BRISTOL BLENHEIM IV

GUIDE BY CHUCK

PERFORMANCE SHEET

	(Unit)	SPITFIRE Mk Ia 100 oct	HURRICANE Mk IA Rotol 100oct	BLENHEIM Mk IV	TIGER MOTH DH.82	BF.109 E-4	BF.110 C-7	JU-87B-2 STUKA	JU-88 A-1	HE-111 H-2	G.50 SERIE II	BR.20M
TEMPERATURES												
Water Rad Min Max	Deg C	60 115	60 115	-	-	40 100	60 90	38 95	40 90	38 95	-	-
Oil Rad (OUTBOUND) Min Max	Deg C	40 95	40 95	40 85	-	40 105	40 85	30 95	40 80	35 95	50 90	50 90
Cylinder Head Temp Min Max	Deg C	-	-	100 235	-	-	-	-	-	-	140 240	140 240
ENGINE SETTINGS												
Takeoff RPM	RPM	3000	3000	2600 FINE	2350	2400	2400	2300	2400	2400	2520	2200
Takeoff Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+6	+6	+9 BCO ON	See RPM Gauge	1.3	1.3	1.35	1.35	1.35	890	820 BCO ON
Climb RPM	RPM	2700	2700	2400 COARSE	2100	2300 30 min MAX	2300 30 min MAX	2300 30 min MAX	2300 30 min MAX	2300 30 min MAX	2400 30 min MAX	2100 30 min MAX
Climb Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+6	+6	+5	See RPM Gauge	1.23	1.2	1.15	1.15	1.15	700	740
Normal Operation/Cruise RPM	RPM	2700	2600	2400 COARSE	2000	2200	2200	2200	2100	2200	2100	2100
Normal Operation/Cruise Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+3	+4	+3.5	See RPM Gauge	1.15	1.15	1.1	1.1	1.10	590	670
Combat RPM	RPM	2800	2800	2400 COARSE	2100	2400	2400	2300	2300	2300	2400	2100
Combat Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+6	+6	+5	See RPM Gauge	1.3 5 min MAX	1.3 5 min MAX	1.15	1.15	1.15	700	740
Emergency Power/ Boost RPM @ km	RPM	2850 5 min MAX	2850 5 min MAX	2600 COARSE 5 min MAX	2350	2500 1 min MAX	2400 5 min MAX	2300 1 min MAX	2400 1 min MAX	2400 1 min MAX	2520 3 min MAX	2200 5 min MAX
Emergency Power / Boost Manifold Pressure @ Sea Level	UK: PSI GER: ATA ITA: mm HG	+12 BCO ON	+12 BCO ON	+9 BCO ON	See RPM Gauge	1.40 1 min MAX	1.3 5 min MAX	1.35 1 min max	1.35 1 min max	1.35 1 min max	890 3 min max	820 BCO ON 5 min MAX
Supercharger Stage 1 Operation Altitude	UK: ft GER: M	-	-	-	-	-	-	0 1500	0 1220	0 1220	-	-
Supercharger Stage 2 Operation Altitude	UK: ft GER: M ITA: M	-	-	-	-	-	-	1500+ (AUTO/MAN MODES)	1220+	1220+	-	-
Landing Approach RPM	RPM	3000	3000	2400	As required	2300	2300	2000	2100	2300	2400	2200
Landing Approach Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	As required	As required	As required	See RPM Gauge	As required	As required	As required	As required	As required	As required	As required
Notes		Use "Rich" mixture for normal operation. Use "Lean" mixture for fuel conservation for RPM under 2600 & boost @ +1 or lower.		Boost Cut-Out Override (BCO) during takeoff often required	**Min Oil Press: 35 psi** **Max Oil Press: 45 psi**			No Abrupt Throttling	Eng. very sensitive to ata/rpm	Eng. very sensitive to ata/rpm		Boost Cut-Out Override (BCO) during takeoff often required
AIRSPEEDS												
Takeoff – Rotation	UK: mph GER/ITA: km/h	120	120	110	55	180	190	170	185	150	170	175
Max Dive Speed		420	390	260	160	750	620	720	675	600	410	600
Optimal Climb Speed		165	175	135	66	240	270	215	250	240	240	210
Landing – Approach		160	160	140	55	200	220	170	200	200	175	175
Landing – Touchdown		90	90	85	50	160	180	150	180	140	160	160

TABLE OF CONTENT – BLENHEIM IV

PART 1: AIRCRAFT HISTORY

Designed by Frank Barnwell in 1935, the **Bristol Blenheim** was a British light bomber aircraft designed and built by the Bristol Aeroplane Company that was used extensively in the early days of the Second World War. It was adapted as an interim long-range and night fighter, pending the availability of the Beaufighter. It was one of the first British aircraft to have all-metal stressed-skin construction, retractable landing gear, flaps, a powered gun turret and variable-pitch propellers. The Mark IV variant was unsuccessful in its daylight bombing role, suffering many losses in the early stages of the war.

PART 1: AIRCRAFT HISTORY

Just one minute after Britain's formal declaration of war against Germany took effect on September 3, 1939, a Blenheim IV of 139 Squadron took off to fly the RAF's first sortie of the war, a photo-reconnaissance operation. The next day, Blenheims made the first Bomber Command attack by bombing enemy warships.

PART 1: AIRCRAFT HISTORY

The Blenheim units operated throughout the battle of Britain, often taking heavy casualties, although they were never accorded the publicity of the fighter squadrons. The Blenheim units raided German occupied airfields throughout July to December 1940, both during daylight hours and at night. Some of these missions produced an almost 100% casualty rate amongst the Blenheims.

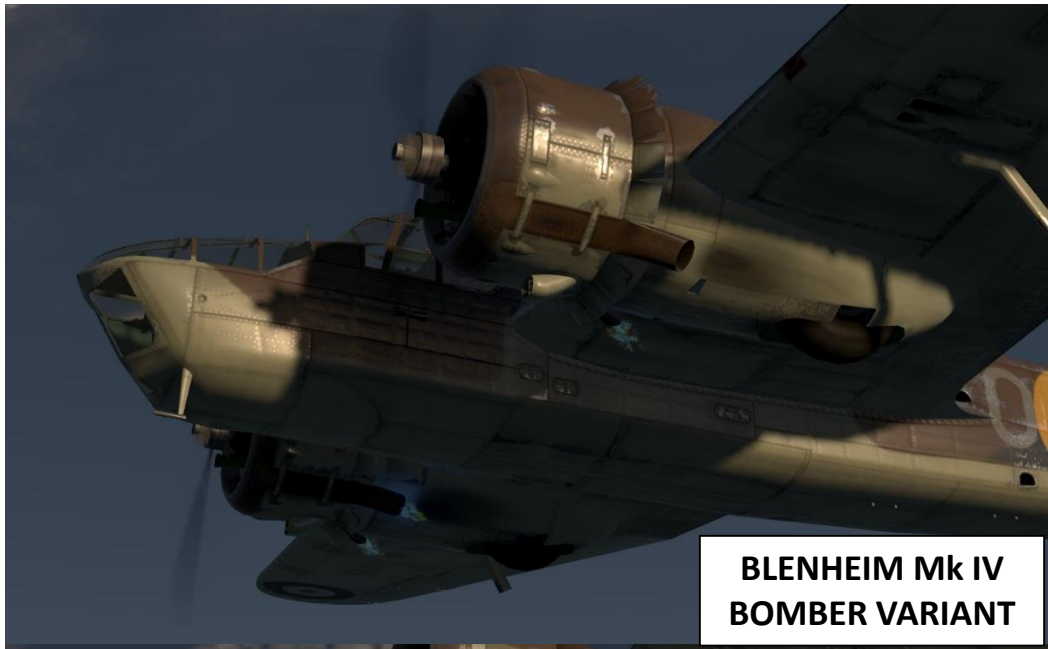
The action on 12 August 1941 was described by the Daily Telegraph in 2006 as the "RAF's most audacious and dangerous low-level bombing raid, a large-scale attack against power stations near Cologne. The raid was a low-level daylight raid by 54 Blenheims under the command of Wing Commander Nichol of No. 114 Squadron RAF. The Blenheims hit their targets (Fortuna Power and the Goldenberg Power Station) but 12 of the Blenheims were lost during the raid, 22% of those that took part, which was far above the sustainable loss rate of less than 5%.

PART 1: AIRCRAFT HISTORY

The Blenheim paid the price for being conceived in a period of rapid development which saw it arrive as the premier medium day bomber of the time. The tension between urgent need to expand with modern equipment, the rationale for pressing ahead with lightly armed day bombers in quantity, all while developing eight-gun fighters capable of destroying them: these issues were certainly recognised. The issues were complex: firepower, bomb load, weight, range, production volume and production lead times were all in play—among a host of other concerns. In the end, the sort of medium bomber that the Blenheim represented was a compromise: it was what was available to produce in 1937, in numbers sufficient over the next few years to be ready for a war in 1939.

PART 2: AIRCRAFT VARIANTS

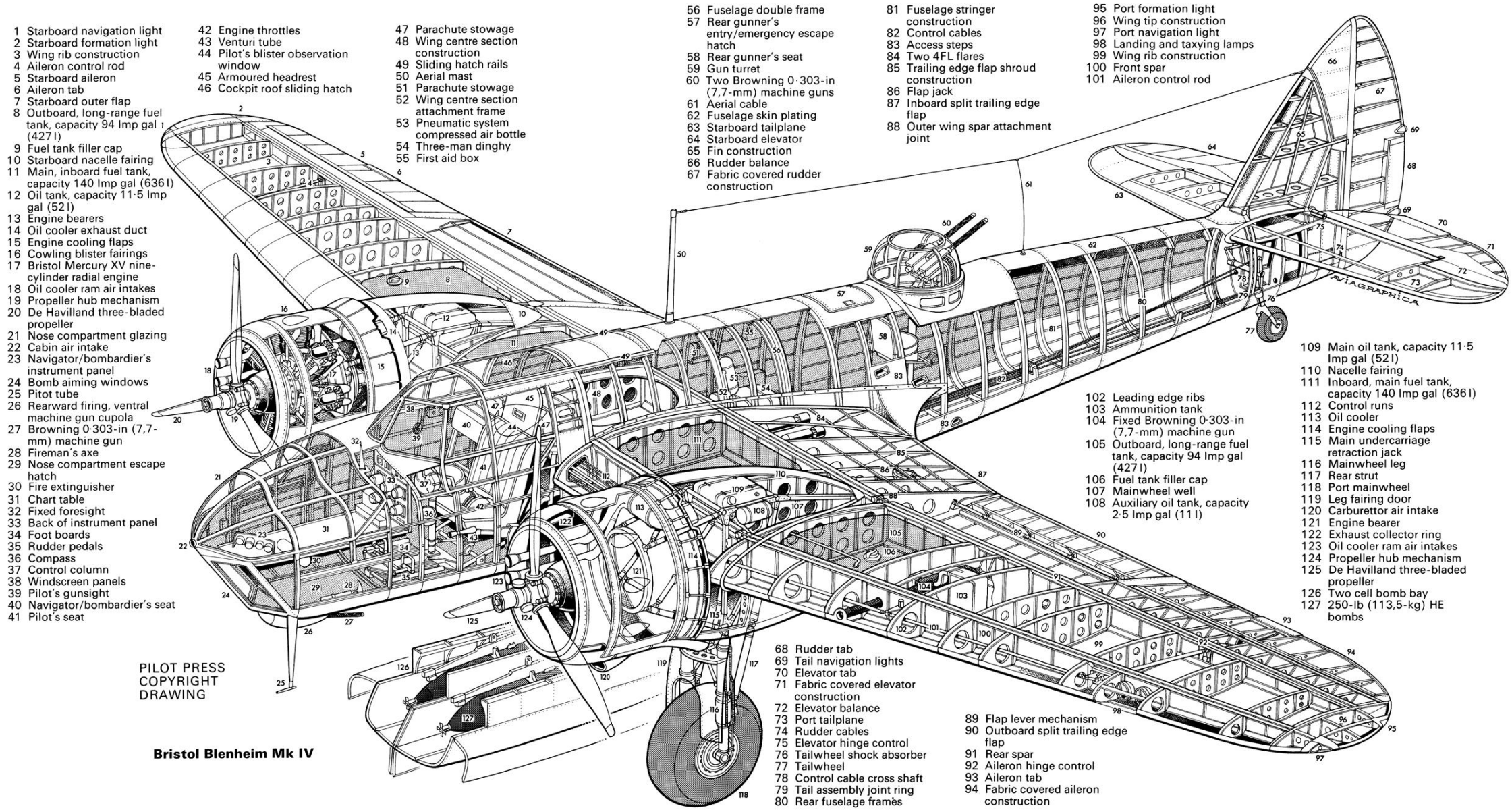
	(Unit)	BLENHEIM MK IV (BOMBER)	BLENHEIM MK IVF (FIGHTER)
TEMPERATURES			
Oil Rad (OUTBOUND) Min	Deg C	40	40
Max		85	85
Cylinder Head Temp Min	Deg C	100	100
Max		235	235
ENGINE SETTINGS & PROPERTIES			
Engine & Fuel grade		Mercury XV- 100 octane fuel	Mercury XV- 100 octane fuel
Takeoff RPM	RPM	2600 FINE	2600 FINE
Takeoff Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+9 BCO-ON	+9 BCO-ON
Climb RPM	RPM	2400 COARSE	2400 COARSE
Climb Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+5	+5
Normal Operation/Cruise RPM	RPM	2400 COARSE	2400 COARSE
Normal Operation/Cruise Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+3.5	+3.5
Combat RPM	RPM	2400 COARSE	2400 COARSE
Combat Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	+5	+5
Emergency Power/ Boost RPM @ km	RPM	2600 COARSE 5 min MAX	2600 COARSE 5 min MAX
Emergency Power / Boost Manifold Pressure @ Sea Level	UK: PSI GER: ATA ITA: mm HG	+9 BCO ON	+9 BCO ON
Landing Approach RPM	RPM	-	-
Landing Approach Manifold Pressure	UK: PSI GER: ATA ITA: mm HG	-	-
Top Speed @ Sea Level	UK: MPH GER-ITA: km/h	**266**	**266**
Notes & Peculiarities		Fit with a Hamilton Standard Two Speed Propeller, maximum RPMs are not restricted by the propeller governor. The two settings available are either 'Fine Pitch' or 'Coarse Pitch'.	



BLENHEIM Mk IV BOMBER VARIANT

BLENHEIM Mk IVF FIGHTER VARIANT

PART 2: AIRCRAFT VARIANTS



PART 2: AIRCRAFT VARIANTS

The propeller installed on your aircraft means that a specific prop mechanism is used. The Hamilton Standard two-pitch props were used on the Blenheim, mainly during the Battle of Britain. These propellers were produced by De Havilland under license from Hamilton-Standard, after Bristol failed to produce its own variable pitch props.

