

DO NOT USE FOR FLIGHT

McDonnell-Douglas MD-11(F)

Checklist / Flow-Procedure

including basic Flight-Planning-Charts

*for PMDG MD-11(F)
with Microsoft Flight Simulator / Prepar3D*

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Version 7.0

Print Notice: Page size DIN A5. Print 2 pages per A4 or Letter page. This page is the front cover.

Attention:

You should have read the PMDG MD11 introduction, especially where you find all 7 click spots if you operate in 2D-mode like me.

I recommend setting the IRS alignment time to something like 180 seconds if you do not want to wait 10 minutes for the alignment.

You must have the AP Disengage Button Set! Standard Key: Z

Parking Position / Preparation:

- | | |
|---|--------------------------------|
| • Load & Fuel (at Configurator) | Set |
| • ZFW, ZFW-CG & TO-CG | Note! |
| • FSX | Start & load/create 747-flight |
| • Parkingbreak | Set |
| • Dark & Cold | Load D&C panel setting |
| • Fuel (at FSX) | Set |
| • IVAP-Connection | Activate |
| • Dep-Metar | Check & note |
| • Arr-Metar | Check & note |
| • Flight –Plan | Create at website (FS Build) |
| | |
| • Weather Radar Switch | Off |
| • Fuel Switches | Off |
| • Spoiler | Retract / Detent & Disarmed |
| • Flaps | Set “Up/Retract” |
| • Gear | Down |
| • Dump / Fuel Dump | Stop & Guarded |
| • MANF Drain | Guarded |
| • Emergency Power Selector | Off |
| | |
| • Battery | On & Guarded |
| --- BAT BUS OFF light should extinguish --- | |
| • Cockpit Lights | On, if required |
| • Master Caution | Push / Off |
| --- If Ext Pwr Light illuminated --- | |
| • EXT PWR Switch | On |

--- Check	Ext Pwr Light	Illuminated
	AC and DC 1, 2 and 3 Off Lights	Extinguished
	Gen 1, 2 and 3 ARM Lights	Illuminated
	BUS Off Lights (pwrd busses)	Extinguished ---

- Door(s) Open (via FMC Menu)
- Gangway Enable (if available) (Ctrl + J)
- Galley (GLX) EXTR PWR On
- Captains SIS Panel → EIS Source Aux

--- Verify normal presentation of AUX DEU on main displays ---

- Captains SIS Panel → EIS Source 1
- Static Air Selector Norm (labeled "ELEC/AIR")
- Display Units Check powered and appropriate indications displayed
- Clock Verify time correct, elapsed time to zero
- Radio Selector Switch VHF-1
- FMC
 - Init Page → INIT
 - FMC-1 → LSK L1
 - F-PLN INIT → LSK R6
 - Check GNS Position → Make corrections if needed
- NAV Light On
- EMER LT (Light) Armed
- EMER LT TEST Switch Push & Hold for 8 seconds
- EMER LTS TST PASS (could be) displayed on EAD. ---
- No Smoke Lights On
- Seat Belts Lights Auto

--- Continue here after a turn-around / Cockpit not dark & cold ---

- ENG/APU Fire Test Button Push & Hold
- Verify ENG1 Fire, ENG2 Fire, ENG3 Fire sounds played. ---
- ENG/APU Fire Test Button Release
- APU PWR Button On

--- Check	APU PWR AVAIL Light then ...	Flashing till available,
	APU PWR AVAIL Light	Illuminated steady
	AC / DC 1, 2, 3 OFF Lights	Extinguished
	AC TIE 1, 2, 3 ARM Lights	Illuminated
	GEN 1, 2, 3 ARM Lights	Illuminated
	BUS OFF Lights (pwr bus)	Extinguished
	APU Start/Stop Light	Illuminated ---

--- If APU Start fails press APU Start/Stop switch. ---

--- BAT Charging Alert may be displayed, switches off after 2-5 minutes. ---

- Trim Air Off Light Verify Extinguished (AIR panel)
- Annun LT Test Button Push & hold

--- Verify Annunciator Lights illuminated and aural overspeed warning ---

- Cabin Press SYSTEM Light Verify Extinguished (= cabin press auto mode active)
- Cabin Outflow Valve Verify Open
- AIR → APU Switch On

