SECTION 9
SUPPLEMENTS
(Optional Systems Description & Operating Procedures)

TABLE OF CONTENTS

INTRODUCTION

This section consists of a series of supplements, each covering a single optional system which may be installed in the airplane. Each supplement contains a brief description, and when applicable, operating limitations, emergency and normal procedures, and performance. As listed in the Table of Contents, the supplements are classified under the headings of Major Configuration Variations, General and Avionics, and have been provided with reference numbers. Also, the supplements are arranged alphabetically and numerically to make it easier to locate a particular supplement. Other routinely installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

Limitations contained in the following supplements are FAA approved. Observance of these operating limitations is required by Federal Aviation Regulations.

SUPPLEMENT

O-235-N2C ENGINE MODIFICATION

SECTION 1
GENERAL

INTRODUCTION

This supplement, written especially for operators of the Model 152 Aerobat, provides information not found in the basic handbook. It contains procedures and data required for safe and efficient operation of Model 152 Aerobat airplanes modified with an O-235-N2C engine.

Information contained in the basic handbook for unmodified Model 152 Aerobat airplanes, which is the same as that for Model 152 Aerobat airplanes modified with an O-235-N2C engine, is generally not repeated in this supplement.

PERFORMANCE-SPECIFICATIONS

*SPEED:		
Maximum at Sea Level		108 KNOTS
Cruise, 75% Power at 8500 Ft		105 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.		
75% Power at 8500 Ft	Range	310 NM
24.5 Gallons Usable Fuel	Time	3.0 HRS
75% Power at 8500 Ft	Range	530 NM
37.5 Gallons Usable Fuel	Time	5.2 HRS
Maximum Range at 10,000 Ft	Range	365 NM
24.5 Gallons Usable Fuel	Time	4.1 HRS
Maximum Range at 10,000 Ft	Range	615 NM
37.5 Gallons Usable Fuel	Time	6.9 HRS
RATE OF CLIMB AT SEA LEVEL		715 FPM
SERVICE CEILING		14,700 FT
TAKEOFF PERFORMANCE:		
Ground Roll		725 FT
Total Distance Over 50-Ft Obstacle		1340 FT
LANDING PERFORMANCE:		
Ground Roll		475 FT
Total Distance Over 50-Ft Obstacle		1200 FT
STALL SPEED (KCAS):		
Flaps Up, Power Off		48 KNOTS
Flaps Down, Power Off		43 KNOTS
MAXIMUM WEIGHT:		
Ramp		1675 LBS
Takeoff or Landing		1670 LBS
STANDARD EMPTY WEIGHT		1129 LBS
MAXIMUM USEFUL LOAD		546 LBS
BAGGAGE ALLOWANCE		120 LBS
WING LOADING: Pounds/Sq Ft		10.5
POWER LOADING: Pounds/HP		15.5
FUEL CAPACITY: Total		
Standard Tanks		26 GAL.
Long Range Tanks		39 GAL.
OIL CAPACITY		7 QTS
ENGINE: Avco Lycoming 108 BHP at 2550 RPM		O-235-N2C
PROPELLER: Fixed Pitch, Diameter		69 IN.

*Speed performance is shown for an airplane equipped with optional speed fairings, which increase the speeds by approximately 2 knots. There is a corresponding difference in range, while all other performance figures are unchanged when speed fairings are installed.

The above performance figures are based on indicated weights, standard atmospheric conditions, level hard-surface dry runways, and no wind. They are calculated values derived from flight tests conducted by the Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting flight performance.

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Avco Lycoming.
Engine Model Number: O-235-N2C.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, carburetor equipped, four-cylinder engine with 233.3 cu. in. displacement.
Horsepower Rating and Engine Speed: 108 rated BHP at 2550 RPM.

OIL

Oil Specification:

MIL-L-6082 Aviation Grade Straight Mineral Oil: Used when the airplane is modified with an O-235-N2C engine and should be used to replenish the supply during the first 25 hours. This oil should be drained after the first 25 hours of operation. Refill the engine and continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

MIL-L-22851 Aviation Grade Ashless Dispersant Oil: Oil conforming to Avco Lycoming Service Instruction No. 1014, and all revisions and supplements thereto, **must be used** after first 50 hours or oil consumption has stabilized.

Recommended Viscosity for Temperature Range:

All temperatures, use multi-viscosity oil or
Above 16° C (60° F), use SAE 50
-1° C (30° F) to 32° C (90° F), use SAE 40
-18° C (0° F) to 21° C (70° F), use SAE 30

NOTE

When operating temperatures overlap, use the lighter grade of oil.

Oil Capacity:

Sump: 6 Quarts.
Total: 7 Quarts (with oil filter).

SPECIFIC LOADINGS

Wing Loading: 10.5 lbs./sq. ft.
Power Loading: 15.5 lbs./hp.

SECTION 2
LIMITATIONS

INTRODUCTION

Except as shown in this section, the operating limitations for Model 152 Aerobat airplanes modified with an O-235-N2C engine are the same as those for Model 152 Aerobat airplanes which are not modified. The limitations in this section apply only to operations of Model 152 Aerobat airplanes modified with an O-235-N2C engine. The limitations included in this section have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

POWER PLANT LIMITATIONS

Engine Manufacturer: Avco Lycoming.
Engine Model Number: O-235-N2C.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Power: 108 BHP rating.
Maximum Engine Speed: 2550 RPM.

NOTE

The static RPM range at full throttle (carburetor heat off and mixture leaned to maximum RPM) is 2280 to 2380 RPM.

Maximum Oil Temperature: 245°F (118°C).
Oil Pressure, Minimum: 25 psi.
Maximum: 115 psi.
Fuel Grade: See Fuel Limitations.
Oil Grade (Specification):
MIL-L-6082 Aviation Grade Straight Mineral Oil or
MIL-L-22851 Ashless Dispersant Oil.
Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: 1A103/TCM6958.
Propeller Diameter, Maximum: 69 inches.
Minimum:67.5 inches.