Propeller Pitch Terminology

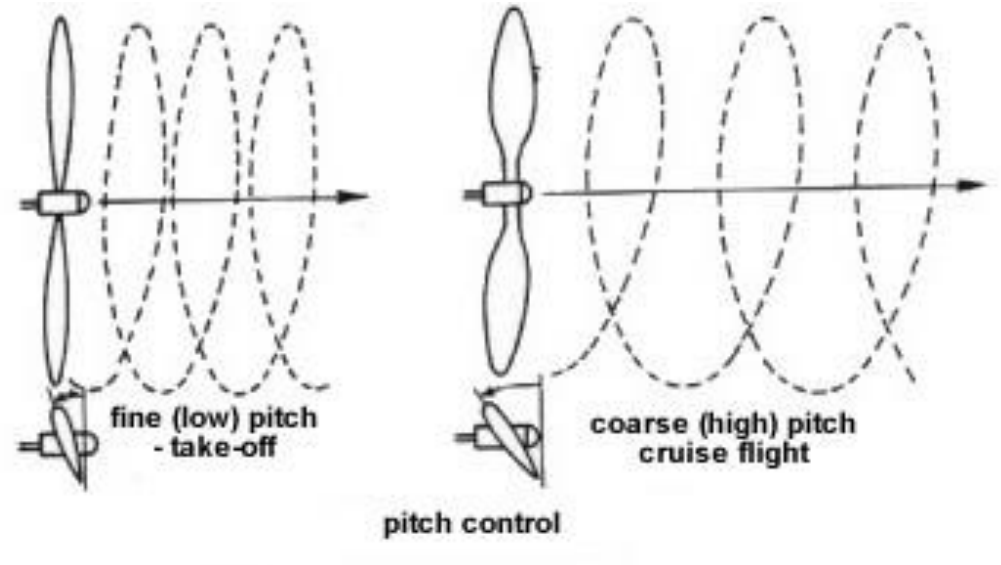
				
RAF USAAC Luftwaffe	Fine Flat / Low Startstellung (Start Position)	Coarse High Reisestellung (Cruise Position)	Feathered Feathered Segelstellung (Sail Position)	RAF USAAC Luftwaffe

Propeller Types

Propeller Types	Definition	Example
Fixed Pitch (FP)	Propeller Pitch Angle is fixed and cannot be changed.	Tigermoth
Variable Pitch (VP)	Propeller Pitch Angle may be changed by the pilot in flight. May be fully variable or limited to a defined set of positions. Susceptible to overspeed/overrev.	Hurricane DH5-20, Spitfire MkIa, Bf 109E-3 Blenheim MkIV
Constant Speed (CS)	Variable Pitch Propeller governed by a Constant Speed Unit (CSU). Governor maintains a commanded RPM and prevents propeller overspeed/overrev.	Hurricane Rotol, Spitfire MkII,
Luftschauben Verstellautomatik (LV)	Propeller with an automatic pitch changing device that prevents overrevs. Additionally, every throttle position has a corresponding RPM that is maintained within narrow limits by the automatic device. May be switched off.	Bf 109E-4, 109E-4/B

Propeller Operations

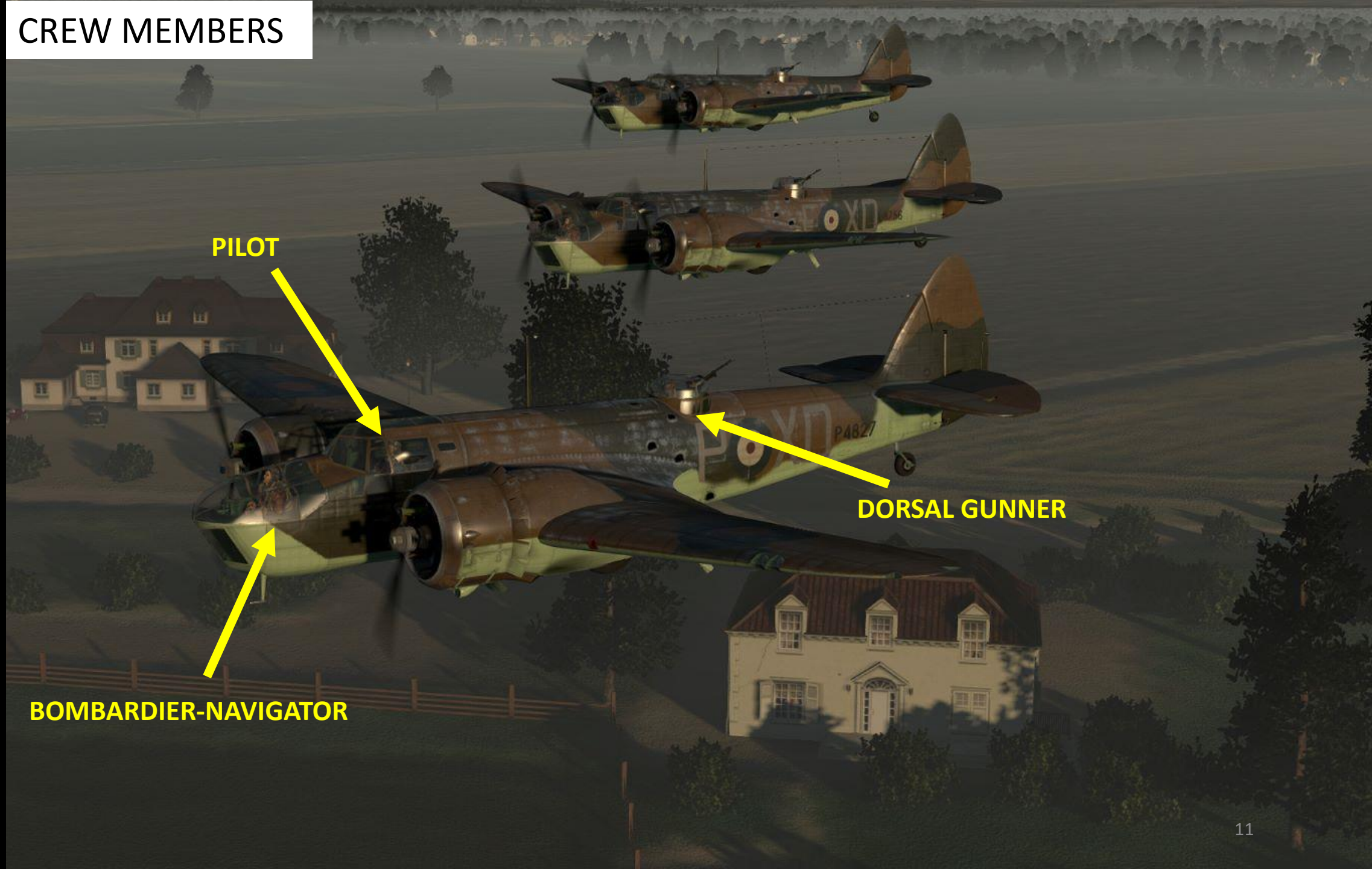
Propeller	Operation
De Havilland 5-20 (RAF) VP (hydraulic)	The DH 5-20 VP propeller functions as a pilot selectable two pitch prop. Pitch Ranges from 5° (Fully Fine) to 20° (Fully Coarse). Moving the Propeller Pitch Control selects the pitch angle (fine or coarse). Fine Pitch will result in higher RPMs and Coarse Pitch will result in lower RPMs for a given throttle setting.
Rotol (RAF) CS (hydraulic)	The Rotol is a VP prop with a CSU. The CSU governor provides for 35° of pitch change and will automatically adjust the pitch angle to maintain a commanded RPM. This will prevent overspeed until the CSU unit hits the "Full Coarse" stops at which point overspeed becomes possible. The Propeller Pitch Control commands the governor to maintain a constant RPM. "Fully Fine" commands "maximum RPM". Retarding the Pitch Control commands a lower RPM setting. "Fully Coarse" commands "Positive Coarse Lock" at which point the prop will function as a FP prop in the "Fully Coarse" position.



A **controllable-pitch propeller** (CPP) or **variable-pitch propeller** is a type of propeller with blades that can be rotated around their long axis to change their pitch. If the pitch can be set to negative values, the reversible propeller can also create reverse thrust for braking or going backwards without the need of changing the direction of shaft revolutions. Such propellers are used in propeller-driven aircraft to adapt the propeller to different thrust levels and air speeds so that the propeller blades don't stall, hence degrading the propulsion system's efficiency. Especially for cruising, the engine can operate in its most economical range of rotational speeds. With the exception of going into reverse for braking after touch-down, the pitch is usually controlled automatically without the pilot's intervention. A propeller with a controller that adjusts the blades' pitch so that the rotational speed always stays the same is called a constant speed propeller (see paragraph above). A propeller with controllable pitch can have a nearly constant efficiency over a range of airspeeds.

PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

CREW MEMBERS



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

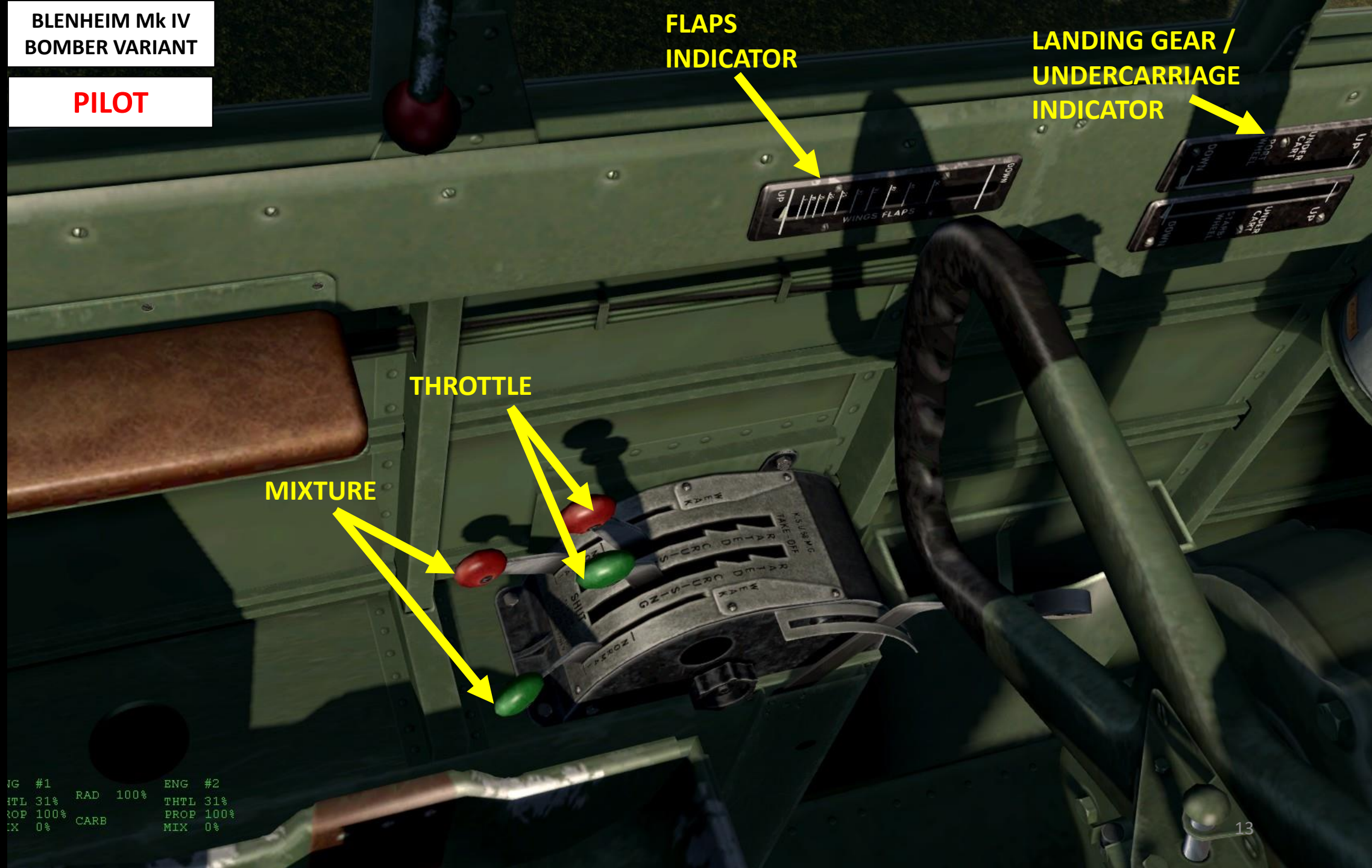
BLENHEIM Mk IV BOMBER VARIANT

PILOT

PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

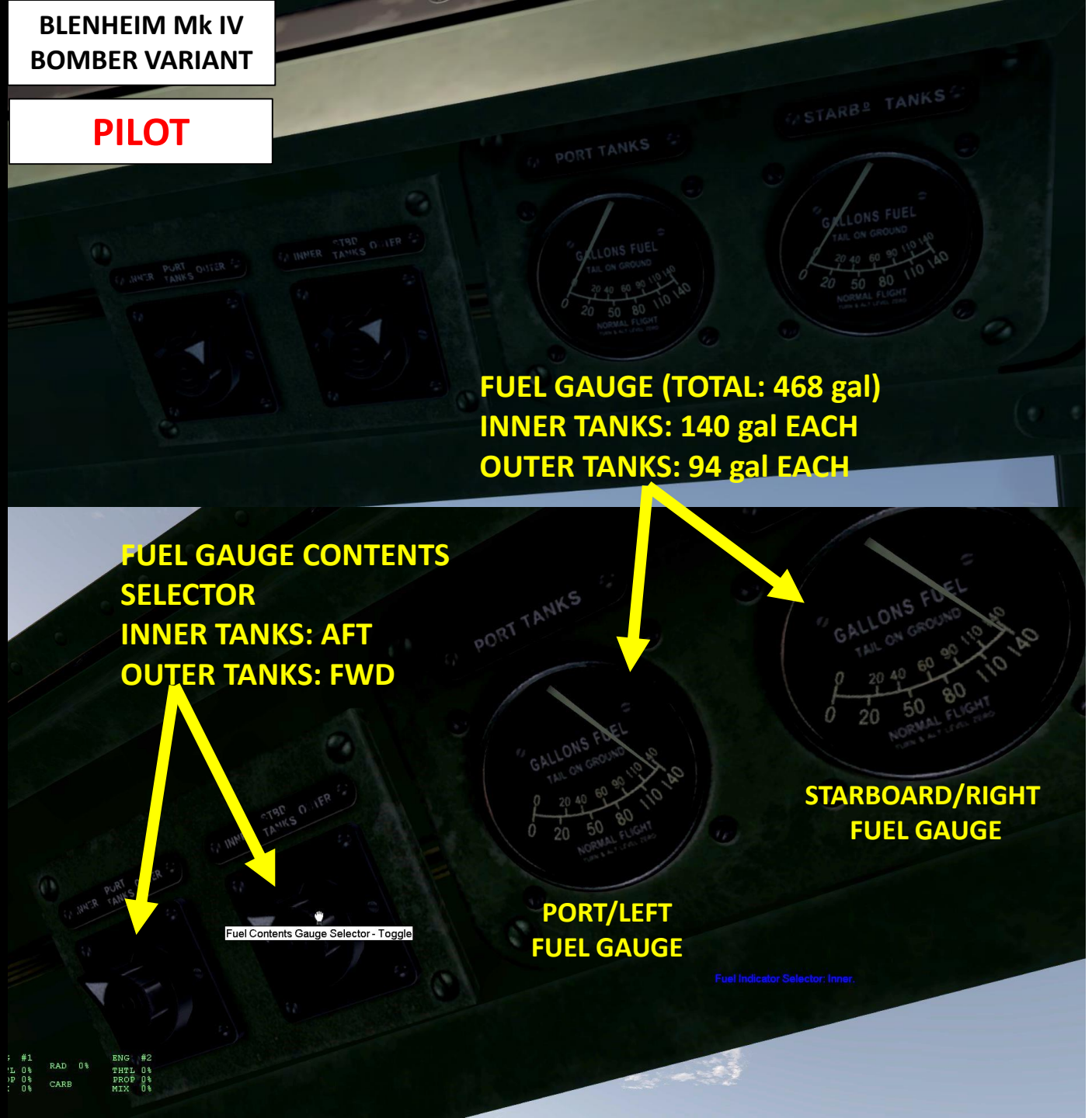
PILOT



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

PILOT



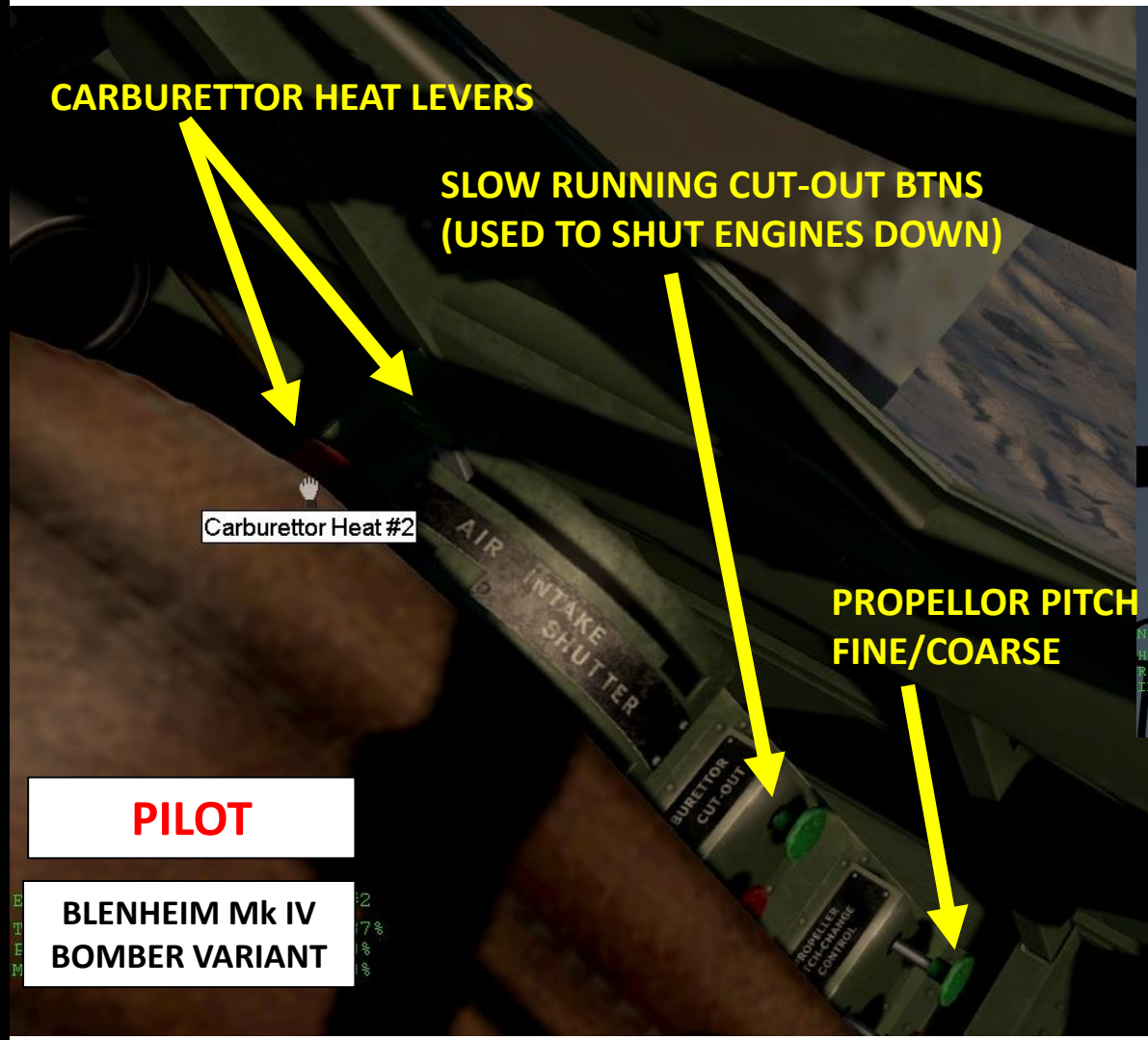
The Blenheim has 4 fuel tanks: 2 inner tanks (which are filled first) and 2 outer tanks.

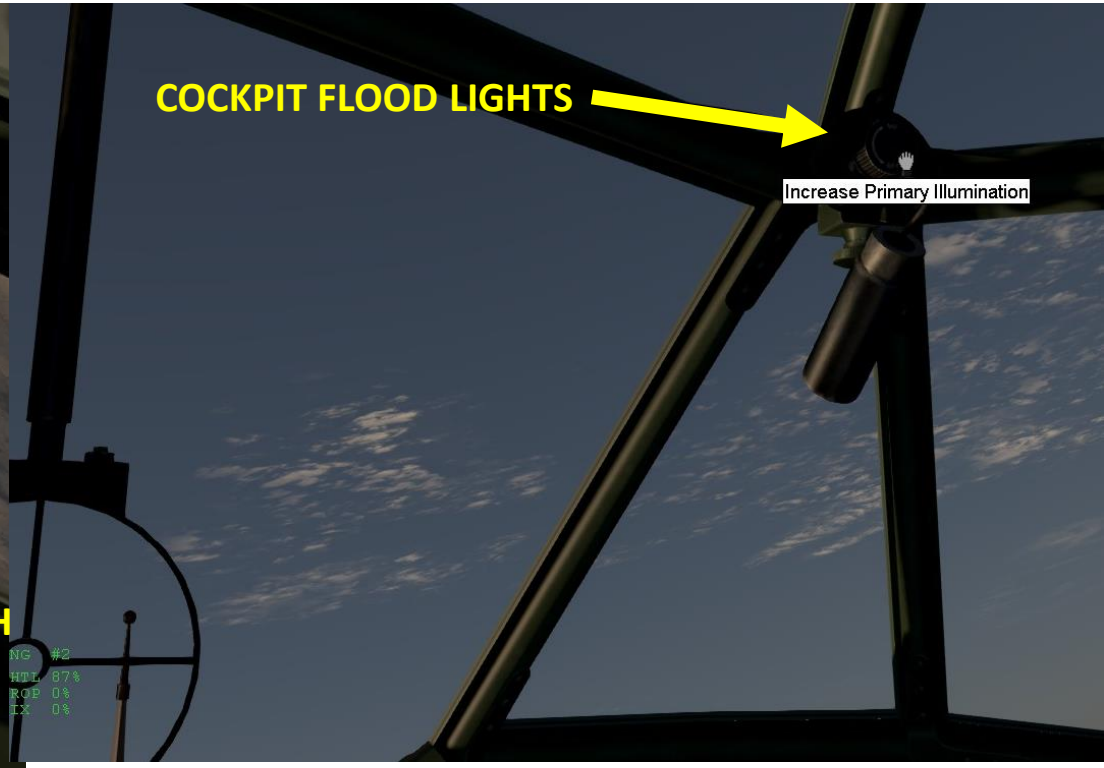
With a full bomb load (1000 lbs), the maximum fuel load you can carry is about 60 % (approx. 280 gal, so just about enough to completely fill your inner tanks without having to use fuel for the outer ones).

With Full Rich (strong) mixture for a boost setting of +3.5 PSI and a RPM of 2400, you consume approx. 112 gals/hour. Assuming you are going at 240 mph in level flight (a fairly reasonable assumption), you can fly for about 2.5 hours at MAX Takeoff Weight. This means that you have a range of about 300 miles, or about 480 km.

Fuel planning will be further elaborated in the “BOMBING TUTORIAL” section.

PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION





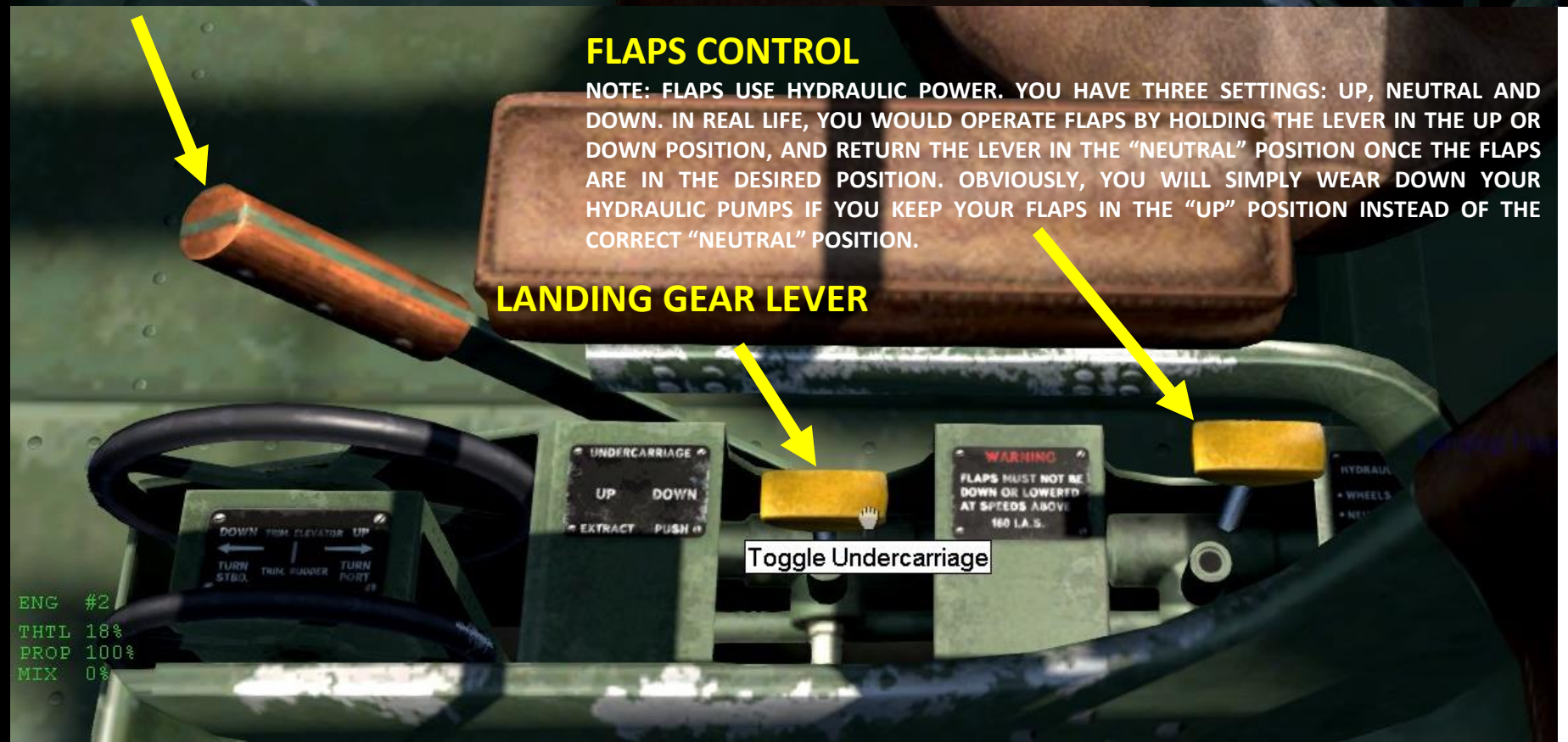
PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

PILOT

HAND PUMP

USE WHEN LANDING GEAR FAILS TO RETRACT COMPLETELY. THIS IS USED IN CASES WHEN YOUR WINGMAN TELLS YOU THAT HE SEES THAT YOUR LANDING GEAR IS NOT COMPLETELY RETRACTED AND NOT COMPLETELY DEPLOYED.



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV
BOMBER VARIANT

CYLINDER HEAD TEMPERATURE (DEG C)

CROSSFEED VALVE

2 POSITIONS: ON/OFF

THIS VALVE IS USED IN CASE OF FUEL LEAK TO GET THE ENGINES TO TAKE FUEL FROM FUEL TANKS FROM BOTH WINGS AT THE SAME TIME.

FOR EXAMPLE: IF YOU HAVE A FUEL LEAK ON THE LEFT WING AND GET TO A POINT WHERE YOU ARE OUT OF FUEL ON THE LEFT INBOARD TANK (OUTBOARD TANKS ARE GENERALLY EMPTY UNLESS YOU WANT TO GO FOR VERY LONG FLIGHTS)… GENERALLY WHAT HAPPENS IS YOUR LEFT ENGINE COUGHS AND DIES SINCE IT RUNS OUT OF FUEL TO CONSUME. IF YOU OPEN YOUR CROSSFEED VALVE, THE LEFT ENGINE WILL KEEP RUNNING EVEN IF THE LEFT INNER TANKS ARE EMPTY. WHY? BECAUSE THE CROSSFEED VALVE SET TO "OPEN/ON" WILL ALLOW THE LEFT ENGINE TO TAKE FUEL FROM BOTH THE RIGHT AND THE LEFT WING TANKS!

