

# Chapter 12

## Servicing

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**12-00-00****GENERAL**

This chapter describes the procedures and precautions necessary for proper servicing of the EXTRA 400. The specified intervals (refer to Chapter 5) are considered adequate to meet average requirements under normal operating conditions.

It is advisable, however, to shorten service and maintenance intervals when operating under abnormal conditions, such as extreme temperature ranges, dusty atmospheric conditions, high humidity and moisture, unimproved airport facilities, or unusual operating requirements.

## 12-10-00 REPLENISHING

The replenishing procedures contained in this section provide the proper methods for replenishing consumed fuel, engine oil and brake fluid. Also included are methods for inflation of tires.

### 12-10-01 Refueling

Refueling is accomplished by pumping or pouring fuel into the two wing tanks through their respective filler caps. When fueling the aircraft, the following safety precautions must be followed:

#### **DANGER**

**Never refuel the aircraft with the engine running.**

**Always ensure that the aircraft is grounded before refueling.**

**Ensure that no one is smoking within 100 feet of the aircraft.**

**Ensure that all aircraft electrical systems are deenergized while refueling.**

**Ensure that no aircraft radar or powerful transmitters are operating within 100 feet of the aircraft during fueling.**

**If fuel is spilled, ensure that the area of spillage is thoroughly flushed with water and that all residual fuel and vapor have dissipated or neutralized prior to starting the aircraft engine.**

#### **Fuel Grade and Limitations**

The recommended minimum aviation grade fuel for the TSIOL-550-C engine is AVGAS 100 or 100LL.

#### **IMPORTANT**

**Under no circumstances should fuel of lower octane rating or automotive fuel (regardless of octane rating) be used.**

#### **Fuel System Capacities**

The EXTRA 400 fuel system capacities are as follows:

Wing tank LH 234 l (61.6 US Gallons)

Wing tank RH 234 l (61.6 US Gallons)

Total fuel capacity 468 l (123.2 US Gallons)

Usable fuel capacity 72 l (19.0 US Gallons)

#### **IMPORTANT**

**After refueling, it has to be ensured that both fuel tank caps are securely installed prior to flight.**

Additionally one has to wait at least five minutes for moisture and sediment to settle before draining and checking the fuel drain valves.

## 12-10-02 Defueling

**DANGER**

During the aircraft defueling observe the safety precautions specified in Section "12-10-01 Refueling".

Using appropriate containers, defuel the aircraft by pumping or by siphoning off fuel through the filler ports and by opening the gascolator and wing tank drain valves.

## 12-10-03 Fuel Drains

The EXTRA 400 has three fuel drain valves to provide for drainage of moisture and sediment. Two fuel drain valves are located near the root rib of each wing tank, the third fuel drain which is interconnected to the fuel gascolator is located at the lowest point between nose wheel well and main gear doors.

**DANGER**

Do not drain the fuel system when the engine or the exhaust is hot or while the wind is strong.

A quantity of fuel must be drained prior to the first flight of the day and at least five min. after refueling to inspect for water and/or contamination. Continue draining until free of water or contamination.

**IMPORTANT**

After draining, you have to be sure that the fuel drain valve is returned to the closed position and the valve is not leaking outside the aircraft.

## 12-10-04 Replenishment of Engine Oil

The engine oil replenishment is accomplished by pouring oil into the oil filler spout. The oil quantity can be conveniently checked by use of the dipstick attached to the oil filler spout cap.

### Oil Quantity

The oil quantity is checked as follows:

- 1 Check oil level after engine has been stopped long enough for oil to drain back into sump.
- 2 Open the hatch on the upper part of the cowling.
- 3 Unscrew oil filler cap and dipstick from engine oil filler spout.
- 4 Remove cap and dipstick from engine and wipe oil from dipstick with a clean cloth or paper towel.
- 5 Return dipstick into filler spout and tighten finger tight.
- 6 Unscrew and remove dipstick. Check oil level on dipstick versus the markings stamped on the dipstick.
- 7 If replenishment is required see "Replenishment of Engine Oil" below.