PLACARDS

The following information must be displayed in the form of composite

or individual placards in addition to those in the basic handbook.

1. On right side of the instrument panel.

THIS AIRCRAFT IS EQUIPPED WITH A LYCOMING O-235-N2C ENGINE. SEE SPECIAL POH REVISION FOR OPERATING INSTRUCTIONS.

SECTION 3
EMERGENCY PROCEDURES

INTRODUCTION

Checklist and amplified procedures contained in the basic handbook should be followed. There is no change to the airplane emergency procedures when the Model 152 Aerobat is modified with an O-235-N2C engine.

SECTION 4
NORMAL PROCEDURES

INTRODUCTION

Checklist and amplified procedures contained in the basic handbook generally should be followed. The additional or changed procedures specifically required for operation when the Model 152 Aerobat is modified with an O-235-N2C engine are presented in this section.

CHECKLIST PROCEDURES

ENROUTE CLIMB

1. Airspeed -- 70-80 KIAS.

NOTE

If a maximum performance climb is necessary, use speeds shown in the Maximum Rate Of Climb chart in Section 5 of the basic handbook.

2. Throttle -- FULL OPEN.
3. Mixture -- RICH below 3000 feet, LEAN for maximum RPM above 3000 feet (after a total of 50 hours has accumulated).

AMPLIFIED PROCEDURES

ENROUTE CLIMB

Normal climbs are performed with flaps up and full throttle and at speeds 5 to 10 knots higher than best rate-of-climb speeds for the best combination of performance, visibility and engine cooling. The mixture should be full rich below 3000 feet and may be leaned above 3000 feet for smoother operation or to obtain maximum RPM.

NOTE

Leaning is not recommended until a total of 50 hours has accumulated.

For maximum rate of climb, use the best rate-of-climb speeds shown in the Rate Of Climb chart in Section 5 of the basic handbook. If an obstruction dictates the use of a steep climb angle, the best angle-of-climb speed should be used with flaps up and maximum power. Climbs at speeds lower than the best rate-of-climb speed should be of short duration to improve engine cooling.

CRUISE

Normal cruising is performed between 55% and 75% power. The engine RPM and corresponding fuel consumption for various altitudes can be determined by using your Cessna Power Computer or data in Section 5 of this supplement.

NOTE

Cruising should be done at 75% power as much as practicable until a total of 50 hours has accumulated or oil consumption has stabilized. Operation at this higher power will ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The data in Section 5 shows the increased range and improved fuel economy that is obtainable when operating at lower power settings. The use of lower power settings and the selection of cruise altitude on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption.

The Cruise Performance Table, figure 1, shows the true airspeed and nautical miles per gallon during cruise for various altitudes and percent powers. This table should be used as a guide, along with the available winds aloft information, to determine the most favorable altitude and power setting for a given trip.

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
2500 Feet	100	16.2	94	17.4	86	18.4
5500 Feet	102	16.7	96	17.8	88	18.8
8500 Feet	105	17.1	98	18.2	90	19.2
Standard Conditions					Zero Wind	

Figure 1. Cruise Performance Table

To achieve the recommended lean mixture fuel consumption figures shown in Section 5, the mixture should be leaned until engine RPM peaks and drops 10-25 RPM. At lower powers it may be necessary to enrichen the mixture slightly to obtain smooth operation. An alternate method for obtaining the above cruise mixture setting in rough air is to lean until engine roughness or a sharp drop off in power is experienced and then immediately enrichen the mixture by rotating the mixture control vernier approximately 3/4 of a turn clockwise.

Use of recommended lean mixture rather than that for maximum RPM can provide fuel savings of up to 10% and an increase in flight endurance of approximately 20 minutes based on standard fuel tanks and 75% power. Use of recommended lean mixture rather than full rich mixture can provide fuel savings as high as 34% and an increase in flight endurance of approximately one hour when operating at an altitude of 7500 feet with 75% power and standard fuel tanks.

Carburetor ice, as evidenced by an unexplained drop in RPM, can be removed by application of full carburetor heat. Upon regaining the original RPM (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since the heated air causes a richer mixture, readjust the mixture setting when carburetor heat is to be used continuously in cruise flight.

The use of full carburetor heat is recommended during flight in very heavy rain to avoid the possibility of engine stoppage due to excessive water ingestion. The mixture setting should be readjusted for smoothest operation.

LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 75% power or less. To adjust the mixture, using this indicator, lean the mixture slowly to establish the peak EGT as a reference point and then enrichen the mixture by the desired increment based on figure 2.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN	25°F Rich of Peak EGT
BEST ECONOMY	Peak EGT

Figure 2. EGT Table.

NOTE

For best accuracy, lean in small increments while waiting approximately 10 seconds between increments when nearing peak EGT. This is to enable the pilot to observe the stabilized EGT for each mixture setting.

As noted in this table, operation at peak EGT provides the best fuel economy. This results in approximately 5% greater range than shown in this handbook accompanied by approximately a 2 knot decrease in speed.

Under some conditions, engine roughness may occur while operating at peak EGT. In this case, operate at the recommended lean mixture. Any change in altitude or throttle position will require a recheck of EGT indication.

FUEL SAVINGS PROCEDURES FOR FLIGHT TRAINING OPERATIONS

For best fuel economy during flight training operations, the following procedures are recommended.

1. Lean the mixture for maximum RPM during climbs above 3000 feet (after 50 hours has accumulated). The mixture may be left leaned for practicing such maneuvers as stalls.
2. Lean the mixture for maximum RPM during all operations at any altitude, including those below 3000 feet, when using 75% or less power.

NOTE

When cruising at 75% or less power, the mixture may be further leaned until the RPM peaks and drops 10-25 RPM. This is especially applicable to cross-country training flights, but may also be practiced during transition flights to and from the practice area.

Using the above recommended procedures can provide fuel savings in excess of 5% when compared to typical training operations at full rich mixture.