FUEL COCK (PORT = RED)
3 POSITIONS:
OFF/INNER/OUTER TANKS

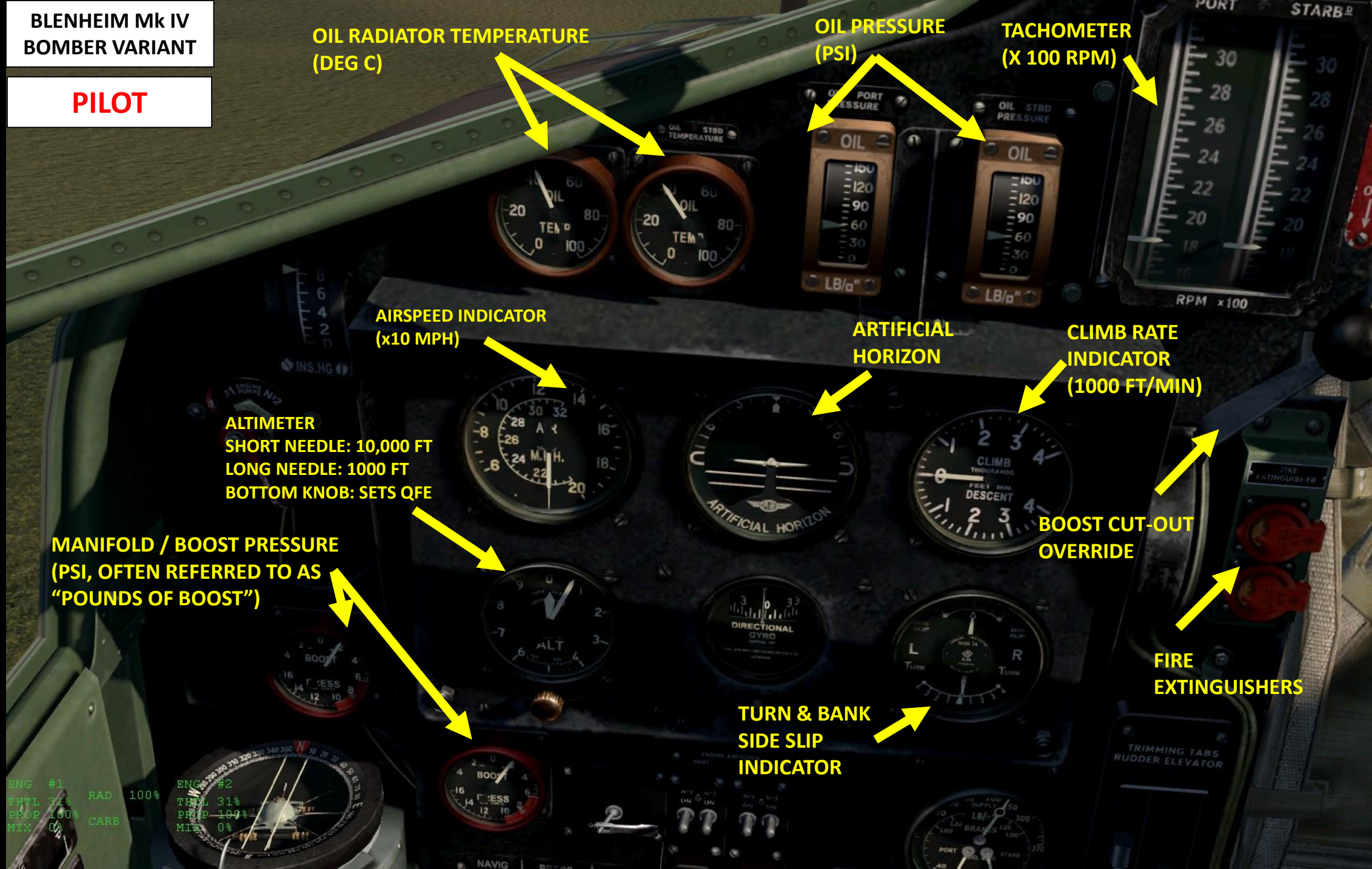
FUEL COCK (STBD = GREEN)
3 POSITIONS:
OFF/INNER/OUTER TANKS

ENG #2
THTL 31%
PROP 100%
MIX 0%

PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

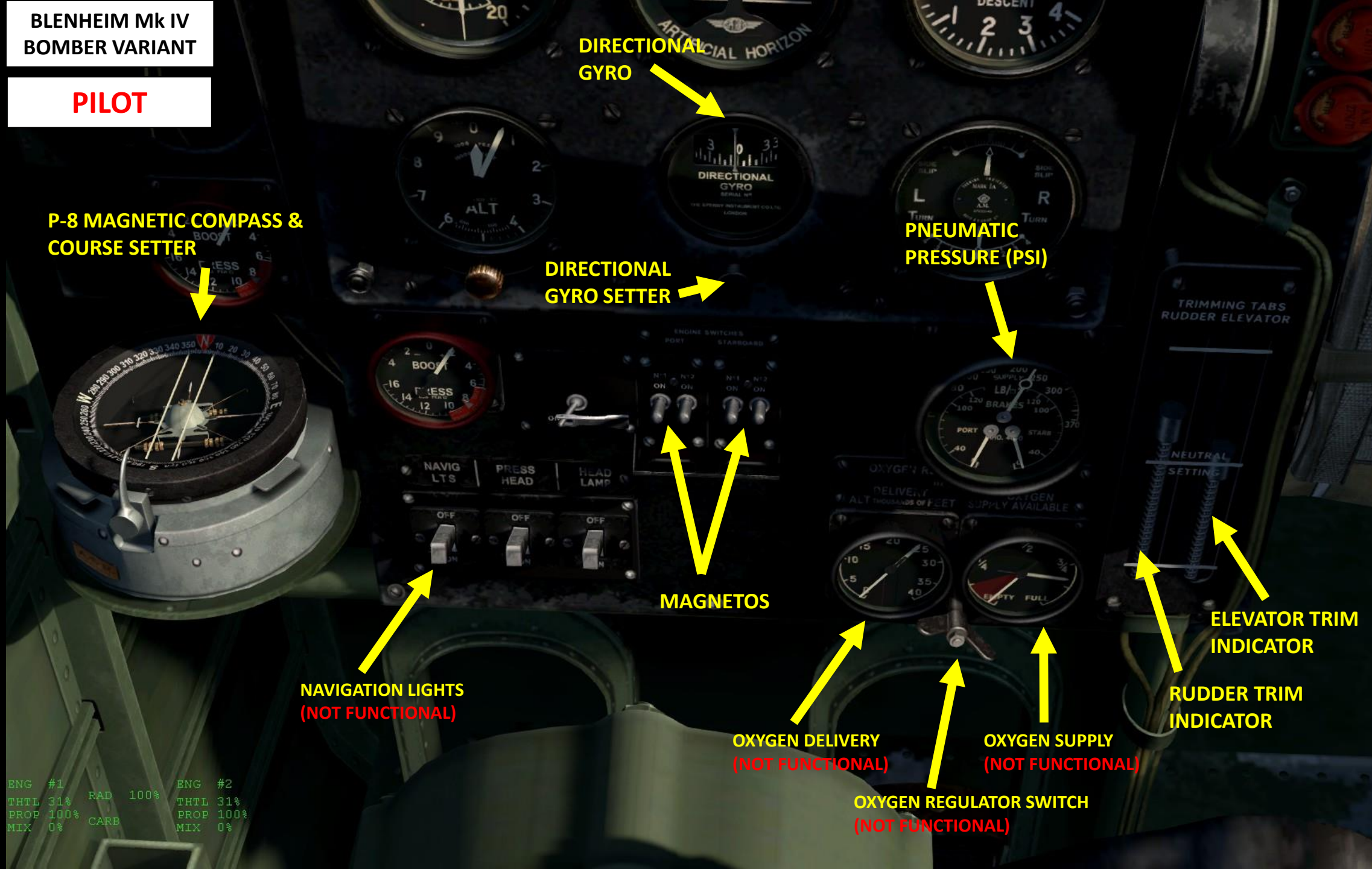
PILOT



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

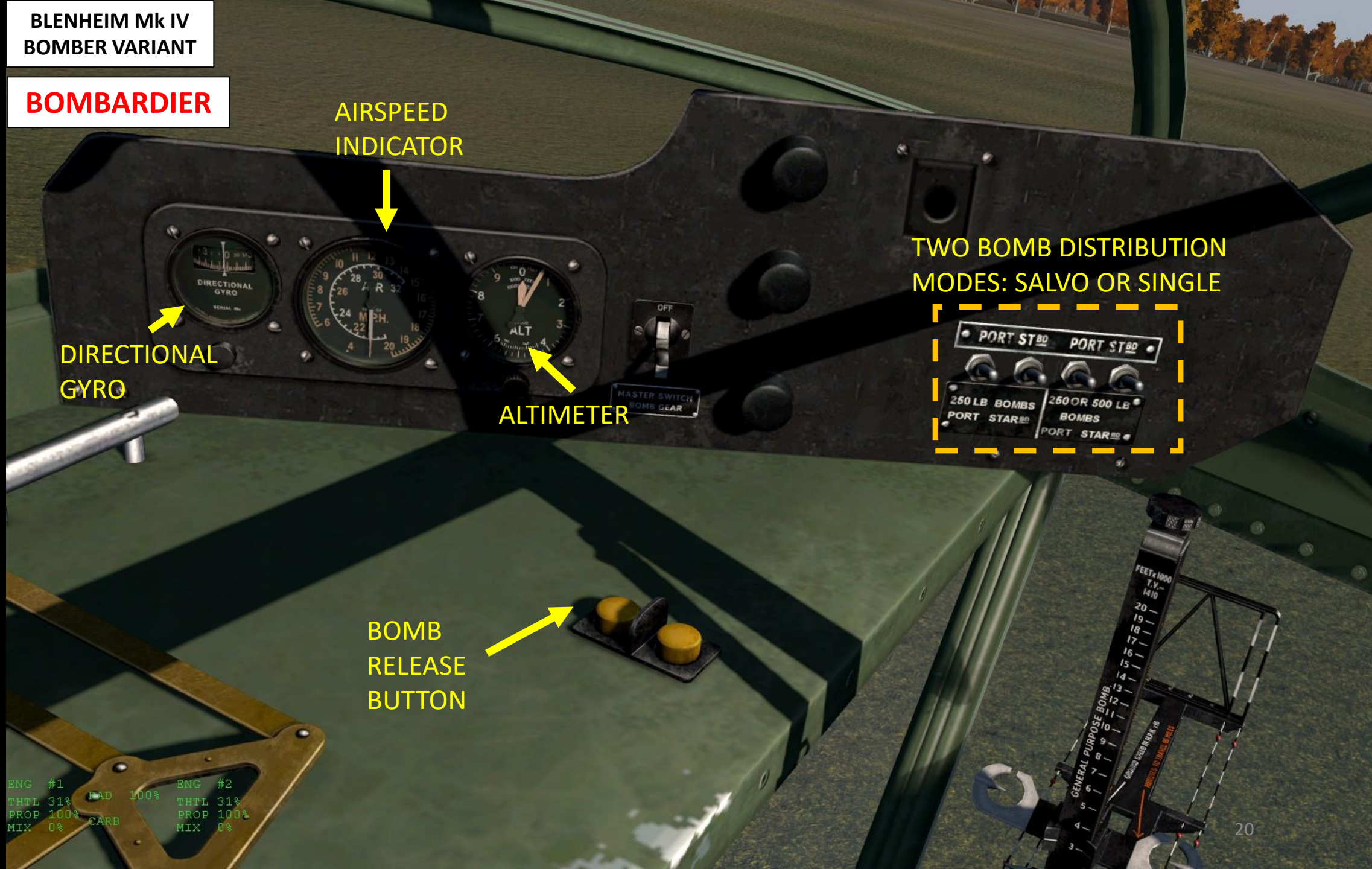
PILOT



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV BOMBER VARIANT

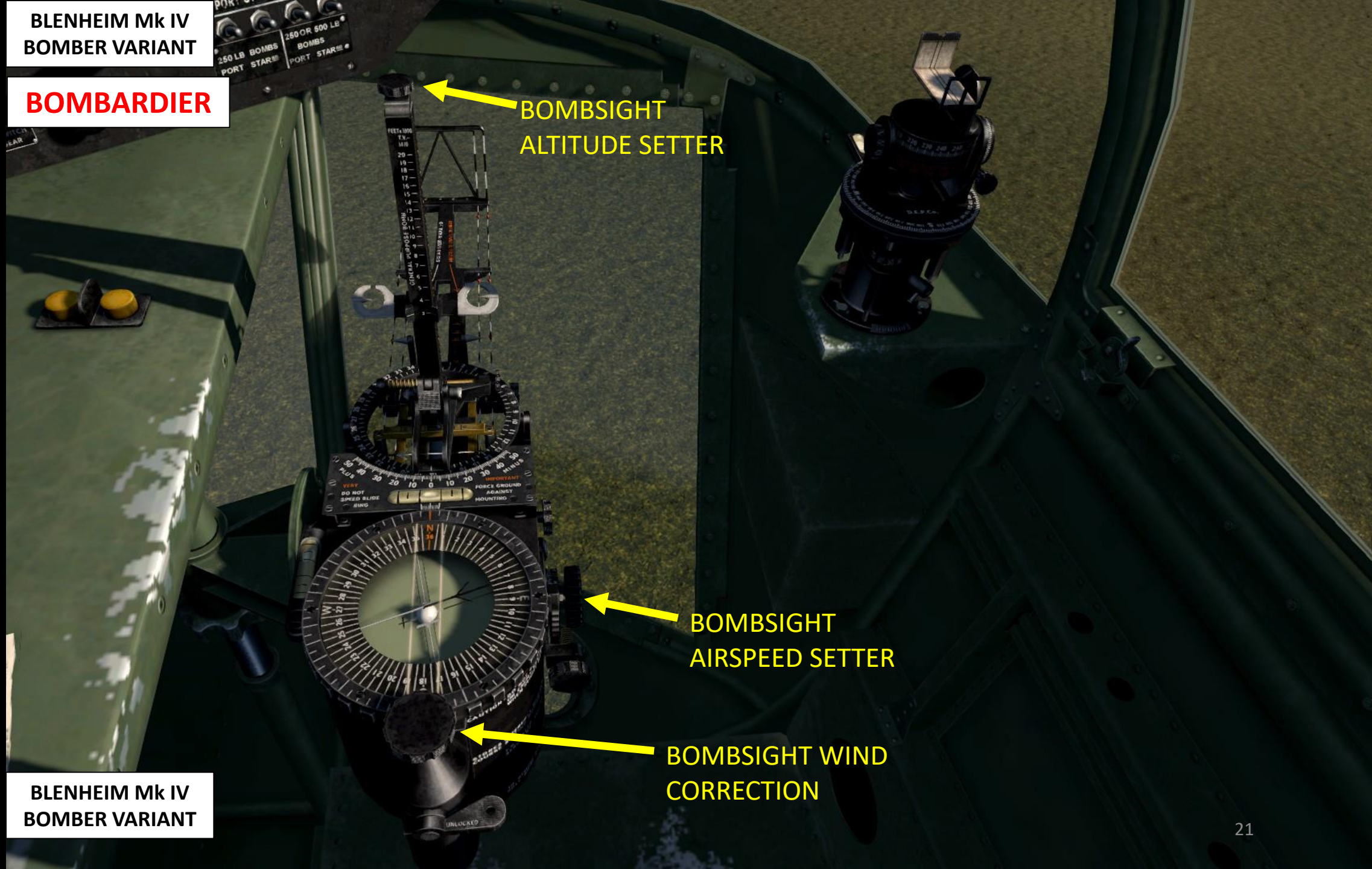
BOMBARDIER



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

BLENHEIM Mk IV
BOMBER VARIANT

BOMBARDIER



BLENHEIM Mk IV
BOMBER VARIANT

DORSAL GUNNER

DORSAL GUNNER CONTROLS

-MOVE MOUNT LEFT: **LEFT KEYBD ARROW**
-MOVE MOUNT RIGHT: **RIGHT KEYBD ARROW**
-CRUISE POSITION: **O**
-FIRING POSITION: **CUSTOM KEY**
-LEAN TO GUNSIGHT: **CUSTOM KEY**
-FIRE WEAPON: **LEFT MOUSE BUTTON**
-SWITCH GUNNER/BOMBARDIER POSITION: **C**
-CHANGE MANNED POSITION: **L_SHIFT_C**
-GIVE GUNNER CONTROL TO AI: **L_ALT+F2**
-TAKE CONTROL OF GUN (TOGGLE INDEPENDENT MODE): **F10**

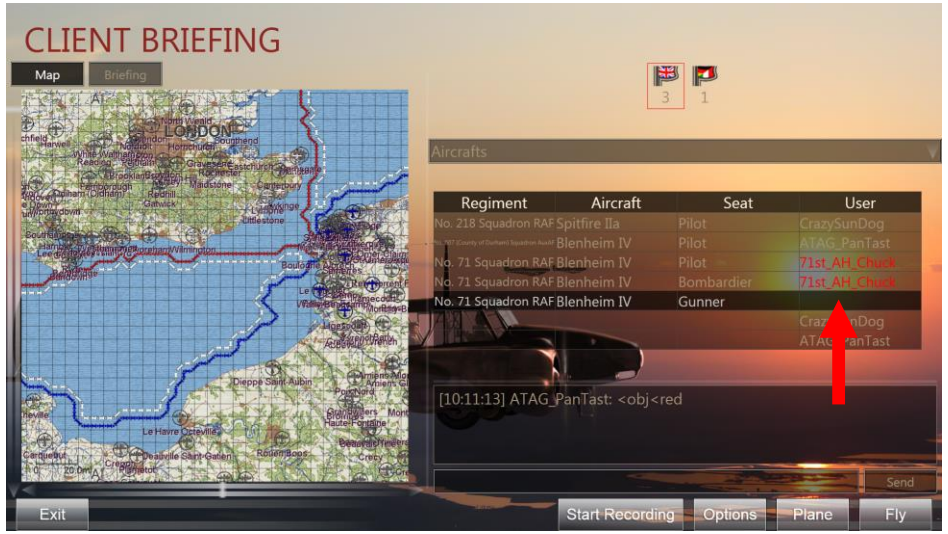
PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

