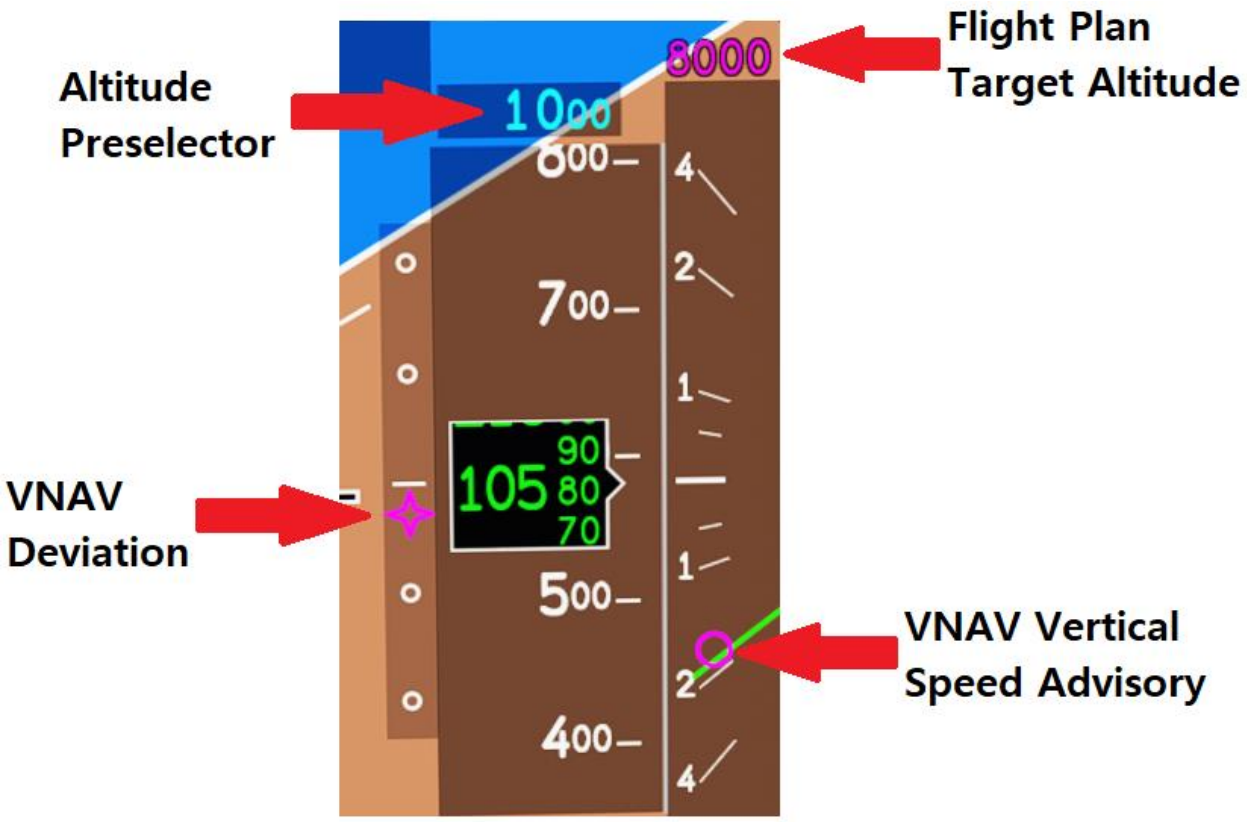
CJ4 VNAV

What is VNAV?: Vertical Navigation. The addition of a vertical component to the two-dimensional lateral navigation waypoints with which most pilots are familiar. To go from a 2-D to a 3-D environment, the FMS calculates a complete vertical profile for the flight using predicted aircraft performance, pilot inputs, and environmental factors. The FMS can apply constraints for speed, altitude, or both to waypoints in the profile.

Guidance Indications



VNAV Deviation (Pink Snowflake):

The pink snowflake is your vertical deviation pointer for the VNAV path and operates the same way as an ILS glideslope. It shows directly left of the altimeter tape. When VNAV is active, the vertical deviation scale and pointer show on the display 60 seconds before the aircraft arrives at the Top of Descent (TOD). Full-scale deviation is 500ft in en-route and terminal, and 250ft on an approach. If advisory VNAV is selected, the vertical deviation scale and pointer show when the vertical deviation is within 1000 feet of the descent path.

