

II Morrow Inc.
2345 Turner Rd SE
Salem, OR 97302

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

**FAA Approved Supplementary Airplane Flight Manual
II Morrow Apollo SL50 GPS/SL60 GPS-Comm**

Airplane Make: Partenavia
Airplane Model: P68 Series
Airplane Serial No.:
Registration No.:

This Supplementary Flight Manual must be attached to or with the Registro Aeronautica Italiano (R.A.I.) approved Flight Manual when the Apollo SL50 GPS/SL60 GPS-COMM is installed in accordance with STC **SA00420SE**.

The information contained herein supplements the basic Registro Aeronautica Italiano (R.A.I.) approved Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

FAA Approved: *Lester H. Berven*
for Manager, Seattle Aircraft Certification Office
Northwest Mountain Region

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

Revision Log

Rev	Date	Description	EN	By	FAA Approval	Date
-	03/17/97	Initial release. Word 6.0		RMG	<i>Lester H. Brown</i>	03/31/97

TABLE OF CONTENTS

1. GENERAL.....	4
1.1 APOLLO SL50 GPS/SL60 GPS-COMM DESCRIPTION	4
1.1.1 SL50.....	4
1.1.2 SL60.....	5
1.2 OPERATION.....	5
2. LIMITATIONS	5
3. EMERGENCY/ABNORMAL PROCEDURES.....	7
3.1 EMERGENCY PROCEDURES	7
3.2 ABNORMAL PROCEDURES	7
4. NORMAL PROCEDURES	7
4.1 GENERAL	7
4.2 SYSTEM ANNUNCIATORS	7
4.3 SYSTEM SWITCHES/CONTROLS	8
4.4 PILOT'S DISPLAY	8
4.5 HSI / AUTOPILOT COUPLED OPERATION - NAV SOURCE SELECTION.....	9
4.6 COMM SOURCE SELECTION.....	9
4.7 TO/FROM "OBS" SELECTION	9
4.8 RAIM	9
4.8.1 Enroute RAIM (2.0 nm.).....	9
4.8.2 Terminal RAIM (1.0 nm.)	10
4.9 PARALLEL TRACK	10
4.10 AIRSPACE ALERTS.....	10
5. PERFORMANCE	10
6. WEIGHT AND BALANCE	10
7. SYSTEM DESCRIPTION	10
7.1 APOLLO SL50 GPS/SL60 GPS-COMM SYSTEM COMPONENTS.....	12
7.1.1 Apollo SL50/SL60	12
7.1.2 Apollo SL50.....	12
7.1.3 Apollo SL60.....	12
7.1.4 Circuit Protection	12
7.2 NAVIGATION SOURCE SELECTION	13
7.3 COMM SOURCE SELECTION.....	13
7.4 APOLLO SL50 GPS/SL60 GPS-COMM OPERATION	13
7.4.1 Basic Navigation Data	13
7.4.2 Viewing Messages	13
7.4.3 Direct To -	13
7.4.4 Basic Communication Functions	14

LIST OF ILLUSTRATIONS

FIGURE 1 - APOLLO SL50	4
FIGURE 2 - APOLLO SL60	5
FIGURE 3 APOLLO SL50 GPS/SL60 GPS-COMM ANNUNCIATORS	8
FIGURE 4 SL50/SL60 NAVIGATION SYSTEM BLOCK DIAGRAM.....	11
FIGURE 5 SL60 COMMUNICATIONS SYSTEM BLOCK DIAGRAM.....	11
FIGURE 6 - APOLLO SL50 KEYS/CONTROLS	12
FIGURE 7 - APOLLO SL60 KEYS/CONTROLS	12

1. GENERAL

1.1 APOLLO SL50 GPS/SL60 GPS-COMM DESCRIPTION

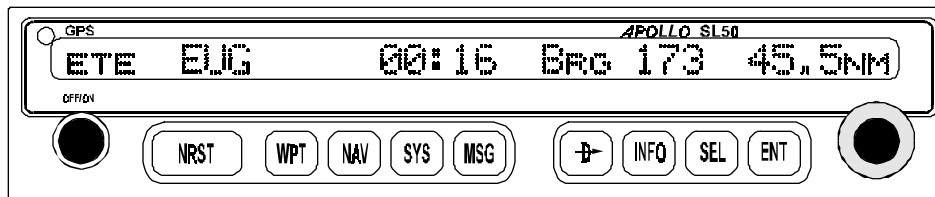
The Apollo SL50 GPS is a TSO-C129 CLASS A2 GPS. It provides for connection to an external annunciator/switch array. The Apollo SL50 GPS can drive a dedicated display such as a CDI/HSI, or it can be coupled to a shared HSI/CDI and autopilot system using navigation source selectors and annunciators. The Apollo SL50 GPS is authorized for IFR/VFR enroute oceanic and remote, enroute domestic, and terminal operation.