TURRET IN "CRUISE" POSITION

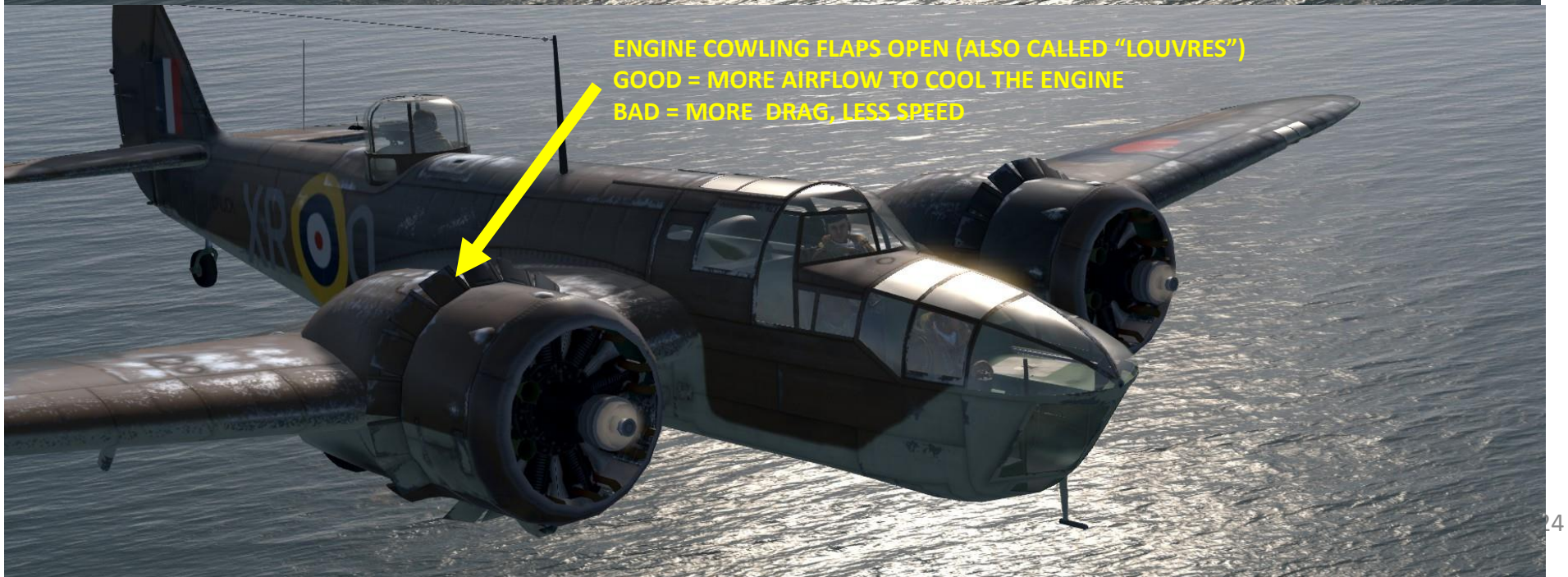
TURRET IN "FIRING" POSITION

NOTES

- Your gunner can call out fighters if you have your in-game chat info window enabled. However, if you switcher to your gunner position and switched back to your pilot seat, it is possible that the AI gunner will not take control of the gun. In other words, your gunner will not fire unless the AI takes control of it. To give back the AI control of your turret, you should use the "L_ALT+F2".
- Your turret has 2 positions: CRUISE and FIRING. During aircraft cold start, you start in "CRUISE/PARKED" position. In this mode, the gunner cannot fire his gun nor move his turret. This mode is primarily used to generate less drag and consume less power. "FIRING" position, on the other hand, is powered by the left engine. This mode allows you to use your gun and rotate your turret to get a better view angle. It is useful to track targets or examine damage on the wings or upper forward fuselage. Your gunner will only fire when the turret is in "FIRING" position.
- Any turret or other air crew position (like the bombardier) can be manned by other players in multiplayer. They just need to **double-click on the available slot in multiplayer** once they clicked on the "flag".

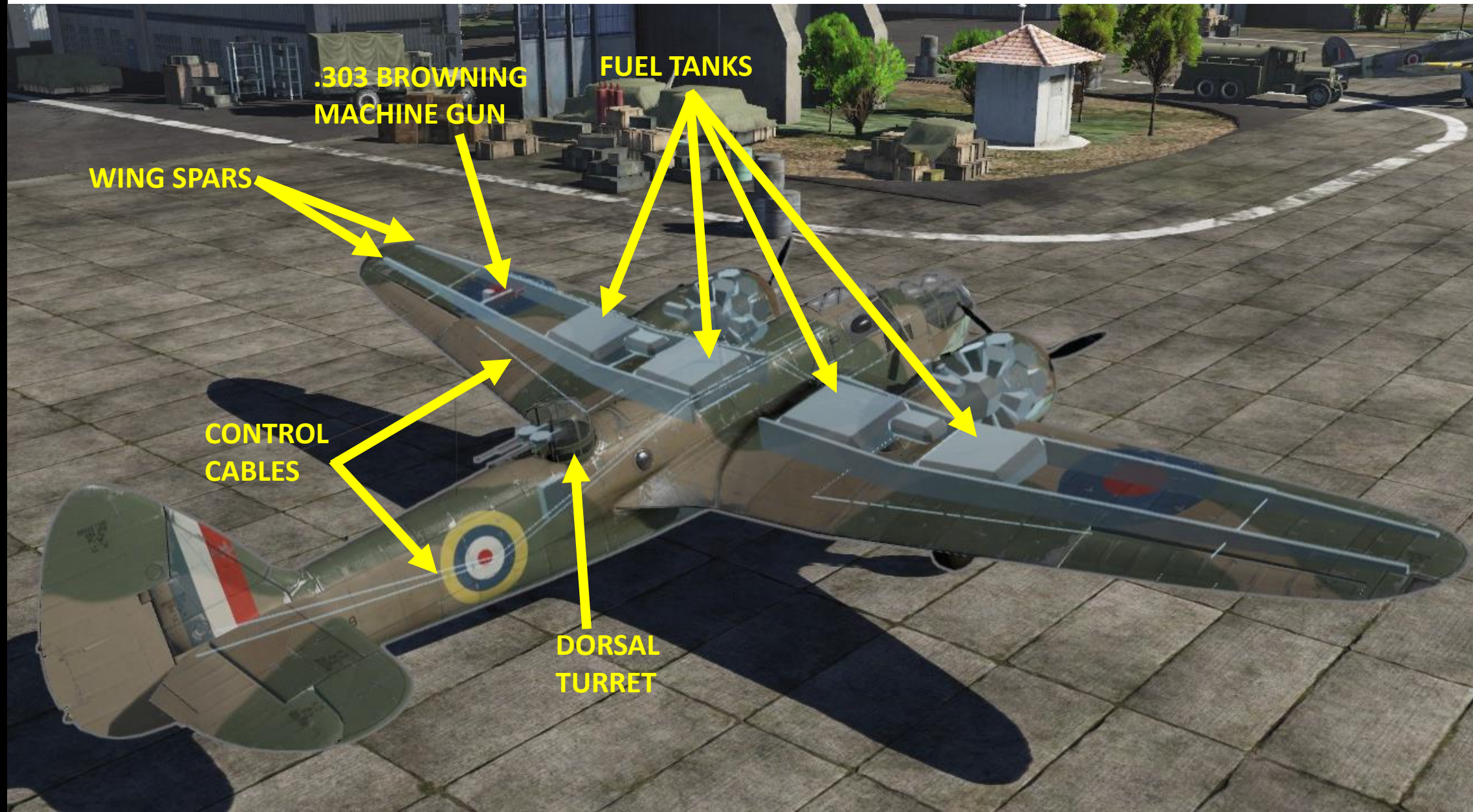


PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

CRITICAL COMPONENTS



PART 3: AIRCRAFT & COCKPIT FAMILIARIZATION

RAF

HOW TO RECOGNIZE A TAIL NUMBER

The system used for most British aircraft flying in the Battle of Britain was rather uniform regardless of plane type or squadron.

Tail Number. Usually a single-character letter from A to Z. Numbers entered into the Tail Number field will be translated into a corresponding letter, such as 2 into B, 11 into K, etc.

The only exception is the Tiger Moth when assigned to the London School of Flying regiment. In this case the aircraft code will consist of three letters.

Serial Number. Usually a five-character string starting with a letter and followed by four numbers.

Some Examples (symbols in **bold** can be set by the player, symbols in *italics* are automatically set by Cliffs of Dover)

Plane	Squadron	Tactical #	Serial #
Hurricane Mk I	No. 151 Squadron	*DZ*-**E**	**L1754**
Hurricane Mk I	No. 312 Squadron	*DU*-**J**	**L1926**
Spitfire Mk I	No. 74 Squadron	*ZP*-**J**	**K9867**
Spitfire Mk II	No. 41 Squadron	*EB*-**Z**	**P7666**
Blenheim Mk IV	No. 40 Squadron	*BL*-**V**	**R3612**
Short Sunderland	No. 201 Squadron	*ZM*-**Q**	**T9087**

PART 4: CONTROLS

BRISTOL BLENHEIM (ALL MARKS)		
DESCRIPTION	MAPPED TO	ESSENTIAL / NON-ESSENTIAL
Wheel Chocks		ESSENTIAL
toggle primary cockpit illumination		CLICKABLE IN COCKPIT
View-Position #1 (pilot)	L_ALT+1	ESSENTIAL
View-position #2 (bombardier)	L_ALT+2	ESSENTIAL
View-position #3 (rear gunner) optional	L_ALT+3	ESSENTIAL
Next Manned Position (Cycles through air crew)	C	ESSENTIAL
Course autopilot – Previous Mode	A	ESSENTIAL
Course autopilot – Next Mode	S	ESSENTIAL
course setter - increase	NUMPAD + (CUSTOM)	CLICKABLE IN COCKPIT
course setter - decrease	NUMPAD - (CUSTOM)	CLICKABLE IN COCKPIT
directional gyro - increase	NUMPAD / (CUSTOM)	ESSENTIAL
directional gyro - decrease	NUMPAD * (CUSTOM)	ESSENTIAL
toggle selected engine (ignition)	“I” by default	ESSENTIAL
directional controls (ailerons, elevators, and rudder)	Joystick & Rudder Pedal axes	ESSENTIAL
Trim controls (elevator and rudder)	Joystick hat switch	ESSENTIAL
Field of View + (allows you to zoom out)		ESSENTIAL
Field of View – (allows you to zoom in)		ESSENTIAL

PART 4: CONTROLS

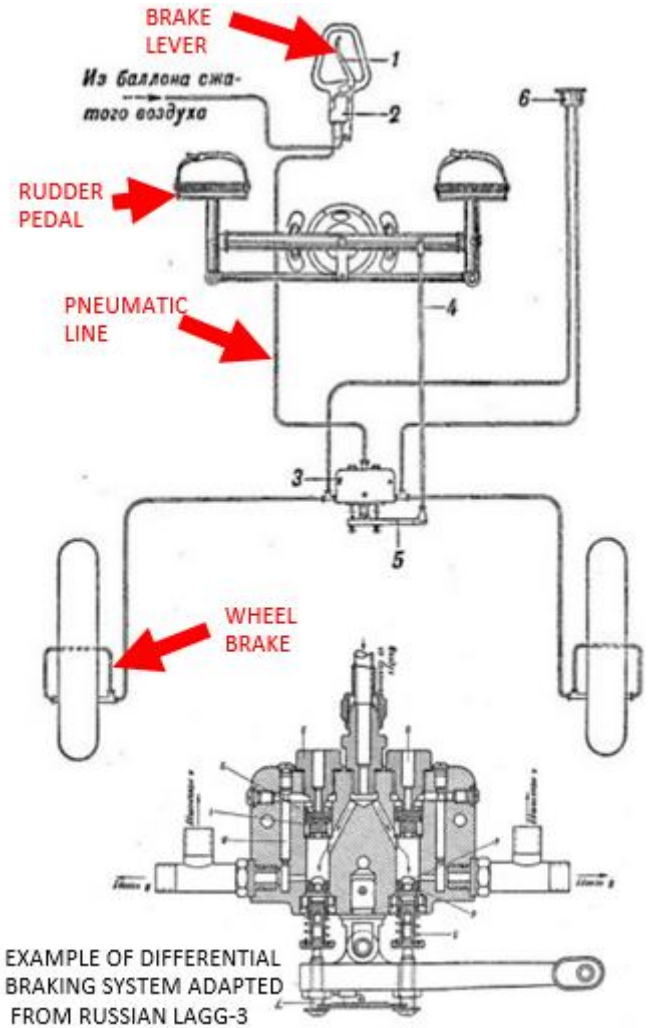
BRISTOL BLENHEIM (ALL MARKS)		
DESCRIPTION	MAPPED TO	ESSENTIAL / NON-ESSENTIAL
lean to gunsight		ESSENTIAL
fire guns	Joystick Gun Trigger	ESSENTIAL
drop ordnance (bomb)	B	ESSENTIAL
throttle	Throttle axis	ESSENTIAL
boost cut-off (boost cut-out override)		ESSENTIAL
toggle canopy/hatch		ESSENTIAL
increase mixture		NON-ESSENTIAL
decrease mixture		NON-ESSENTIAL
open radiator	Up Arrow keyboard	ESSENTIAL
close radiator	Down Arrow keyboard	ESSENTIAL
increase propeller pitch	Usually set to Axis for second throttle. Set to keyboard otherwise.	ESSENTIAL
decrease propeller pitch		ESSENTIAL
Toggle undercarriage (landing gear)		ESSENTIAL
Wheel brakes		ESSENTIAL
bail out		ESSENTIAL
Fuel Cock # 1, 2, 3		CLICKABLE IN COCKPIT
Toggle Independent Mode (allows you to use/hide mouse cursor and take control of your gun)	F10	ESSENTIAL

PART 4: CONTROLS

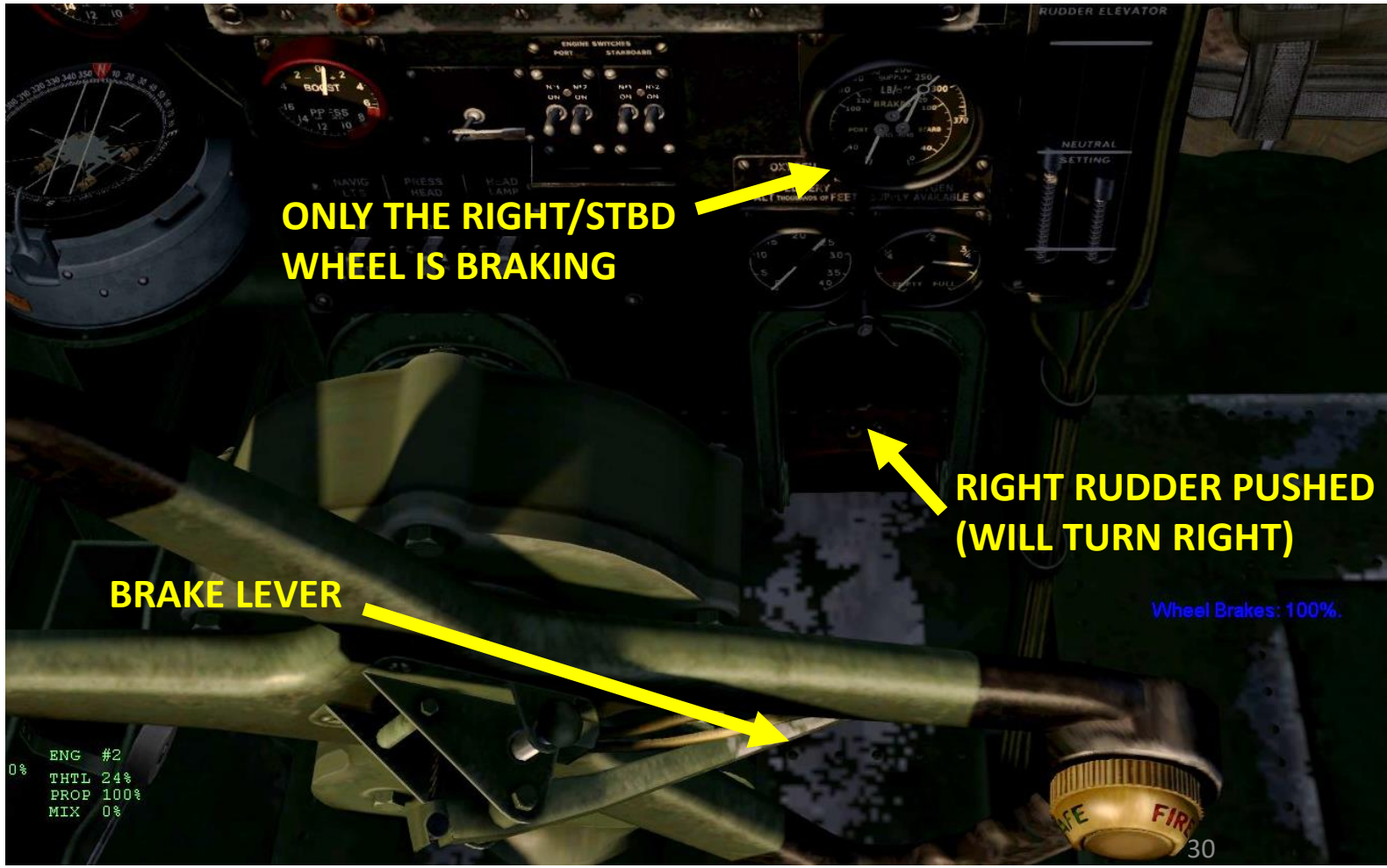
BRISTOL BLENHEIM (ALL MARKS)		
DESCRIPTION	MAPPED TO	ESSENTIAL / NON-ESSENTIAL
previous bomb distributor mode (Salvo/Single)		CLICKABLE IN COCKPIT
next bomb distributor mode (Salvo/Single)		CLICKABLE IN COCKPIT
Bombsight altitude + / -		CLICKABLE IN COCKPIT
Bombsight velocity + / -		CLICKABLE IN COCKPIT
Adjust Bombsight left / Right (adjusts bombsight for crosswind)		NON-ESSENTIAL
engine #1 select	L_SHIFT+1	ESSENTIAL
engine #2 select	L_SHIFT+2	ESSENTIAL
all engines select	L_SHIFT+3 (CUSTOM)	ESSENTIAL
Turret – Move Mount Left	Left Arrow keyboard	ESSENTIAL
Turret – Move Mount Right	Right Arrow keyboard	ESSENTIAL
Turret – Cruise Position	O	ESSENTIAL
Turret – Firing Position	L_SHIFT+O (CUSTOM)	ESSENTIAL
External View (Give Turret Gunner Control to AI)	L_ALT+F2	ESSENTIAL
Carburettor Heat # 1 / # 2		NON-ESSENTIAL
Open/Close Bomb Bay Door	N (CUSTOM)	NON-ESSENTIAL (bomb bay door has an automatic closing system)