VNAV Vertical Speed Advisory (Pink Donut):

The VNAV vertical speed advisory pointer shows on the PFD Vertical Speed Indicator (VSI) to let the flight crew know what climb or descent rate is necessary for the aircraft to reach the next altitude constraint. It displays the minimum average climb or descent rate from present position to the next constraint if it's at least 100fpm. The donut is not shown for AT OR BELOW for climbs or AT OR ABOVE for descents as there is no minimum value.

Flight Plan Target Altitude (FPTA):

The VNAV data has a Flight Plan Target Altitude (FPTA) derived from the altitude constraints in the active flight plan. The FPTA shows on the PFD near the preselector altitude when VNAV is active. Generally, it is the next altitude constraint in the flight plan consistent with the current phase of flight. Therefore, a distant descent altitude constraint is not shown when the aircraft is climbing to cruise altitude. The FPTA sequences to the next target 60 seconds before the aircraft arrives at the switch point, provided the current target altitude has been captured.

Autopilot and Flight Mode Annunciator (FMA)

VNAV is turned on or off by pressing the VNAV button, it is never armed. A "V" will appear in front of the active mode to indicate VNAV is on.

VFLC, VVS, VPITCH behave the same but will capture a path when able

VPATH – VNAV has captured and flying the vertical path

VALTV – VNAV is engaged and holding at the constraint

VALTS – VNAV is engaged and holding the preselector

VALT – VNAV is engaged and holding the pressure altitude

VGP – VNAV glidepath is captured

ALTV – Altitude hold on a VNAV constraint is armed

ALTS – Altitude hold on the preselector is armed

PATH – The VNAV path is armed and ready for capture

NOPATH – VNAV can't capture the path in current config, descend with FLC or VS to recapture

GP – The approach glidepath is armed

Operation

VNAV Climbs

-Mostly applicable to “Climb via the SID” clearances where the SID has AT OR BELOW altitude constraints.

1) Set altitude preselector to the top altitude of the SID before takeoff
2) Using PITCH, VS, or FLC, engage VNAV shortly after takeoff
3) VNAV will level off at any altitude constraints and re-engage FLC when passed the fix (You must currently re-engage FLC yourself (WIP))

VNAV Descents

-Generally you would keep the preselector at your cruise altitude until you were given a descent clearance. Once cleared, you would dial in the bottom altitude of the arrival and press VNAV. Once you are cleared for the approach, you would dial in the FAF altitude and capture the glidepath (VGP) and then dial in the missed approach altitude. The altitude preselector is the master control and the aircraft will never descend below it for any reason other than 2 circumstances: You have captured a glideslope (ILS) which will show as GS or you capture a glidepath (RNAV approach) which will show as GP. This is to allow you to capture either of them and then set the missed approach altitude in the preselector

1) Set a lower altitude in the preselector
2) Engage VNAV
3) ???
4) Profit from LPV (Can set preselector to 50’ above airport elevation on runway fix to get a glidepath all the way down to any runway)

Entering Custom Restrictions

Speeds: Minimum 100 Max 500

Entry Format: XXX or XXX/
Example: 290/10000, 190/---, 170/-----
Values below 500 are automatically interpreted as speeds
The / slash is also used to distinguish between altitude or speed

Altitudes: Minimum 0 Max 65000

At: Cross a fix exactly at a specific altitude
Entry Format: X, XX, XXX, /XXX, XXXX, XXXXX, FLXXX
Example: ---/50, ---/500, ---/5000, ---/FL180
A / slash is required for altitudes below 500 feet

At or Above: Cross a fix at or above, depending on path conditions
Entry Format: XA, XXA, XXXA, /XXXA, XXXXA, XXXXXA, FLXXXA
Example: ---/50A, ---/500A, ---/5000A, ---/FL180A
A / slash is required for altitudes below 500 feet

At or Below: Cross a fix at or below, depending on path conditions
Entry Format: XB, XXB, XXXB, /XXXB, XXXXB, XXXXXB, FLXXXB
Example: ---/50B, ---/500B, ---/5000B, ---/FL180B

Between: Cross a fix between two altitudes: Below and Above
Entry Format: XXXXBXXXXA, XXXXXBXXXXXA, FLXXXBFLXXXA, FLXXXBXXXXXA, FLXXXBXXXXA
Example: ---/7000B5000A, ---/15000B10000A, ---/FL230BFL190A, ---/FL180B15000A, ---/FL180B9000A