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FAA Approved Supplementary Airplane Flight Manual
II Morrow Apollo GX55 GPS

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

This Supplementary Flight Manual must be attached to or with the Regsitro Aeronautica Italiano (R.A.I.) approved Flight Manual when the Apollo GX55 GPS is installed for IFR use in accordance with STC **SA00464SE** .

The information contained herein supplements the basic Regsitro 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

Revision Log

Rev	Date	Description	EN	By	FAA Approval	Date
00 -	06/16/97	Initial release. Word 6.0. Duplex Print Long Edge Binding. HP LaserJet 4Si/4SiMX PS 600 dpi. Note: No release without FAA approval.	5687	RMG	Tim Seeley	AUG 13 1997
01 -	03/03/99	Modified for navigation software version 3.0. Added references to RNP-5 qualifications as defined for European B-RNAV (AC 90-96 & JAA TGL No. 2)	6068	RDG	Judith Bowen	21 June 1999

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1 GENERAL

1.1 APOLLO GX55 GPS DESCRIPTION

The Apollo GX55 GPS is a TSO-C129 Class A(2) GPS. It provides for connection to an external annunciator/switch array. The Apollo GX55 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 GX55 GPS is authorized for IFR/VFR enroute oceanic and remote, enroute domestic, and terminal operation.

The Apollo GX55, if GPS software is version 2.3 (or later FAA-approved version), meets all requirements for RNP-5/B-RNAV operations in accordance with FAA AC 90-96 and JAA TGL No. 2 revision 1 (or later).

The GX55 is a TSO-C129 Class A(2) 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. It also provides an internal moving map display.

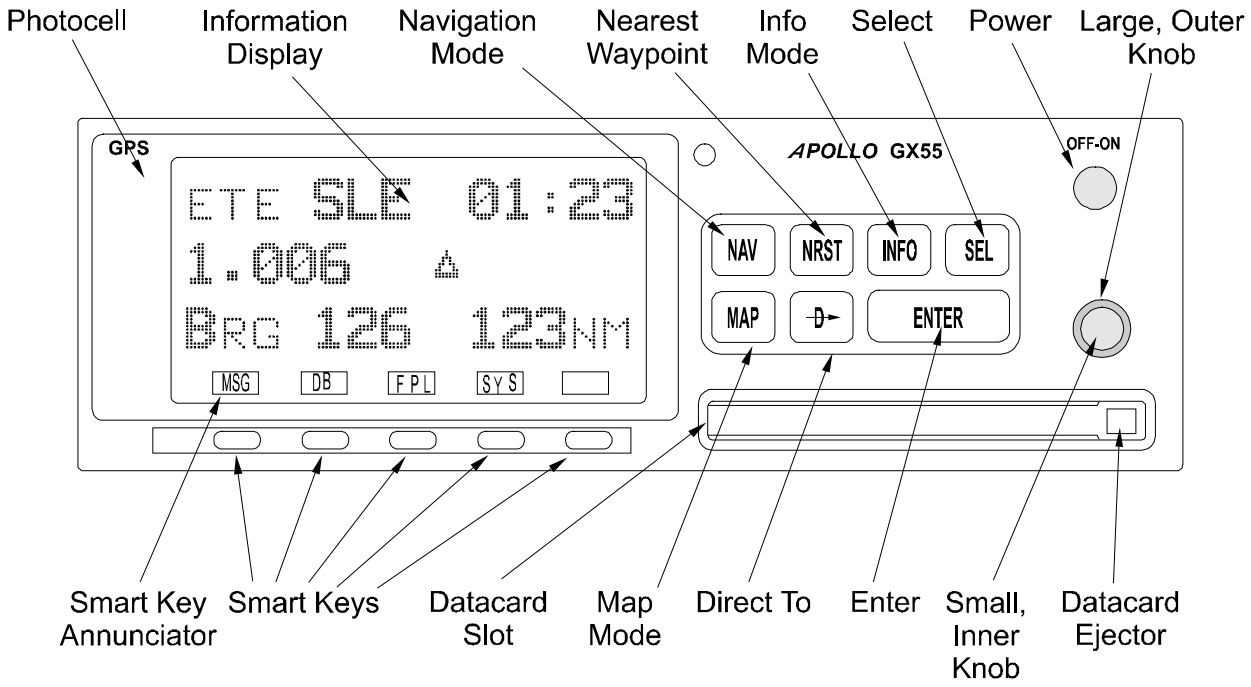

Figure 1: Apollo GX55

1.2 OPERATION

Provided the Apollo GX55 GPS is receiving adequate useable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications of:

- 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.
- RNP-5/B-RNAV Operations as defined in AC 90-96 & JAA TGL 2 (requires GPS software version 2.3 or later FAA-approved version).