--- Verify Flow & Off Lights extinguished. ---

- IRS Selectors 1-3 Nav
- Master Warnings Push / Off

• FMC

- Init Page → INIT
- ALIGN IRS → LSK R4
--- If position needs correction: ---
- POS REF → LSK R4
- Enter corrected coordinates if needed → LSK L1
- Update → LSK R1
--- If "cruise level above max flight level" is indicated, correct crz lev. at INIT Page. ---
- F-PLAN INIT → LSK R6
--- Continue here: ---
- Enter Dep Airport / Arr Airport → LSK R1 → Return → LSK R6
- Enter Alternate Airport → LSK R2 → Return → LSK R6
- Enter Flight Number → LSK L4
- Enter Initial Cruise Level (and step climb level) → LSK L5
- Enter Cost Index (recommend 80 to 100) → LSK R6

- Weight Init Page → PAGE
- Use UFOB Block-Fuel → LSK R1
- Enter ZFW (xxx.x) → LSK R3
- Enter ZFW-CG (xx.x) → LSK R6 (easy auto-mode: 1st right click, then left click)
- Enter TO-CG (xx.x) → LSK R5 (easy auto-mode: 1st right click, then left click)
- F-PLAN Page → F-PLAN
- Departure LAT REV Page → LSK L1 (next to Dep Airport)
- SID → LSK L1
- Choose Runway → LSK Rx
--- Now choose SID leading to the first waypoint of your route. ---
- Choose SID → LSK Lx
- Insert → LSK L6
- First Enroute Waypoint LAT REV Page → LSK Lx (next to First Enr. Wayp. after SID)
- Airways Page → LSK L2
- Enter first airway → LSK L1
- Enter second airway → LSK L2
--- Continue with all airways in the same manner. ---
- Enter exit waypoint for the last airway (last enroute waypoint) → LSK Rx
- Insert → LSK L6
- Delete any discontinuities → CLR LSK Lx
- F-PLAN INIT Page → INIT
- WEIGHT INIT Page → PAGE
- Note Block Fuel (xxx.x)
- FUEL INIT Page → PAGE
- Enter Block Fuel as REFUEL QTY → LSK L1
- TAKE OFF Page → TO/APPR
- Enter Flex Temp (derated 50 to 70 non-derated) → LSK L1
- Enter appropriate flap settings → LSK L3
- Enter dep rwy slope (always 0) / rwy wind → LSK R2
- Enter Outside Air Temperature (OAT) (xxC or xxF) → LSK R3
- Confirm all V-Speeds → LSK L4 → LSK L5 → LSK L6
--- Check V-Speeds now indicated on the PFD. ---

- [IVAP-flightplan](#)

[Create](#)

- Speed at flightplan Enter MACH
- Departure Time Enter (UTC)
- IFR Clearance Request
- Note Squawk, initial Alt, SID, etc. ---
- Squawk Set
- Voice Recorder Test Button Push & Hold 5 seconds
- You should hear a test tone & see deflection into the green band. ---
- BUS FAULT Lights Verify Extinguished
- CARGO TEMP Set FWD & AFT
- ENG IGN OFF Light Verify Extinguished
- Hydraulic SYSTEM Manual Light Verify Extinguished (= hyd system auto mode active)
- HYD SYS 1, 2 & 3 PRESS Lights Verify Illuminated
- HYD PRESS TEST Button Push
- HYD PRESS ALERT should be displayed on EAD. ---
- Test will take about 1 minute, wait till TEST Light extinguished before proceeding. ---
- SMOKE ELEC/AIR Selector Verify Norm
- DRIVE 1, 2 & 3 Switches Guarded
- CAB BUS Switch Guarded
- EMER PWR Armed
- EMER PWR ON Light illuminates for 30sec during tets. ---
- Air MASK Switch Verify Guarded
- Fuel SYSTEM Manual Light Off (= fuel system auto mode active)
- Exterior Lights
 - LDG LT Ret
 - NOSE LT Off
 - L & R WING & RWY TURNOFF On / Extinguished
 - NAV Verify On / Extinguished
 - LOGO On
 - BCN & HI-INT Off
- FLAP LIMIT / ELEVEL FEEL Auto & all lights extinguished
- Cabin Press Controller Verify Auto
- CABIN PRESS Valve Verify Open (cabin press meter full upper position)
- DITCHING Switch Verify Guarded