PART 4: CONTROLS

- Unlike the German bombers, the Blenheim uses differential braking instead of toe brakes.
- In order to brake, you need to hold your “Full Wheel Brakes” key (which is physically mapped as a lever on your control column) while you give rudder input to steer your aircraft. Make sure you have adequate mixture, RPM and Manifold Pressure settings or your turn radius will suffer. Keep in mind that that for British and Italian aircraft, you use this braking system (Full Wheel Brakes key), while for the German aircraft you use toe brakes (“Full Left/Right Wheel Brakes” keys or “Left/Right Wheel Brakes” axes in your controls).

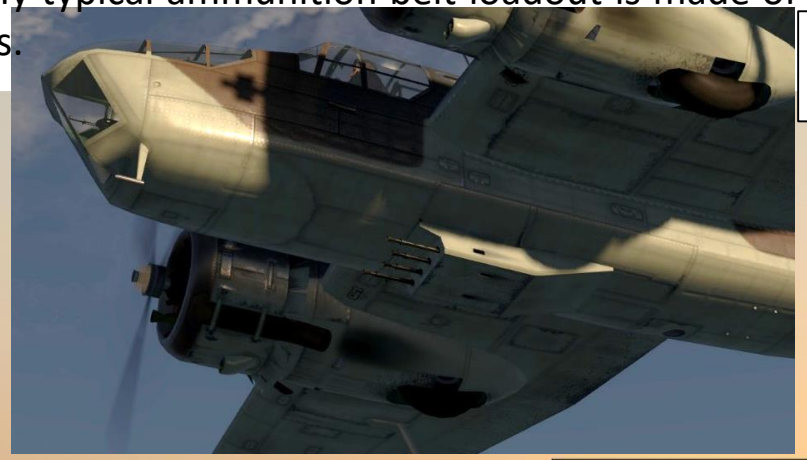


EXAMPLE OF DIFFERENTIAL BRAKING SYSTEM ADAPTED FROM RUSSIAN LAGG-3



PART 5: WEAPONS AND ARMAMENT

The Blennie Fighter variant is armed with a rack of four .303 in Browning guns under its fuselage, a single .303 gun in its left wing and a .303 gun turret. Aiming with the fixed gunsight while using TrackIR is very difficult. Recommended way of aiming is to use tracers each 5-6 bullets and to correct after each short burst based on where the trail of bullets is going. Tracers are also very useful for turret gunners if they want to aim properly. My typical ammunition belt loadout is made of DeWilde Incendiary Rounds, Armour Piercing rounds and Incendiary/Tracer rounds.



BLENHEIM Mk IVF FIGHTER VARIANT

PLANE LOADOUT OPTIONS

Blenheim IVF

Weapon sets | Guns | Bombs

1/6

Weapon 1: Browning .303 Mk. II Browning .303 Mk. II

Previous gun | Next gun

Main

Main Belt
Incendiary/Tracer (White), B, .303 inch, Nitrocellulose, Mark Iz
Incendiary, B, .303 inch, Nitrocellulose, Mark VIz, "De Wilde"
Incendiary, B, .303 inch, Nitrocellulose, Mark VIz, "De Wilde"
Incendiary, B, .303 inch, Nitrocellulose, Mark VIz, "De Wilde"
Armour Piercing, W, .303 inch, Nitrocellulose, Mark Iz
Armour Piercing, W, .303 inch, Nitrocellulose, Mark Iz
Armour Piercing, W, .303 inch, Nitrocellulose, Mark Iz

Insert | Add | Remove | Default

Guns preset

BLENNIE FIGHTER

Save | Save As... | Delete

Default Convergence

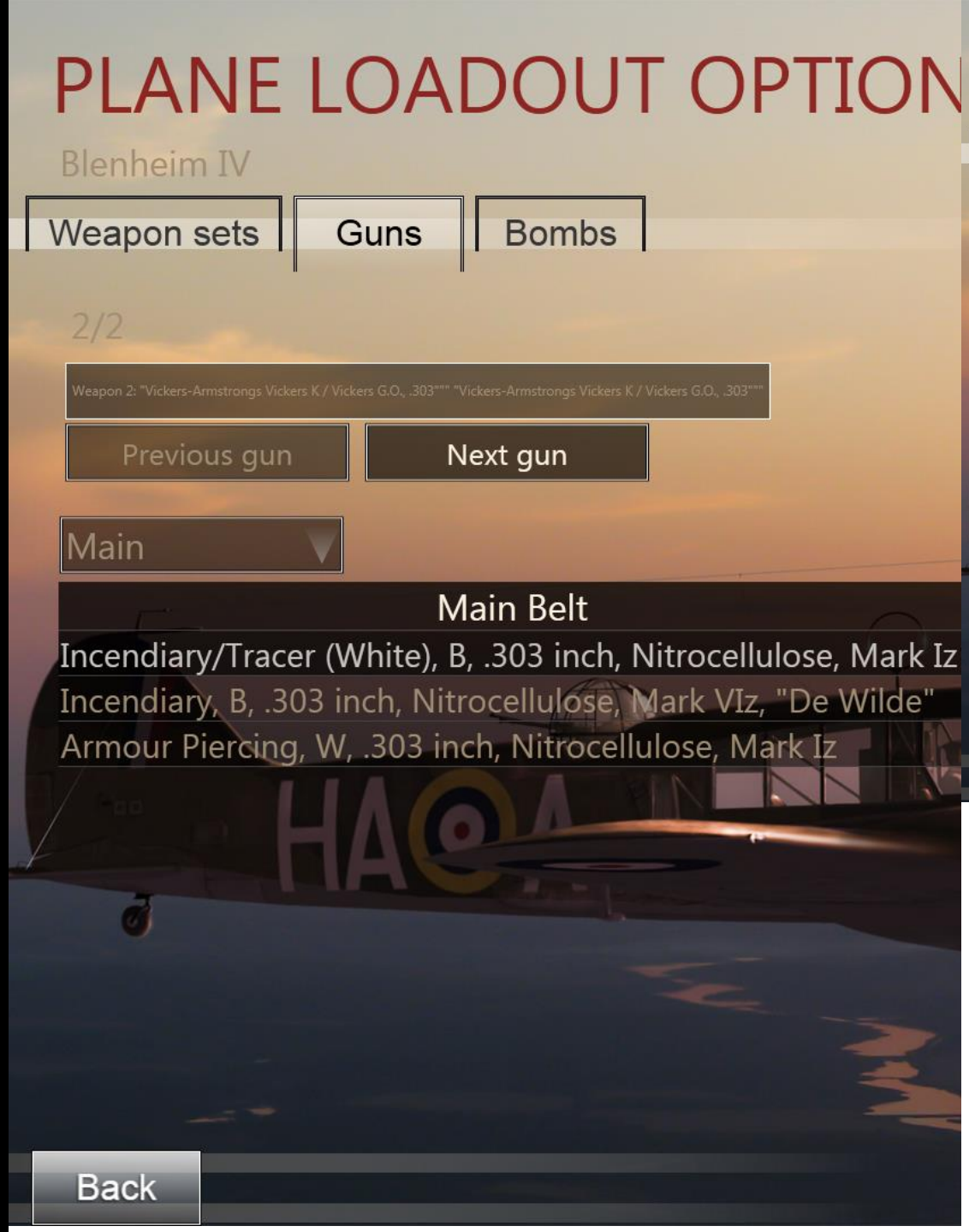
Hor Convergence 175

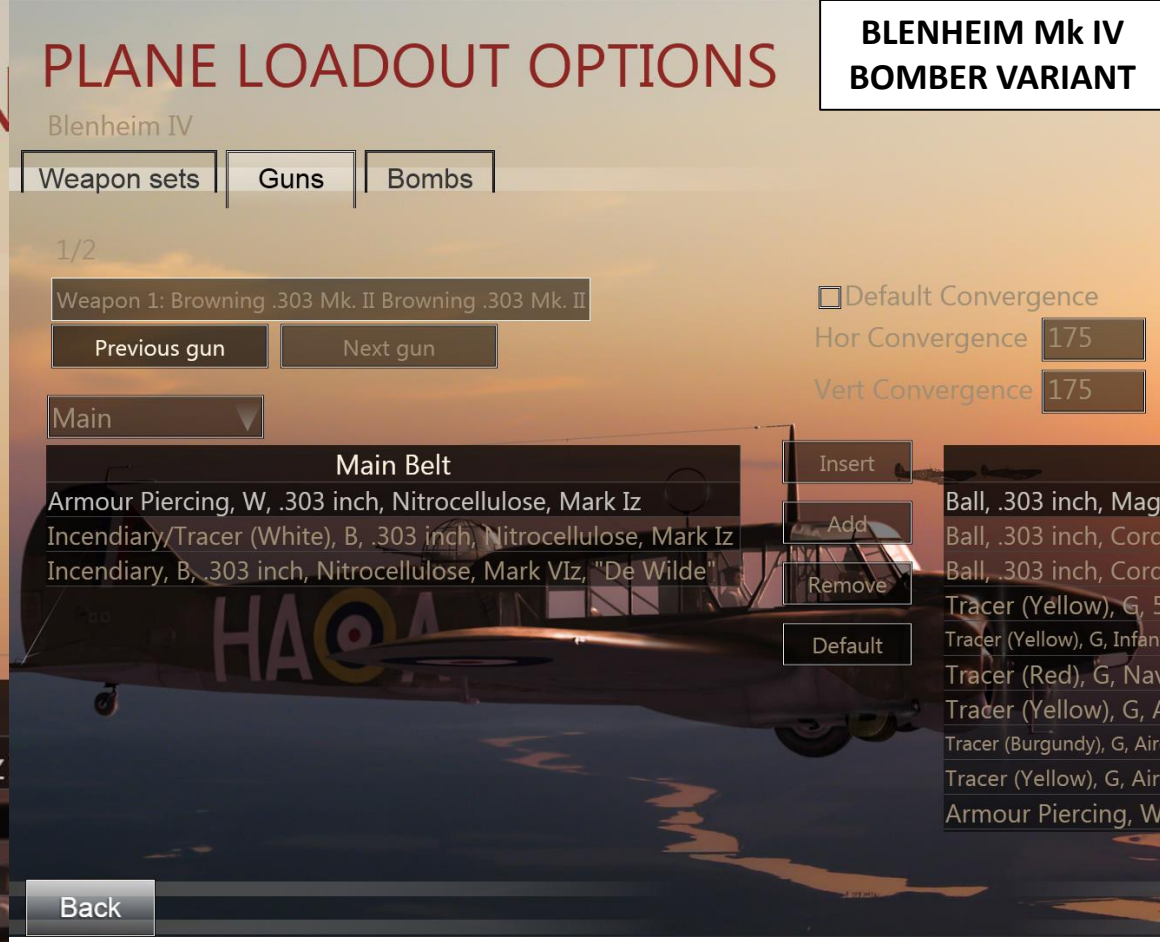
Vert Convergence 500

Bullets
Ball, .303 inch, Magazine Rifle, Cordite, Mark I
Ball, .303 inch, Cordite, Mark VI
Ball, .303 inch, Cordite, Mark VII
Tracer (Yellow), G, 500 yd, .303 inch, Cordite, Mark I
Tracer (Yellow), G, Infantery Long Range, 1000 yd, .303 inch, Cordite, Mark II
Tracer (Red), G, Naval, 800 yd, .303 inch, Cordite, Mark III
Tracer (Yellow), G, Aircraft, 550 yd, .303 inch, Cordite, Mark IIII
Tracer (Burgundy), G, Aircraft Night Dimmed, 550 yd, .303 inch, Cordite, Mark V
Tracer (Yellow), G, Aircraft, 550 yd, .303 inch, Nitrocellulose, Mark VIz
Armour Piercing, W, .303 inch, Nitrocellulose, Mark Iz