SECTION 5
PERFORMANCE

INTRODUCTION

The procedures presented in the Introduction, Use of Performance Charts, and Sample Problem paragraphs in Section 5 of the basic handbook generally are applicable to Model 152 Aerobat airplanes modified with an O-235-N2C engine. Also, all basic handbook performance charts are applicable except the Cruise Performance, Range Profile, and Endurance Profile charts. Using this information and the replacement cruise, range, and endurance charts in this supplement, complete flight planning may be accomplished.

CRUISE PERFORMANCE

CONDITIONS:
1670 Pounds
Recommended Lean Mixture (See Section 4, Cruise)

NOTE:
Cruise speeds are shown for an airplane equipped with speed fairings which increase the speeds by approximately two knots.

PRESSURE ALTITUDE FT	RPM	20°C BELOW STANDARD TEMP			STANDARD TEMPERATURE			20°C ABOVE STANDARD TEMP		
		% BHP	KTAS	GPH	% BHP	KTAS	GPH	% BHP	KTAS	GPH
2000	2400	- - -	- - -	- - -	77	101	6.3	73	100	6.0
	2300	73	96	6.0	69	96	5.7	66	95	5.4
	2200	65	92	5.4	62	91	5.1	58	90	4.9
	2100	58	87	4.9	55	86	4.7	52	84	4.5
	2000	51	81	4.5	48	80	4.3	45	78	4.2
4000	2450	- - -	- - -	- - -	78	103	6.4	74	102	6.0
	2400	78	101	6.4	74	100	6.0	70	100	5.8
	2300	70	96	5.8	66	95	5.5	62	95	5.2
	2200	62	91	5.2	59	90	4.9	55	89	4.7
	2100	55	86	4.7	52	85	4.5	49	83	4.4
6000	2500	- - -	- - -	- - -	78	105	6.4	74	104	6.1
	2400	75	100	6.1	70	100	5.8	66	99	5.5
	2300	67	96	5.5	63	95	5.2	59	94	5.0
	2200	59	90	5.0	56	89	4.7	53	88	4.6
	2100	53	85	4.6	49	83	4.4	47	81	4.3
8000	2550	- - -	- - -	- - -	78	107	6.4	74	106	6.1
	2500	79	105	6.4	74	104	6.1	70	103	5.8
	2400	71	100	5.8	67	99	5.5	63	98	5.2
	2300	64	95	5.3	60	94	5.0	56	92	4.8
	2200	57	89	4.8	53	88	4.6	50	86	4.4
10,000	2500	75	104	6.2	71	104	5.8	67	102	5.5
	2400	68	99	5.6	63	98	5.3	60	97	5.0
	2300	60	94	5.1	57	93	4.8	54	91	4.6
	2200	54	88	4.6	51	86	4.5	48	82	4.3
12,000	2450	68	101	5.6	64	100	5.3	60	98	5.0
	2400	64	98	5.3	60	97	5.0	57	95	4.8
	2300	57	93	4.9	54	91	4.6	51	88	4.5
	2200	51	87	4.5	48	83	4.4	45	78	4.2

Figure 3. Cruise Performance

RANGE PROFILE

45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb.
2. Performance is shown for an airplane equipped with speed fairings which increase the cruise speeds by approximately two knots.

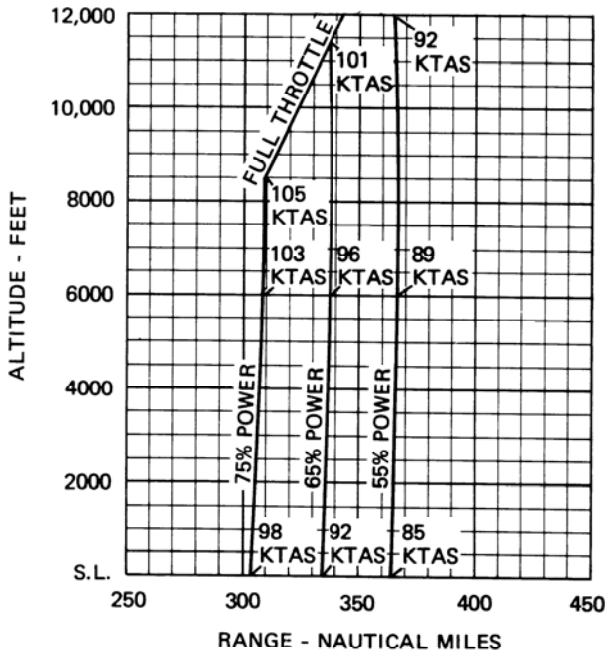


Figure 4. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
37.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTES:
1. This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during climb.
2. Performance is shown for an airplane equipped with speed fairings which increase the cruise speeds by approximately two knots.

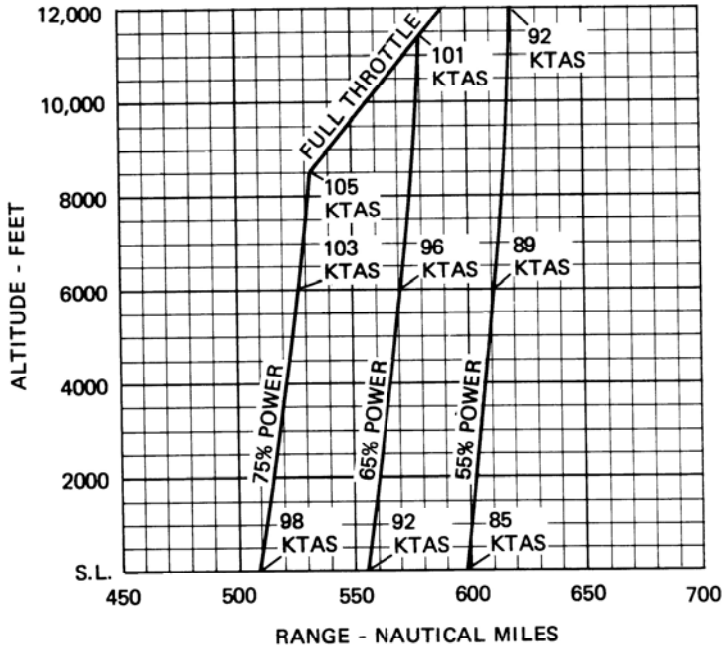


Figure 4. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
24.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb.

