Miltech Simulations-Microsoft C-17 Globemaster III

Automatic Flight System

> Note
> VNAV and PACAH Automatic Flight Modes are currently unsupported. Support for these modes may come in a future update.

The Automatic Flight Control System (AFCS) on the real C17 Globemaster is highly complex, and supports various modes for Engine-managed speed control, stationkeeping, and formation flying.

The system has been adapted and simplified, while maintaining the most important modes in regular operations.



Autopilot Panel/MCP

1. ◇ **NAV Source Selector, Pilot:** Selects source of navigation data for the Pilot MFDs, Navigation Display pages. Currently supports
2. VOR/ILS 1 and 2: Available on ND, currently unavailable for LNAV.
3. MSN: Flightplan as active on FMC, available for LNAV.
4. SKE: Stationkeeping, INOP
5. ETAC: INOP
6. TAC: TACAN, currently unavailable for ND and LNAV. Functional on BDHI.
7. **F/D:** Toggle Pilot/Copilot Flight Director On/Off
8. **CAGE:** INOP
9. **APPR:** Toggle APPROACH autopilot mode
10. ↔ **RA/BA:** Switch altitude reference source from Barometric altimeter to Radio Altimeter, on Pilot/Copilot PFD.
11. **DCLT:** Declutter HUD (Pilot/Copilot), cycle through three Decluttered states.
12. **A/D:** Airdrop, currently unavailable.
13. ◇ **CAT1/CAT2 Selector:** INOP
14. **EPR Speed Mode:** Unavailable

15. **SPEED HOLD Mode:** Manages and holds selected MACH/IAS Speed as displayed on #20. Autothrottle must be engaged for this mode to function.
16. **SPDNAV Speed Mode:** Unavailable
17. **HDG HOLD Mode:** Holds selected heading as displayed on #21. Autopilot Master must be engaged for this mode to function. Engaging this mode will deactivate LNAV.
18. **LNAV:** Lateral Navigation. Follows the nav source selected. Currently only MSN is supported - support for VOR and TCN coming soon. Autopilot Master must be engaged for this mode to function. Engaging this mode will deactivate HDG HOLD.
19. ◇ **Ground Spoiler Arm Selector Switch:** 3-Way Switch - ARM (Arms ground spoilers), OFF (Disarm ground spoiler) and LAPES (Disarm Spoilers).
20. ◇ **Approach Path Selector Angle:** Selects Approach Path angle. Regardless of angle selected, the aircraft will always follow the glideslope as provided by airport ILS systems.
21. **APPR Path Display:** Displays selected Approach Path.
22. ↔ **MACH/IAS:** Switches between SPD HOLD in MACH or in IAS. Switches automatically to MACH at 18,000ft.
23. ◇ **MACH/IAS Selector:** Increase or Decrease selected airpeed. Note that rotating the knobs increases/decreases the selected airspeed, but such change will NOT be made effective until the knob is pushed to acknowledge the change.
24. ↔ **THR/PITCH:** Switches between THR and PITCH modes. Currently only THR is supported.
25. **MACH/IAS Display:** Displays selected airspeed.
26. **HDG Display:** Displays selected heading.
27. ◇ **Maximum Bank Selector:** Selects Bank Angle (Standard/Normal/20)
28. ◇ **HDG Selector:** Increase or Decrease selected heading. Note that rotating the knobs increases/decreases the selected heading, but such change will NOT be made effective until the knob is pushed to acknowledge the change.
29. **Pilot ID:** INOP
30. **ATS:** Autothrottle Master Switch. Required for IAS/MACH to function.
31. **Roll Rate:** INOP
32. **AP:** Autopilot Master Switch, required for all Autopilot modes to function. Spring loaded if Autopilot is force-disconnected. This switch also engages Yaw Damper automatically.
33. **ALT HOLD:** Upon selecting, aircraft will climb to/descend to/hold selected altitude as selected on #33. Manages Vertical Speed hold automatically. Requires Autopilot Master to be engaged.
34. **VNAV Mode:** Temporarily unsupported. To be added in a future update due to outstanding bugs.
35. **TURB Mode:** Unsupported.
36. **SPLIT AXIS:** Overrides Altitude Hold, and manages Vertical Speed independently as selected on #32. Requires Autopilot Master to be engaged.
37. ◇ **Vertical Speed selector and Display:** Select and display Vertical Speed.
38. ◇ **Altitude selector and Display:** Select and display Altitude (always BARO). Note that rotating the knobs increases/decreases the selected altitude, but such change will NOT be made effective until the knob is pushed to acknowledge the change.

