plugs should be gapped to .017" - .021" from the factory and the side wire itself should be flush with the top of the center electrode. If the gap exceeds this tolerance, the side wire can be gapped during regular maintenance. The Iridium material has outstanding resistance to electrical erosion, but is very brittle. Using small needle-nose pliers, grasp the side wire perpendicular to the face of the plug. Smoothly twist the pliers one time only to achieve the proper gap. There is very little spring back of the electrode when bending. Any additional adjustments are not recommended due to the brittle nature of the material. Broken side wires are not covered under warranty.

4.3.9 ROTATING SPARK PLUGS

After placing spark plugs in the spark plug tray (Unison part number T240), exchange the long-lead plugs with the short-lead plugs as shown in Figure 4-1. This should be done at each inspection, cleaning, and gap setting interval to even out the wear caused by constant polarity and high lead capacitance.

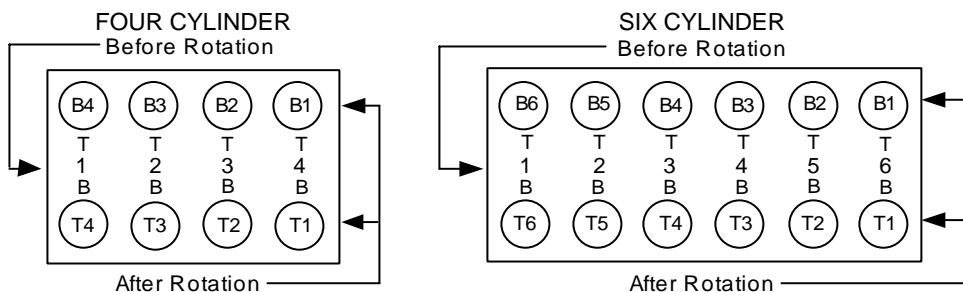


Figure 4-1

NOTE: It is not necessary to rotate plugs used in a four cylinder engine equipped with single drive dual magneto or any engine equipped with the LASAR® system. These ignition systems fire with constant polarity. However, to minimize deposit buildup, rotate the plugs from top to bottom, and from bottom to top.

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4.3.10 PAINTING SPARK PLUGS

Occasionally, plugs that have been in service for an extended period of time might require cleaning and painting to preserve their cosmetic appearance.

1. Remove loose corrosion or loose plating using a hand-held stainless steel brush.
2. Degrease part as described in paragraph 4.3.2 "Degreasing".
3. Mask threads. Ensure that connector end and firing end are also masked.
4. Apply a light coat of paint.
5. Allow a 20-minute dry time for solvent flashoff.
6. Apply a second coat of paint.
7. Dry according to paint manufacturer's instructions.

Recommended Paints:

- | | | |
|---------------------|-----------|----------------------------|
| • Plasti-Kote® | HOT PAINT | HP-14 Aluminum |
| • RUST-OLEUM® | HIGH HEAT | 7778 Black |
| • RUST-OLEUM® | HARD HAT | V2185 Zinc-Rich |
| • Randolph Products | TT-P-28 | Aluminum Aerosol High Heat |

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5.0 PRESERVATION AND STORAGE

All new Autolite® Aviation Spark Plugs come from the factory sealed in a plastic tube with one copper mounting gasket (P-1003).

To preserve reconditioned spark plugs, lightly brush a rust-proofing compound on the shielding barrel and the shell threads.

CAUTION: DO NOT DIP SPARK PLUGS IN A CORROSION PREVENTIVE COMPOUND.

Carefully package the plugs using individual tubular cartons or individually wrap plugs in waxed paper and store in a suitable container.

For lengthy storage, use a ventilated storage cabinet heated with an ordinary light bulb. This is of particular importance in damp, humid climates or near salt water.

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6.0 WARRANTY

6.1 WARRANTY PERIOD

Refer to Unison Industries Warranty Policy, Slick Products, SlickSTART™, and Autolite® Aviation Spark Plugs, form L-1096 (latest revision).

6.2 WARRANTY PROCEDURES

Request for warranty consideration must be made on Unison Form L-1042 (latest revision) within 60 days of the date the spark plug(s) became inoperative. The spark plug(s) and the completed Form L-1042 must be returned to Unison through a Unison distributor with transportation charges prepaid.

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