Miltech Fighters: M2K-C

Inertial Navigation System

Caution
Toggling the Battery Off will erase the INS Memory (eg. all waypoints will be lost), and system alignment will be lost.
Alignment time is approx. 3-5 minutes. Instant alignment is also available. See Step 8 under "Alignment Procedures" for more information.

Tip

New on V1.2.0:

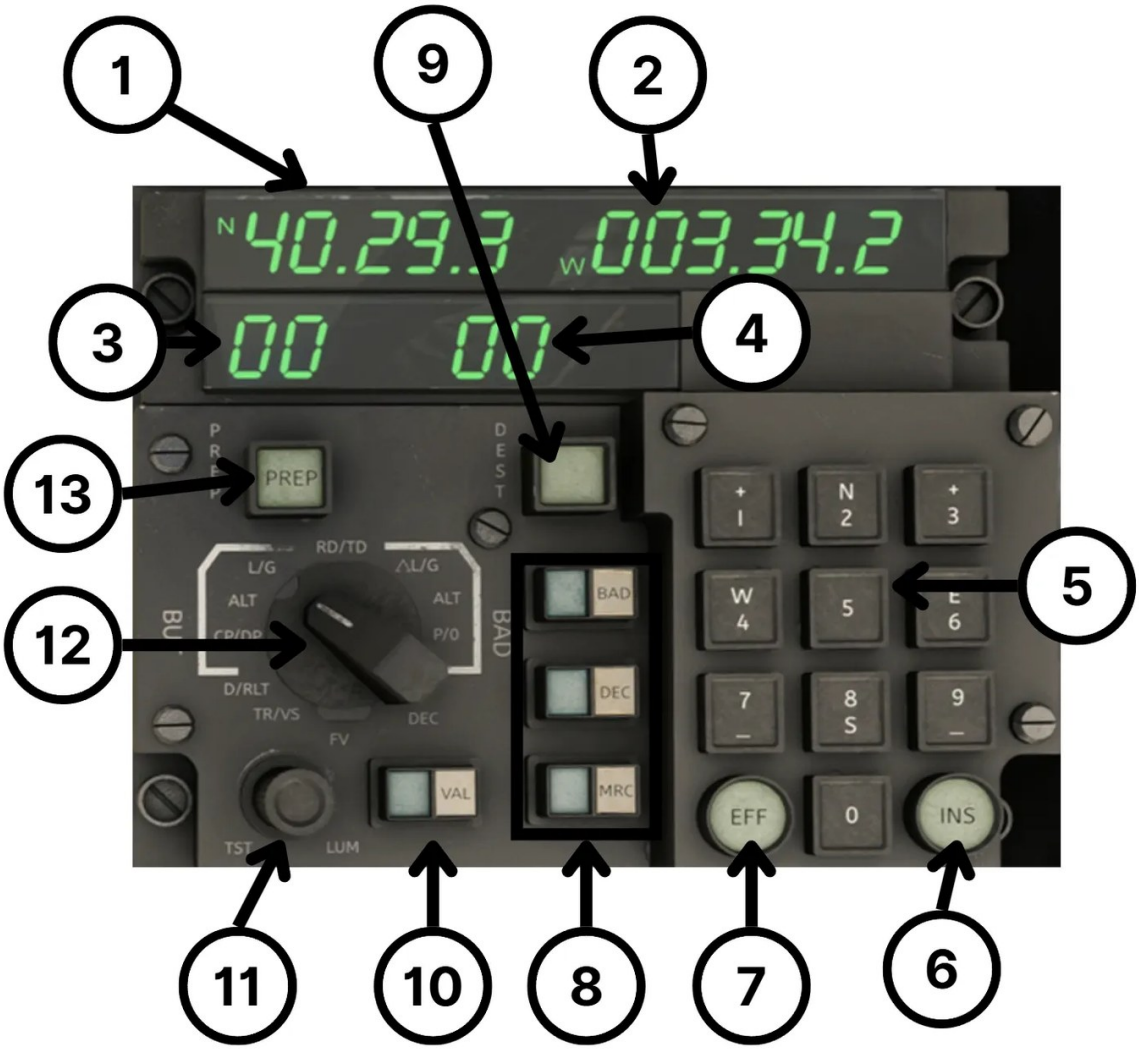
- FS20 and FS24: Over-the-cloud loading of INS Flight Plans Cloud Sync of Flight Plans (INS Planner)
- FS24 Only: Flight Plans created with the Tablet EFB can now be sent to the INS Unit. Importing Flight Plans from the MSFS 2024 Tablet (EFB)

The M2K-C features a fully functional Inertial Navigation System (INS). Inertial Navigation Systems rely exclusively on the use of gyroscopes and accelerometers to determine the location of the aircraft, and follow routes on a flight plan.