The Apollo SL60 contains all navigation functionality of the SL50 and additionally contains VHF airband communications capability with a Mean Time Between Failures (MTBF) for the communications function predicted to be far in excess of 1000 hours. The VHF communication function provides a minimum of 8 Watts of transmit capability.

1.1.1 SL50

The SL50 is a TSO C129 CLASS A2 supplemental navigation system. It interfaces to a non-numeric display (CDI/HSI) and annunciators. It is powered through the aircraft circuit breaker panel and the avionics switches.

Figure 1 - Apollo SL50

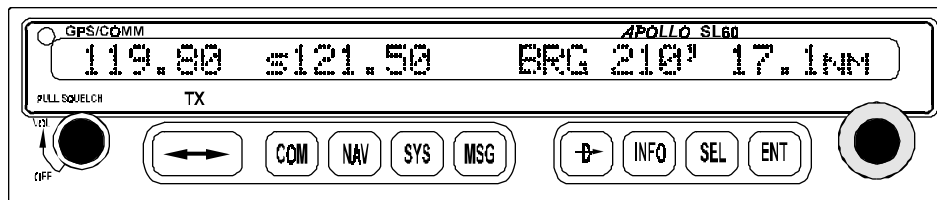


1.1.2 SL60

The SL60 contains the SL50 functionality. In addition it contains airband VHF communications and NOAA weather channel reception capability.

It contains all the interfaces for both the navigation and communications functions. The Comm transceiver function and the GPS function are powered through separate circuits. These are both through the aircraft circuit breaker panel and the avionics master switches.

Figure 2 - Apollo SL60



1.2 OPERATION

Provided the Apollo SL50 GPS/SL60 GPS-COMM is receiving adequate useable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

- a) VFR/IFR enroute oceanic and remote, enroute domestic, and terminal operation using GPS within the U.S. National Airspace System and the North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace using the WGS-84 (or NAD 83) coordinate reference datum in accordance with the criteria of AC 20-138, AC 91-49, and AC 120-33.
- b) The Apollo SL60 additionally provides VHF airband communications capability meeting the requirements of AC 20-67b, Airborne VHF Communications Installations.

2. LIMITATIONS

1. User Manual

The information contained in the User's Guide, Apollo SL50 GPS Receiver, Apollo SL60 GPS Receiver and VHF Comm Transceiver Manual, II Morrow P/N 560-0955-01 (or later approved revision) must be immediately available to the flight crew whenever IFR navigation and/or communication is predicated on the Apollo SL50 GPS/SL60 GPS-COMM system.

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

2. System Software (IFR)

The System must utilize the software version listed below (or later FAA approved versions). Versions can be displayed in the System mode on the SL50 GPS/SL60 GPS-COMM front panel.

- | | |
|---|---------|
| • Apollo SL50 GPS/SL60 GPS Nav Software | Ver 1.0 |
| • GPS Sensor Software | Ver 2.1 |
| • Apollo SL60 only Comm Software | Ver 1.2 |

3. Data Base (IFR)

IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

4. Alternate Navigation System

The aircraft must have other approved navigation equipment installed and operational appropriate to the route of flight.

5. Alternate Communications System

When an Apollo SL60 is installed, for IFR communications, the aircraft must have another independent communication systems having a minimum Mean Time Between Failures (MTBF) of 1000 hours.

6. Magnetic Variation

- a) The magnetic variation (MagVar) correction is not available in the Apollo SL50 GPS/SL60 GPS-COMM above 73 degrees North or below 73 degrees South latitude. All bearing and track information is computed and displayed relative to true north in these polar regions.
- b) If the "Using Manual MAG VAR" message is generated by the Apollo SL50 GPS/SL60 GPS-COMM, the Pilot/Crew must verify or set the manual magnetic variation to the appropriate value.

