Dornier Do J „Wal“

Flight Manual

DO NOT USE IN REAL AIRCRAFT

General information about the Do J

The Do J Wal was created from the basic variant Do GS I and II, from which the Do Wal 22, the widespread Do J Wal, and the 8.5t and 10t Wale emerged. The latter were only produced in small numbers and used as mail flying boats.

The first production version of the Do Wal was built in 1922 in Marina si Pisa, Italy (“Whale 22” or also called “Pisa Whale”, with the number “22” standing for 1922). In 1926, all machines still in flight were retrospectively unified into the "Do J Wal" series.

The Do J Wal is an all-metal monoplane flying boat with engines mounted on the fuselage in twin configuration. The attachment of the engines above, between the wings, which could be dismantled for transport purposes, enabled the greatest possible operational reliability, so that the flying boat could be safely controlled even with only one engine running. Thanks to this engine arrangement, the flying boat behaved like a single-engine landplane.

Initially the engines were air-cooled, but were replaced by less vulnerable water-cooled engines with radiators located between the two engines.
The fuel system held 1450 - 2000 liters of fuel, which was supplied to the two engines by means of a vane pump. To start the engines, the fuel was pumped in by hand. Then the vane pump was driven by the motors.
The Do J Wal could climb up to 4,500 meters, but was mostly flown well below this altitude due to weather conditions.
Thanks to the patented side fins on the fuselage, the flying boat had a high lateral stability.
The hull was keeled more at the back than at the front, which not only made take-off and landing easier, but also made it possible to do without wing flaps.
The tailplane was used for elevator and rudder control, which was carried out by the pilot using foot and hand wheel controls.

In addition to the pilot, there was also the co-pilot, who was mainly responsible for calculating the course, and an on-board mechanic.
The standard equipment of the machine included:
- a speedometer (airspeed indicator)
- two tachometers (rpm indicator)
- an altimeter
- a compass
- a fuel gauge
- a clock

The flying boat did not have batteries.
There was no illumination of the instruments, some of the instruments had a coat of paint that glowed independently in the dark. Lighting (passenger cabin, instruments) could be retrofitted.
The flying boat was mostly offered with double controls, but some also with single controls and, if desired, a radio system could be retrofitted.

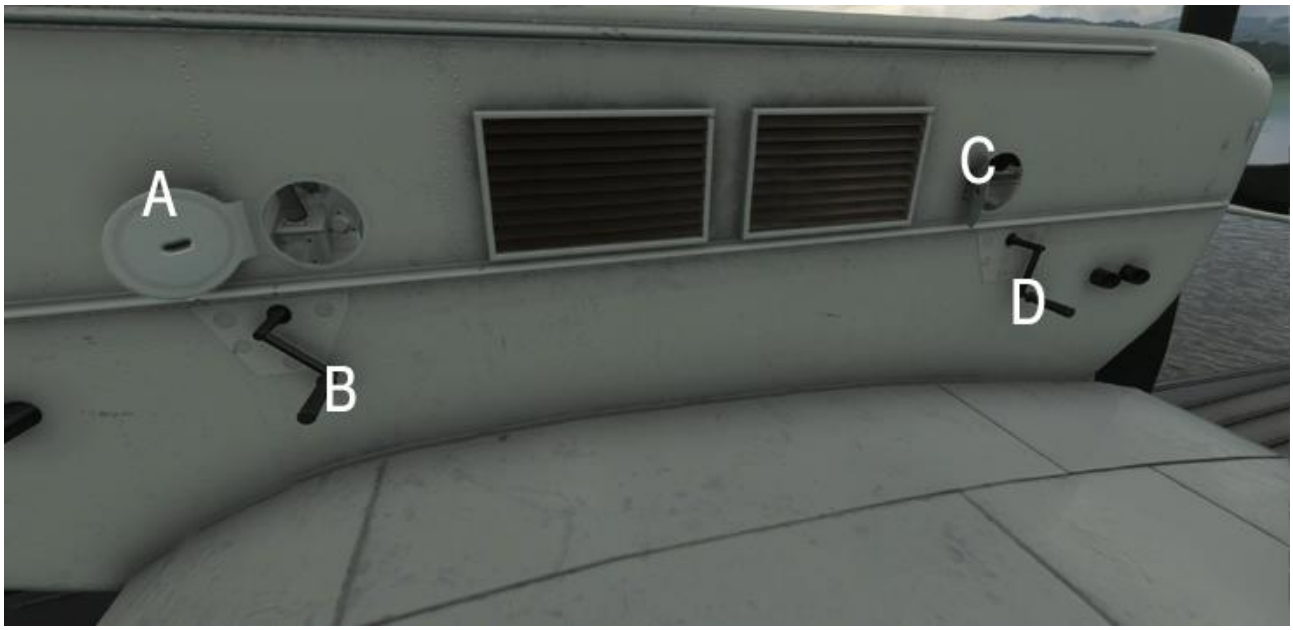
Differences between Real and Simulation:

In real the engines were started hand propped by the mechanist.
Therefore the mechanist stood by the side of the engine. Each engine, front and back, had a separate start module. Clutch. A crank was inserted into it and then the engine was turned on by hand. In order for the engine to ignite, the ignition switch in the driver's cab had to be turned on.

In the simulator we have made that a little more comfortable so we perform these two steps at once by turning the magneto inside the cockpit.

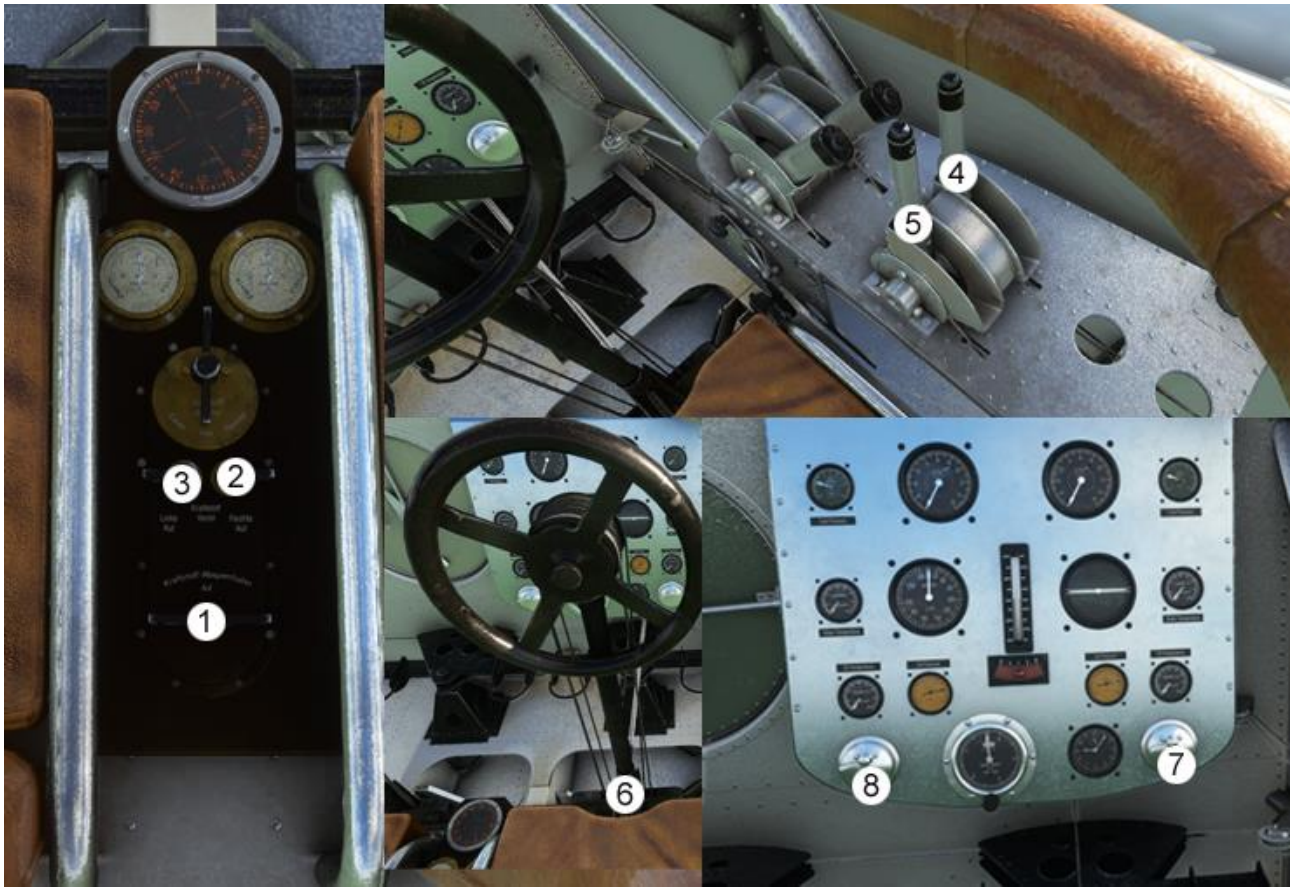
For those who want it more realistic we have also implement a starter crank too, to give you a feeling of a mechanist who start the engines on top of the wings.

