

STC FLIGHT FUNCTIONAL TEST

GDC31 Roll Steering Converter

1049-2080-02

REV A

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1. PURPOSE

This procedure provides a flight test to evaluate the performance of the DAC International model GDC31 autopilot accessory across a variety of flight maneuvers.

The existing GPS and autopilot must be installed and operational in order to perform these flight test procedures.

2. APPLICABLE DOCUMENTS

- | | |
|---|----------------|
| A. Federal Aviation Regulations | CFR14, Part 23 |
| B. Airplane Flight Manual Supplement (GDC31) | 1049-2100-02 |
| C. Aircraft Certification Service Flight Safety Program | 4040.26A |

3. DESCRIPTION

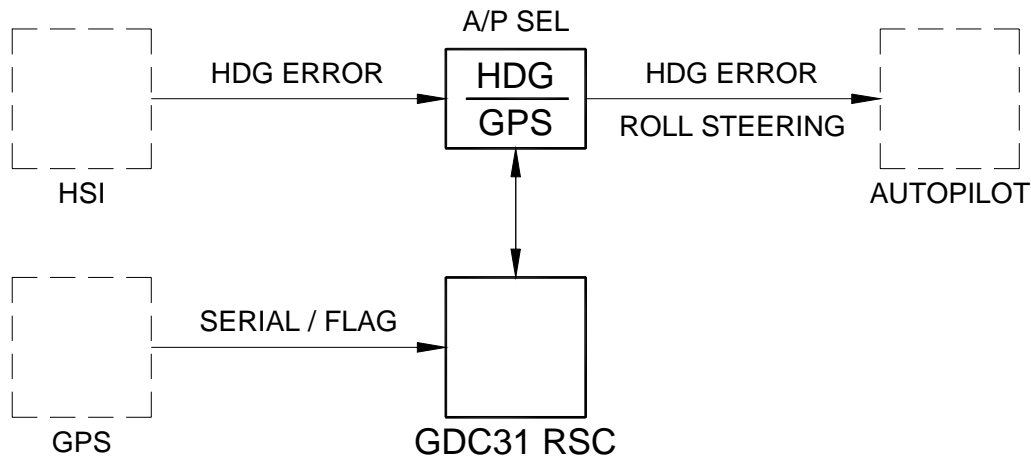
The GDC31 Roll Steering Converter is an autopilot accessory that provides autopilot coupling of the GPS to the autopilot.

When the autopilot is operated in heading mode, (HDG) annunciated on the autopilot controller, the pilot may select either heading bug or GPS as the steering source used by the autopilot. Mode selection is accomplished with the A/P SEL switch/annunciator located on the center instrument panel under the autopilot controller.

When A/P SEL annunciates HDG, the heading bug located in the HSI supplies the autopilot with lateral guidance.

When the A/P SEL annunciates GPS, the GDC31 provides the lateral guidance signal. In the case of a fault the GDC31 blinks the GPS annunciator when GPS mode is selected with the A/P SEL switch.

The GDC31 uses digital data received from the GPS Navigator to produce a commanded turn rate signal for use by the autopilot. The GDC31 does not reduce or otherwise alter any existing safety features of the autopilot, such as bank limiting, rate limiting and protection from a hard over. The GDC31 provides lateral (roll) data only (no pitch data is supplied by the GDC31).



Block Diagram

4. FLIGHT TEST OVERVIEW

This flight test procedure evaluates the ability of the GDC31 to provide acceptable lateral guidance control of the aircraft for en route, terminal and non-precision approach phases of flight within the limitations delineated in the Airplane Flight Manual Supplement.

Evaluate:

- Correct response to the HSI heading selector (heading bug) when operating in HDG mode.
- HSI heading selector has no effect when operating in GPS mode.
- Bank angles do not exceed 30°.
- Maximum course intercept angle shall be 45° (indicated by the difference between GPS computed track and desired track).
- The system must accomplish a new course intercept with no more than one overshoot. Overshoots shall be limited to 0.2 nm maximum.
- Performance in en route, terminal and non-precision approach flight phases.
 - Enroute tracking of Navigator track changes.
 - shallow angles
 - angle of 80° ±10°.
 - Approach tracking of a GPS 'T' approach
 - Tracking and AFMS procedures for a holding pattern.
 - Tracking and AFMS procedures for a procedure-turn course reversal.
 - GDC31 holds desired track to within 0.07nm (13 meters) as displayed on GPS numeric XTK readout.
- Evaluate Flight Director performance

Expected Ground Tracks for Track-Change and Direct-To operations:

If the installed GPS executes track changes with turn anticipation such then the aircraft should be expected to make an inside turn as shown in Figure 1, Course Intercept. Otherwise, expect the aircraft to over fly the waypoint as shown in Figure 2

If this test plan is executed a geographic region other than central Texas, use waypoints and approaches with similar characteristics available in that region.