7. Annunciated Messages (IFR)

All annunciated messages, indicated by the MSG annunciator, must be viewed and acknowledged by the pilot/crew.

8. Display/Annunciators/Indicators (IFR)

Prior to IFR flight, the SL50 GPS/SL60 GPS-COMM display and all annunciators and CDI/HSI indicators must be checked for proper operation. (**Note:** The SL50 GPS/SL60 GPS-COMM automatically sequences through a series of start-up tests that include operational checks of the display, annunciators, flags, and CDI/HSI indicators.)

9. Non-Navigation Information

All non-navigation information displayed by the SL50 GPS/SL60 GPS-COMM, such as timer/clock and waypoint information (frequencies, runways, etc.) is advisory information only.

10. Foreign Airspace

FAA approval of the Apollo SL50 GPS/SL60 GPS-COMM does not necessarily constitute approval for use in foreign airspace.

3. EMERGENCY/ABNORMAL PROCEDURES

3.1 EMERGENCY PROCEDURES

No change. Refer to approved Airplane Flight Manual.

3.2 ABNORMAL PROCEDURES

1. Invalid Nav Data

If the Apollo SL50 GPS/SL60 GPS-COMM navigation information is not available or is invalid (flagged), utilize remaining operational navigation equipment as required.

2. RAIM Not Available

If a “RAIM Not Available” message is displayed, continue to navigate using the GPS equipment or revert to an alternate means of navigation appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using visual reference or another IFR-approved navigation system.

4. NORMAL PROCEDURES

4.1 GENERAL

The normal operating procedures for the Apollo SL50 GPS/SL60 GPS-COMM are outlined in the Apollo SL50 GPS/SL60 GPS-COMM User’s Manual listed under Limitation 1.

4.2 SYSTEM ANNUNCIATORS

The Apollo SL50 GPS/SL60 GPS-COMM is connected to two annunciators in an array of six annunciators located in the upper left of the aircraft instrument panel. The annunciators are illustrated in Figure 3. The brightness of the annunciators is controlled by a toggle switch labeled “Day/Night” located directly above the annunciators. These annunciators are shared by the Apollo 2001 NMS (NMC2). **When the Apollo SL50/SL60 is selected as the navigation source, only the MSG, and PTK annunciators are connected.** The GPS, APPRCH, and ACTIVE annunciators and the OBS/HLD annunciator/switch are used only when the Apollo 2001 is selected as the navigation source. The OBS/HLD annunciator switch is optional for the Apollo SL50/SL60 and is not used in this installation. The function of the six annunciators is as follows:

a) MSG (amber)

The MSG annunciator is illuminated to indicate messages are still active. The annunciator flashes to indicate a new message that has not been viewed.

b) GPS (amber) N/A

Used only by multi-sensor navigation systems which include GPS. The GPS annunciator is illuminated when GPS is **not available or not** in use. (Not used by the Apollo SL50/SL60).

c) PTK (blue)

The PTK annunciator is illuminated when parallel track offset is in use.

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

d) OBS/HLD (blue) N/A

The OBS/HLD annunciator is illuminated to indicate waypoint sequencing is on hold. Waypoint sequencing hold can be enabled/disabled by pressing the waypoint sequencing/hold annunciator button. (Not used by the SL50/SL60 in this installation).

e) APPRCH (blue) N/A

Used only for systems with GPS approach capability. (Not used by the Apollo SL50/SL60).

f) ACTIVE (green) N/A

Used only for systems with GPS approach capability. (Not used by the Apollo SL50/SL60).

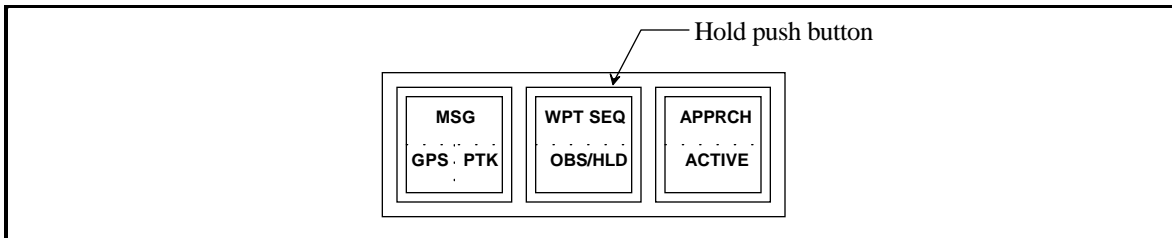


Figure 3 Apollo SL50 GPS/SL60 GPS-COMM Annunciators

4.3 SYSTEM SWITCHES/CONTROLS

The switches and controls for the SL50 GPS/SL60 GPS-COMM system include the navigation source selector switches (described in section 4.5), and the controls on the front panel of the SL50 GPS/SL60 GPS-COMM (described in the Apollo SL50 GPS/SL60 GPS-COMM User's Manual).