PART 5: WEAPONS AND ARMAMENT

BLENHEIM Mk IV BOMBER VARIANT

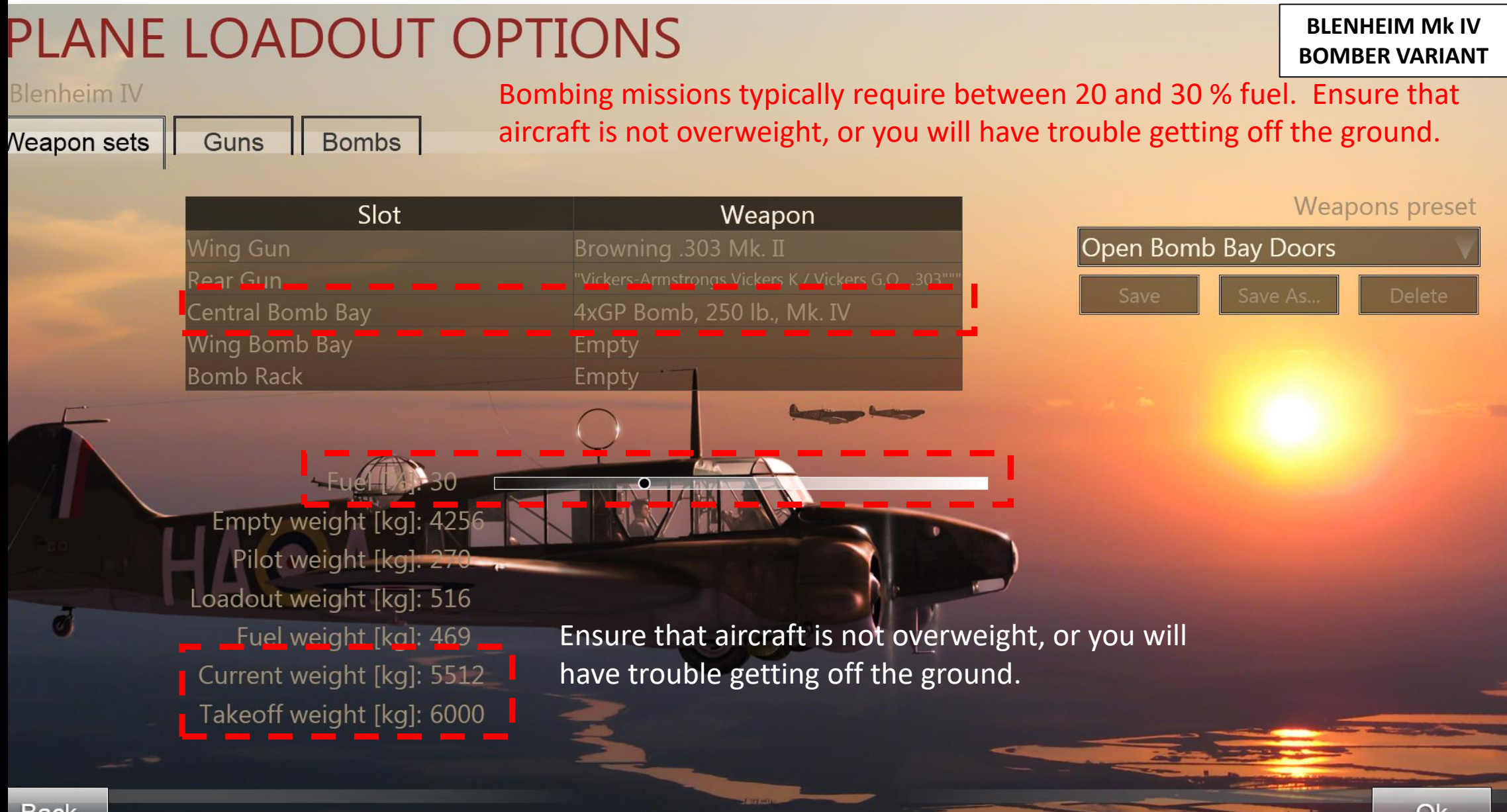




The Blennie bomber variant is armed with a single .303 gun in its left wing and a .303 gun turret. Aiming with the fixed gunsight while using TrackIR is very difficult and overall rather ineffective since .303 caliber is not very lethal in small firepower concentration. The recommended way of aiming is to use tracers each 5-6 bullets and to correct after each short burst based on where the trail of bullets is going. Tracers are also very useful for turret gunners if they want to aim properly. My typical ammunition belt loadout is made of DeWilde Incendiary Rounds, Armour Piercing rounds and Incendiary/Tracer rounds.

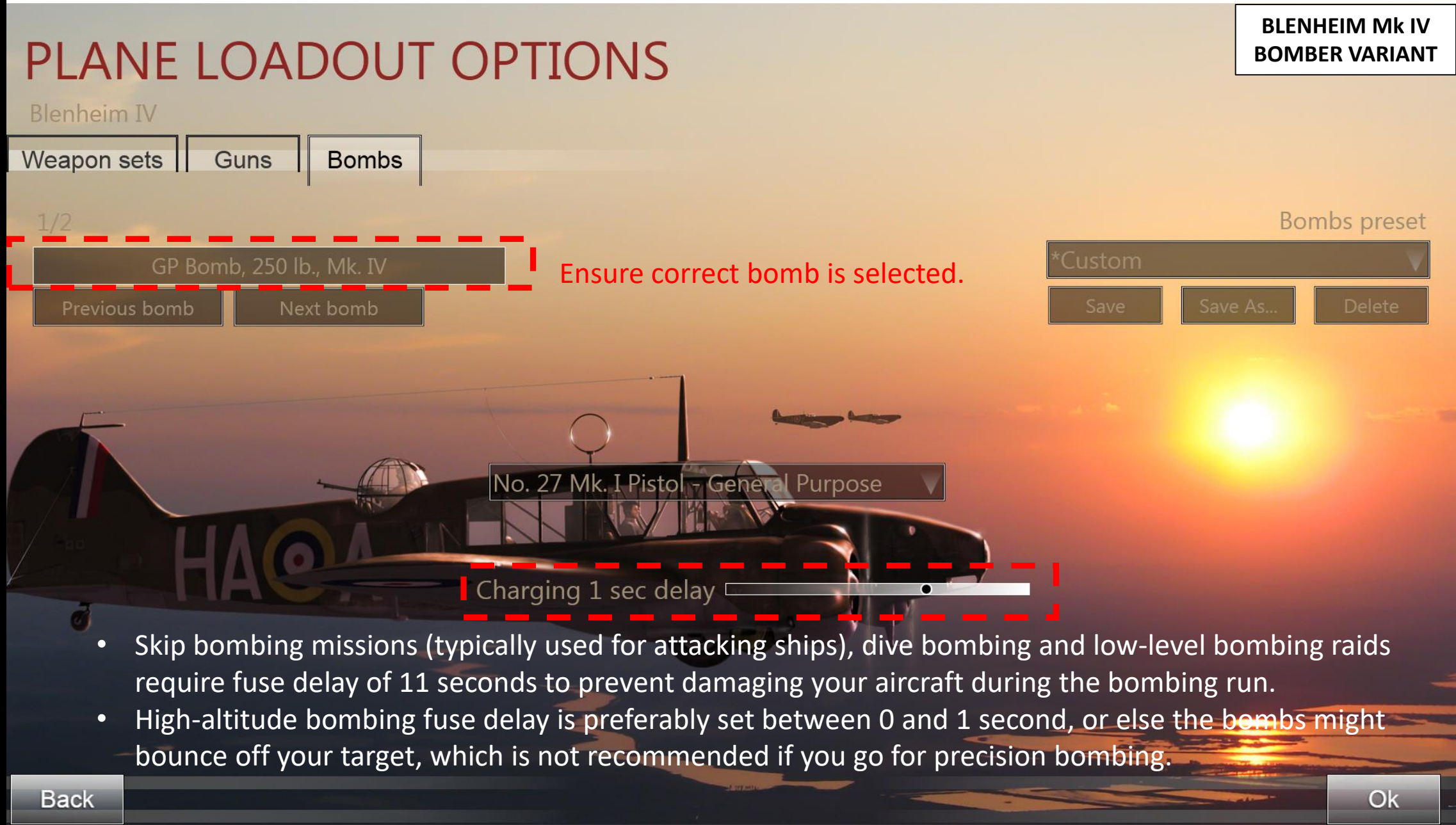
PART 5: WEAPONS AND ARMAMENT

Use adequate bomb and fuel loadout. Typically, I choose 20-30 % fuel (**see BOMBING tutorial to know how to judge your needed fuel quantity**) and I choose 4 X 250 lb bombs rather than 2 X 500 lb bombs. Why? Simply because the current bomb load in the Blenheim is very small and you need to maximize the number of targets you can bomb. For instance, having 2 bombs on board means I can destroy 2 ships instead of 4. Having 4 bombs allows for more flexibility and gives you more options.



PART 5: WEAPONS AND ARMAMENT

Select proper fuse delay based on the type of bombing run you intend to do.



- Skip bombing missions (typically used for attacking ships), dive bombing and low-level bombing raids require fuse delay of 11 seconds to prevent damaging your aircraft during the bombing run.
- High-altitude bombing fuse delay is preferably set between 0 and 1 second, or else the bombs might bounce off your target, which is not recommended if you go for precision bombing.

PART 5: WEAPONS AND ARMAMENT

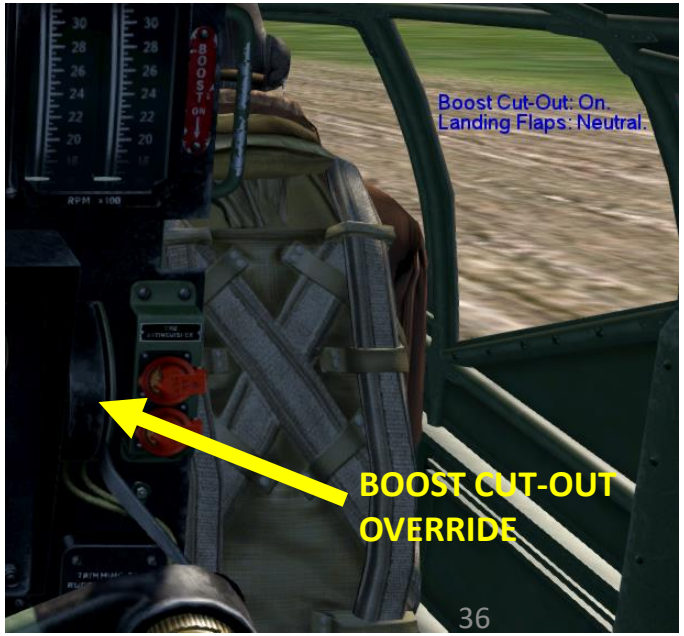
TWO	ROYAL AIR FORCE WEAPON DATA						TWO
RAF Machinegun Ammunition							
Weapon	Nomen	Type	Fill	Burnout	Tracer Color	Smoke Trail	Notes
Browning .303 cal	Mk I	Ball					
	Mk VI	Ball					
	Mk VII	Ball					
	B Mk Iz	Incend	Ph			Yes	Burns
	B Mk VI	Incend	SR379				Schauzeichen
	G Mk I	Tracer		500 yd	Yellow		
	G Mk II	Tracer		1000 yd	Yellow		
	G Mk III	Tracer		800 yd	Red		
	G Mk IV	Tracer		550 yd	Yellow		
	G Mk V	Tracer		550 yd	Burgandy		Slow Tracer
	G Mk VIz	Tracer		550 yd	Yellow		
	W Mk Iz	AP					Steel Core
	O Mk I	Observer					
Hispano Mkl 20mm	Mk Iz	Ball					
		HE	Pentolite				
		HE-T	Pentolite		Red		
Notes	**Fill:** Ph (Phosph.) **SR379:** Incendiary Mixture of Aluminum/Magnesium Alloy and Barium Nitrate - Mg/Al,Ba(NO3)2 **Pentolite:** 50% PETN and 50% TNT **Burns** = Incendiary Composition (usually Phosphorus) is ignited on firing and burns during flight **Flash** = Incendiary Ignition or small HE Burst on impact with target **Slow Tracer** = Delayed tracer ignition for Night use						

Bombs					
Country	Nomen	Type	WT (lbs/kg)	Fuze	Aircraft
RAF	GP 250 MkIV	GP	250 / 113	All	Blenheim MkIV
	GP 500 MkIV	GP	500 / 227	All	Blenheim MkIV
Pistols					
Weapon	Nomen	Type		Settings	Bomb Type
RAF Pistols	No 27 MkI	GP		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 42 MkI	GP		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 44 MkI	Medium Alt		0, .025sD, 1sD, 11sD	GP 250, GP 500
	No 28 MkIIx	Ever-Ready		0, .025sD, .12sD, 1sD, 11sD	GP 250, GP 500
	No 30 MkIIIx	Unadjustable		NA	GP 250, GP 500
	No 37 MkIV	Delay		6hD, 12hD, 36hD, 72hD, 144hD	GP 250, GP 500
Notes	**Settings:** 0 = Instantaneous; 8sD = 8 second Delay; 6hD = 6 hour Delay; etc				

PART 6: TAKEOFF

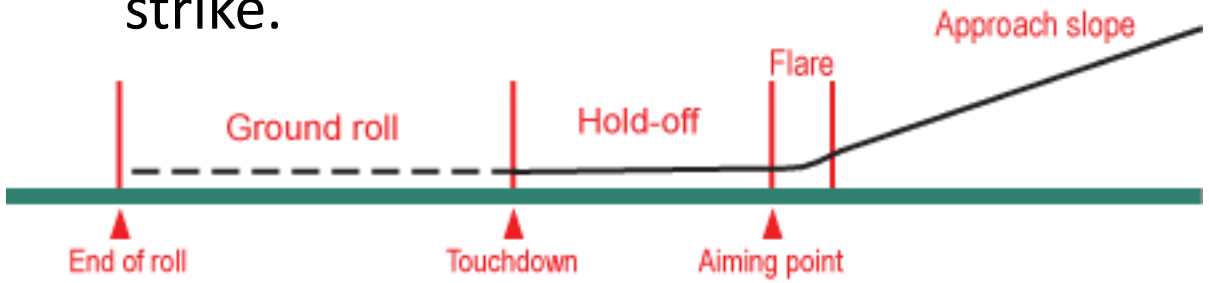
NOTE: This procedure is NOT the real-life start-up procedure, it has been simplified in the sim.

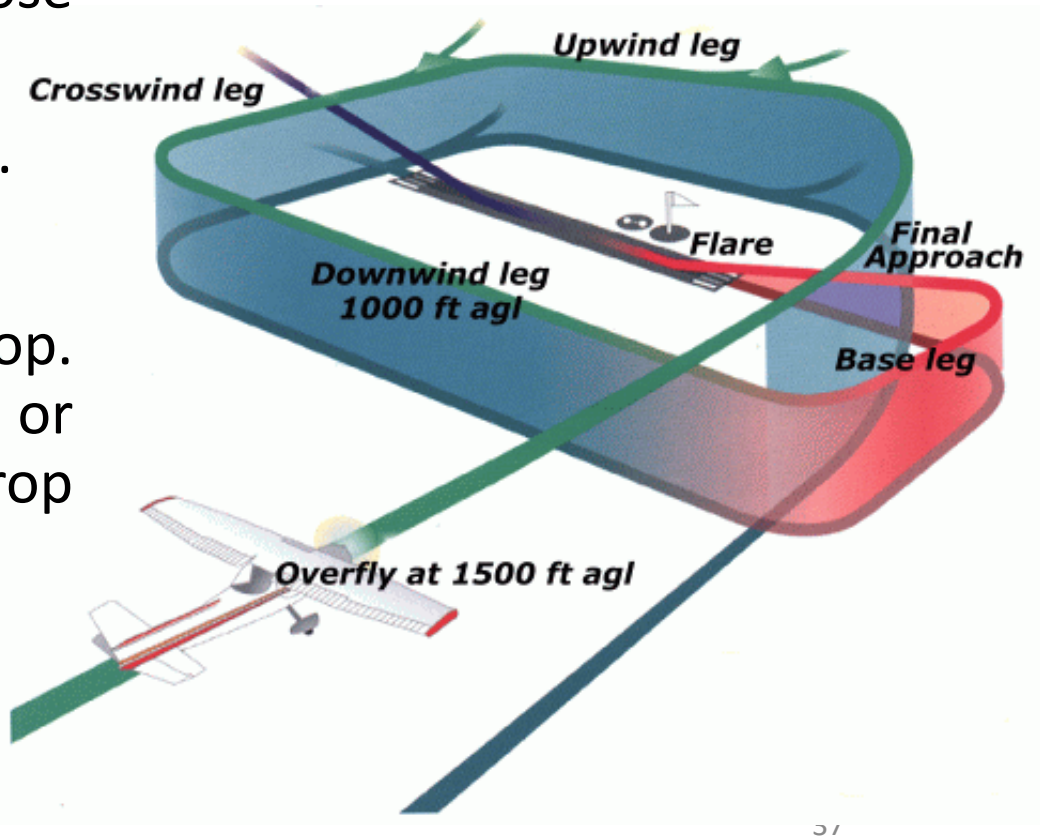
1. Click on both fuel cocks (Red and Green) 2 times to select inner fuel tanks. Make sure you have the proper fuel load by checking the fuel gauges (selected to INNER tanks).
2. Ensure that mixture is set to fully rich (by default it is).
3. Select Engine # 1 (L_Shift + 1).
4. Set your prop pitch to full fine (100 %).
5. Crack throttle half an inch forward.
6. Engine cowling flap fully open.
7. Turn both magnetos for engine # 1 ON.
8. Make sure your propeller is clear ("Clear prop!")
9. Engine ignition! (press "I" by default)
10. Select Engine # 2 (L_Shift + 2).
11. Repeat steps 3 to 9 but for engine # 2.
12. Select BOTH engines (I have it custom mapped to L_Shift + 3).
13. Ensure cowling flaps are fully open (100 %) and prop pitch is fully FINE (100 %).
14. Wait for oil temperature to reach at least 40 deg C and the cylinder head temperature to reach at least 100 deg C.
15. Taxi to the runway. You can taxi with low oil temps without any problem. If your throttle is set to idle, your oil you will hear your engine shake and cough. Try to keep your throttle over 10 %.
16. Make sure you are facing yellow panels on the runway. This means you are facing the right direction for takeoff.
17. Flaps up. Once flaps are fully raised, set flaps to "Neutral" to lock them into the UP position.
    - Note: With the Blenheim, you need to cycle through 3 modes for flaps and landing gear. "Up", "Neutral" and "Down". Up and Down are straightforward, but since the flaps in the Blenheim have a variable setting (unlike the Spitfire, which only has 2 settings – Fully Raised or Fully Down), "Neutral" means that the flaps stop moving. This way, you can have your flaps deployed to the angle you desire. This same methodology is used for the landing gear (undercarriage).
18. Perform last takeoff checks: Canopy Closed, Flaps up, cowlings fully open, Full Fine prop pitch, good oil & cylinder head temperatures.
19. Set Boost Cut-Out Override ON.
20. Gradually throttle up. Compensate for engine torque and wind using right aileron and rudder pedals to keep the aircraft straight. Slightly push the yoke forward to lift the tail.
21. Rotation is at 110 mph.
22. Raise landing gear and set prop pitch to COARSE. Adjust RPM to 2400 max for climb.