Starting Engines with starter crank:					
You can move from the cockpit to the left wing to start the engines manually.					
	Cockpit preparations you should do first:				
	1		Fuel Shut-off Valve	open	
	2		Fuel Valve right (rear Engine)	open	
	3		Fuel Valve left (front Engine)	open	
	4		Mixture Lever Engine 2	Full open	
	5		Mixture Lever Engine 1	Full open	
	Now move with the key arrows to the left engine nacelle side.				
	Start rear Engine:				
	C		Starter crank storage	open	
	D		Rotate the Starter crank slowly clockwise	till engine 1 is running	
	Start front Engine:				
	A		Starter crank storage	open	
	B		Rotate the Starter crank slowly clockwise	till engine 2 is running	



Starting and Shut-off Engines in the Simulator:

You can start and shut-off the engines in different ways.



From Cold and Dark Configuration or after Engine shut-off:					
A.	Manual Start:				
	Starting Engine 2 (Rear Engine)				
	1		Fuel Shut-off Valve	open	
	2		Fuel Valve right (rear Engine)	open	
	4		Mixture Lever Engine 2	Full open	
	6		Hide the Yoke for better handling		
	7		Starter Engine 2 (Rear Engine)	Held for 3 seconds	
	Starting Engine 1 (Front Engine)				
	3		Fuel Valve left (front Engine)	open	
	5		Mixture Lever Engine 1	Full open	
	8		Starter Engine 1 (Front Engine)	Held for 3 seconds	

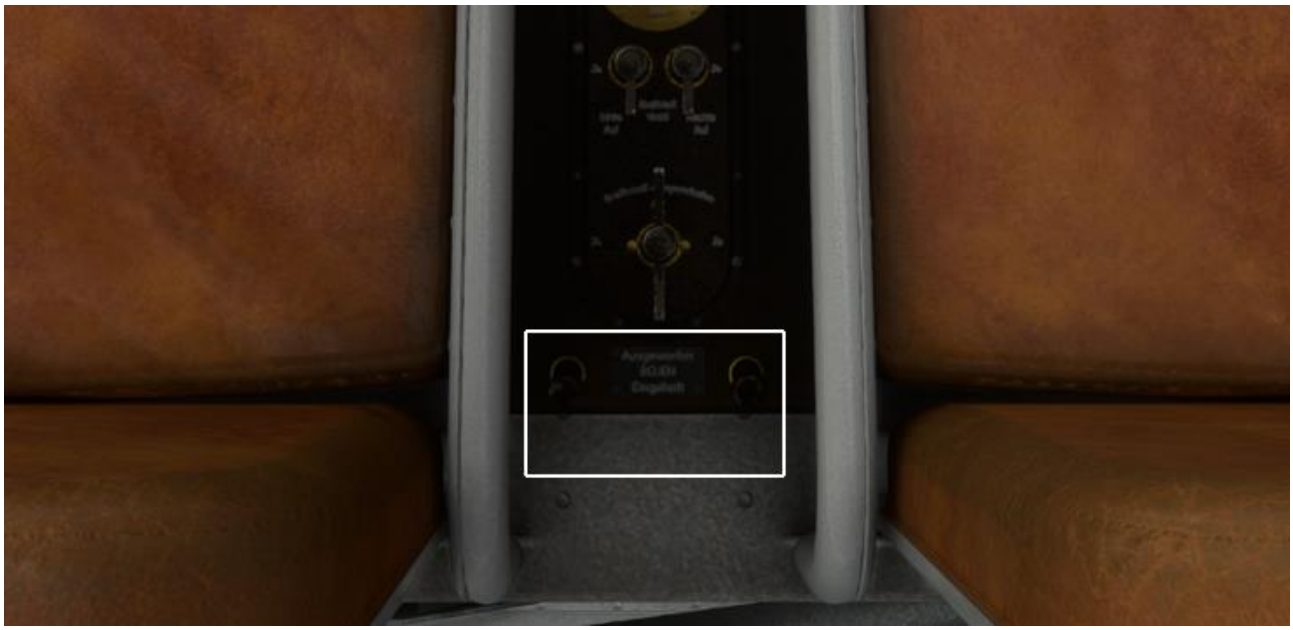
B.	Engine Auto Start:				
	By using the engine auto start function, the starting order is:				
	1		Engine 1 (Front Engine)		
	2		Engine 2 (Rear Engine)		
	3		Auto Start Engine		
			Keybinding:	Control + E	
			Note:		
			Normally both engines should start one after the other. But sometimes it doesn't work right away, so it may happen that this process has to be repeated.		

Engine Shut-Off: Manual					
	3		Fuel Valve left (front Engine)	close	
	2		Fuel Valve right (rear Engine)	close	
	1		Fuel Shut-off Valve	close	
	5		Mixture Lever Engine 1	closed	
	4		Mixture Lever Engine 2	closed	
Engine Shut-Off: Autostop					
			Keybinding:	Shift + Control + E	
Restarting the engines after an Engine Autostop.					
	Sometimes the fuel shutoff valve (1) may not supply fuel so you have to close and reopen the fuel shutoff valve (1) again.				