5. FUNCTIONAL TEST PROCEDURES

Refer to Airplane Flight Manual Supplement (1049-2100-02) for operating instructions and limitations of the GDC31.

Use of Autopilot Altitude Hold function is at the discretion of the test pilot.

This flight test plan shall adhere to the risk mitigation section of the TIA for project _____.

Pre-Flight Briefing

1. Conduct Flight Test Briefing according to Appendix 1 of FAA Order 4040.26A.

Evaluate correct response to the HSI heading selector (heading bug) when operating in HDG mode.

Remain within 2nm of GTU airport for steps 1 - 4.

2. On the GPS, activate a flight plan from HOARY - LZZ.
3. Select HDG mode.
4. Verify the HDG bug can produce right and left turns.
5. Establish a heading of 20°

HSI heading selector has no effect when operating in GPS mode.

6. Verify the aircraft holds the selected heading.
7. Select GPS mode.
8. Verify the aircraft turns to intercept the GPS course.
9. Operate the HDG bug, verify no effect.

Maximum course intercept angle shall be 45° (indicated by the difference between GPS computed track and desired track)

10. Ensure GPS course is HOARY - LZZ. and aircraft is at least 3nm East of course. (XTK)

- 11. Record GPS Track _____
- 12. Record GPS DTK _____
- 13. Verify that (Track - DTK) is $45^\circ \pm 2^\circ$ _____

Bank angles do not exceed a standard rate turn.

Note: Steps 14 - 18 establish performance baseline for existing autopilot roll rate and turn rate.

- 14. Center the HDG bug
- 15. Select HDG mode.
- 16. Rotate the HDG bug 90° to 100° either left or right.
- 17. Observe roll rate.
- 18. Verify turn rate is approximately standard rate as shown on the Turn and Bank indicator.
Record roll rate and bank angle as base line _____
- 19. Use the HDG bug to establish a heading approximately 90° off of GPS course.

Note: Steps 20 - 22 evaluate GDC31 performance against established baseline for roll rate and turn rate.

- 20. Select GPS mode.
- 21. Evaluate that roll rate approximates baseline rate.
- 22. Verify maximum turn rate is approximately standard rate as shown on the Turn and Bank indicator.
Record turn rate and bank angle _____

The system must accomplish a new course intercept with no more than one overshoot. Overshoots shall be limited to 0.2 nm maximum.

- 23. Ensure GPS course is HOARY - LZZ and aircraft is at least 1nm from course. (XTK)
- 24. Evaluate performance during course capture. Overshoot shall not exceed 0.2nm. See Figure 1
- 25. Once established on course, verify XTK (as shown on GPS) is less than 0.07nm _____

Enroute tracking of Navigator track changes, shallow angles and angles of 70° to 90°.

26. Using the GPS track hold feature, select a track that is 10 - 15 degrees left of current track.
27. Evaluate performance during course capture. Overshoot shall not exceed 0.2nm. See Figure 2.
28. Allow aircraft to establish track.
29. Using the GPS track hold feature, select a track that is 80 - 90 degrees left of current track.
30. Evaluate performance during course capture. Overshoot shall not exceed 0.2nm. See Figure 2

Tracking and AFMS procedures for a procedure-turn course reversal

31. Evaluate the AFMS Normal Operation Section for execution of a procedure-turn course reversal.

Note: Suggest GPS-A at T28, LZZ transition. See Figure 3

Approach tracking of a GPS ‘T’ approach

32. Select the GPS 18 approach using a transition appropriate for aircraft current position (LZZ transition, intercept LZZ - DAGHU leg). See Figure 4
33. Evaluate the autopilot tracking throughout the approach, up to and through the MAP.
34. On FAF - MAP leg, verify XTK (as shown on GPS) is less than 0.07nm _____

Tracking and AFMS procedures for a holding pattern

35. Evaluate the AFMS Normal Operation Section for execution of a holding pattern.
Suggest NDB at GTU.

Evaluate Flight Director Performance

36. Evaluate performance of flight director command bars when the GDC31 is the signal source.

Perform any other tests requested by flight test pilot.