4.4 PILOT'S DISPLAY

- a) The primary navigation display for the SL50 GPS/SL60 GPS-COMM is the HSI located in the pilot's primary instrument scan area as are the system annunciators. Cross-track deviation, to/from indication, and validity are displayed on the HSI. Valid flag outputs are provided for the cross-track deviation.
- b) Messages and all other available information as described in the Apollo SL50 GPS/SL60 GPS-COMM operating manual such as distance to waypoint, groundspeed, time to waypoint, and waypoint and flightplan information is available on the Apollo SL50 GPS/SL60 GPS-COMM front panel.

4.5 HSI / AUTOPILOT COUPLED OPERATION - NAV SOURCE SELECTION

The installation allows for pilot selection of the navigation source for coupling to the HSI / autopilot. The available sources that can be selected are:

- NAV1
- SL50/SL60
- NMC 2

The procedure for selecting the navigation source is as follows.

a) To select NAV1

Press the switch labeled “AUX NAV / NAV1” so that “NAV1” is illuminated.

b) To select SL50 GPS/SL60 GPS-COMM

Press the switch labeled “AUX NAV / NAV1” so that “AUX NAV” is illuminated and press the switch labeled “SL50-SL60 / NMC 2” so that “SL50 / SL60” is illuminated.

c) To select NMC 2

Press the switch labeled “AUX NAV / NAV1” so that “AUX NAV” is illuminated and press the switch labeled “SL50-SL60 / NMC 2” so that “NMC 2” is illuminated.

When an SL50 GPS/SL60 GPS-COMM is selected as the HSI navigation source, the HSI course pointer must be manually turned to the desired track as indicated by the Apollo SL50 GPS/SL60 GPS-COMM. For autopilot operation, refer to the autopilot operator’s manual.

4.6 COMM SOURCE SELECTION

The SL60 is selected as the active communications radio by selecting Comm 1 on the existing audio panel.

4.7 TO/FROM “OBS” SELECTION

When waypoint sequencing is suspended a desired course to or from the active waypoint can be selected by pressing the Direct-to key twice, entering the course with the large and small knobs, and pressing enter. Selecting a desired “OBS” to/from course when sequencing is not suspended, will automatically suspend sequencing.

4.8 RAIM

RAIM stands for Receiver Autonomous Integrity Monitor. It provides a method whereby the receiver can provide an integrity check, using more satellites than are needed for a position solution. This integrity check protects you from position errors caused by failed satellites or bad GPS satellite data. RAIM is based on an allowed limit of horizontal position difference called the RAIM alarm limit. Two different RAIM limits are used in the Apollo SL50 GPS/SL60 GPS-COMM corresponding to the phase of flight:

4.8.1 Enroute RAIM (2.0 nm.)

Enroute RAIM alarm limit is 2.0 nm. During the enroute phase of flight a RAIM alarm will mean that an error of 2.0 nm. or greater, caused by bad satellite data, has been detected.

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

4.8.2 Terminal RAIM (1.0 nm.)

Terminal RAIM alarm limit of 1.0 nm is automatically provided by the Apollo SL50 GPS/SL60 GPS-COMM when you are within 30 nm. radial distance of your departure or destination airport as contained in the active flight plan.

4.9 PARALLEL TRACK

When the parallel track feature (PTK) is activated, navigation is predicated on a course offset from the parent route by the selected parallel track distance. The PTK annunciator will be continuously on when the PTK feature is active. All navigation data, such as bearing and distance to active waypoint, is calculated and displayed relative to the “phantom” active waypoint parallel to the actual waypoint. Use of the Direct-to feature or entering a desired “OBS” course relative to the active waypoint automatically cancels PTK and extinguishes the PTK annunciator.