Miltech Simulations has created a Flight Planning tool that will facilitate the process for those pilots looking at following waypoint-to-waypoint flight plans. A few shortcuts have also been implemented for those users looking to perform a quick alignment.

Flight Plans on INS Systems are entirely coordinate-based, the aircraft does not follow typical approach or takeoff procedures using fixes, nor uses them while onroute. Instead, each point on the flightplan is determined by a latitude and longitude inserted into the INS. Waypoint 00 will always display the current location, regardless of alignment status.

Inertial Navigation Computer



INS Panel, Right Side Console

1. **Main LCD Display - Left Side:** Displays Latitude (North/South)/Altitude in Feet/Bearing/ETA, as per mode selected.
2. **Main LCD Display - Right Side:** Displays Longitude (West/East)/Altitude in Meter/Distance in Nm/Ground Speed, as per mode selected.
3. **Bottom LCD Display - Left Side:** Displays PREP (Preparation) waypoint selected. PREP are waypoints selected for modification. Range from 00 to 99.
4. **Bottom LCD Display - Right Side:** Displays DEST (Destination) waypoint selected. DEST are waypoints selected for navigation. Range from 00 to 99.
5. **Keypad:** Numbers from 0-9. Note that number 2=NORTH, 4=WEST, 6=EAST, 8=SOUTH; and number 1=SELECT LEFT LCD, 3=SELECT RIGHT LCD.
6. ▣ **INS (Insert) Button:** Inserts data in the system, as entered by the keypad. Upon entering in editing mode (L/G or ALT Pages), this button lights up to signal the input can be inserted.
7. ▣ **EFF (Erase) Button:** Erases data from the system, as selected with the keypad. Upon entering in editing mode (L/G or ALT Pages), this button lights up to signal the input can be inserted

8. **BAD/DEC/MRC:** Functions not modeled.
9. ▣ **DEST Button:** Pressing this button activates DEST Waypoint Input via the keypad. The button illuminates to indicate that the system is ready for a two-digit keypad entry. DEST are waypoints selected for navigation. Range from 00 to 10.
10. ▣ **VAL (Validate) Button:** Validates entered initial waypoint for alignment process to start.
11. ◉ **TST/Brightness Knob**
12. ↔ **INS Parameter Switch:** Switches INS System across different modes:

1. **TR/VS:** Time remaining to DEST Waypoint selected from current location (ETA), Ground Speed in Knots (READ ONLY)
2. **D/RLT:** Distance (Nm) and Bearing (Deg) relative to DEST Waypoint selected from current location. (READ ONLY)
3. **CP/DP:** Not Modeled.
4. **ALT:** Waypoint Altitude, in Ft and Meter (WRITE ONLY)
5. **L/G:** Waypoint Latitude/Longitude (WRITE ONLY)
6. **RD/TD:** Not Modeled.
7. **DELTA L/G:** Not Modeled.
8. **DELTA ALT:** Not Modeled.
9. **RHO/THETA:** Not Modeled.

13. ▣ **PREP Button:** Pressing this button activates PREP Waypoint Input via the keypad. The button illuminates to indicate that the system is ready for a two-digit keypad entry. PREP are waypoints selected for navigation. Range from 00 to 10.

Additionally, the following knobs control the Operational Mode and Operational Selector:

Operational Selector Panel



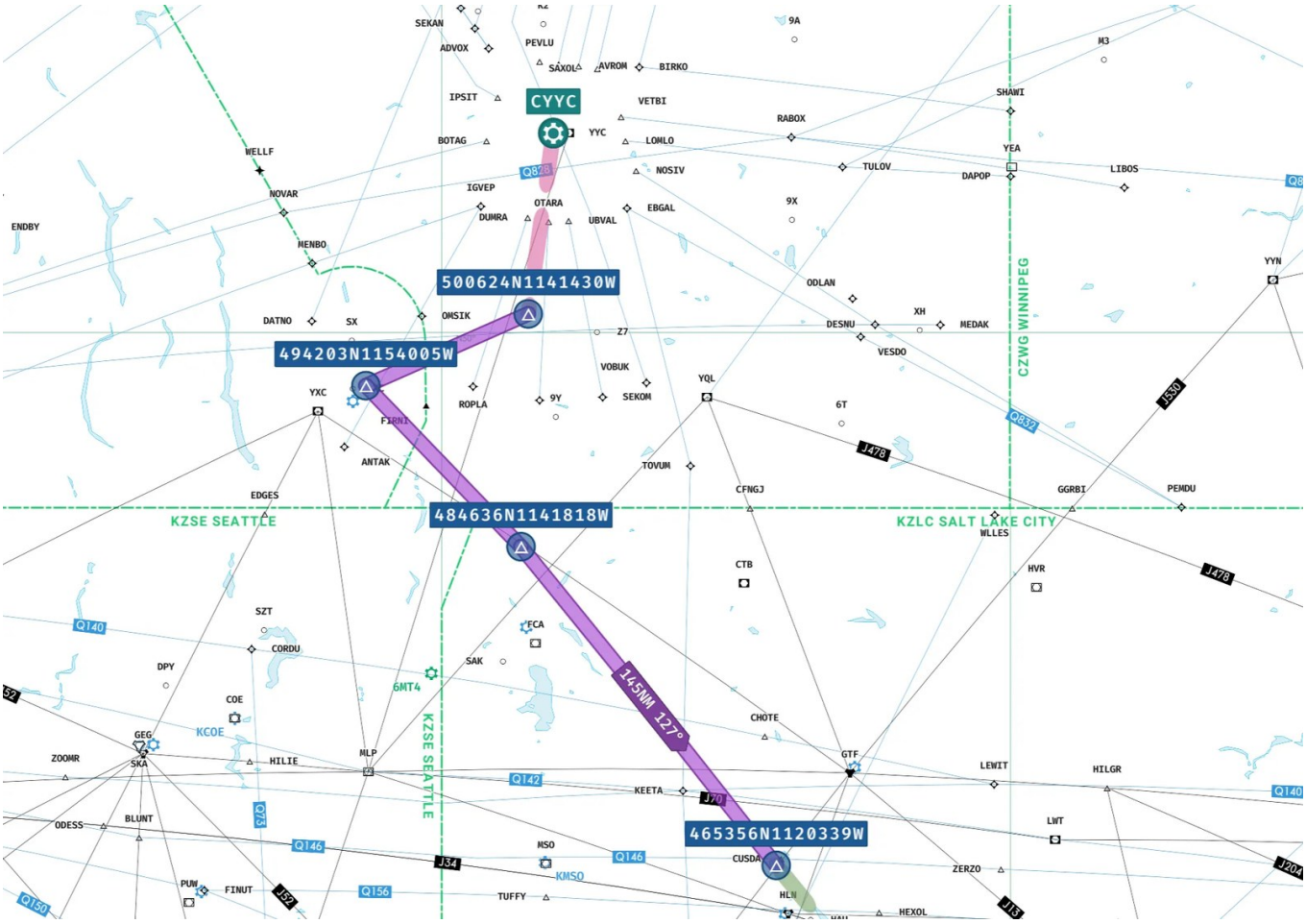
OM/OS Panel, Right Side Console

1. ◇ **PCN Selector:** Selects INS Panel mode:
2. **VEI:** Standby Mode. Allows for input of waypoints, but not suitable for alignment or navigation.

3. **CAL:** Not Modeled.
4. **TST:** Not Modeled.
5. **ALN:** Alignment Mode. Prepares system of realistic alignment, taking 2-3 minutes to complete. Not suitable for entering waypoint data.
6. **ALCM:** Quick Alignment Mode. Prepares system for instantaneous alignment. Not suitable for entering waypoint data.
7. **NAV:** Navigation Mode. User for navigation. This is the only mode that will return data to the pilot and instruments. Allows for entering waypoint data.
8. **SEC:** Not Modeled.
9. **Operational Mode:** Selects operational mode of the INS System:
10. **N:** Normal operation mode. Used for STBY and Navigation.
11. **STS:** Status mode. Used to verify alignment status in ALN/ALCM modes.
12. **DCI:** Not Modeled.
13. **CRV:** Not Modeled.
14. **MAIN:** Not Modeled.