- 8 Return dipstick into filler spout and tighten cap finger tight.

**CAUTION**

**When tightening the filler spout cap ensure that is secure. But do not overtighten, as this may damage the "O" ring seal in the cap.**

- 9 Close the hatch on the upper part of the cowling.

### **Replenishing Engine Oil**

Replenish engine oil using oil of the following specification:

#### **Aviation Grade Straight Mineral oil**

MIL-L-6082 or SAE J 1966 Aviation Grade Straight Mineral oil shall be used to replenish oil supply during the first 25 hours of operation and at the first 25-hour oil change. Continue to use this grade of oil the first 50 hours of operation or until oil consumption has stabilized. The aircraft is delivered from EXTRA Flugzeugbau with proper break-in oil (MIL-L-6082 Aviation Grade Straight Mineral oil).

#### **Ashless Dispersant Oil**

MIL-L-22851 or SAE J 1899 Ashless Dispersant Oil shall be used after the first 50 hours of the engine operation.

#### **Additive Oil**

If an engine has been operating on straight mineral oil for several hundred hours, a change to additive oil should be undertaken with caution. If the engine is in an extremely dirty condition, the switch to additive oil should be deferred until after engine has been overhauled.

When changing from straight mineral oil to additive oil take the following precautionary steps:

**IMPORTANT**

**Do not mix additive oil and straight mineral oil. Drain straight mineral oil from engine and fill with additive oil.**

**Do not operate engine longer than five hours before again changing oil.**

**Check oil screen for evidence of sludge.**

Change oil and clean oil screen element every 10 hours if sludge is evident. Resume normal oil drain periods after sludge conditions improve.

**Recommended Viscosity of Engine Oil**

Average Ambient Air Temperature	MIL-L-6082 SAE J 1966 Spec. Mineral Grades	MIL-L-22851 or SAE J 1899 Spec. Ashless Dispersant Grades
All Temperature	—	SAE 15 W 50 or SAE 20 W 50
Above 27° C (80° F)	SAE 60	SAE 60
Above 16° C (60° F)	SAE 50	SAE 40 or SAE 50
- 1° C (30° F) to 32° C (90° F)	SAE 40	SAE 40
- 18° C (0° F) to 21° C (70° F)	SAE 30	SAE 30, SAE 40 or SE 20 W 40
- 18° C (0° F) to 32° C (90° F)	SAE 20 W 50	SAE 20 W 50 or SE 15 W 50
Below - 12° C (10° F)	SAE 20	SAE 30 or SAE 20 W 30

**NOTE**

**Refer to latest revision of Teledyne Continental Motors Service Instructions for further information.**

Replenish engine oil as follows:

- 1 Open the hatch on the upper part of the cowling and unscrew oil filler cap.
- 2 Using a clean paper towel, wipe any oil foreign material from the edges of the filler spout opening. Also wipe oil from the dipstick.
- 3 Pour oil of proper specification and viscosity into filler spout to achieve desired oil level.
- 4 Replace oil filler spout cap / dipstick and tighten finger tight. Close the hatch on the upper part of the cowling and secure engine cowling.

**Oil System Capacities**

	U.S. Quarts	Liters
Total Engine Capacity	12	11.4
Minimum Safe Quantity	8.5	9

## 12-10-05 Oil Change

The engine oil must be changed after 25 hours of operation. It should be refilled in accordance with Section "12-10-04 Engine Oil Replenishing".

At the time of each oil change the engine oil screen at the engine should be removed, cleaned, and inspected for metal particles.