4.10 AIRSPACE ALERTS

Airspace alerts [set under System Mode - Navigation Info] should be set to “OFF” for IFR operations to prevent unnecessary airspace alert messages.

5. PERFORMANCE

No change. Refer to the approved Airplane Flight Manual.

6. WEIGHT AND BALANCE

Refer to the current aircraft weight and balance information.

7. SYSTEM DESCRIPTION

The **Apollo SL50 GPS/SL60 GPS-COMM** is a TSO C129 GPS navigation system. The SL60 is also a TSO C37d, C38d and C128 VHF Airband Communications system. The SL50 GPS/SL60 GPS-COMM system is installed using the guidelines of AC 20-138 for the GPS navigation functions and AC 20-67b for the communications functions. The SL50 GPS/SL60 GPS-COMM system is illustrated in Figure 4 SL50/SL60 Navigation System Block Diagram (GPS navigation) and in Figure 5 SL60 Communications System Block Diagram (Comm functions).

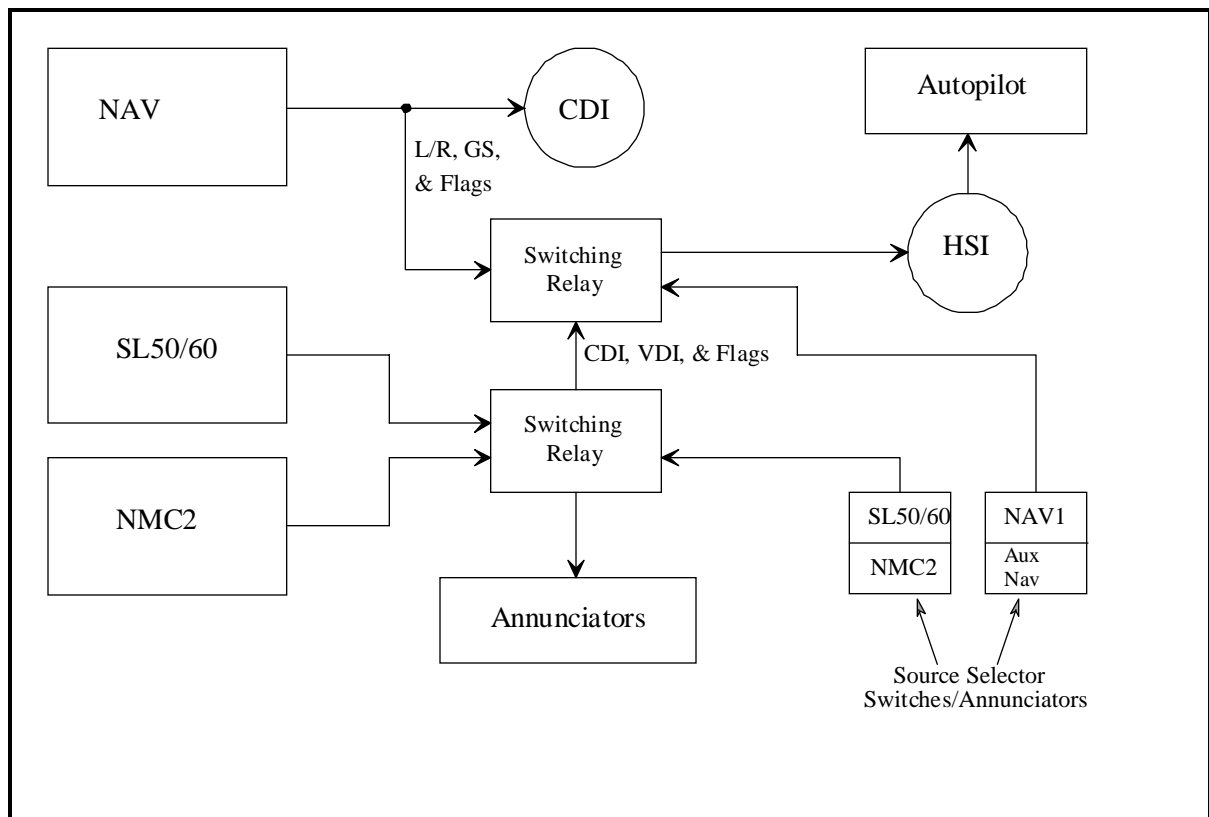


Figure 4 SL50/SL60 Navigation System Block Diagram

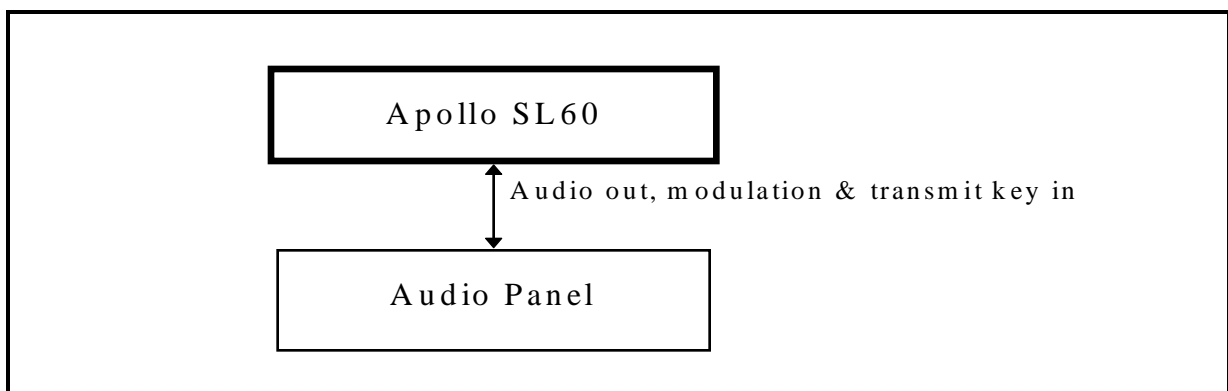


Figure 5 SL60 Communications System Block Diagram

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

7.1 APOLLO SL50 GPS/SL60 GPS-COMM SYSTEM COMPONENTS

7.1.1 Apollo SL50/SL60