1. Extras

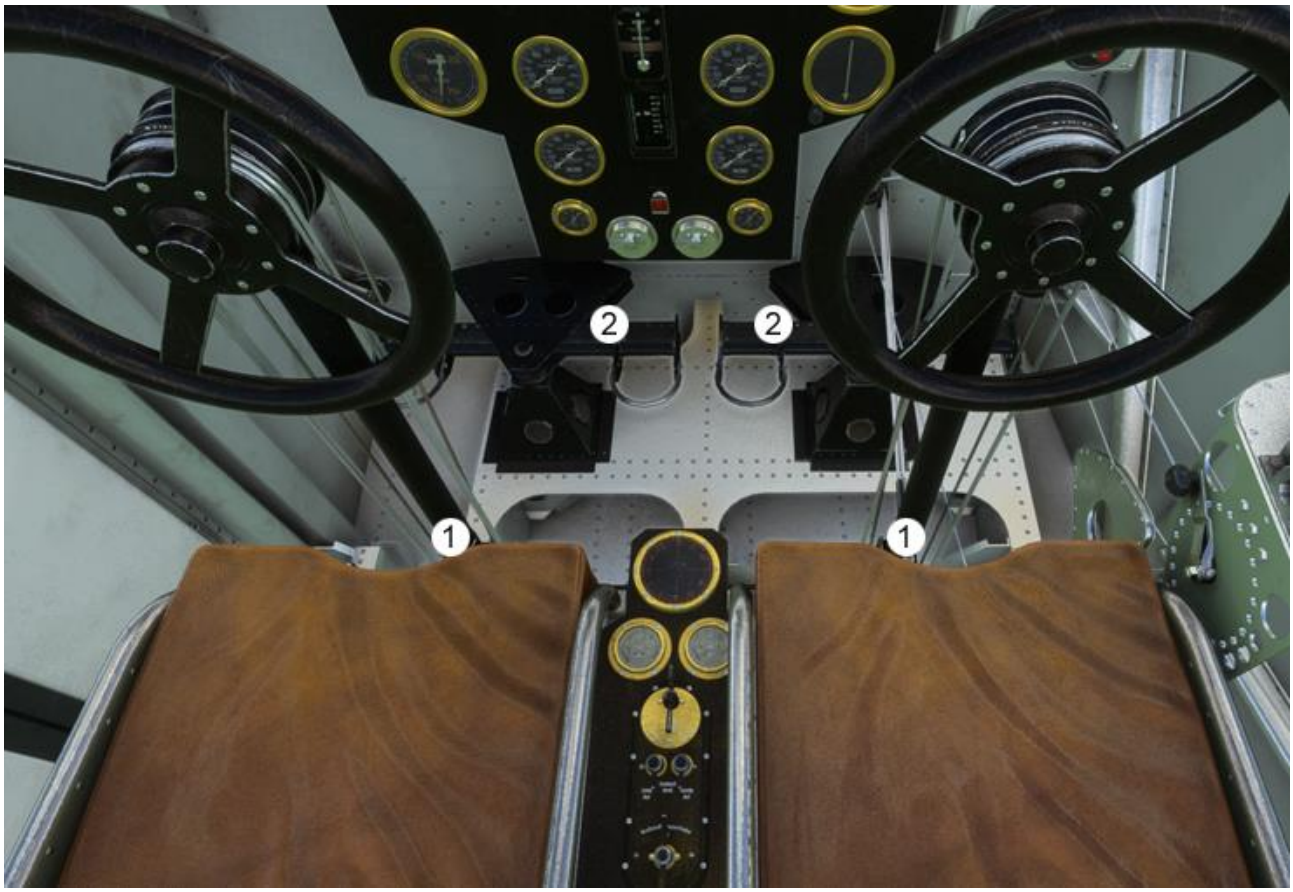
Buoys

All Wals have buoys, that can be ejected or retrieved. There are two switches between the seats for this.