37. End of test

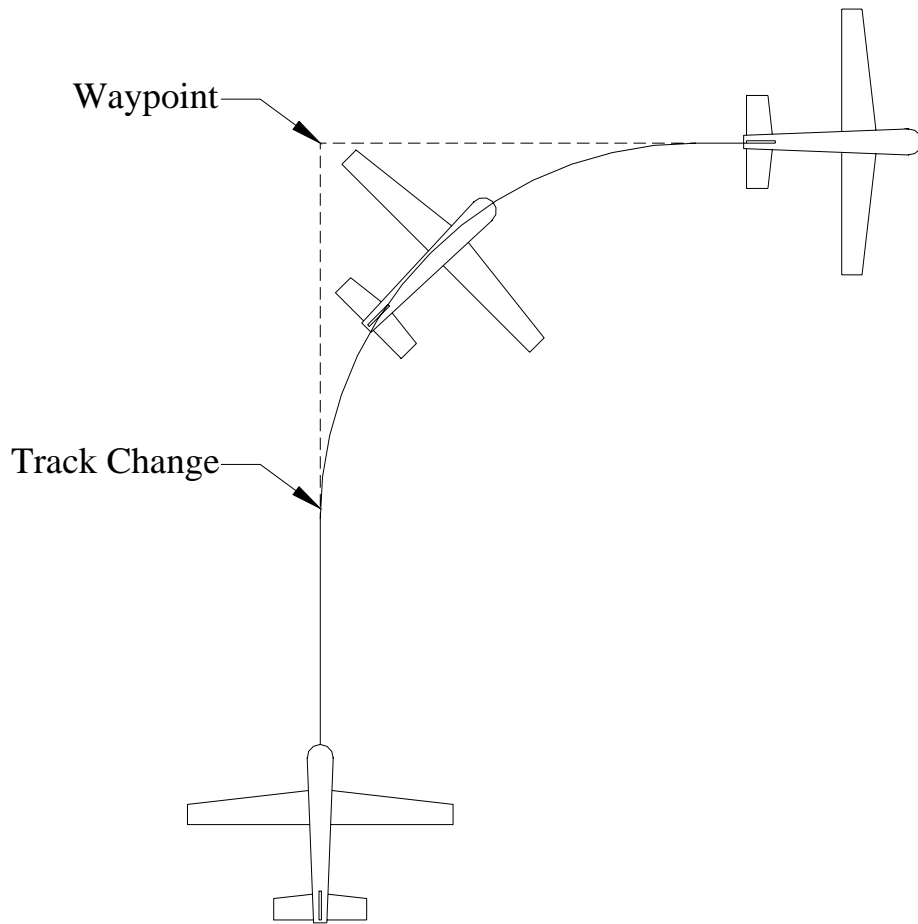


Figure 1
Course Intercept Path