39. **Alert Reset:** INOP
40. ◇ **NAV Source Selector, First Officer:** Selects source of navigation data for the First Officer MFDs, Navigation Display pages. Refer to #1 for all the modes available.

Understanding the AFCS System

The AFCS system manages the aircraft in three axes: Speed, Altitude/Pitch and Heading/Roll.

Speed Modes:

- Autothrottle Engaged:
- IAS HOLD MODE: Holds selected IAS
- MACH HOLD MODE: Holds selected MACH

Other modes (EPR, SPD NAV, etc.) are not modeled.

Altitude/Pitch Modes:

- Autopilot Master Engaged:
- ALT HOLD: Increases/Decreases/Holds altitude as selected.
- VERT SPD (Split Axis): Overrides ALT HOLD and holds selected VS.
- APPR: Follows Glideslope

Other modes (Turb) are not modeled.

Heading/Roll Modes:

- Autopilot Master Engaged:
- HDG HOLD: Turns to and holds selected heading.
- LNAV: Follows navigation source selected on NAV Source Selector. Currently only MSN is available, but VOR and TAC will be soon supported.
- APPR: Follows localizer.

Other modes (SKE, ETAC, etc.) are not supported.

Autopilot State Displays

Unlike other aircraft, the Autopilot Pushbuttons on the C17 are not backlighted, nor any indicator lights are available on the cockpit. Instead, the engaged modes can be validated on the Primary Flight Display and HUD. Additionally, indicator lights will turn on when Autothrottle or Autopilot are engaged.

Aural alarms, MASTER CAUTION warnings, and WAP Display messages show up when autopilot or autothrottle are disconnected, either manually or by force.



Primary Flight Display showing active modes - IAS, ALT, HDG. Notice AP and ATS lights are active, indicating the system is engaged.

LNAV Tips and Tricks

In some circumstances, users have reported having problems to engage LNAV. Lateral Navigation is fully supported on the C-17 Globemaster III, however, it has a few tricks:

- A complete flight plan, with no discontinuities, must be entered on the MSN (FMS) System. LNAV will not engage unless a plan is entered and executed.
- LNAV system is designed to follow the route as specified on the flightplan. If you fly past the first waypoint on your Flightplan, the aircraft may want to turn and return to that previous waypoint instead of flying to the next waypoint ahead of the aircraft. **If you engage LNAV at any time AFTER your first waypoint on your flightplan,** you may have to do a Direct To - next waypoint on your flightplan through the D-> (Direct To) menu on the MSN System. This ensures the aircraft properly follows a route to your next waypoint.
- Beware VNAV is not currently supported. Takeoff performance calculations are now available, but VNAV still remains pending a future update.

Performing ILS CATII/III Landings

ILS Landings are fully supported on the aircraft, however, they require systems to be correctly setup for the aircraft to follow the automated landing procedure.

1. **Program the approach on the FMS/MSN Systems.** An approach procedure, including selecting the active runway, type of approach and Standard Arrival must be inputted and activated on the aircraft FMS/MSN System. There shall be no flight plan discontinuities from the current position of the aircraft to the destination airport.

2. **Follow the procedure using LNAV:** Autopilot must be engaged, and LNAV mode must be active. The aircraft will follow the standard arrival procedure.
3. **Tune in the ILS Frequency on the NAV1 Radio:** Make sure the frequency is correctly selected on NAV1. When the aircraft has entered the localizer range, distance and bearing to LOC will display on the BDHI Indicator.
4. ◇ **Select VOR/ILS on NAV Source Selector:** On the Pilots side NAV Source Selector, make sure to select VOR/ILS (1 assuming that you have entered the ILS Frequency on NAV1).
5. **Intercept the Approach:** Most airports have ILS intercepts of 30 degrees or less. You may either follow the LNAV through the intercept, or engage APPR mode shortly before the aircraft intercepts the localizer.
6. **Engage APPROACH (APPR) Mode:** Engage APPR Mode and verify the lateral mode automatically switches from LNAV to APPR (verify on PFD bottom left corner). You will see the deviation diamonds on both the horizontal and glideslope bars.
7. **Fly the Glideslope:** The aircraft will automatically intercept the Glideslope, and the ALT Mode (upper right corner) will display GLIDESLOPE once intercepted. Monitor the instruments throughout the approach.

Bear in mind that the aircraft will be unable to fly the ILS if the approach and runway selection is not performed on the MSN system.