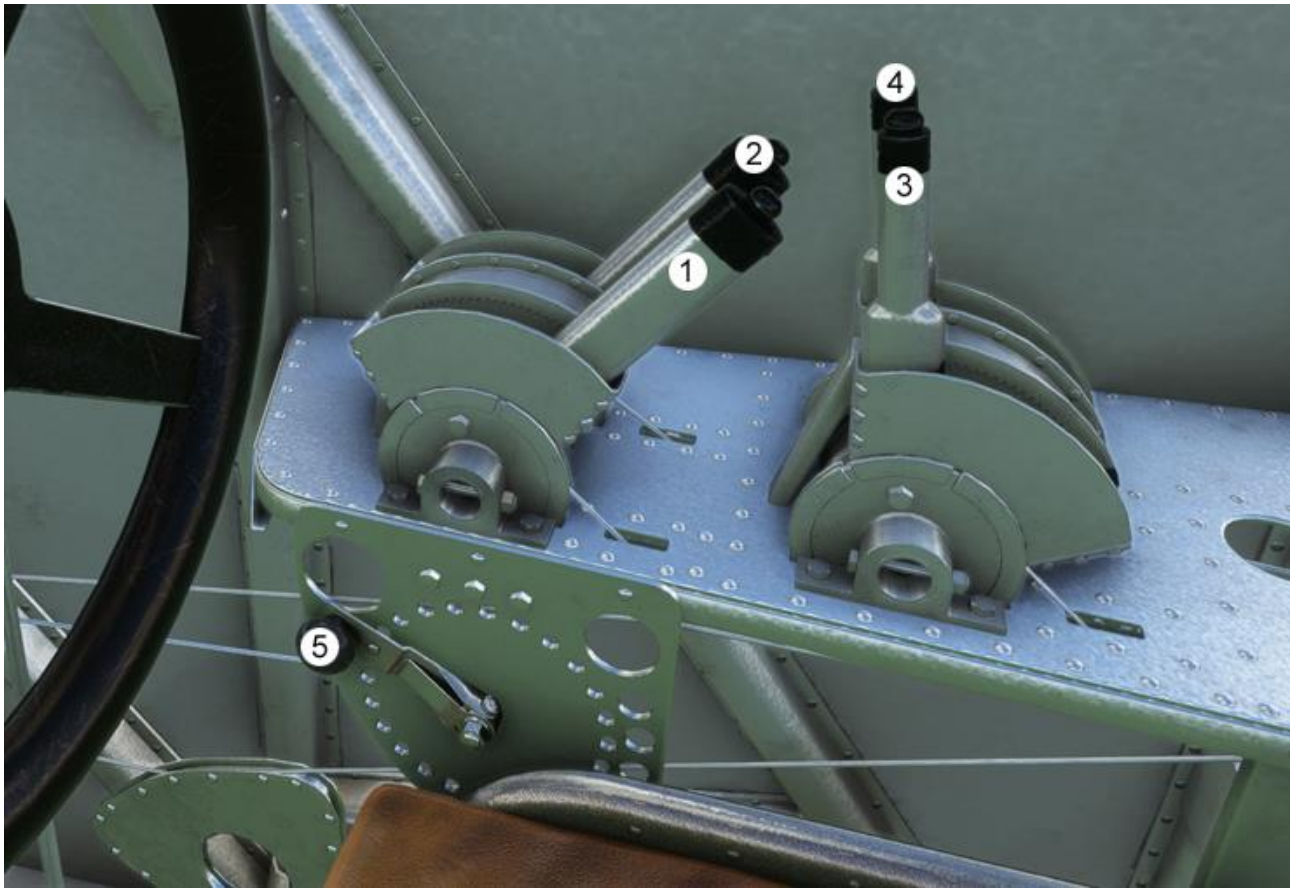
2. Common Systems

Yokes and Pedals



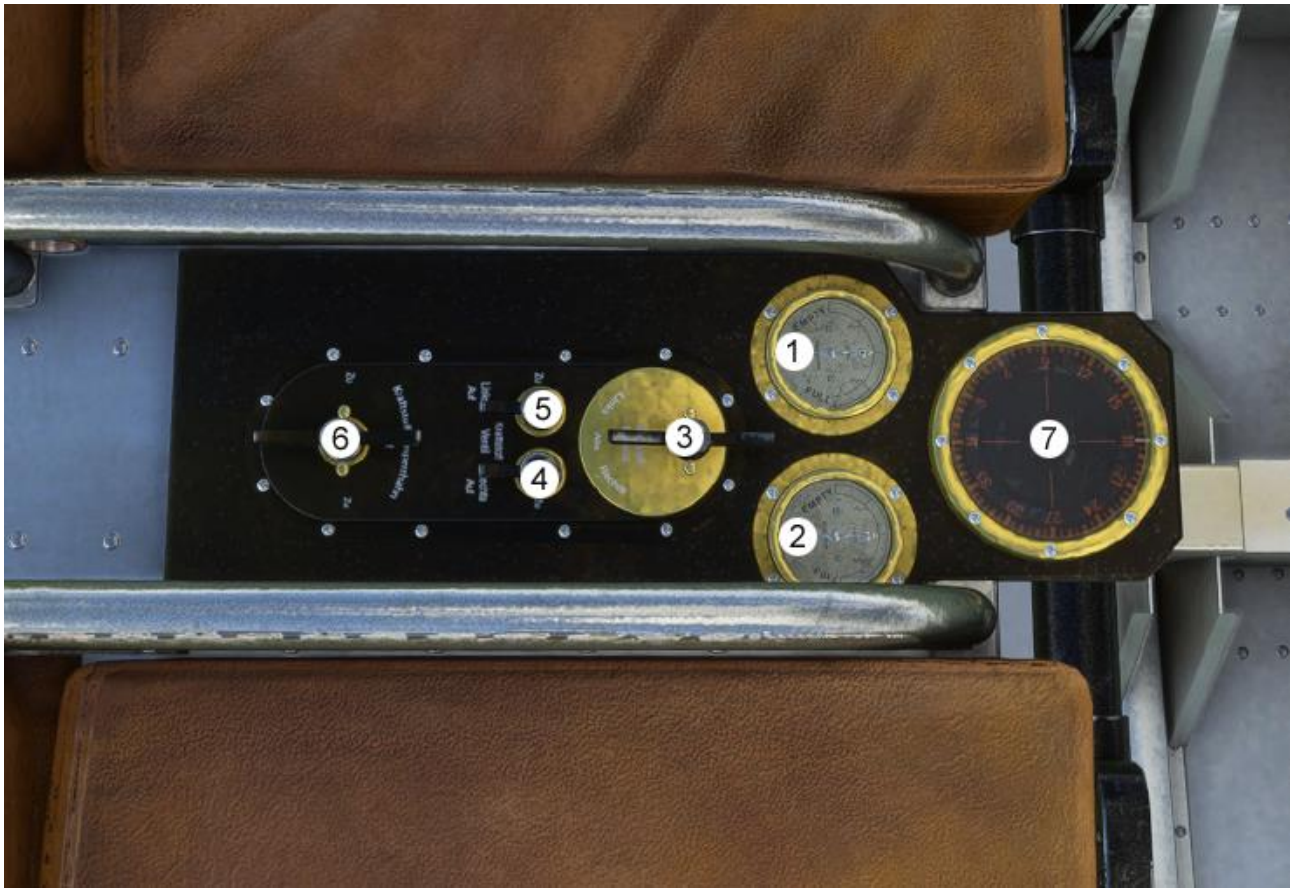
1		Yoke Hide Area	
2		Pedals	

Levers



1		Throttle Lever Engine 1 (front engine)	
2		Throttle Lever Engine 2 (rear engine)	
3		Mixture Lever Engine 1	
4		Mixture Lever Engine 2	
5		Trim Lever	

Fuel Control



1		Fuel Quantity Indicator (Left Tank)	
2		Fuel Quantity Indicator (Right Tank)	
3		Fuel Selector Lever	
4		Fuel Valve left (front Engine)	
5		Fuel Valve right (rear Engine)	
6		Fuel Shut-off Valve	
7		Magnetic Compass	

Instrument and Cockpit Lighting

The “Cabina” has a batterie dependent instrument and passenenger cabin lighting.
The “N25” and “Plus Ultra” has on there instruments self lighting color, the are fluorescent.
The begin to light after dark.
No cockpit lights are available, only a flashlight, use “ALT + L” to enable/disable.

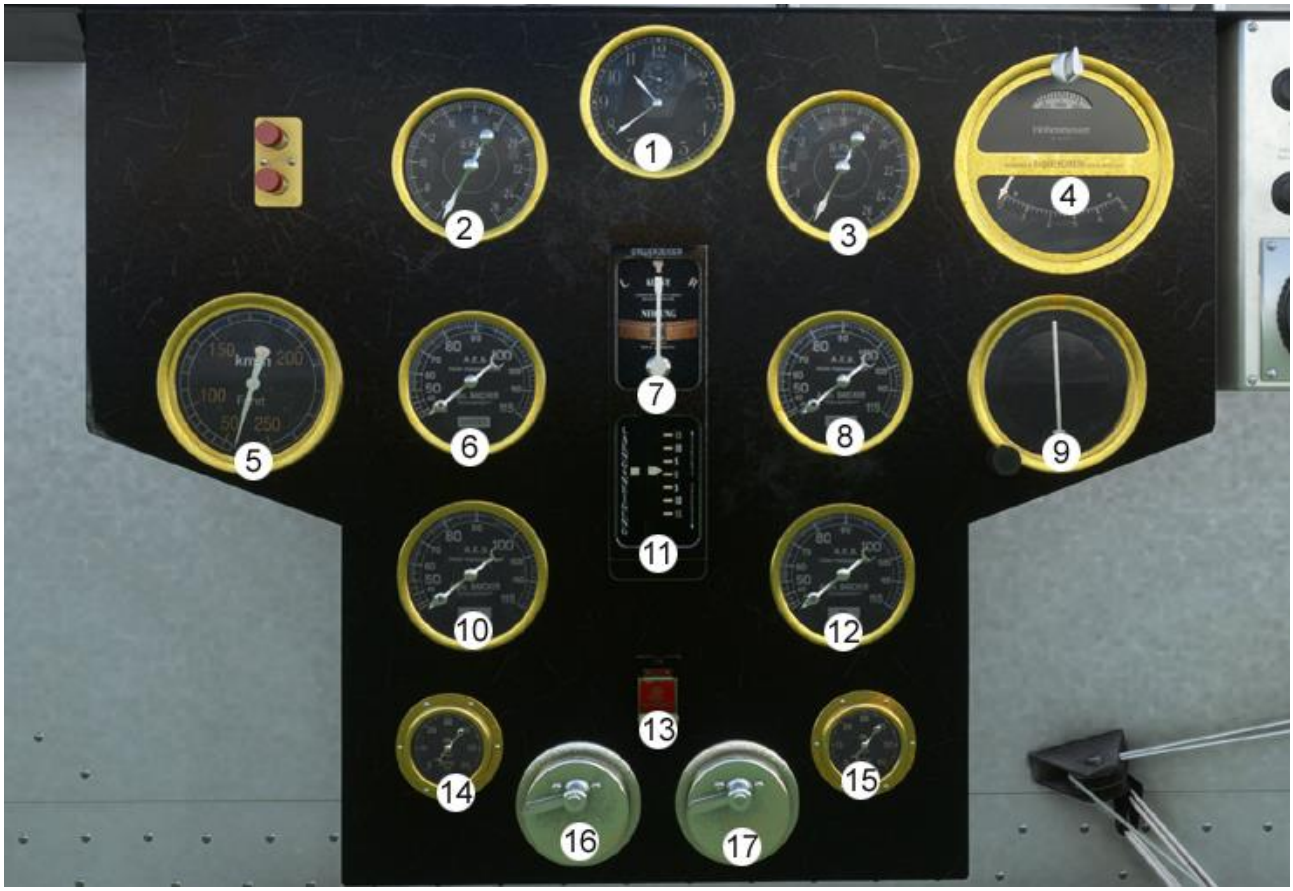
Fuel Pump

The Fuel Pumps (1) are driven by the engines.
If no engine is running, the fuel pumps don´t work.