2 LIMITATIONS

2.1 USER MANUAL

The manuals, or the information contained in the manuals listed below (or later FAA-approved revisions), must be immediately available to the flight crew whenever navigation is predicated on the Apollo GX55 system.

Nav Software Version 1.0

- Apollo GX Model 55 User's Guide ..... P/N 560-0962-00

Nav Software Version 2.1

- Apollo GX Models 50, 55, & 60 User's Guide..... P/N 560-0961-00

Nav Software Version 2.2

- Apollo GX Models 50, 55, 60, & 65 User's Guide... P/N 560-0961-01

Nav Software Version 3.0

- Apollo GX Models 50, 55, 60, & 65 User's Guide... P/N 560-0961-02

2.2 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 GX55 GPS front panel.

- Apollo GX55 GPS Nav Software ..... Ver 1.0, 2.1, 2.2, or 3.0 (139-0235-030)
- GPS Sensor Software ..... Ver 2.1 or Ver 2.3

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.

2.4 ALTERNATE NAVIGATION SYSTEM

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

2.5 MAGNETIC VARIATION

a) The magnetic variation (MagVar) correction is not available in the Apollo GX55 GPS 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 GX55 GPS, the Pilot/Crew must verify or set the manual magnetic variation to the appropriate value.

2.6 ANNUNCIATED MESSAGES (IFR)

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

2.7 DISPLAY/ANNUNCIATORS/INDICATORS (IFR)

Prior to IFR flight, the GX55 GPS display and all annunciators and CDI/HSI indicators must be checked for proper operation. (**Note:** The GX55 GPS automatically sequences through a series of start-up tests that include operational checks of the display, annunciators, flags, and CDI/HSI indicators.)

2.8 NON-NAVIGATION INFORMATION

All non-navigation information displayed by the GX55 GPS, such as timer/clock and waypoint information (frequencies, runways, etc.) is advisory information only.

2.9 FOREIGN AIRSPACE

FAA approval of the Apollo GX55 GPS does not necessarily constitute approval for use in foreign airspace.

2.10 RNP-5/B-RNAV OPERATIONS

If 22 or fewer GPS satellites are projected to be operational for the flight, then RAIM detection availability for the flight must be confirmed using II Morrow Mission Planning Software, P/N 139-0240-012 and Mission Planning for Windows User's Guide 560-0177-00 (or later FAA-approved revisions).

3 EMERGENCY/ABNORMAL PROCEDURES

3.1 EMERGENCY PROCEDURES

No change. Refer to approved Airplane Flight Manual.

3.2 ABNORMAL PROCEDURES

3.2.1 Invalid Nav Data

If the Apollo GX55 GPS navigation information is not available or is invalid (flagged), utilize remaining operational navigation equipment as required.

3.2.2 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 GX55 GPS are outlined in the Apollo GX Series User's Manual listed under Limitation 1.

4.2 SYSTEM ANNUNCIATORS

The Apollo GX55 GPS 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 2. 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. **When the Apollo GX55 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.

a) MSG
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 (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 GX55).

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

d) OBS/HLD (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 Apollo GX55).

e) APPRCH (N/A)
Used only for systems with GPS approach capability. (Not used by the Apollo GX55).

f) ACTIVE (N/A)
Used only for systems with GPS approach capability. (Not used by the Apollo GX55).