Change engine oil as follows:

- 1 Remove lower cowling of the aircraft (see Chapter 71-10-02).
- 2 Cut and remove the safety wire securing the oil drain plug.
- 3 Place funnel and hose under oil drain plug to let draining oil bypass the cooler air outlet box.
- 4 Place a suitable container under the oil drain resp. hose.
- 5 Unscrew engine oil drain plug and allow the oil to drain thoroughly. Discard gasket.
- 6 Using a clean rag or paper towel, clean drain plug and area on engine around oil drain.
- 7 Reinstall drain plug with new gasket, torque and safety wire.
- 8 Remove, clean, inspect and reinstall engine oil strainers in accordance with *TCM Operating and Maintenance Instructions* (OMI - 15).
- 9 Replenish engine oil as per Chapter 12-10-04.
- 10 Reinstall and secure lower cowling.



## 12-10-06 Coolant Change

**WARNING**

Do not remove filler cap with a hot pressurized system. Spilling hot coolant can cause severe burns.

**CAUTION**

Allow engine to cool down before servicing. Engine damage may result from filling cold coolant into a hot system.

**CAUTION**

Refill coolant tank slowly to prevent overflow and to allow air to escape from the tank.

The coolant tank with filler cap as highest part of the system is mounted at the rear upper left of the engine compartment. Coolant quantity can be checked by a looking glass on the tank.

Coolant type: 60/40 mixture by volume of ethylene glycol / distilled water

Coolant approved for use: Texaco Havoline Antifreeze Coolant (AFC / previous ETX 6024); TCM P/N 653125

Coolant tank capacity: 5.15 liters (1.4 US Gallons)

Total system capacity: 9.5 liters (2.5 US Gallons)

- 1 Drain coolant. Open the filler cap on top of the coolant tank, place a bucket under the radiator front side and open the drain plug at the lower RH front side of the radiator.
- 2 When servicing the coolant system, the system must be purged of air according to the corresponding instructions in *TCM Operation and Maintenance Instructions* (Form OMI-15).

**CAUTION**

After refilling, do not forget to reinstall the filler cap !

## 12-10-07 Replenishment of Brake Fluid

In order to assure proper brake action, it is necessary to have positive transfer of hydraulic pressure through the system. Any air trapped in the system must be removed.

The brake fluid reservoir is installed at the right side of the firewall.

Follow the procedure described below using a bleed tank:

- 1 Remove engine cowlings.
- 2 Remove fluid reservoir filler plug and screw a clear plastic hose with appropriate fitting into the filler hole at the top of the fluid reservoir.
- 3 Remove bleeder fitting cap of the wheel brake assembly.
- 4 Assure that the bleeding equipment to be used is absolutely clean and is filled with brake fluid that conforms to Specification MIL-H-5606, (refer to Chapter 05-20 Lubrication Charts) and is uncontaminated.

- 5 Maintain an adequate supply of fluid during the entire operation. A low fluid supply will allow air to be drawn into the system.
- 6 Ensure master cylinders are in neutral position.
- 7 Attach the connector hose to the bleeder fitting.
- 8 Turn the bleeder fitting 1/2 rotation to the left for opening.
- 9 Slowly pump clean hydraulic fluid in the system. Bleeding should continue until no more air bubbles are expelled from the system (observe the immersed end of the clear hose), and a firm brake pedal is obtained (fill each side of the system with min. 0.33 ltr (0.1 U.S Gallons) for complete change).
- 10 Fill the fluid reservoir up to full reservoir capacity.
- 11 Reinstall fluid reservoir filler plug.
- 12 Close bleeder fitting.
- 13 Disconnect the connector hose.
- 14 Reinstall bleeder fitting cap.
- 15 Check the brake operation.

## **12-10-08**

### **Tire Inflation**

Required tire pressure:

Main wheels: 5.7 bar (83 psi)

Nose wheel: 3.5 bar (51 psi)

When inflating tires, regulated air pressure through valve stems has to be used.