3. Dornier Do J „Cabina“ (Passenger Wal)

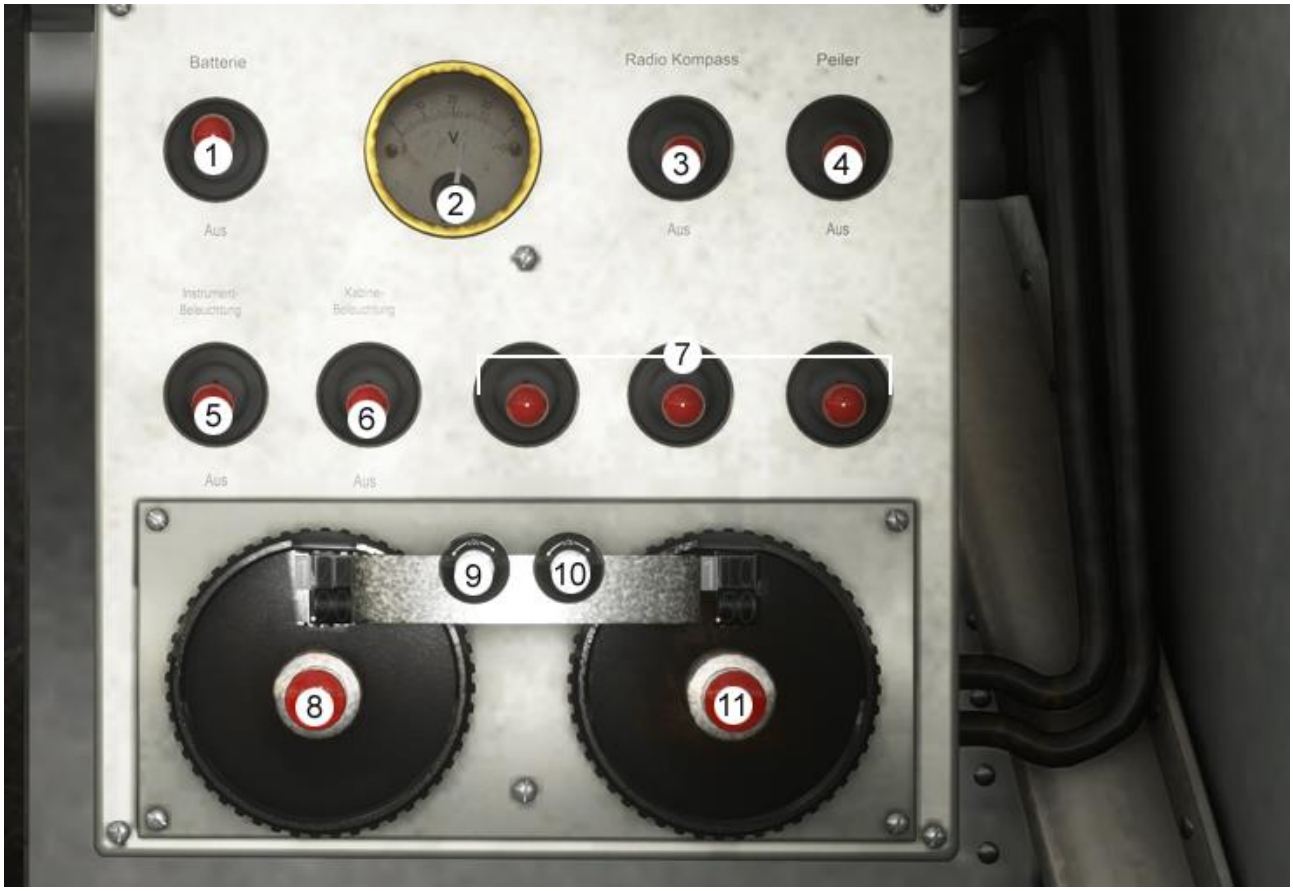
TECHNICAL DATA				
Length		17,25 m	56,59 ft	
Wingspan		22,50 m	73,82 ft	
Height		4,70 m	15,42 ft	
Wing area		97 m²	1.044 sq ft	
Empty weight		3.500 kg	7.606 lbs	
Max. Take off Weight		5.600 kg	12.436 lbs	
Engine		2 × Rolls-Royce Eagle IX	395 PS	390 hp
Cylinder		12		
Fuel Quantity		1.450 Liter	383 Gallons	
Max. Airspeed		174 km/h	94 kts	108 mph
Cruise Speed		135 km/h	73 kts	84 mph
Max. Altitude		3.100 m	10.170 ft	
Crew		2 - 3		
Passengers		8 - 10		

DESCRIPTION MAIN PANEL



1		Clock	
2		RPM Indicator Engine 1	
3		RPM Indicator Engine 2	
4		Altimeter with calibration knob	
5		Airspeed Indicator	
6		Radiator Engine 1	
7		Turn Coordinator	
8		Radiator Engine 2	
9		Radio Compass	
10		Oil Temperature Engine 1	
11		Vertical Speed Indicator	
12		Oil Temperature Engine 2	
13		Netzausschalter (Emergency Cut Off switch)	
14		Oil Pressure Engine 1	
15		Oil Pressure Engine 2	
16		Starter Engine 1 (Front Engine)	
17		Starter Engine 2 (Rear Engine)	

DESCRIPTION CONTOL BOX



1		Battery Master Switch	
2		Battery Volt Indicator	
3		Radio Master Switch	
4		Radio Direction Finder Switch	
5		Instrument Lighting Switch	
6		Passenger Cabin Lighting Switch	
7		INOP	
8		Com 1 Setting Knobs	
9		Com 1 Volume Knobs	
10		NAV 1 Volume Knobs	
11		NAV 1 Setting Knobs	

DESCRIPTION RADIO COMPASS

Note: This function is only available in the Dornier DoJ “Cabina”.