Flight Planning

1. **Access insplanner.miltechsimulations.com.** This is our new portal for Flight Planning, designed for INS Systems. This will be used across all future INS-based aircraft. The website is quite basic at the time, but will get you the necessary info to enter manually into INS System. Sync to Aircraft may be an option available in the future.
2. **Click on the map to add Waypoints.** Start with Waypoint 01, which must be your Departure Airport. Continue adding route waypoints up to waypoint 10, which must be your target location. Use the map search bar and mouse buttons to navigate, and add waypoints based off your mission purpose.
3. Unfortunately at this time we do not have a good provider of Aviation Charts, so Map Layers are limited to satellite and street maps.
4. Users of Navigraph may use Navigraph's Flight Planner instead, creating "User Waypoints" along the route and copying the coordinates. Make sure that total number of waypoints, including departure airport and arrival airport is less or equal to 10.



Navigraph Flight Planning with "User Waypoints"

3. **You may move waypoints by clicking and dragging.** Once your flightplan is complete, take a look at the table on the bottom right hand side - your waypoint coordinates will be displayed in the format expected by the aircraft INS System. You may rename your flightplan, and download as CSV from here. This website will not store flight plans.
4. **Copy and manually enter your Waypoints on the aircraft's INS System,** or use the 6-digit number to load flight plan from the cloud: Cloud Sync of Flight Plans (INS Planner)

Alignment Procedure

Aligning the INS is always required, regardless if aircraft has started C\&D or Ready for Takeoff. The system requires the pilot to enter an initial alignment waypoint manually - otherwise, alignment will not be executed.

Aircraft will require realignment if battery power is set to OFF at any time, as this action will erase the memory and restart the system.

Instant alignment is available, however, it still requires the user to enter an initial waypoint 01.

1. **Turn your battery switch ON.** INS System will automatically initialize, which takes approx 5 seconds.
2. **Verify ◇ PCN Selector** is set to VEI (STBY), **◉ Operational Mode Knob** is set to N (Normal) and set **INS Parameter** to L/G
3. **By default, PREP Point 00 is selected.** This is the aircraft current Latitude and Longitude. Generally, an INS System would be unable to provide this info without alignment, however, for simplicity this is provided as "Last Position Registered".

4. **Press PREP and enter Waypoint Number 01.** Page switches automatically.
5. **Enter Current Aircraft Position, starting with Latitude**. You may copy the position on PREP Waypoint 00.
6. To enter current Latitude, press #2 (NORTH) or #8 (SOUTH) on the numberpad to define the direction. Use keypad to enter the coordinates in degree-minute-second format.
7. Seconds are limited to one digit. Subsequent digits entered are registered, even when not displayed.
8. ERR Button will erase entered coordinate and return to Direction Selection.
9. INS Button will insert the coordinates entered.
10. **After inserting the Latitude, proceed with Longitude.**
11. Press #4 (WEST) or #6 (EAST) on the numpad to define the direction. Use keypads to enter coordinate in degree-minute-second format.
12. Errase and Cancel with ERR Button, insert with INS Button.

Note
Alignment is absolutely required for the system to function. A system that isn't aligned is unable to provide Bearing, Distance and ETA calculations, even if the entire flightplan is inserted correctly.

7. **Switch INS Parameter Knob to ALT.** Enter current Barometric altitude, in feet or meter. Press #1 on Keypad to enter in Feet, #3 on Keypad to enter in Meter. Then press INS to insert or ERR to Erase.
8. **Set System for INS Alignment.**
9. Set PCN Selector to ALN (for realistic alignment, 2-3 minutes) OR ALCM (for instant alignment)
10. Set Operational Mode Knob to STS
11. If the initial waypoint is correctly inserted, and the system is correctly setup for INS Alignment, the VAL Button will light up, and ALN will flash orange on the INS Display.
12. Press VAL Button to initialize alignment.
13. Monitor STS Page, Right side LCD.

1. 00 indicates system is currently aligned. If you wish to re-align, cycle BATT on-off-on. Beware this will erase the INS memory, deleting all your waypoints.
2. 100 indicates system is not aligned
3. Any other value indicates an active, ongoing alignment process.