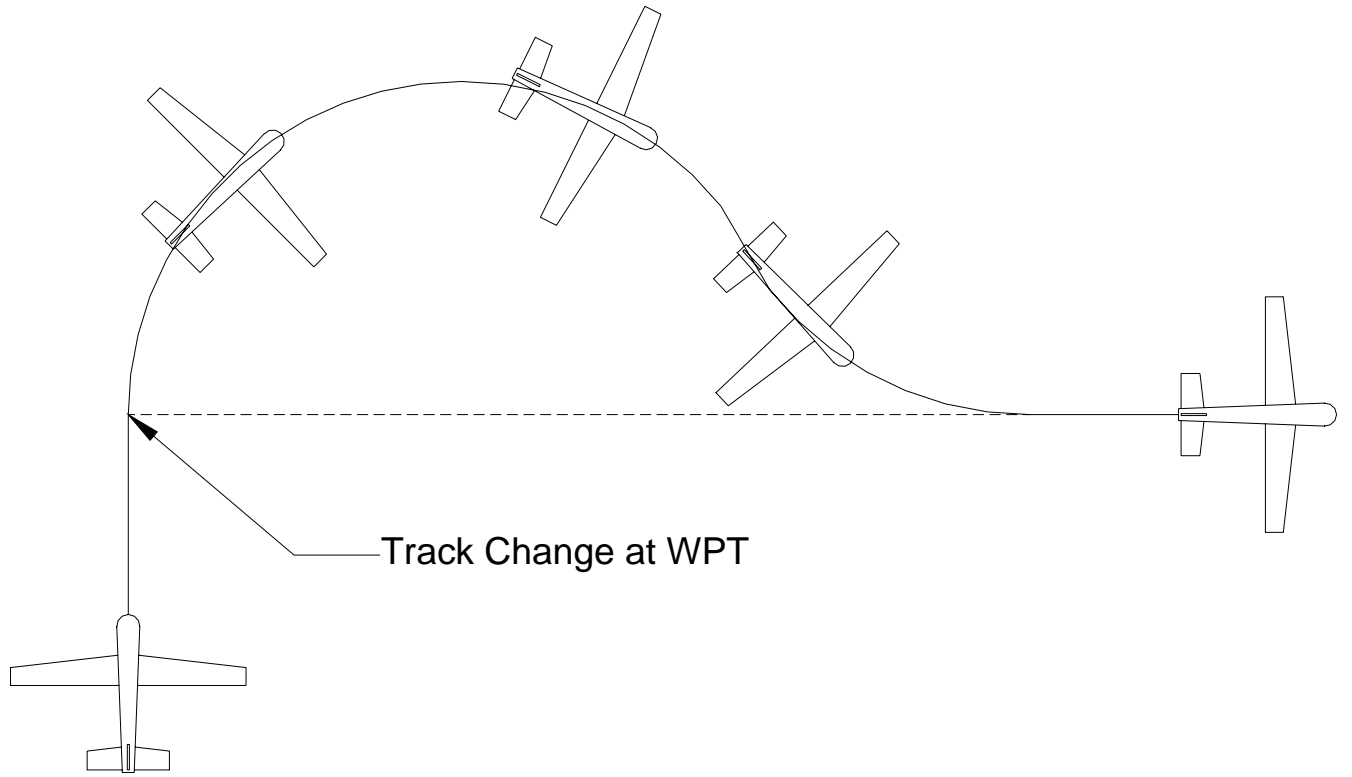


Figure 2
Waypoint Over Fly Path

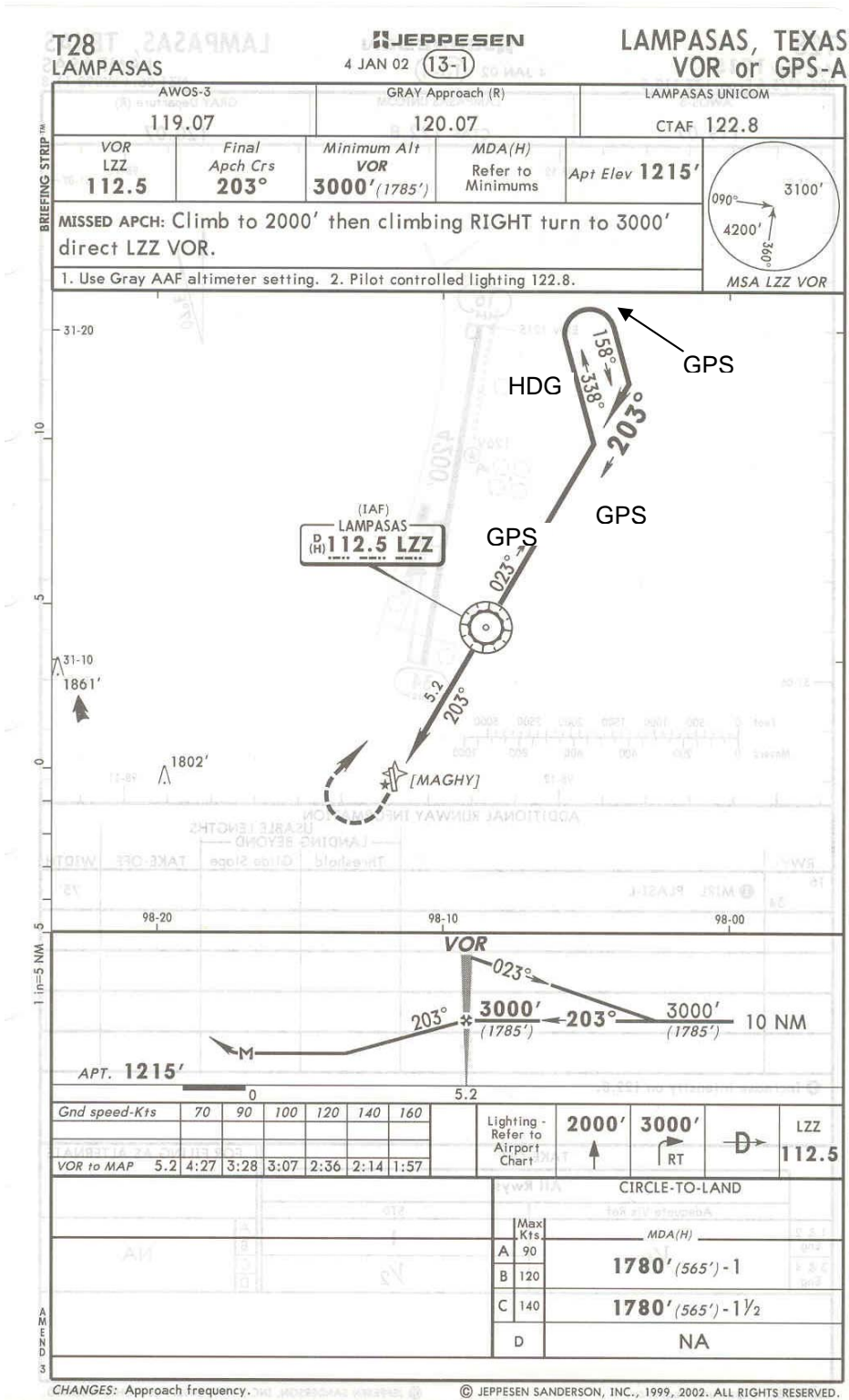


Figure 3