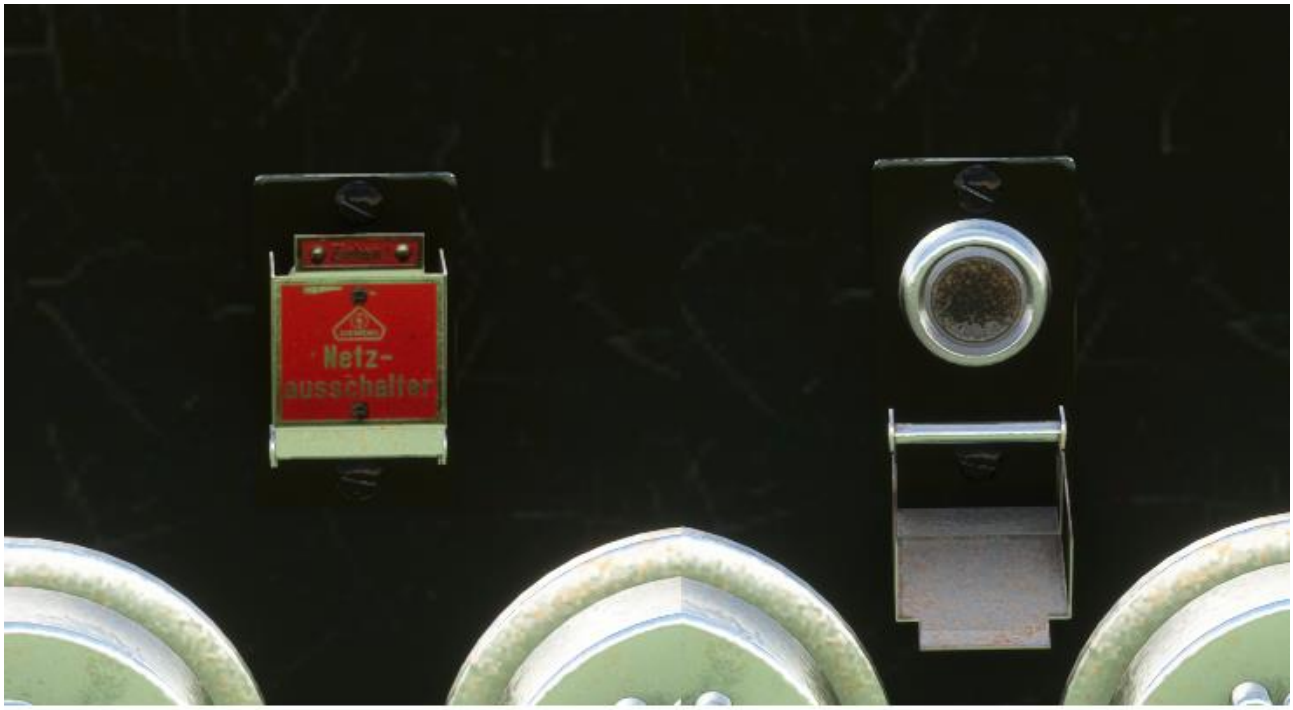
The Radio Compass has two operating modes: “Manual” or “Radio Dependent”.

Manual:
In order to set a course manually, it does not require any power supply from the battery. The radio main switch does not have to be switched on. The RADIO STATUS SWITCH (3) must be set to “MAN”. After a course has been calculated, it can be set using the COURSE SETTING KNOB (5). If the flying boat drifts off the set course due to wind conditions, the pilot sees this on the basis of the course needle (4) and can correct the flight attitude.

Radio dependent:
The BATTERY (1) and the RADIO MAIN SWITCH (1) must be switched on for this. The RADIO STATUS SWITCH (3) must be set to “VOR”. If a current course signal is set in the NAV radio and this is received, this is automatically transmitted to the radio compass (4) and the pilot can orientate himself using the position of the course needle.

DESCRIPTION NETZAUSSCHALTER (Emergency cut off switch)

Note: Do not use in normal flight condition.

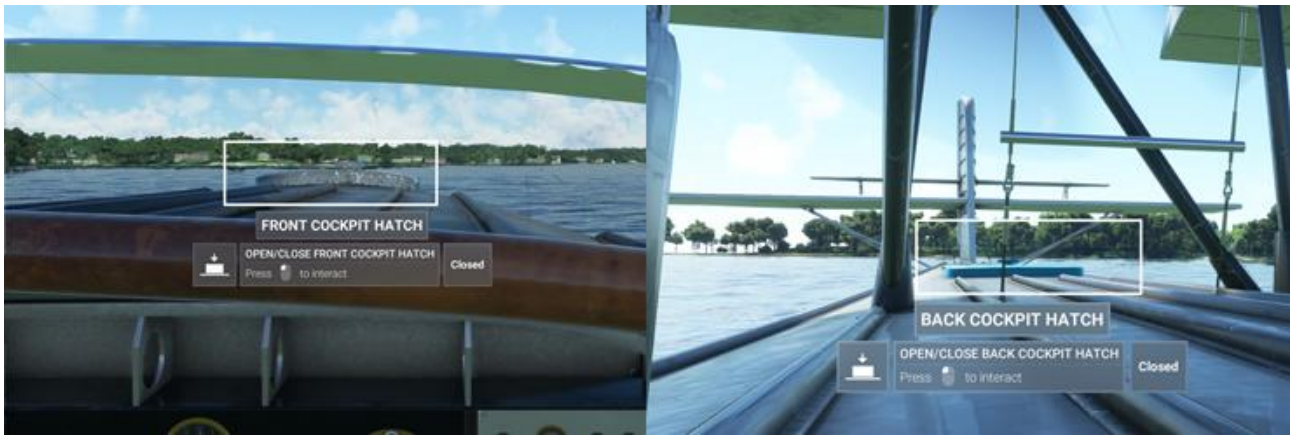


The “NETZAUSSCHALTER” interrupts all flight relevant systems.
The button must be pushed in (“On”, this is standard if the cover is closed), otherwise the fuel supply to the engines is stopped and all power is cut off.

CABINA HATCHES

The Cabina Wal has two hatches that can be opened/closed with the mouse.
Note: To do this you must sit inside the cockpit.

You also can move over the flight boat deck through and climb into the cabin, same for the cargo room and if you are under the engine nacelle you can climb here into it too.



4. Dornier Do J „Plus Ultra“

TECHNICAL DATA				
Length		17,25 m	56,59 ft	
Wingspan		22,50 m	73,82 ft	
Height		4,70 m	15,42 ft	
Wing area		97 m²	1.044 sq ft	
Empty weight		3.450 kg	7.606 lbs	
Max. Take off Weight		5.450 kg / 7.000 kg	12.015 lbs	15.432 lbs
Engine		2 × Napier „Lion V“	450 PS	444 hp
Cylinder		12		
Fuel Quantity		2.000 Liter	528 Gallons	
		4.000 Liter	1056 Gallons	
Max. Airspeed		167 km/h	90 kts	103 mph
Cruise Speed		135 km/h	73 kts	84 mph
Max. Altitude		4.500 m	14.764 ft	
Crew		3 - 4		
Passengers		0		

Background information about the Do J “Plus Ultra”

The Plus Ultra, which means “always further” in Latin, was built in Pisa, Italy, in 1925.
Its origin was the military Do J variant, it was given the serial number 40 and was transferred from Pisa to Bacrelona with the identification "M-MWAL".

In the Spanish Air Force it received the service number “W12”. It was later renamed “Plus Ultra” by Franco.
To increase the range, the tank capacity of the Plus Ultra has been expanded to 4,000 liters.

On January 22, 1926, Ramón Franco, his co-pilot Julio Ruiz de Alda Miqueleiz, naval lieutenant Juan Manuel Duran and mechanic Pablo Rada took off from Palos de la Frontera, in Huelva, Spain on the first transatlantic flight, who would later make history.