14. Monitor STS Page, Left side LCD:

1. When system is <60 seconds from completing alignment, an ETA indicator will count down to 00:00.

15. Orange ALN indicator disappears, and PRET indicator lights up, to indicate alignment is completed.
16. **System is fully aligned now.** Switch ◇ **PCN Selector** is set to NAV (Navigation), ◉ **Operational Mode Knob** set to N (Normal)
17. **Proceed with entering other waypoints in flightplan.** D/RLT and TR/VR will now be fully enabled, provided that the DEST waypoint selected is valid and >00

Requirements for a Successful Alignment

If one (or more) of these are not correctly entered, the INS will not align.

- Initial Waypoint must have been entered correctly (Latitude, Longitude and Altitude). Generally you'd want to use PREP 01 to store this initial waypoint.
- Initial Waypoint must be correctly selected in PREP screen. If initial waypoint was entered as PREP 01, you'd want to have PREP01 currently selected.
- PCN Selector Knob must be on the "ALN" Position, or "ALCM" for Instant Alignment.
- Operational Mode Knob must be on the "STS" Position.
- On Status (STS) Page, the displayed value must be equal to 100.
- Press VALIDATE (VAL) Button on INS to start alignment.

VAL button will not light up if the system is not correctly configured for alignment.

Navigating Procedures

Inertial Navigation is executed from waypoint-to-waypoint, coordinate to coordinate.

1. System must be correctly aligned. **Refer to Aligning Procedure** above.
2. ◇ **PCN Selector** must be on the **"NAV"** (Navigation) Position. * VEI Poisition is "STBY" - entering waypoints is possible, but not suitable for navigation. ALN and ALCM Positions are only used for alignment. Other pages are not supported on this product.
3. ◉ **Operational Mode Knob** must be on the **"N"** (Normal) Position. * STS Page is only used for Alignment Status. Other pages are not supported on this product.
4. DEST waypoint must be from 00-99. This is the waypoint selected for navigation.
5. Assume that the DEST waypoint selected is a valid waypoint, otherwise the aircraft will be unable to calculate bearing and distance.
6. INS System will now provide bearing and distance from current position to the selected DEST Waypoint.
7. This bearing and distance will display on HUD. See Head-Up Display (HUD) for more information.
8. You may also select NAV mode as source on BDHI to see bearind and distance. See Navigation & Communication Systems for more information.
9. You may also use the ↔ **INS Parameter Switch** to change selected parameter to D/RLT or TR/VS to get bearing, distance and ETA information.
10. To change DEST waypoint, you may use the DEST button on INS panel, or use the PLUS and MINUS buttons on the bottom left side of the glareshield.

Importing Flight Plans from the MSFS 2024 Tablet (EFB)

Create a flight plan using the built-in MSFS 2024 tablet (EFB) and use the "Send to Avionics" button. The INS will automatically detect the route and load all waypoints - no additional steps are required.

If you modify the flight plan on the tablet, the INS will update automatically with the new route after the "Send to Avionics" function is used.

Once loaded, PREP and DEST are set to waypoint 01. You can navigate through loaded waypoints using the DEST +/- buttons as usual.

Caution
Note: Up to 99 waypoints can be loaded. Altitude data is not included from the EFB - waypoint altitudes must

be entered manually if needed.
INS Unit must be aligned prior to importing. Follow the guide above: Alignment Procedure

Cloud Sync of Flight Plans (INS Planner)

Flight plans created in the INS Planner web tool (**insplanner.miltechsimulations.com)** can be loaded directly into the INS using their 6-digit flight plan number.

Steps

1. Create a flight plan using **insplanner.miltechsimulations.com.** Click on "Send to Aircraft" to get a 6-digit Flight Plan number.
2. Turn the ◇ **PCN Selector** to the **CAL** position.
3. Type the **6-digit flight plan number** on the INS keyboard (e.g., 294017). The digits appear on the display as you type.
4. Press **INS** to load.
5. Once loaded, PREP and DEST are set to waypoint 01 and all waypoints are ready for navigation.

Display Messages

Message	Meaning
123___	Entry in progress (underscores show remaining digits)
LOADING	Fetching the flight plan from the cloud
LOADED	Flight plan successfully loaded into the INS
FAIL	The number is invalid, or no flight plan was found

The status message clears after a few seconds. Press **EFF** at any time to cancel the entry.

Caution
Note: The flight plan number must be exactly 6 digits. Pressing INS with fewer digits will show FAIL.
INS Unit must be aligned prior to importing. Follow the guide above: Alignment Procedure