## 12-11-00 MAIN GEAR

### 12-11-01 Shock Absorber

#### Oil Draining / Refilling

Warning	<b>High-pressure oil-jet damages eyes and limbs!</b> <b>The shock absorber is under high pressure (827 psi /57 bar). Expand the nitrogen gas-pressure before disassembly</b>	
	Detail Steps/Work Items	Key Items
1	Remove the filling nipple - cover	5
2	Push the insert of the filling nipple to expand the nitrogen inflation	
3	Remove the plug and O-ring from outer cylinder	
4	Drain the hydraulic fluid completely in a sump	
5	Replace O-rings and scraper ring	Chapter 32-10
6	Refill hydraulic fluid into the cylinder	Use only MIL-H-5606 Hydraulic Fluid 25.6 cu in / 420 cm <sup>3</sup>
7	Replace the O-ring on the plug	
8	Screw the plug in the outer cylinder	
9	Lock the plug by a safety wire	
10	Connect a nitrogen charging apparatus at the filling nipple	
11	Refill nitrogen	Till inflation pressure 57.0 bar / 827 psi
12	Recover the cover-filling nipple	

### 12-11-02 Actuators

#### Interlocking Actuator

Check new interlocking actuator after replacing for length:

Retracted      578 mm    (22.76 " )

Extended      1008 mm   (39.69 " )

## 12-20-00 SCHEDULED SERVICING

### 12-20-01 Exterior Cleaning

The painted surfaces of the aircraft have a long lasting, all-weather finish and should require no buffing or rubbing out in normal conditions. However, it is desirable to wash and polish it to preserve the outstanding exterior. Cleaning is best accomplished with cool water, mixed with a mild aircraft detergent, if required.

**CAUTION**

**Do not use so called "mild" household detergents to wash aircraft exterior. Such detergents may damage finish and corrode aluminum components.**

In order to remove especially heavy dirt from the wing leading edges due to insect splatter and the like, it is good practice to undertake cleaning immediately after the flight, since deposits of this kind are more difficult to remove when dry. All lubricated components are to be covered before cleaning.

Roughly twice a year, the complete surface should be treated with a non-silicone car polish and repolished to high gloss. But do not apply wax or use pre-wax cleaners during initial paint curing period. Use only mild aircraft detergent and cool water when washing exterior during the first 90 days after repainting.

**CAUTION**

**Never use cleaning agents containing silicone!**

In order to maintain good visibility at all times, the canopy Plexiglas should be given good care and kept clean at all times. Techniques and materials used to clean glass should be avoided since Plexiglas is softer than glass and subject to damage by solvents and abrasive glass cleaning agents.

Therefore it should be paid particular attention to using ample water applied with clean sponges and leather, otherwise even the smallest dust particles will tend to scratch the glazing.

**CAUTION**

**Never polish Plexiglass dry!**

Dull or scratched canopy sections can be returned to their transparent state by treating with especially formulated plexiglass cleaning agents.

## 12-20-02 Interior Cleaning

Prior to the first acrobatic flight of the day it is recommended to clean the interior with a vacuum cleaner to remove dust and loose dirt. If liquid is spilled on the cockpit floor, blot it up promptly with cleansing tissue or rags. Continue blotting until no more liquid is taken up.

**CAUTION**

**Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher fluid, anti-ice fluid, lacquer thinner, or glass cleaner to clean the canopy. These materials will damage the canopy and may cause severe crazing.**

## 12-20-03 Engine Cleaning

Accumulation of dirt and oil within the engine compartment creates a fire hazard and hampers inspection. All cleaning operations have to be performed in well ventilated work areas, and it has to be ensured that adequate fire-fighting and safety equipment is available.

The engine is to be cleaned as follows:

- 1 After running, allow the engine to cool before cleaning.

**CAUTION**

**The magnetos, alternator, starter, the air inlets and the engine cowling (the inside of the engine cowling is covered with water soluble fire protection paint) must be protected against cleaning agents.**

- 2 Wash down engine compartment using a nonflammable engine cleaning agent.
- 3 Thoroughly rinse with clean, warm water to remove all traces of cleaning agents.
- 4 It is very important not to start the engine before the cleaning agent has been completely removed or has evaporated.