The **Apollo SL50 GPS/SL60 GPS-COMM** is the main control, display, and navigation computer for the Apollo SL50 GPS/SL60 GPS-COMM system. The SL50 GPS/SL60 GPS-COMM also includes outputs and drivers for connection to external CDI/HSI indicators, autopilots, and system annunciators. The database for the SL50 GPS/SL60 GPS-COMM is contained on an internal database which can be updated from a Personal Computer (PC). Data is available on the standard ARINC 28-day update cycle.

7.1.2 Apollo SL50

The **Apollo SL50** is a TSO C129 CLASS A2 GPS navigation system.

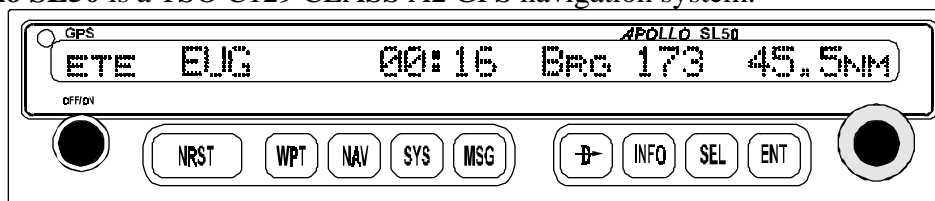


Figure 6 - Apollo SL50 Keys/Controls

7.1.3 Apollo SL60

The **Apollo SL60** contains the same buttons, knobs and display as the Apollo SL50 GPS; however, the key labeled NRST on the Apollo SL50 is labeled with a double-ended arrow on the SL60 and is used to “flip-flop” the active and standby communications frequency. The nearest function on the SL60 is reached through a top level page under NAV mode or in a short-cut method by pressing MSG twice. The key labeled WPT on the SL50 is labeled COM on the SL60 and is used to select and display the Comm functions. The WPT function on the SL60 is available from a top-level page under SYS mode. The knob in the lower-left corner of the SL60 functions both as the power switch (as it also does on the SL50) and as the VHF airband radio audio volume control.