- ANTI-ICE & DEFOG All extinguished
--- Next step only if refueling (after turn-around) is planned. ---
- FUEL USED RESET Button Push
- FMA / Autopilot:
 - IN / HP Set Barometer to IN or HP as required
 - BAROSET QNH
 - Barometer Set to atmospheric pressure
 - MINIMUMS Control Knob RA
 - HDG Readout MAG (indicated on ND)
 - ND / PFD Set as desired (Range, Map, etc.)
 - IAS/MACH 250 (or alternate initial speed)
 - HDG / TRK HDG (indicated on ND)
 - HDG on ND / Standby Comp. Cross Check
 - Bank Angle Selector Auto
 - AFS OVRD OFF Switches Up
 - Altitude Set assigned initial Altitude
- Oxygen Mask Test/Reset Switch Push & verify oxygen flow
- ND clock Verify correct time displayed
- Gear Lights Verify 4 green
- CTR GEAR NORM/UP Light Verify extinguished
- System Display Open
- System Display Config Page Config
- Gear Test Push & Hold (Gear Lever down)
--- Verify 4 red lights. --- Release. --- Verify four green lights. ---
- System Display Close
- Throttle 1 Test → Full Up → Verify Warning Horn Sounds → Idle
- Throttle 2 Test → Full Up → Verify Warning Horn Sounds → Idle
- Throttle 3 Test → Full Up → Verify Warning Horn Sounds → Idle
- Flap T.O. Selector Rotate Wheel to required setting
- HDG Set HDG of departure runway
- Auto Break Select T.O. position
- Auto Break ABS disarm Light Verify extinguished
- Gangway Disable (Ctrl + J)
- Doors All closed (via FMC FS Shortcuts Menu)

- Doors Slides Menu) Arm all (via FMC FS Shortcuts)

Engine s/u & Pushback:

- Engine s/u & Pushback p/b clrc request
- Beacon Light On
- AUX HYD PUMP 1 On
- ENG IGN A or B Push
- Fuel SYSTEM Manual Light Verify Extinguished (= fuel auto mode active)
- Air SYSTEM Manual Light Verify Extinguished (= air auto mode active)
- Parking break Off (Push the brakes)
- Pushback Start (via FMC FS Shortcuts Page)

- Engine 3 START Switch Pull
 --- Observe switch light illuminates. Wait till 15% N2. ---
- Engine 3 FUEL Switch On
 --- Wait till N1 & N2 stabilized. EGT & ENG OIL in normal range. ---
- Engine 1 START Switch Pull
 --- Observe switch light illuminates. Wait till 15% N2. ---
- Engine 1 FUEL Switch On
 --- Wait till N1 & N2 stabilized. EGT & ENG OIL in normal range. ---
- Engine 2 START Switch Pull
 --- Observe switch light illuminates. Wait till 15% N2. ---
- Engine 2 FUEL Switch On
 --- Wait till N1 & N2 stabilized. EGT & ENG OIL in normal range. ---

- If CARGO DOOR TEST FAIL alert is displayed, perform manual test. ---
- Cargo Door Test Button Push & Hold for 4 seconds

- Engine & Airfoil Anti-Ice On if required (< 10° TAT)
- AIR APU Off (Verify on light extinguishes)
- APU Verify Off (On light extinguished)
- GLY EXT PWR Off
- EXT PWR Off

--- If FADEC Alternate Mode is displayed and not desired. ---

- | | |
|-----------------------------|-------------------------|
| • FADEC MODE Switches 1 - 3 | Open, Push, Guard |
| • Nose Light | Taxi |
| • Landing Light | Ext Off |
| • Logo Light | On |
| • Pushback | Finish |
| • IRS / PFD | Verify "TAXI" indicated |

Taxi:

- | | |
|-------------------|---|
| • Taxi-Clrc | Request |
| • Taxiways | Note (if needed) |
| • Ground-Guidance | Request (if needed) |
| • Flaps | Select (as filled in FMC) |
| • Spoilers | Arm |
| • PFD | Verify flap setting indicated correctly |
| • TCAS | TA/RA |
| • Stabilizer Trim | Set as indicated on TO/APPR Page |
| • FMC T/O Page | Check |
| • NAV Mode | Push / Arm |

h/p:

- | | |
|--|---|
| • Hand-off GND to TWR | Change frequency |
| • l/u & t/o clrc | Request (rdy for dep h/p xx) |
| • Landing Lights | On |
| • HI-INT Lights | On (= Off Light extinguished) |
| • IVAP-Transponder | On |
| • AUTOFLIGHT | Arm |
| --- Attention: Applying more then 65% N1 thrust activates auto-thrust now! - | |
| --- | |
| • EAD | Verify "Green Box" displayed
(=t/o config) |
| --- "Green Box" will not be displayed with parking break set. --- | |
| • Postion & hold | Taxi & stop on rwy |

Ready to Takeoff:

- Parkingbreak Set
- Thrust Levers Forward
--- Move forward till „T/O Thrust“ is displayed on the PFD. ---
- Parkingbreak Release
--- Verify “T/O Clamp” indicated; following “T/O Thrust”. ---
- V1 Takeoff abortion impossible
- VR Lift nose up
- V2 Lift-off

Takeoff:

- Trim settings Adjust (when needed)
- Gear Up (at positive climb rate >500ft)
- Speed Verify V2+10kts maintained (by nose pitch)
- Autoflight / -pilot On
--- Verify blue AP1 or 2 light illuminated & AP off extinguished (PFD). ---
--- After 1500ft RA: ---
- PROF On
- Speed FMS
--- verify Thrust in magenta color on PFD ---
- Airborne Publish airborne when on Unicom (no ATC)
--- After 3070 ft RA: ---
- Flaps Retract (on schedule; PFD displaying “-FR”)
- Slats Retract (on schedule; PFD displaying “-SR”)
- Start time Note (if required)
- Hand-off TWR to APP(DEP) Change frequency

Climb:

- VS / Vertical Speed Set manually if higher climb rate desired
- Landing-/Taxi Lights Off
- Spoiler Disarm

- Autobreak Off
- FMA Altitude Readjust to next cleared / final Flight Level
- Hand-off APP to CTR Change frequency
- Anti-Ice (all) On (under 10°C OAT, see FMC PROG page)
- Altimeter Readjust (above 18000ft)
- Landing Lights Ret
- Seat Belts Off (depends on weather)

Cruise:

- Radio / ATC contact Maintain / Check continuously
- FMA (Autopilot) / FMC Check permanently
- FMC Check PERF & PROG pages [ETA & EFOB(fuel)]

Descent & Approach:

- Descent preparations Begin 30 to 50nm before T/D (Top of Descent)
- Airport-/Meta-Information Retrieve
- FMC:
 - F-PLAN Page → F-PLAN
 - Last EnRoute Waypoint Lat Rev Page → LSK Lx
 - STAR & App Selection Page → LSK R1
 - Choose Arrival Runway → LSK Rx
 - Choose corresponding STAR → LSK Lx
 - Insert → LSK L6
 - Select App Transition if available & desired → LSK Rx
 - Check F-PLAN for discontinuities
- Seat Belts On
- Descent Request start of descent
- FCP / Autopilot Altitude Reset to next (cleared) Flight Level
 --- Verify airplane starts descent at T/D ---
 --- Repeat last step whenever cleared to next FL ---
- FMC
 - TO/APPR Page → TO/APPR
 - Set landing flaps or leave default setting (35°) → LSK L4
 - Note Final Approach Speed → LSK L5
 - Verify Landing Weight under Maximum LW → LSK R1

--- If magenta ADD DRAG message appears: ---

- Speedbrakes / Spoiler Up (if required)
- Altimeter Readjust (under 18000ft)
- Hand-off CTR to APP Change frequency
- Landing lights On
- Taxi light Land
- Speedbrakes / Spoiler Off & Arm
- Autobreaks Set

--- After STAR, entering Approach / overflying Transition: ---

- Flaps 15 (or as required)

Final approach & Landing (Autoland):

- FCB Autopilot APPR/LAND Arm
- Verify LAND ARMED indicated on PFD. ---
- Flaps Lower as required till reaching 35° after “Gear Down”

--- Stabilize on glide slope /ILS app. ---

- ILS captured Announce
- Verify white “LOC” & “G/S” indicated on PFD. ---
- Hand-off APP to TWR Change frequency
- Gear Down
- Landing clrc Request

- Verify 1400ft above ground:
 - PFD → Speed at App Speed
 - PFD → Green DUAL LAND indication
 - PFD → Flaps 35
 - EAD → Green Box
- Throttles Idle (Important: Before flare & touchdown!!!)