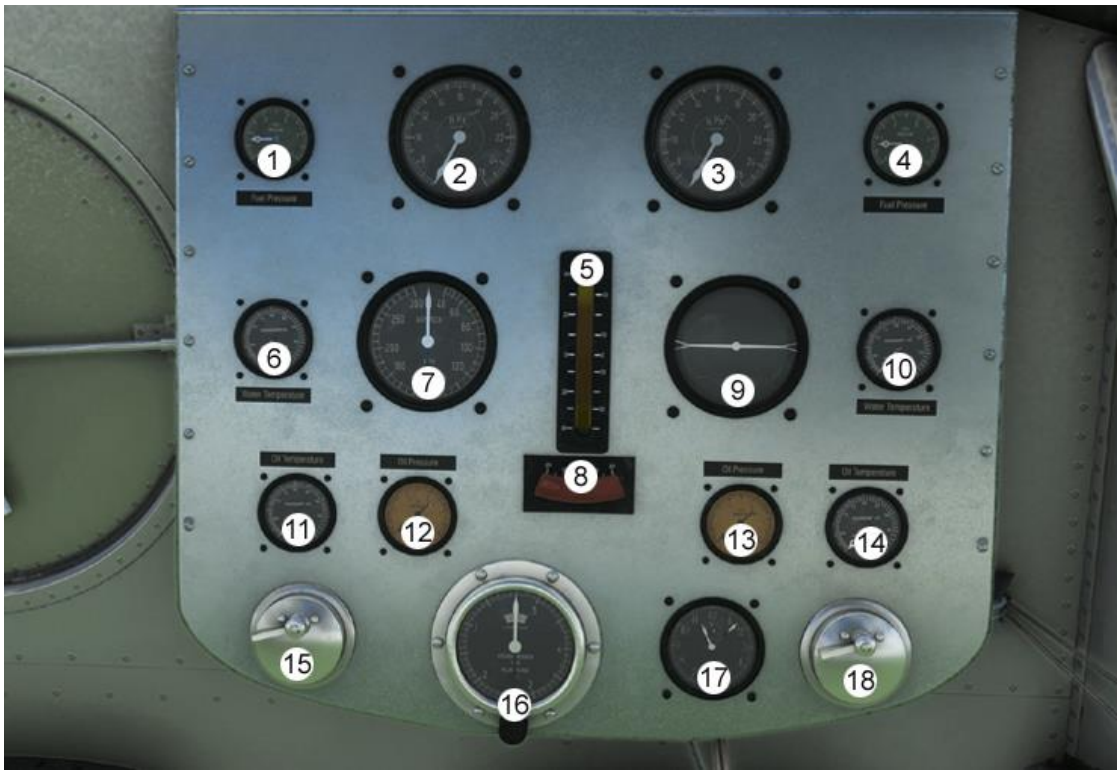
On the first leg to Las Palmas, Canary Islands, they also took photographer Leopoldo Alonso with them to film the start of the trip. The journey takes eight hours. On January 26, 1926, the Plus Ultra set off towards Porto Praia (Cape Verde Islands), the end of the second stage, which lasted nine hours and fifty minutes.

On February 9, 1926, after a total of 10,270 km, the Plus Ultra landed in Buenos Aires after 59 hours and 39 minutes.

The plane did not return to Spain with the successful fliers. King Alfonso XIII. donated it to the Argentine Navy, who used it as a mail plane.
It later came back to Spain where it was restored and is now on display at the Enrique Udaondo Provincial Museum in the city of Luján, Argentina.

The individual flight stages of the Plus Ultra transatlantic crossing.

DESCRIPTION MAIN PANEL



1		Fuel Pressure Engine 1	
		If Fuel Valve right (rear Engine) is close you see and feel a drop in performance on the instrument and less RPM (Throttle power) is available.	
2		RPM Indicator Engine 1	
3		RPM Indicator Engine 2	
4		Fuel Pressure Engine 2	
		If Fuel Valve left (front Engine) is close you see and feel a drop in performance on the instrument and less RPM (Throttle power) is available.	
5		Pitch Indicator	
6		Radiator Engine 1	
7		Airspeed Indicator	
8		Bank Indicator	
9		Attitude Indicator	
10		Radiator Engine 2	
11		Oil Temperature Engine 1	
12		Oil Pressure Engine 1	
13		Oil Pressure Engine 2	
14		Oil Temperature Engine 2	
15		Starter Engine 1 (Front Engine)	
16		Altimeter with calibration knob	
17		Clock	
18		Starter Engine 2 (Rear Engine)	

5. Dornier Do-J N25 “Amundsen Wal”

TECHNICAL DATA				
Length		17,25 m	56,59 ft	
Wingspan		22,50 m	73,82 ft	
Height		4,70 m	15,42 ft	
Wing area		97 m²	1.044 sq ft	
Empty weight		3.430 kg	7.562 lbs	
Max. Take off Weight		5.430 kg	12.971 lbs	
Engine		2 × Rolls-Royce Eagle IX	360 PS	355 hp
Cylinder		12		
Fuel Quantity		2.000 Liter	528 Gallons	
Max. Airspeed		170 km/h	92 kts	105 mph
Cruise Speed		135 km/h	73 kts	84 mph
Max. Altitude		3.700 m	12.139 ft	
Crew		3 - 4		
Passengers		0		

Roald Amundsen starts with the N25 on the first flight expedition to the North Pole

Norwegian polar explorer Roald Amundsen used two Dornier seaplanes in his attempt to reach the North Pole on May 21, 1925. The N-24 and N-25 converted to Amundsen's imagination for this purpose. In addition to the normal instrumentation, they received a sextant and an anemometer.

Accompanying Amundsen were Lincoln Ellsworth, pilot Hjalmar Riiser-Larsen and German Dornier engineer Karl Feucht, as well as two other team members.

Both aircraft had three men on board and despite the 500 kg overload on both machines, the take-off went smoothly.

After around 8 hours of flight, an engine failure in the N-25 brought the expedition to an abrupt end. During the emergency landing, the two planes landed several miles apart without radio contact, but the crews were able to reunite. However, the N-24 was damaged beyond repair upon landing in the ice, leaving only the N-25.

For over three weeks, Amundsen and his crew worked to prepare a runway for takeoff from the ice. They shoveled away around 500 tons of ice and snow using only a pound of the daily food ration. In the end, six crew members were packed into the N-25. Riiser-Larsen took off and they were able to return.

His two planes landed at the northernmost latitude, 87° 44' north, that an airplane had ever reached up to that point.

DESCRIPTION MAIN PANEL

1		Starter Engine 1 (Front Engine)	
2		Starter Engine 2 (Rear Engine)	
3		Oil Pressure Engine 1	
4		Fuel Pressure Engine 1	
		If Fuel Valve right (rear Engine) is close you see and feel a drop in performance on the instrument and less RPM (Throttle power) is available.	
5		Fuel Pressure Engine 2	
		If Fuel Valve left (front Engine) is close you see and feel a drop in performance on the instrument and less RPM (Throttle power) is available.	
6		Oil Pressure Engine 2	
7		Oil Temperature Engine 1	
8		RPM Indicator Engine 1	
9		Pitch Indicator	
10		RPM Indicator Engine 2	
11		Oil Temperature Engine 2	
12		Radiator Engine 1	
13		Bank Indicator	
14		Radiator Engine 2	
15		Airspeed Indicator	
16		Clock	
17		Altimeter with calibration knob	

DESCRIPTION ANEMOMETER

For measuring the wind speed.

N25 HATCHES

The N25 Wal has two hatches that can be opened/closed with the mouse.