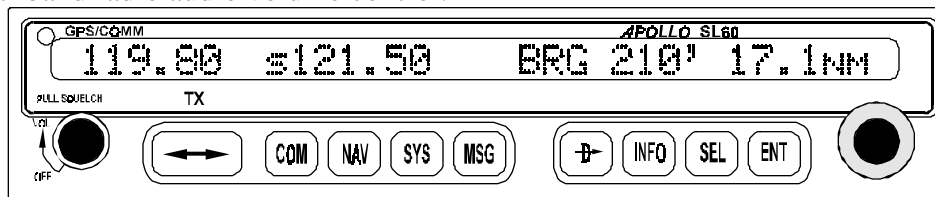


Figure 7 - Apollo SL60 Keys/Controls

7.1.4 Circuit Protection

Circuit breakers for SL50 GPS/SL60 GPS-COMM navigation and communication functions are located in the circuit breaker panel to the left of the pilot and can be pulled or reset

during flight. The circuit breaker for the navigation functions is labeled SL50/SL60. The circuit breaker for the communications function is labeled Comm 1.

7.2 NAVIGATION SOURCE SELECTION

The Apollo SL50 GPS/SL60 GPS-COMM system is connected to the aircraft HSI indicator and autopilot systems using switching relays and source selection switches. The navigation source selection connections are illustrated in Figure 4 SL50/SL60 Navigation System Block Diagram. The procedure for selecting the navigation source is included in section 4.5 on page 8.

7.3 COMM SOURCE SELECTION

The SL60 is selected as the communications source by selecting COM 1 on the existing audio panel.

7.4 APOLLO SL50 GPS/SL60 GPS-COMM OPERATION

This section highlights several of the basic operational features of the Apollo SL50 GPS/SL60 GPS-COMM. Refer to the user manual listed in Limitation 1 for complete operating instructions.

7.4.1 Basic Navigation Data

The basic navigation data can be selected on the SL50 GPS/SL60 GPS-COMM display by pressing the NAV button (twice), then rotating the SMALL knob to view the navigation pages. The basic navigation data available includes:

- Bearing and distance to the next waypoint
- Cross track error bar graph and numeric display
- Ground speed and track angle
- ETE (estimated time enroute) to the next waypoint

7.4.2 Viewing Messages

To view messages, press the MSG button, rotate the LARGE knob to select “new” or “old” messages, and rotate the SMALL knob to view the messages.

The MSG annunciator is illuminated when there are active messages, flashing when there are new messages. “Old” messages are those messages that have already been viewed as a “new” message.

7.4.3 Direct To -

a) Waypoint Entry

To enter a waypoint as the next waypoint, press the DIRECT-TO button, rotate the LARGE and SMALL knobs to select the desired waypoint, and press ENT.

b) “OBS” Entry

To enter a bearing to or from the active “To” waypoint, press the DIRECT-TO button twice, rotate the LARGE and SMALL knobs to select the desired course, and press ENT. If waypoint sequencing was not already suspended (OBS/HLD annunciator illuminated), entering a

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

II Morrow Inc.
2345 Turner Rd. SE
Salem, OR 97302

to/from bearing will automatically suspend sequencing and the OBS/HLD annunciator will illuminate.

Note: When you cross a waypoint the first time when sequencing is suspended, a message will be generated to remind you to enter the desired inbound course for your hold. This message will ask you to press ENT to enter your inbound course or any other key to ignore the message. Pressing ENT when this message is displayed will result in displaying the course entry page, just as if you had pressed Direct-To button twice.

7.4.4 Basic Communication Functions

a) Comm functions

To select the comm function display on the SL60 press the button labeled Comm. Pressing Comm again, when in the Comm mode will activate the standby frequency monitor and an 'M' will be displayed by the standby frequency. The standby frequency will be monitored by the audio output, with a slightly reduced volume and audio quality, unless there is activity on the active frequency.

b) Flip Flop Key

Pressing the flip flop key will transfer the standby frequency to the active frequency and vice-versa.

c) Standby Frequency Selection

The standby frequency may be selected by using the large and small knobs. The standby frequency may also be selected from "stacks" of available frequencies for waypoints, last-used list, user-stored list, weather channels, and the emergency channel (121.50). Refer to the user's manual listed in Limitation 1., for details.

d) Optional

The Apollo SL60 may optionally connected to an external frequency flip-flop switch which duplicates the function of the flip-flop key. It may also provide internal 2-place intercom capability when installed in aircraft without existing intercom systems. These features are not used for this installation.

II Morrow Inc.
2345 Turner Rd SE
Salem, OR 97302

**Airplane Flight Manual Supplement
for II Morrow Apollo SL50/SL60**

March 17, 1997
Part #: 560-1006-00

THIS PAGE INTENTIONALLY BLANK