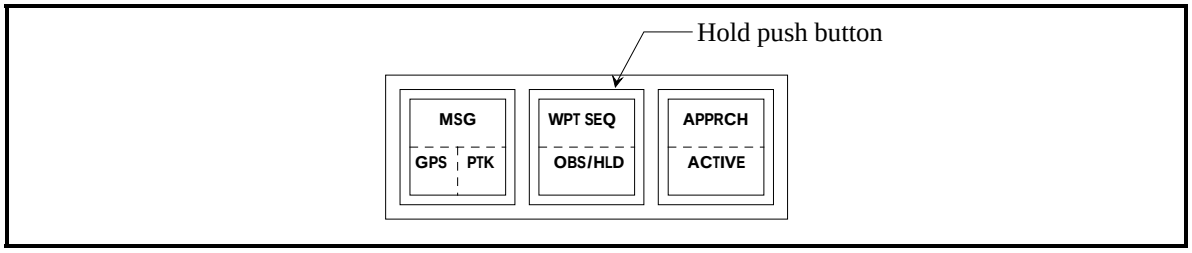

Figure 2: Apollo GX55 GPS Annunciators

4.3 SYSTEM SWITCHES/CONTROLS

The switches and controls for the GX55 GPS system include the navigation source selector switches (described in section 4.5), and the controls on the front panel of the GX55 GPS (described in the Apollo GX User's Guide).

4.4 PILOT'S DISPLAY

a) The primary navigation display for the GX55 GPS 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) The primary display for navigating DME arcs may be the HSI, the DME arc assist page available on the GX55 front panel, and/or the moving map.
c) Messages and all other available information as described in the Apollo GX55 GPS operating manual such as distance to waypoint, groundspeed, time to waypoint, and waypoint and flightplan information are available on the Apollo GX55 GPS 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
- GX_GPS
- 2001

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 GX55 GPS
Press the switch labeled "AUX NAV / NAV1" so that "AUX NAV" is illuminated and press the switch labeled "GX_GPS / 2001" so that "GX_GPS" is illuminated.

c) To select 2001
Press the switch labeled "AUX NAV / NAV1" so that "AUX NAV" is illuminated and press the switch labeled "GX_GPS / 2001" so that "2001" is illuminated.

When the GX55 GPS is selected as the HSI navigation source, the HSI course pointer must be manually turned to the desired track as indicated by the Apollo GX55 GPS. For autopilot operation, refer to the autopilot operator's manual.

4.6 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.

4.7 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 GX55 GPS corresponding to the phase of flight:

4.7.1 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.

4.7.2 Terminal RAIM (1.0 nm.)

Terminal RAIM alarm limit of 1.0 nm is automatically provided by the Apollo GX55 GPS when you are within 30 nm. radial distance of your departure or destination airport as contained in the active flight plan.

4.8 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. When PTK is in use, the route line drawn on the moving map display represents the parallel course.

The Apollo GX55 will not allow the activation of the parallel track feature if the active flightplan has a future turn of more than 120 degrees or if a flightplan "doubles back" with a series of turns all less than 120 degrees and that would cause the parallel offset course to overlap itself.

4.9 AIRSPACE ALERTS

Airspace alerts [set under MAP Mode - Airspace Setup] 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 GX55 GPS** is a TSO-C129 Class A(2) GPS navigation system. The GX55 GPS system is installed using the guidelines of AC 20-138. The GX55 GPS system is illustrated in Figure 3: GX55 Navigation System Block Diagram.