## 12-20-04 Lubrication Chart

Interval	Item	Location	Lubricant
<b>Caution</b>	<b>Do not lubricate TEFLON coated bearings and rod ends</b>		
<b>Engine Compartment</b>			
100 h	Waste Gate Butterfly Valve	Rear bottom of engine	<i>Mouse Milk</i> penetrating oil, produced by: Worldwide Filter 689 Abram Court San Leandro, CA 94577 Phone (415) 483 5122 ; specified by Airesearch.
100 h	Engine Controls (Throttle, Mixer, Prop.) Rod Ends and Bearings	Engine compartment	TEFLON Spray
100 h	Engine Accessories (Cabin Cooler, Alternate Air, Cabin Pressure) Bowden Cable Ends	Engine compartment	WD 40
<b>Controls</b>			
100 h	Control Shafts	Below Instrument Panel	Aeroshell Grease 22c
100 h	Cable Chain Coupling (between Control Wheels)	Below Instrument Panel close to the firewall	Aeroshell Grease 22c
100 h	Chain Interconnection (Aileron/Rudder)	Below Instrument Panel close to the firewall	Aeroshell Grease 22c
100 h	Pedal Bearings	Below Instrument Panel	WD 40
100 h	Control Cable Bolt Attachments	Pedal Torque Tube and Controls/Control Surfaces and Nose Wheel Steering	Aeroshell Grease 22c
100 h	Pressure Dome Control Cable Bushing	Cabin Pressure Dome	MIL-G-21164 Aeroshell Grease 17
100 h	Trim Tab Hinge	Elevator	WD 40
100 h	Trim Servo Chain	Tail Cone	MIL-G-3278 or MIL-G-23827 Aeroshell Grease 7
100 h	Wing Flap Tracks	Wing	Aeroshell Grease 22c

Interval	Item	Location	Lubricant
2000 h	Front and rear Track Rollers at middle Flap Tracks	Wing	Aeroshell Grease 22c
2000 h	Rear Track Rollers at inner Flap Tracks	Wing	Aeroshell Grease 22c
100 h	Wing Flap Spindles	Wing	Aeroshell Grease 22c
<b>Engine Controls</b>			
100 h	Bowden Cable Bolt Attachments	Middle Console	TEFLON Spray
<b>Landing Gear</b>			
100 h	Main Gear Doors Hinges	RH and LH Main Gear	WD 40
100 h	Nose Gear Doors Hinges	Nose Gear	WD 40
50 h	Nose Gear Steering Arm Guide	Nose Gear	Aeroshell Grease 22c
50 h	Bearings with Lubrication Nipple	Nose and Main Gear	Aeroshell Grease 17
<b>Wheels and Brakes</b>			
100 h or annually	Wheel Bearings	Main Gear	Aeroshell Grease 22c
100 h	Brake Guide Pins	Brakes	Silicone-base Lubricant
<b>Doors</b>			
100 h	Upper and Lower Door Hinges	Upper and Lower Door	WD 40
100 h	Locking Mechanism	Upper and Lower Door	Aeroshell Grease 22c
100 h	Locking Pivots	Upper and Lower Door	Aeroshell Grease 22c
100 h	Rod Ends of Telescopic Lift Cylinder	Upper Door	WD 40

## **12-30-00 UNSCHEDULED SERVICING**

### **12-30-01 Removal of Snow and Ice**

After snowfall, the snow should be removed immediately from surface of the aircraft. Otherwise the water formed from melted snow will freeze on the surface or in slots and gaps of fairings.

#### **CAUTION**

**Do not use sharp tools for removing the snow.**

If the aircraft shows signs of ice formation, it is recommended to defrost in a room. Remove as much snow as possible with a soft bristle boom, make sure the wheels and brakes are clear, and tow the aircraft into a room with elevated temperature. This method is particularly desirable, since it will melt any undetected ice and snow that could constitute a flight hazard.