THE WARNER AIRCRAFT CORPORATION
20263 Hoover Avenue
Detroit, Michigan

November 24, 1943

SERVICE LETTER A-14

Subject: Spark Plugs - Installation, Inspection, Maintenance and Overhaul

To: All owners of Scarab Series Engines
All authorized Warner Aircraft Service Representatives

I. INTRODUCTION

Listed below are all plugs which we have carefully tested for proper heat range and for satisfactory service life. All these plugs have, to our knowledge, been used for a number of years under various climatic and operating conditions. This list of factory approved spark plugs does not necessarily indicate that they are the only plugs which will operate satisfactorily in our engines, but it does indicate that their suitability has been established.

SPARK PLUGS			APPROVED FOR ENGINES:				
Manufacturer	Type	Model	Scarab Junior 90 HP.	Scarab 125 HP	Super Scarab 145 HP	Super Scarab 165 HP	Super Scarab 180 HP
AC Spark Plug Div. General Mtrs. Corp. Flint, Michigan	Unshielded Ceramic	N	X	X	X		
B.G. Corporation 136 W 52nd St., New York City	Unshielded Mica	5B2	X	X	X	X	X
	Shielded Mica	317-S	X	X	X	X	X
Bendix-Scintilla Scintilla Magneto Div. Sidney, N. Y.	Unshielded Mica	18 CB		X	X		
Champion Spark Plug Company Toledo, Ohio	Unshielded Ceramic	13 C-26	X X	X X	X	X	X
	Unshielded Mica	M-4	X	X	X	X	X
	Shielded Ceramic	C-26-S	X	X	X	X	X
	Shielded Mica	M-4-S		X	X	X	X

SPARK PLUGS			APPROVED FOR ENGINES:				
Manufacturer	Type	Model	Scarab Junior 90 HP.	Scarab 125 HP	Super Scarab 145 HP	Super Scarab 165 HP	Super Scarab 180 HP
Simmonds-Benton Mfg. Div. Vergennes, Vt.	Unshielded Mica	3B5	X	X	X	X	X
	Shielded Mica	3B5S		X	X	X	X
K.L.G. (British)	Unshielded Mica	V.17/5-RL			X	X	X
	Shielded Mica	R-V.17/5			X	X	X

II. INSTALLATION

a. The spark plug gap must be checked with wire feeler gage and not with flat or shim type gages.

b. The spark plug gaps on new or reconditioned spark plugs should be as follows:

Mica Plugs: .015 - .017 inches
Ceramic Plugs: .011 - .014 inches

NOTE: A gap of .011 to .014 inches will not give satisfactory idling characteristics on mica spark plugs.

c. A good mica base thread lubricant preferably conforming to either U. S. Army Air Corps Specification No. 3578 or specification AN-VV-C-566 or equivalent should be used.

d. The earlier 90, 125, 145 and 165 HP engines were equipped with spark plug bushings having at the outer end a diameter of 1-1/16". All later engines have a spark plug bushing diameter at the outer end of 1-15/64". The following gaskets are recommended for the two types of spark plug bushings:

1. For the small, 1-1/16" diameter, spark plug bushing: Copper, asbestos gaskets, Warner Aircraft Part No. 8461 or equivalent which should be re-tightened after several hours of operation whenever new gaskets have been installed. Solid copper gaskets are not recommended since the bushing may come loose when removing a plug.

2. For the large, 1-15/64" diameter spark plug bushing: Solid copper spark plug gaskets. (Copper asbestos gaskets may be used.)

e. It is very important that the correct torque be applied when installing spark plugs. It is important that a torque wrench be used if available and if not that the safeguards explained below be carefully followed:

1. If a torque wrench graduated in foot-pounds is available: 25 ft. lb. minimum to 30 ft. lb. maximum torque should be applied.

2. If a torque wrench graduated in inch-pounds is available: 300" lbs. minimum to 360" lbs. maximum should be applied.

3. If a conventional spark plug wrench is available: Grip the wrench so that the center of your fist is ten inches from the spark plug center, then pull with approximately 30 to 36 pounds on the handle.

4. If a tee handle spark plug wrench is available: Grip the wrench with the center of the fists ten inches apart, one fist on each branch of the handle, or in other words, each fist five inches from the spark plug centerline, then apply a force of 30 to 36 pounds with each fist.

NOTE: If torque wrenches are used, they must be checked periodically.

f. With shielded spark plugs, great care must be taken when installing the elbow connector to the spark plug. Not more than 15 foot pounds or 180 inch pounds should be applied, which can be measured when a torque wrench is available. If no torque wrench is available a conventional wrench should be gripped so that the center of the fist is not more than five inches from the center of the spark plug and a force of not exceeding 18 pounds should be applied on the wrench.

III. INSPECTION AND MAINTENANCE

a. New or properly reconditioned spark plugs will usually operate satisfactorily from 25 to 100 hours, the longer service period in most instances being obtainable with mica plugs. All plugs should be removed every 25 hours for inspection.

b. During this inspection the lower half, or firing end, of the plug should be cleaned in an approved non-inflammable solvent, but at no time should spark plugs be cleaned in leaded Aviation gasoline. After being cleaned, the plugs should be thoroughly dried with compressed air.

c. When using shielded mica spark plugs, great care must be taken that no solvent gets into the upper or outer end of the spark plug. If this should happen, the spark plug should first be dried by compressed air and then in an oven of 250° to 300°F. for two hours to make sure that the plug is not shorted at the outer end.

d. All plugs should next receive a careful visual inspection for any apparent damage to the plugs, especially ceramic plugs must be carefully inspected for cracks or broken down insulators, both uppers and lowers. Any reddish brown or yellow deposits appearing on the firing end of the insulators is lead oxide which forms on plugs used with leaded fuel. Lead oxide is an electric conductor and therefore will cause improper operation of the plugs if the deposit is heavy. Plugs with heavy deposits must be sent to an overhaul station.

e. The spark plug and gaskets must be carefully inspected for indications of distortions or leaks. Such leaks result in localized discoloration and cause malfunctioning due to the spark plug being excessively hot.

f. The spark gaps must next be measured with wires as explained above. Plugs with gaps slightly larger than the values given above for new plugs will be satisfactory for another fifty-hour period unless rapid electrode burning takes place due to some abnormal operating condition. Spark plugs with gaps of .022 to .025 must be removed from the engine and overhauled.

IV. OVERHAUL

a. Resetting of spark plug gaps, cleaning of the lower end of the insulator by sand blasting or other means, general overhaul of the plugs and the required testing after overhaul should and can be undertaken only by authorized spark plug overhaul service stations which have the proper equipment and experience. As a rule, ceramic plugs can only be cleaned and have the spark plug gap reset, whereas on mica spark plugs new center electrodes can be welded to the firing end of the insulator and the lower spark plug shell can be replaced if the electrodes are worn excessively.

b. If no authorized spark plug service station is in your vicinity the manufacturer of the plugs should be contacted for his recommendations regarding the nearest authorized service station.

c. Where such a service station is not available in the near vicinity, it is recommended that the operator have spare sets of spark plugs available so that reconditioned and tested plugs are available for uninterrupted operation of the equipment while plugs needing overhauls are being overhauled.

Yours very truly,

THE WARNER AIRCRAFT CORPORATION
20263 Hoover Avenue
Detroit, Michigan

November 24, 1943