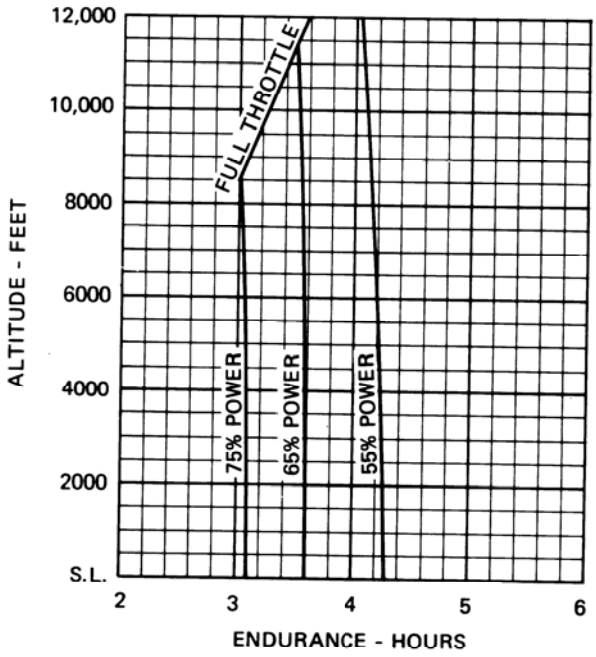


Figure 5. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
37.5 GALLONS USABLE FUEL

CONDITIONS:
1670 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during climb.

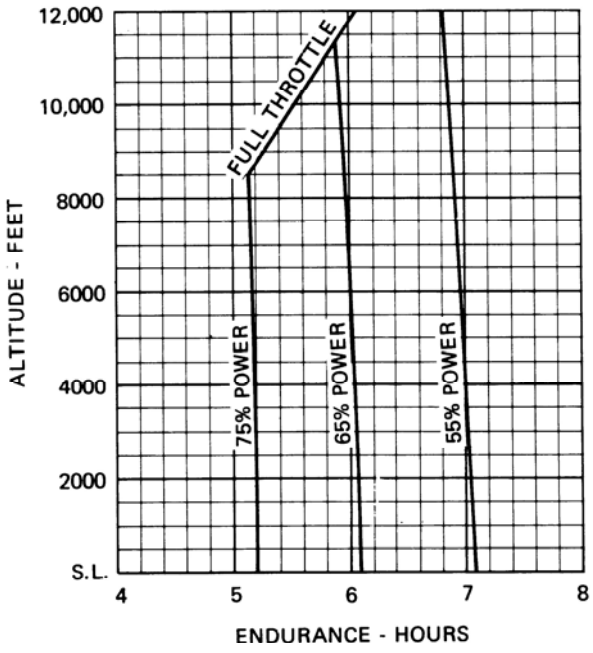


Figure 5. Endurance Profile (Sheet 2 of 2)

SECTION 6
WEIGHT & BALANCE/ EQUIPMENT LIST

INTRODUCTION

Airplane weighing and weight and balance information in Section 6 of the basic handbook is applicable to Model 152 Aerobat airplanes modified with an O-235-N2C engine. Also, the basic handbook equipment list is applicable except for the engine designation listed under the equipment grouping titled "A. Powerplant & Accessories"; when the airplane is modified with an O-235-N2C engine, the proper engine designation is O-235-N2C rather than O-235-L2C.

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

INTRODUCTION

The descriptions and operational information contained in Section 7 of the basic handbook generally are applicable to Model 152 Aerobat airplanes modified with an O-235-N2C engine. The additional or changed information which specifically describes O-235-N2C engine modification differences are presented in this section.

ENGINE

The airplane is powered by a horizontally-opposed, four-cylinder, overhead-valve, air-cooled, carbureted engine with a wet sump oil system. The engine is a Lycoming Model O-235-N2C and is rated at 108 horsepower at 2550 RPM. Major engine accessories (mounted on the front of the engine) include a starter, a belt-driven alternator, and an oil cooler. Dual magnetos and a full-flow oil filter are mounted on the rear of the engine. Provisions are also made for a vacuum pump.

NEW ENGINE BREAK-IN AND OPERATION

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, suggested that cruising be accomplished at 75% power as much as practicable until a total of 50 hours has accumulated or oil consumption has stabilized. This will ensure proper seating of the rings.

COOLING SYSTEM

Ram air for engine cooling enters through two intake openings in the front of the engine cowling. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through an opening at the bottom aft edge of the cowling. No manual cooling system control is provided.

A winterization kit is available for the airplane. The kit consists of cover plates to partially cover the cowl nose cap opening (and the oil cooler on those airplanes with an O-235-N2C engine), placards to be installed on the cover plates, insulation for the engine crankcase breather line, and a placard to be installed on the map compartment door. This equipment

should be installed for operations in temperatures consistently below -7°C (20°F). Once installed, the crankcase breather insulation is approved for permanent use regardless of temperature. Additional operating details of the winterization kit are presented in the Winterization Kit Supplement in Section 9, Supplements.

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

INTRODUCTION

Section 8 of the basic handbook applies, in general, to Model 152 Aerobat airplanes modified with an O-235-N2C engine. The additional or changed information which describes O-235-N2C engine modification differences is presented in this section.

SERVICING

OIL

OIL SPECIFICATION --

MIL-L-6082 Aviation Grade Straight Mineral Oil: Used when the airplane is modified with an O-235-N2C engine and should be used to replenish the supply during the first 25 hours. This oil should be drained after the first 25 hours of operation. Refill the engine and continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

MIL-L-22851 Aviation Grade Ashless Dispersant Oil: Oil conforming to Avco Lycoming Service Instruction No. 1014, and all revisions and supplements thereto, **must be used** after first 50 hours or oil consumption has stabilized.