5. TUTORIAL FLIGHT

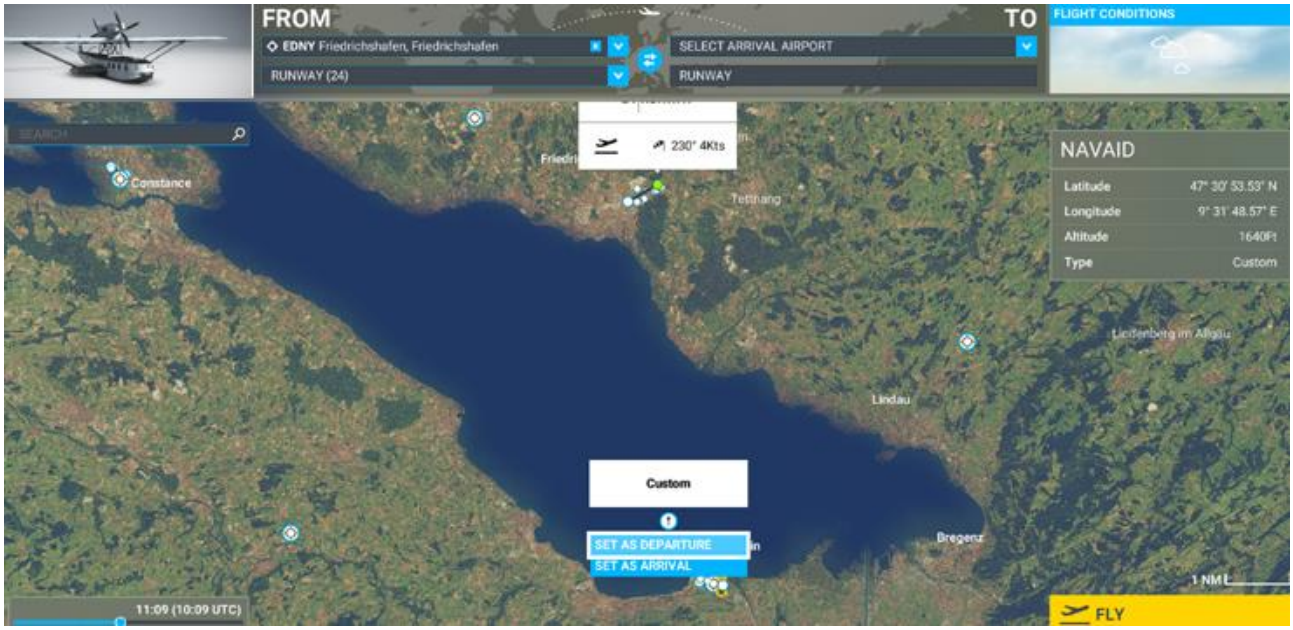
1. Flight from Friedrichdshafen (EDNY) to the Geneva (LSZG)

	Flight model:	Dornier Do J Cabina
	Departure:	Lake Constance
	Destination:	Geneva Lake
	Flight time:	2 hours
	Distance:	~200 nm
	Fuel used:	168,96 Gallones (32%)

Since we cannot load our flight directly on the water of Lake Constance, we start 1500 ft (457 m) above the water.

Flight configuration:

Set Departure Airport: EDNY
Now enlarge the map and set a custom departure near to LSZR, Altenrhein. This give us enough time to fly an approach to the bay of Friedrichshafen.



After our flight is loaded, we advance the throttle levers until we reach about 1600 RPM and trim our flying boat to get a stable flight attitude.
Now open the VFR card and begin with the approach to the bay of Friedrichshafen.

Reduce RPM to ~1400 and sink with 300 – 500 ft/min (91 m/min – 152 m/min).
Hold the airspeed under 70 knots (130 km/h).

For final approach, reduce speed to 60 knots (111 km/h). Before touching down, set the throttles to idle and pull the flying boat up slightly.

	Fuel Valve Left	Closed
	Fuel Valve Right	Closed
	Mixture Lever left and right	Closed
	Fuel Shut-off Valve	Closed
	Radio Master Switch	Off
	Battery Master Switch	Off

Now we are ready for the tutorial flight.
Check fuel Quantity, should be not less than 50%. Otherwise refuel.

Starting Engines		
	First we start the rear engine:	
	Fuel Shut-off Valve	Open
	Fuel Valve right	Open
	Mixture Lever right	Full open
	Starter Engine 2	Rotate and hold
	After starting Engine 2:	
	Check Water Temperature	< 50°C
	Check Oil Temperature	< 50°C
	Check Oil Pressure	> 35 psi
	Now we start the front engine:	
	Fuel Valve left	Open
	Mixture Lever left	Full open
	Starter Engine 1	Rotate and hold
	After starting Engine 1:	
	Check Water Temperature	< 50°C
	Check Oil Temperature	< 50°C
	Check Oil Pressure	> 35 psi

Roll them to a good take-off position with direction to the West.

	Battery Master Switch	As required
	Radio Master Switch	As required
	Instrument Lighting	As required
	Altimeter	Checked and set

Take-off		
	Apply full throttle to launch and pull the yoke toward you when exceeding 50 knots (93 km/h).	
	Note that a flying boat can get stuck on the water if you don't catch a good wave. Move the yoke back and forth to take off. The heavier you are, the more noticeable this effect is.	
Climb		
	RPM	~ 1900
	Airspeed	70 - 75 kts (130 – 139 km/h)
	Vertical Speed	300 – 500 ft/min (91 m/min – 152 m/min)
	Check Water Temperature	< 97°
	Check Oil Temperature	< 105°
	Check Oil Pressure	< 50 psi

Climb to 3500 ft (1067 m) and fly west to the island of Mainau.
Turn left, course 260°, and fly down over the Untersee to the mouth of the Rhine.
Here we leave the lake of constance and follow the Rhine in the direction of the Rhine Falls, which we will reach after about 35 minutes.

Cruise		
	RPM	~ 1750
	Airspeed	70 - 81 kts (130 – 150 km/h)
	Check Water Temperature	< 97°
	Check Oil Temperature	< 105°
	Check Oil Pressure	< 50 psi

Now we also want to use our direction finding during the flight.

Note: Direction finding is only available if we get a signal from a radio station.
In order to be able to use radio direction finding, we need power from the battery.

	Battery Master Switch	On
	Radio Master Switch	On
	Radio Direction Finder Switch	VOR
	NAV 1 Frequency	set 114.20 for VOR TRA (Trasadingen)

However, we continue to follow the course of the Rhine and use radio direction finding only for rough orientation.
As long as the weather is kind to us and we have a view of the river, we fly by sight.
After a flight time of 40 minutes we come to the city of Koblenz, here we meet the river Aare.
Which we now follow in a southeasterly direction (about 188°).
After we have also left the VOR TRA behind us, we set NAV 1 to VOR WIL (Willisau) 116.90.
We fly further down the Aare, after a flight time about 50 minutes we pass the city of Aarau and have VOR WIL on our left. Our course should be about 240°.
Should cloud fields unexpectedly appear during the flight, we will sink under them if possible so that we can continue to follow the river.

After a flight time of 1 hour and 15 minutes we see Lake Biel in front of us, and shortly afterwards Lake Neuchâtel.
We fly over Lake Neuchâtel on a course of 229°. For support we use the direction finder again, we set the VOR SPR (St. Prex) 113.90.

At the southern end of the lake we turn to 217° and fly over land again. Lake Geneva can already be seen in the distance.
We reduce RPM and descend to 2500 ft (762 m) at about 300 ft/min (91 m/min).

After 1 hour and 50 minutes we are above Lake Geneva and begin the landing approach.

Descent		
	RPM	~ 1400
	Vertical Speed	300 – 500 ft/min (91 m/min – 152 m/min)
	Airspeed	~ 65 kts (120 km/h)
	Check Water Temperature	< 97°
	Check Oil Temperature	< 105°
	Check Oil Pressure	< 50 psi
	Altimeter	Checked and set

Approach and Landing		
	Airspeed	reduce speed to 60 kts (111 km/h)
	Before touching down, set the throttles to idle and pull the flying boat up slightly.	