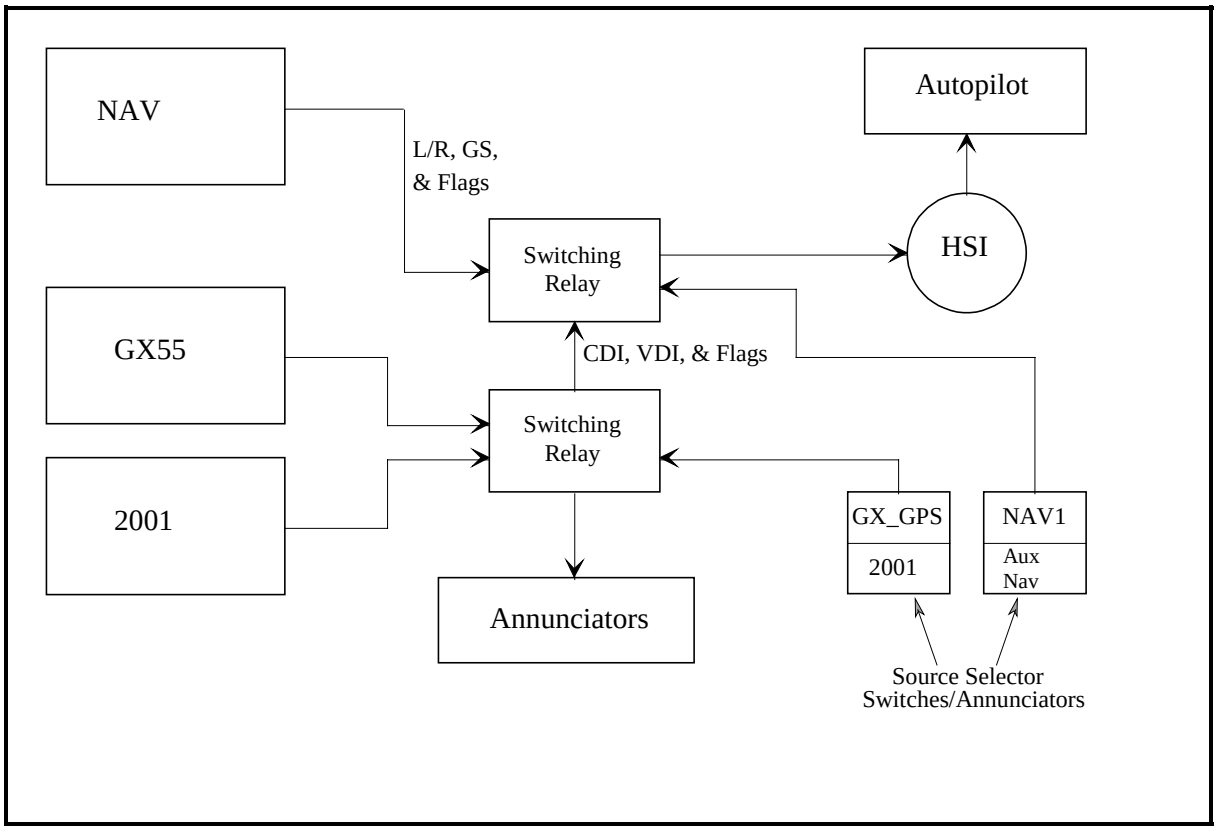

Figure 3: GX55 Navigation System Block Diagram

7.1 APOLLO GX55 GPS SYSTEM COMPONENTS

7.1.1 Apollo GX55

The **Apollo** GX55 GPS is the main control, display, and navigation computer for the Apollo GX55 GPS system. The GX55 GPS also includes outputs and drivers for connection to external CDI/HSI indicators, autopilots, and system annunciators. The database for the GX55 GPS is contained on a user replaceable database card. Data is available on the standard AIRAC 28-day update cycle.

7.1.2 Circuit Protection

The circuit breaker for the Apollo GX55 GPS navigation system is 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 GX55.

7.2 NAVIGATION SOURCE SELECTION

The Apollo GX55 GPS 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 3: GX55 Navigation System Block Diagram. The procedure for selecting the navigation source is included in section 4.5 on page 10.

7.3 APOLLO GX55 GPS OPERATION

This section highlights several of the basic operational features of the Apollo GX55 GPS. Refer to the user manual listed in Limitation 1 for complete operating instructions.

7.3.1 Basic Navigation Data

The basic navigation data can be selected on the GX55 GPS 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

7.3.2 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.

7.3.3 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 ENTER.

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 ENTER. If waypoint sequencing was not already suspended, entering a to/from bearing will automatically suspend sequencing.

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 ENTER to enter your inbound course or any other key to ignore the message. Pressing ENTER when this message is displayed will result in displaying the course entry page, just as if you had pressed Direct-To button twice.

7.3.4 Moving MAP

To display a moving map, press the MAP key. In the Map mode, the large knob selects the map display and setup pages. The small knob changes the map scale on the map display pages. In the MAP mode, the "smartkeys" are used to change the display of waypoint types. Each key is identified by a waypoint type, such as Airport or VOR. Pressing the button or "smartkey" under each waypoint type will change the display selection for that waypoint type. There are three display selections: Off, waypoints only, and waypoints with identifiers.

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