RECOMMENDED VISCOSITY FOR TEMPERATURE RANGE --

All temperatures, use multi-viscosity oil or
Above 16° C (60° F), use SAE 50
-1° C (30° F) to 32° C (90° F), use SAE 40
-18° C (0° F) to 21° C (70° F), use SAE 30

NOTE

When operating temperatures overlap, use the lighter grade of oil.

CAPACITY OF ENGINE SUMP -- 6 Quarts.

Do not operate on less than 4 quarts. To minimize loss of oil through breather, fill to 5 quart level for normal flights of less than 3 hours. For extended flight, fill to 6 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one addi-

tional quart is required.

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain the engine oil sump and replace the filter. Refill sump with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to ashless dispersant oil. Drain the engine oil sump and replace the oil filter again at the first 50 hours; thereafter, the oil and filter change may be extended to 100-hour intervals. Change engine oil at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

During the first 25-hour oil and filter change, a general inspection of the overall engine compartment is required. Items which are not normally checked during a preflight inspection should be given special attention. Hoses, metal lines and fittings should be inspected for signs of oil and fuel leaks, and checked for abrasions, chafing, security, proper routing and support, and evidence of deterioration. Inspect the intake and exhaust systems for cracks, evidence of leakage, and security of attachment. Engine controls and linkages should be checked for freedom of movement through their full range, security of attachment, and evidence of wear. Inspect wiring for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals. Check the alternator belt in accordance with Service Manual instructions, and retighten if necessary. A periodic check of these items during subsequent servicing operations is recommended.

SUPPLEMENT

DIGITAL CLOCK

SECTION 1
GENERAL

The Astro Tech LC-2 Quartz Chronometer (see figure 1) is a precision, solid state time keeping device which will display to the pilot the time-of-day, the calendar date, and the elapsed time interval between a series of selected events, such as in-flight check points or legs of a cross-country flight, etc. These three modes of operation function independently and can be alternately selected for viewing on the four digit liquid crystal display (LCD) on the front face of the instrument. Three push button type switches directly below the display control all time keeping functions. These control functions are summarized in figures 2 and 3.

The digital display features an internal light (back light) to ensure good visibility under low cabin lighting conditions or at night. The intensity of the back light is controlled by the RADIO LT rheostat. In addition, the display incorporates a test function (see figure 1) which allows checking that all elements of the display are operating. To activate the test function, press the LH and RH buttons at the same time.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the digital clock is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the digital clock is installed.

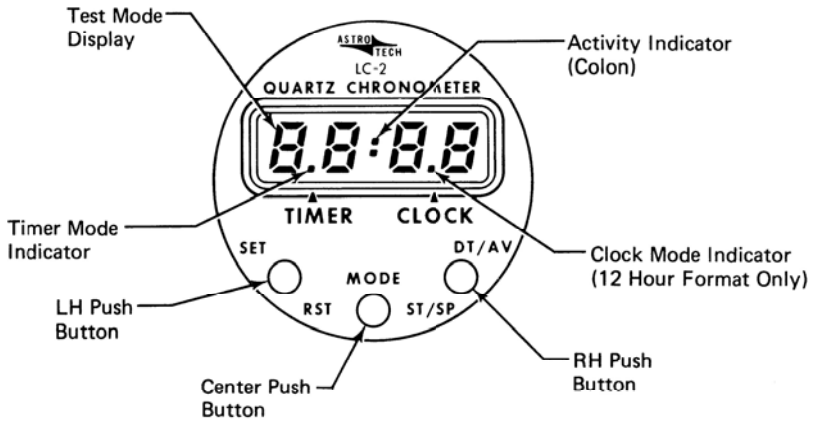


Figure 1. Digital Clock

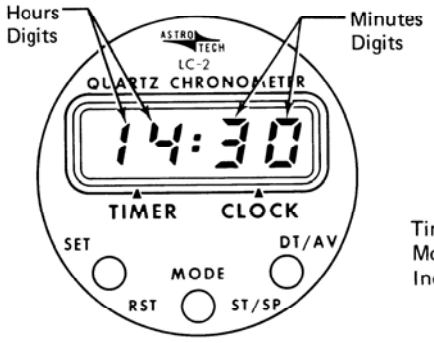
SECTION 4
NORMAL PROCEDURES

CLOCK AND DATE OPERATION

When operating in the clock mode (see figure 2), the display shows the time of day in hours and minutes while the activity indicator (colon) will blink off for one second each ten seconds to indicate proper functioning. If the RH push button is pressed momentarily, while in the clock mode, the calendar date appears numerically on the display with month of year to the left of the colon and day of the month shown to the right of the colon. The display automatically returns to the clock mode after approximately 1.5 seconds. However, if the RH button is pressed continuously longer than approximately two seconds, the display will return from the date to the clock mode with the activity indicator (colon) blinking altered to show continuously or be blanked completely from the display. Should this occur, simply press the RH button again for two seconds or longer, and correct colon blinking will be restored.

NOTE

The clock mode is set at the factory to operate in the 24-hour format. However, 12-hour format operation may be selected by changing the position of an internal slide switch accessible through a small hole on the bottom of the instrument case. Notice that in the 24-hour format, the clock mode indicator does not appear.

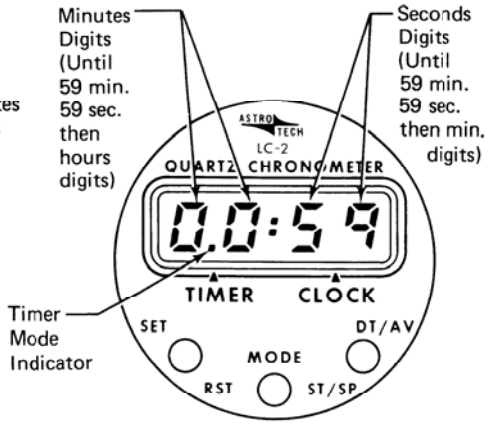


LH Button: Sets date and time of day (when used with RH button).