--- Flare & Touchdown: ---

- Verify on PFD:
 - White RETARD
 - Green FLARE
- Thrust reversers Engage (if needed)
- Thrust reversers Disengage (at 60kt) (idle fwd)

- | | |
|-------------------|------------------------------|
| • Autopilot (FCP) | Disengage (AP Disengage Btn) |
| • Warnings | Off |
| • Brakes | Disable auto-break |
| • Runway | Vacate („rwy vacated“) |

Final approach & Landing (w/o Autoland):

- | | |
|---|---|
| • Flaps | Lower as required till reaching 35° after “Gear Down” |
| --- Stabilize on glide slope /ILS app. --- | |
| • ILS captured | Announce |
| • Gear | Down |
| • Hand-off APP to TWR | Change frequency |
| • Autopilot (FCP) | Disengage (AP Disengage Btn) |
| • Warnings | Off |
| --- Continue approach & landing manually – hand-flying: --- | |
| • Trim settings | Adjust (when needed) |
| • Landing clrc | Request |
| --- Touchdown: --- | |
| • Throttles | Idle |
| • Thrust reversers | Engage (if needed) |
| • Thrust reversers | Disengage (at 60kt) (fwd idle) |
| • Brakes | Disable auto-break |
| • Runway | Vacate („rwy vacated“) |

Taxi:

- | | |
|-----------------------|----------------------|
| • Transponder | Stdbby |
| • Hand-off TWR to GND | Change frequency |
| • Taxiways | Note and follow |
| • (Ground-Guidance | Request if required) |
| • Flaps | Set 0 |
| • Speedbrakes | Disengage |
| • Autobrakes | Off |
| • Landing lights | Off |
| • Taxi Light | On / Taxi |
| • HI-INT Light | Off |
| • Landing time | Note (if needed) |

- APU PWR On
--- Verify AVAIL Light flashing indicating APU start. ---
- Air APU Bleed On

Parking Position:

--- Before turning into gate / parking position: ---

- Taxi Light Off
- At parking position: ---
- Parking brake Set
- ATC contact End (state "on blocks")
- Engine 1 & 3 Fuel Flow Switches Off
--- Verify APU AIR/ELEC On" alert on EAD: ---
- Engine 2 Fuel Flow Switch Off
- Seatbelts Off
- Doors Disarm all (via FMC)
- Doors Open
- Gangway Enable (Ctrl + J)
- IRS Selectors 1 – 3 Off
- All exterior lights (except NAV) Off
- EXT PWR On
- GLY EXT PWR On
- TCAS Stdbby
- Anti-Ice All Off
- Cargo Temp Off
- APU Off

--- Aircraft ready for turn-around /next flight. ---

--- Continue if "Cold & Dark" required: ---

- EMER LT Off
- NAV Light Off
- GLY EXTR PWR Off
- EXT PWR Off
- Cockpit Lights All Off
- Battery Off

Intentionally Blank

MD-11F --- Fuel Planning Charts:

MD-11 see next page!

<u>Flightplan Fuel only (lbs)</u>	CI = <u>80 !</u> No Winds! MZFW !	MZFW 461.300 lbs	Break Release to Landing	Climb: 250 / 300 kt M 0.78	Cruise: M 0.82	Descend: M 0.70 290 / 250 kt
MD-11 max. Range at MZFW: 3500nm						
<u>Distance (nm)</u>	<u>Fuel (lbs) at FL 290/300</u>	<u>Fuel (lbs) at FL 310/320</u>	<u>Fuel (lbs) at FL 330/340</u>	<u>Fuel (lbs) at FL 350 - 430</u>		
100	12.000	≈ 97% of FL290	≈ 96% of FL290	≈ 95% of FL290		
200	16.000					
300	21.000					
400	25.000					
500	29.000					
600	33.000					
700	37.000					
800	41.000					
900	45.000					
1000	49.000					
1500	68.000					
2000	91.000					
2500	109.000					
3000	135.000					
3500	156.000 *					
After 3500nm Payload has to be traded for fuel. **						
4000	172.000	≈ 97% of FL290	≈ 96% of FL290	≈ 95% of FL290		
4500	191.000					
5000	210.000					
5500	228.000					
After 5500mm Payload has to be traded for range (max. fuel capacity reached). **						
6000	245635	≈ 97% of FL290	≈ 96% of FL290	≈ 95% of FL290		
-						
7000						

* At MZFW the maximum range of 3500nm can only be achieved with additional reserves limited to 16.500 lbs (instead of 21.000 lbs), otherwise MTOW of 630.500 lbs will be exceeded.
➔ Additional 2000 lbs of taxi fuel can be loaded a GW of 632.500 lbs. These 2000 lbs have to be consumed with APU & taxi before takeoff.