Center Button: Alternately displays clock or timer status

RH Button: Shows calendar date momentarily; display returns to clock mode after 1.5 seconds.

Figure 2. Clock Mode



LH Button: Resets timer to "zero".

Center Button: Alternately displays clock or timer status

RH Button: Alternately starts and stops timer; timer starts from any previously accumulated total.

Figure 3. Timer Mode

SETTING CORRECT DATE AND TIME

The correct date and time are set while in the clock mode using the LH and RH push buttons as follows: press the LH button once to cause the date to appear with the month flashing. Press the RH button to cause the month to advance at one per second (holding button), or one per push until the correct month appears. Push the LH button again to cause the day of month to appear flashing, then advance as before using RH button until correct day of month appears.

Once set correctly, the date advances automatically at midnight each day. February 29 of each leap year is not programmed into the calendar mode, and the date will advance to March 1. This may be corrected the following day by resetting the mode back to March 1.

Pressing the LH button two additional times will cause the time to appear with the hours digits flashing. Using the RH button as before, advance the hour digits to the correct hour as referenced to a known time standard. Another push of the LH button will now cause the minutes digits to flash. Advance the minutes digits to the next whole minute to be reached by the time standard and "hold" the display by pressing the LH button once more. At the exact instant the time standard reaches the value "held" by the display, press the RH button to restart normal clock timing, which will now be synchronized to the time standard.

In some instances, however, it may not be necessary to advance the minutes digits of the clock; for example when changing time zones. In such a case, do not advance the minutes digits while they are flashing. Instead, press the LH button again, and the clock returns to the normal time keeping mode without altering the minutes timing.

TIMER OPERATION

The completely independent 24-hour elapsed timer (see figure 3) is operated as follows: press the center (MODE) push button until the timer mode indicator appears. Reset the display to "zero" by pressing the LH button. Begin timing an event by pressing the RH button. The timer will begin counting in minutes and seconds and the colon (activity indicator) will blink off for 1/10 second each second. When 59 minutes 59 seconds have accumulated, the timer changes to count in hours and minutes up to a maximum of 23 hours, 59 minutes. During the count in hours and minutes, the colon blinks off for one second each ten seconds. To stop timing the event, press the RH button once again and the time shown by the display is "frozen". Successive pushes of the RH button will alternately restart the count from the "held" total or stop the count at a new total. The hold status of the timer can be recognized by lack of colon activity, either continuously on or continuously off. The timer can be reset to "zero" at anytime using the LH button.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the digital clock is installed.

SUPPLEMENT

GROUND SERVICE PLUG RECEPTACLE

SECTION 1
GENERAL

The ground service plug receptacle permits the use of an external power source for cold weather starting and during lengthy maintenance work on the electrical and avionics equipment. The receptacle is located behind a door adjacent to the firewall on the left side of the upper cowl.

A special fused circuit is included with the ground service receptacle which will close the battery contactor when external power is applied with the master switch turned on. This circuit is intended as a servicing aid when battery power is too low to close the contactor, and should not be used to avoid performing proper maintenance procedures on a low battery.

NOTE

Use of the ground service plug receptacle for starting an airplane with a "dead" battery or charging a "dead" battery in the airplane is not recommended. The battery should be removed from the airplane and serviced in accordance with maintenance manual procedures. Failure to observe this precaution could result in loss of electrical power during flight.

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located on the inside of the ground service plug access door:

CAUTION 24 VOLTS D.C.
This aircraft is equipped with alternator and a negative ground system.
OBSERVE PROPER POLARITY
Reverse polarity will damage electrical components.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the ground service plug receptacle is installed.

SECTION 4
NORMAL PROCEDURES

Just before connecting an external power source (generator type or battery cart), the master switch should be turned ON.

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand within the arc of the propeller, since a loose or broken wire or a component malfunction could cause the propeller to rotate.

Turning on the master switch is especially important since it will enable the battery to absorb transient voltages which otherwise might damage the transistors in the avionics equipment.

The following check should be made after engine start and removal of the external power source, if there is any question as to the condition of the battery.

1. Master Switch -- OFF.
2. Taxi and Landing Light Switches -- ON.
3. Engine RPM -- REDUCE to idle.
4. Master Switch -- ON (with taxi and landing lights turned on).
5. Engine RPM -- INCREASE to approximately 1500 RPM.
6. Ammeter and Low-Voltage Warning Light -- CHECK.

NOTE

If the ammeter does not show a charge or the low-voltage warning light does not go out, the battery should be removed from the airplane and properly serviced prior to flight.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the ground service plug receptacle is installed.

SUPPLEMENT

STROBE LIGHT SYSTEM

SECTION 1
GENERAL

The high intensity strobe light system enhances anti-collision protection for the airplane. The system consists of two wing tip-mounted strobe lights (with integral power supplies), a two-position rocker switch labeled STROBE LTS on the left switch and control panel, and a 5-ampere push-to-reset circuit breaker on the right switch and control panel.

SECTION 2
LIMITATIONS

Strobe lights must be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when strobe lights are installed.

SECTION 4
NORMAL PROCEDURES

To operate the strobe light system, proceed as follows:

1. Master Switch -- ON.
2. Strobe Light Switch -- ON.

SECTION 5
PERFORMANCE

The installation of strobe lights will result in a minor reduction in cruise performance.

SUPPLEMENT

WINTERIZATION KIT

SECTION 1
GENERAL

The winterization kit consists of two cover plates to partially cover the cowl nose cap opening, two placards to be installed on the cover plates, insulation for the engine crankcase breather line, and a placard to be installed on the map compartment door. This equipment should be installed for operations in temperatures consistently below 20°F (-7°C). Once installed, the crankcase breather insulation is approved for permanent use, regardless of temperature.

SECTION 2
LIMITATIONS

The following information must be presented in the form of placards when the airplane is equipped with a winterization kit.

1. On each cover plate:

REMOVE WHEN OAT EXCEEDS 20°F

2. On the map compartment door in the cabin:

WINTERIZATION KIT MUST BE REMOVED WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 20°F.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the winterization kit is installed.

SECTION 4
NORMAL PROCEDURES

There is no change to the airplane normal procedures when the winterization kit is installed.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the winterization kit is installed.

SUPPLEMENT
AUDIO CONTROL PANELS

SECTION 1
GENERAL

Two types of audio control panels (see figure 1) are available for this airplane. One type of control panel is installed without an intercom system or 400 marker beacon system and the other type control panel is installed anytime an intercom option or 400 marker beacon option is installed. The operational features of both audio control panels are similar and are discussed in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

When the avionics package includes two transmitters, a two-position toggle-type switch, labeled TRANS SELECT or XMTR (depending upon which audio control panel is installed, see figure 1), is provided to switch the microphone to the transmitter the pilot desires to use.

The action of selecting a particular transmitter using the transmitter selector switch simultaneously selects the audio amplifier associated with that transmitter to provide speaker audio. For example, if the number one transmitter is selected, the audio amplifier in the number one NAV/COM is also selected and is used for ALL speaker audio. Headset audio is not affected by audio amplifier operation.

AUDIO SELECTOR SWITCHES

Both audio control panels (see figure 1) incorporate three-position toggle-type audio selector switches for individual control of the audio systems installed in the airplane. These switches allow receiver audio to be directed to the airplane speaker or to a headset, and heard singly or in combination with other receivers. To hear a particular receiver on the airplane speaker, place that receiver's audio selector switch in the up (SPEAKER) position. To listen to a receiver over the headset, place that receiver's audio selector switch in the down (PHONE) position. The center (OFF) position turns off all audio from the associated receiver.

NOTE

Volume level is adjusted using the individual receiver volume controls on each radio.

When the audio control panel used without marker beacon or intercom is installed, audio from both NAV and COM frequencies is combined, and is selected by the audio selector switches labeled NAV/COM, 1 and 2.

A special feature of the audio control panel used with marker beacon, or intercom, is separate control of NAV and COM audio from the NAV-/COM radios. With this installation, the audio selector switches labeled NAV, 1 and 2 select audio from the navigation receivers of the NAV/COM radios only. Communication receiver audio is selected by the switches labeled COM, AUTO and BOTH. Description and operation of these switches is described in figure 1.

COM AUTO AUDIO SELECTOR SWITCH

If the audio control panel incorporates marker beacon controls or intercom, a three-position toggle switch, labeled COM AUTO, is provided to automatically match the audio of the appropriate communications receiver to the radio selected by the transmitter selector switch.

COM BOTH AUDIO SELECTOR SWITCH

If the audio control panel incorporates marker beacon controls or intercom, a three-position toggle switch, labeled COM BOTH, is provided to allow both COM receivers to be monitored at the same time.

ANNUNCIATOR LIGHTS BRIGHTNESS AND TEST SWITCH

When a marker beacon receiver is installed, the audio control panel includes a three-position toggle-type switch to control the brightness level of the marker beacon indicator lights when placed in either NITE, or DAY position and a TEST position to verify marker beacon indicator light operation.

NOTE

A potentiometer is installed inside the audio control panel to provide further minimum light dimming capabilities. Refer to the appropriate Avionics Service/Parts manual for adjustment procedure.

SIDETONE OPERATION

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). While adjusting sidetone on either audio control panel, be aware that if the speaker sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

On airplanes not equipped with marker beacon receivers or intercom, a control for speaker sidetone volume only is provided on the audio control panel. To adjust the level of the sidetone heard on the speaker, rotate the knob, labeled SIDETONE VOL, clockwise to increase volume or counterclockwise to decrease it. Sidetone provided through the headset is not adjustable by the pilot on audio control panels without marker beacon.

On the audio control panel incorporating marker beacon controls or intercom, sidetone is provided in both the speaker and headset anytime the COM AUTO selector switch is utilized. Placing the COM AUTO selector switch in the OFF position will eliminate sidetone. Sidetone internal adjustments are available to the pilot through the front of the audio control panel (see figure 1). Adjustment can be made by removing the appropriate plug-button from the audio control panel (left button for headset adjustment and right button for speaker adjustment), inserting a small screwdriver into the adjustment potentiometer and rotating it clockwise to increase the sidetone volume level.

OPTIONAL INTERCOM SYSTEM

The optional intercom system is a pilot and copilot intercom phone system which is only offered with the marker beacon type audio control panel. The system incorporates its own audio amplifier with a volume control (labeled INT) and a "hot mike" feature.

The intercom system is used with the headphones only and plug-ins for the two sets of auxiliary phone and mike jacks are located under the front edge at the bottom center of the instrument panel. They are labeled PHONE and AUX MIKE.

The "hot mike" feature allows the pilot and copilot to communicate at anytime through their microphone/headsets without having to key the mike. However, they must key the mike button on their control wheel to transmit over the aircraft's transceiver. Sidetone is present on the intercom system when the AUTO switch is in the PHONE position.

NOTE

Any ambient noise attenuating type padded headset and boom mike combination is not compatible with this system.