** Flying in higher altitudes - consuming less fuel - it is possible to carry the same payload over a longer range with the trade-off between the fuel, range and payload affecting the aircraft after a longer distance.

MD-11 --- Fuel Planning Charts:

Flightplan Fuel only (lbs)	CI = 80 ! No Winds! MZFV !	MZFV 461.300 lbs	Break Release to Landing	Climb: 250 / 300 kt M 0.78	Cruise: M 0.82	Descend: M 0.70 290 / 250 kt
MD-11 max. Range at MZFV: ≈ 4500nm						
Distance (nm)	Fuel (lbs) at FL 290/300	Fuel (lbs) at FL 310/320	Fuel (lbs) at FL 330/340	Fuel (lbs) at FL 350 - 430		
100****	12.000					
200	16.000					
300	21.000					
400	25.000					
500	29.000					
600	33.000					
700	37.000					
800	41.000	≈ 97%	≈ 96%		≈ 95%	
900	45.000	of	of		of	
1000	49.000	FL290	FL290		FL290	
1500	68.000					
2000	90.000					
2500	110.000					
3000	130.000					
3500	150.000					
4000	171.000					
4500	191.000					
After 4500nm Payload has to be traded for fuel. ***						
5000	208.000					
5500	227.000					
6000	254.200 **					
After 6000nm Payload has to be traded for range (max. fuel capacity reached). ***						
6500		≈ 97%	≈ 96%		≈ 95%	
-	245635	of	of		of	
7000		FL290	FL290		FL290	

* At MZFV the maximum range of 3500nm can only be achieved with additional reserves limited to 11.500 lbs (instead of 21.000 lbs), otherwise MTOW of 630.500 lbs will be exceeded.
 → Additional 2000 lbs of taxi fuel can be loaded a GW of 632.500 lbs. These 2000 lbs have to be consumed with APU & taxi before takeoff.

** At a payload of ≈ 100.000 lbs the maximum range of 6000nm can only be achieved with additional reserves limited to 10.000 lbs (instead of 21.000 lbs), otherwise MTOW of 630.500 lbs will be exceeded.

➔ Additional 2000 lbs of taxi fuel can be loaded a GW of 632.500 lbs. These 2000 lbs have to be consumed with APU & taxi before takeoff.

*** Flying in higher altitudes - consuming less fuel - it is possible to carry the same payload over a longer range with the trade-off between the fuel, range and payload affecting the aircraft after a longer distance.

**** For a distance of 100nm altitudes of 15000ft maximum are assumed.

Fuel planning notes --- MD-11 & MD-11F:

	Basic Operating Weight (OEW) (11F: 248.500 LBS)	291.100	LBS
+	Payload (passengers & cargo)	XXX.XXX	LBS
=	Zero Fuel Weigh (ZFW) (max 461.300 LBS)	XXX.XXX	LBS
+	Minimum Landing Fuel	008.000	LBS
+	Alternate Fuel (200nm distance)	005.000	LBS
+	Contingency Fuel (holding, taxi, etc.)	008.000	LBS
=	Planned Landing Weight (PLW) (max 491.500 LBS)	XXX.XXX	LBS
+	Flight Plan Fuel (fuel for route)	XXX.XXX	LBS
=	Planned Takeoff Weight (PTOW) (max 630.500 LBS)	XXX.XXX	LBS

➔ **Flight Plan Fuel + 21.000 LBS = Total Fuel = Block Fuel**

➔ *Total fuel = Enough fuel for route, 1h contingency (holding & taxi), problematic winds, alternate fuel for 200nm and a minimum landing fuel (1h+). Modify alternate value as needed.*

➔ Load all wing tanks with same amount of fuel; outer tanks full ➔ inner tanks ➔ center tanks.