The intercom audio volume is controlled by the INT knob located on the front of the audio control panel. Clockwise rotation of the knob increases the volume of the intercom audio and counterclockwise rotation decreases it. The INT knob controls the audio volume for the intercom system only. Receiver audio volume is adjusted using the individual receiver volume

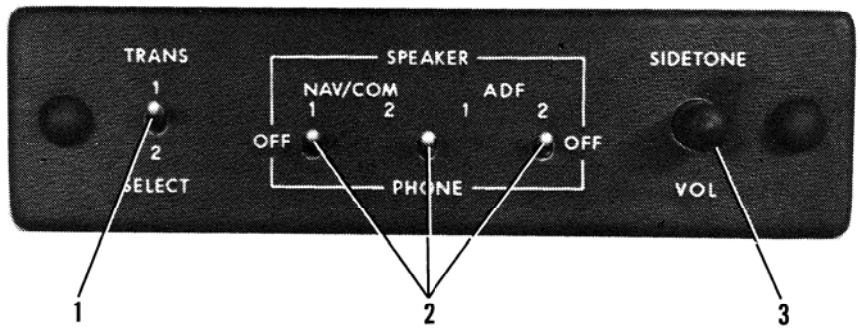
controls. When the intercom system is not being used, the volume control should be turned full counterclockwise to eliminate any noise over the headphones.

NOTE

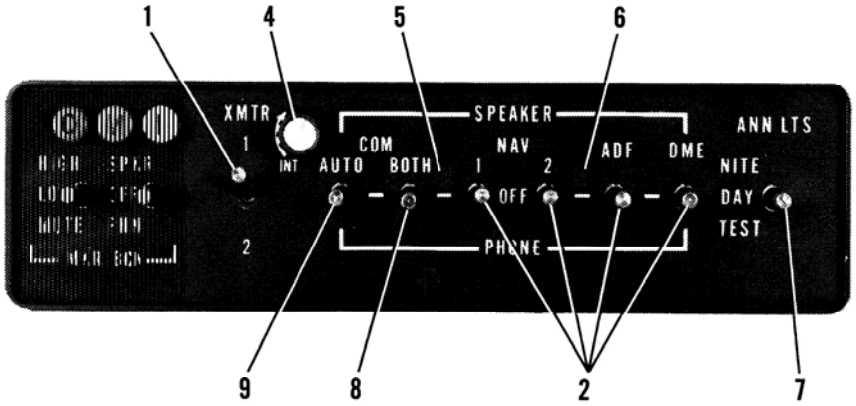
When the intercom volume is turned up and an auxiliary mike is plugged in, there will be a loud squeal over the speaker if the COM BOTH and COM AUTO switches are inadvertently placed in the opposite positions (one in the SPEAKER position and the other in the PHONE position). To eliminate this squeal turn the volume down or place both switches in the same position.

When the optional intercom system is not installed, a plug button will be installed in place of the INT volume control knob.

USED WITHOUT MARKER BEACON OR INTERCOM



USED WITH MARKER BEACON OR INTERCOM



1. TRANSMITTER SELECTOR SWITCH (TRANS SELECT or XMTR) - A two-position toggle switch used to activate the audio amplifier and switch the microphone to the desired transmitter. The numbers 1 (up position) and 2 (down position) corresponds to the first and second (from top to bottom) transmitters, respectively.

Figure 1. Audio Control Panel Operating Controls
(Sheet 1 of 2)

2. AUDIO SELECTOR SWITCHES - Three-position selector switches used to select either SPEAKER or PHONE operation for audio outputs. Enables the operator to select any one or more, audio signals on either SPEAKER or PHONE at the same time or to silence audio when placed in the off position.

3. SPEAKER SIDETONE VOLUME CONTROL (SIDETONE VOL) - Controls speaker sidetone audio volume. Rotate knob clockwise to increase sidetone audio volume or counterclockwise to decrease it.

4. INTERCOM VOLUME CONTROL (INT) - Controls the intercom audio volume. Clockwise rotation of the knob increases the intercom audio volume and counterclockwise rotation decreases it.

5. HEADSET SIDETONE INTERNAL ADJUSTMENT ACCESS - To adjust headset sidetone, remove the plug button, place COM AUTO selector switch in the PHONE position, insert a small screwdriver into the adjustment potentiometer and rotate it clockwise to increase the sidetone volume or counterclockwise to decrease sidetone.

6. SPEAKER SIDETONE INTERNAL ADJUSTMENT ACCESS - To adjust speaker sidetone, remove the plug button, place COM AUTO selector switch in the SPEAKER position, insert a small screwdriver into the adjustment potentiometer and rotate it clockwise to increase the sidetone volume or counterclockwise to decrease sidetone. While adjusting sidetone, be aware that if the sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

7. ANNUNCIATOR LIGHTS BRIGHTNESS SELECTOR AND TEST SWITCH (ANN LTS-NITE/DAY/TEST) - Three-position toggle switch; in the up (NITE) position, annunciator lights (marker beacon indicator lights) will show at a reduced light level for typical night operations. In the center (DAY) position, marker beacon annunciator lights will show full bright. In the down (TEST) position, marker beacon annunciator lights will show full bright to verify lamp operation. In the NITE position, marker beacon annunciator light levels can be further adjusted down to a preset minimum using the RADIO LT dimming rheostat knob.

8. COM BOTH AUDIO SELECTOR SWITCH (COM BOTH) - A three-position toggle switch used to allow both COM receivers to be monitored at the same time. Placing the COM BOTH switch in the up (SPEAKER) position will enable the pilot to monitor both the number 1 and number 2 COM receivers over the SPEAKER at the same time. Placing the switch in the down (PHONE) position allows the pilot to monitor both the number 1 and number 2 COM receivers through the headset at the same time. Center (OFF) position, removes the non-selected COM receiver (or both COM receivers if COM AUTO switch is OFF) from the audio system.

9. COM AUTO AUDIO SELECTOR SWITCH (COM AUTO) - A three-position toggle switch provided to automatically match the audio of the appropriate communications receiver to the transmitter selected by the transmitter selector switch. In the up (SPEAKER) position, audio from the selected receiver will be heard on the airplane speaker. In the down (PHONE) position, audio from the selected receiver will be heard through the headset. Center (OFF) position, removes the automatic SPEAKER/PHONE selection feature and will also disable the sidetone feature.

Figure 1. Audio Control Panel Operating Controls
(Sheet 2 of 2)