PART 7: LANDING

1. Start your approach at 140 mph @ approx. 1500 ft.
2. Rads fully open (100 %) and RPM set prop pitch to FINE (100 %).
3. Deploy flaps (down) and landing gear when you slowed down to 120 mph or less.
4. Cut throttle and try to keep your nose pointed to the end of the runway.
5. Touchdown at 85 mph in a 3-point landing.
6. Yoke fully back.
7. Tap your brakes until you come to a full stop. Be careful not to overheat your brakes or force your aircraft to nose over into a prop strike.





PART 8: ENGINE MANAGEMENT

The Bristol Airplane Company is probably best known for its larger "sleeve valve" engines such as the 1675 h.p. Hercules which powered the four-engined Halifax bomber and Lancaster Mk. II's. However, Bristol also produced the smaller Pegasus and Mercury engines which had "poppet" valves.

The **Bristol Mercury XV** installed on the Blenheim IV has four valves per cylinder, an unusual number for a radial engine. They are actuated by lifter rods and valve levers. Mercury engines had a single carburetor and a gear-driven supercharger.

Derived from the famous Jupiter engine of the 1920’s, the engine developed 825 hp at 2,650 RPM and weighs 1,065 lbs. It has a diameter of 51.5 inches. Mercury engines were manufactured in 20700 units of different versions both by Bristol and under license by other engine companies.

PART 8: ENGINE MANAGEMENT

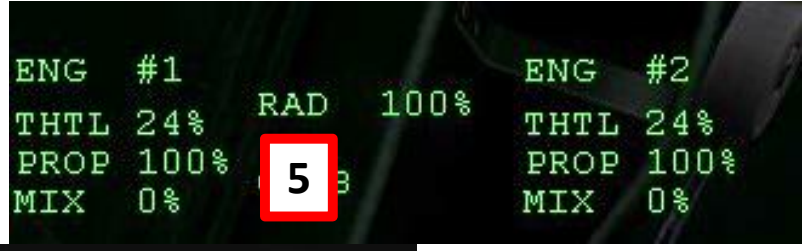
FOUR	ENGINES IN CLIFFS OF DOVER	FOUR

Mixture Control	
Engine	**Operation**
Gypsy Major	Mixture Lever in rear cockpit has 2 operating positions only: RICH and WEAK. The mixture should be set to RICH at all times under 5000 feet. Above 5000 feet, mixture ajustment should not cause a drop in RPM.
Merlin II - XII	Mixture Lever has 2 operating positions only: RICH (NORMAL) and WEAK. An interlocking arrangement returns the mixture control to RICH when the throttle is closed. **Note: Mixture Control moves AFT for RICH and FORWARD for WEAK.**
Mercury XV	Mixture Lever has 2 operating positions only: RICH (NORMAL) and WEAK. An interlocking arrangement returns the mixture control to RICH when the throttle is closed. **Note: Mixture Control moves AFT for RICH and FORWARD for WEAK.**
DB 601 A - A1	The DB 601 Series engines are Direct Fuel Injection engines and do not have a pilot selectable mixture control.
Jumo 211 B/D	The Jumo 211 B/D Series engines are Direct Fuel Injection engines and do not have a pilot selectable mixture control.

PART 8: ENGINE MANAGEMENT

- During a mission, the flight lead usually calls out his engine settings once in a while for the pilots to know what settings they should use.
- Always remember that this is a twin-engine: you must select “ALL ENGINES” in order to throttle up and change your cowling flap settings.
- You can read your engine settings from the gauges in the cockpit or from an info window.
  - The RPM indicator (1) shows 2150 RPM. The boost (2) reads +5 lbs/in^2 (psi). The oil radiators can be approximated by looking at the engine cowlings from the window or read from the info window in %. The control for cowling flaps is the same as the one used for water radiators. (100 % = fully open).
  - The resulting RPM is affected by both boost pressure and prop pitch (5).
  - Cowling flaps settings:
    - 70 % during normal operation
    - 70+ % during combat
    - 50-60 % over 20,000 ft during cruise
    - 100 % during takeoff & landing
  - Engine Settings for Low-Level High-Speed bombing run (skip bombing):
    - 45 % cowling flaps / rad
    - 110 % throttle (Boost Cut-Out Override ON)
  - During flight, I usually keep an eye on the oil rad gauges (3) rather than the cylinder head temp gauges (4). I usually overheat my oil before my cylinder heads reach a critical temperature.

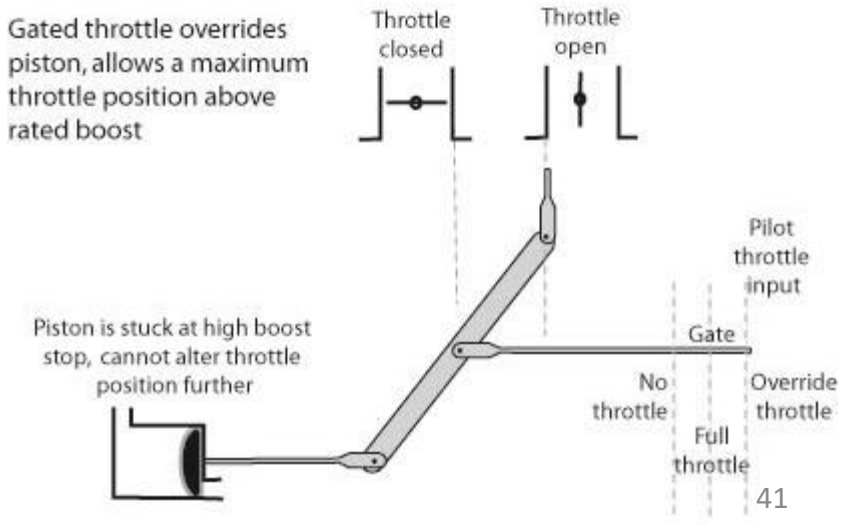
		(Unit)	BLENHEIM MK IV	BLENHEIM MK IVF
TEMPERATURES				
Oil Rad (3)	**Min**	Deg C	40	40
	Max		85	85
Cylinder Head Temp (4)	**Min**	Deg C	100	100
	Max		235	235



Boost cut-out override (BCO)

The Boost control override did not originate as an emergency power setting, but was adapted to be so by the British. In original form, it was just a way of disabling the boost controller in case of malfunction, thus making the system directly link the pilot handle to the throttle valve and giving him the ability to set any boost the supercharger was capable of (but without control, boost would change with altitude).

Although it is hard to find references on this, it is easy to see how the BCO could become an unofficial emergency power switch. A pilot could pull it and try for a bit more boost than the rated 6.25psi, and hopefully get a bit more power without damaging the engine.



PART 8: ENGINE MANAGEMENT

Carburettor Heat Control

- The carburettor heat is a system used in automobile and piston-powered light aircraft engines to prevent or clear carburetor icing. It consists of a moveable flap which draws hot air into the engine intake. The air is drawn from the heat stove, a metal plate around the (very hot) exhaust manifold.
- Access to Carb Heat Controls for each engine are hard to see, so I recommend mapping a key to each one.
- Set ON when you fly at less than +3.5 boost and air temperature is under 15 deg C or when you are flying above 2,500 ft, OR in conditions of high humidity or cold weather.
- Set OFF when you fly at more than +3.5 boost (or during engine start, takeoff and landing).

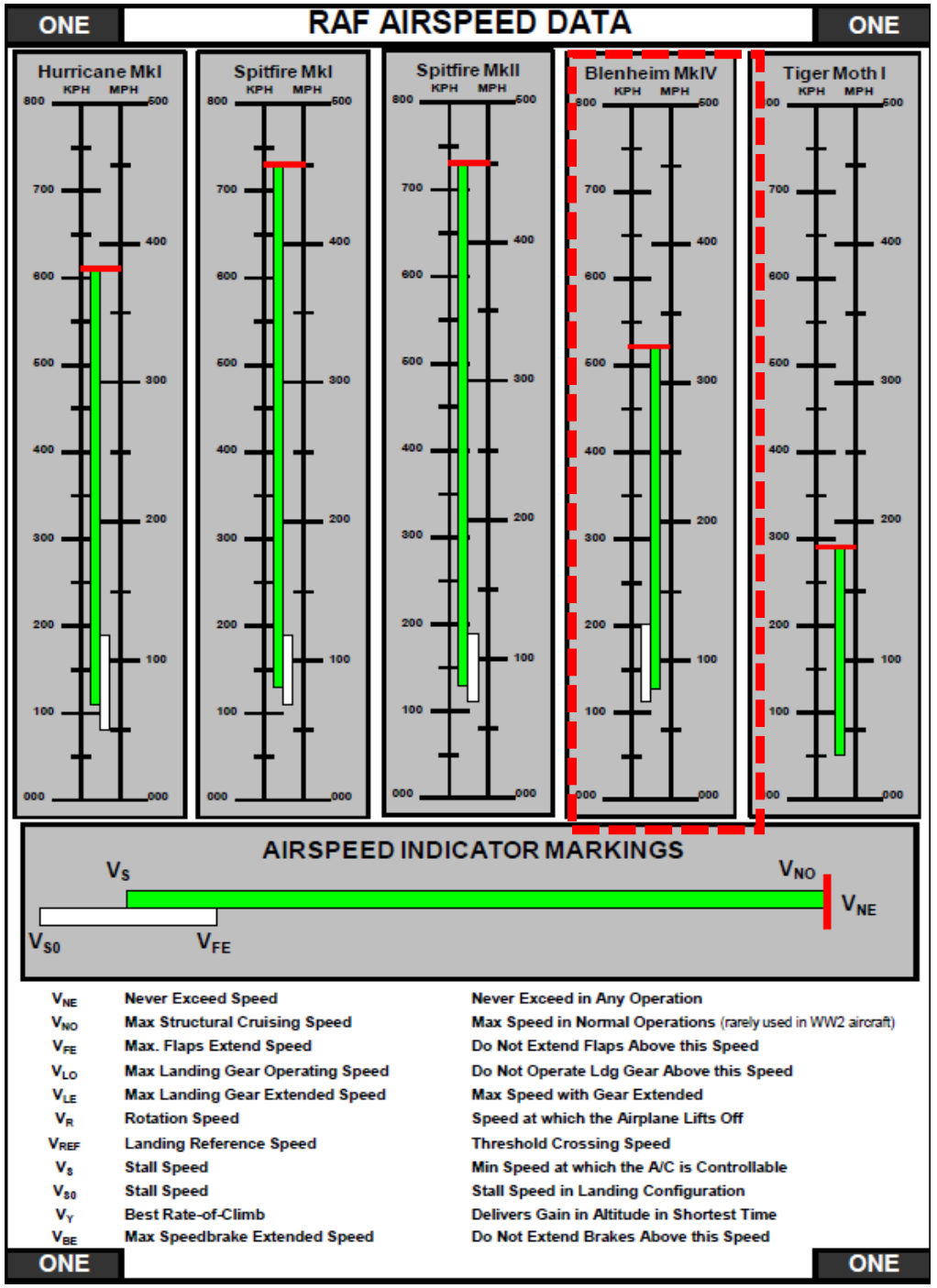
PART 9: AIRCRAFT PERFORMANCE

AIRSPEEDS

Takeoff – Rotation	UK: mph GER/ITA: km/h	110
Max Dive Speed		260
Optimal Climb Speed		135
Landing – Approach		140
Landing – Touchdown		85

- A max climb rate of 1000-1500 ft/min is recommended. Anything higher will overheat your engines.
- For more information on either aircraft or engine performance, consult the **2nd Guards Composite Aviation Regiment** Operations Checklist. It is a fantastic resource (link below).

https://drive.google.com/open?id=0B-uSpZROuEd3NGN4c0JRNHJpYkk&authuser=0



PART 9: AIRCRAFT PERFORMANCE

ONE	Blenheim Mk IV		ONE
Aircraft Type	Engine & Prop	Fuel	Reference
Blenheim MkIV	Mercury XV / DH CSP	100 Oct	Pilot's Notes: AP 1530C; Jan 1943

AIRSPEED LIMITATIONS

	Design Speeds	MPH	
V_{NE}	Never Exceed Speed	325	Never Exceed in Any Operation
V_{FE}	Max. Flaps Extend Speed	125	Do Not Extend Flaps Above this Speed
V_{LO}	Max Landing Gear Operating Speed	140	Do Not Operate Ldg Gear Above this Speed
V_{LE}	Max Landing Gear Extended Speed	NA	Max Speed with Gear Extended
V_R	Rotation Speed	90	Speed at which the Airplane Lifts Off
V_{REF}	Landing Reference Speed	NA	Threshold Crossing Speed
V_S	Stall Speed	80	Min Speed at which the A/C is Controllable
V_{S0}	Stall Speed	70	Stall Speed in Landing Configuration
V_Y	Best Rate-of-Climb	130	Delivers Gain in Altitude in Shortest Time
V_{BE}	Max Speedbrake Extended Speed	NA	Do Not Extend Brakes Above this Speed

AIRSPEED INDICATOR OPERATING RANGES

ASI MARKING	MPH Range	Description
White Arc	70 - 125 MPH	Full Flap Operating Range. Lower Limit is Max. Weight V_{S0} . Upper Limit Max Speed w/Flaps Extended.
Green Arc	80 - 325 MPH	Normal Operating Range. Lower Limit is Max. Weight V_S . Upper limit Is Max Structural Cruising Speed.
Red Line	325 MPH	Maximum Speed for ALL operations.

PART 9: AIRCRAFT PERFORMANCE

FUEL CONSUMPTION

	gals/hour @ 10k Feet		RPM				
	Mixture	Boost	2400	2200	2000	1900	
	WEAK	+1 PSI	75	70	65		
		0 PSI	69	65	61	58	
		-1 PSI	66	62	58	54	
		-2 PSI	61	57	53	49	
		-3 PSI	56	52	48	45	

Mixture	Boost	RPM	gals/hr
NORMAL	+5 PSI	2650	146
	+3.5 PSI	2400	112
	+ 1.5 PSI	2400	90

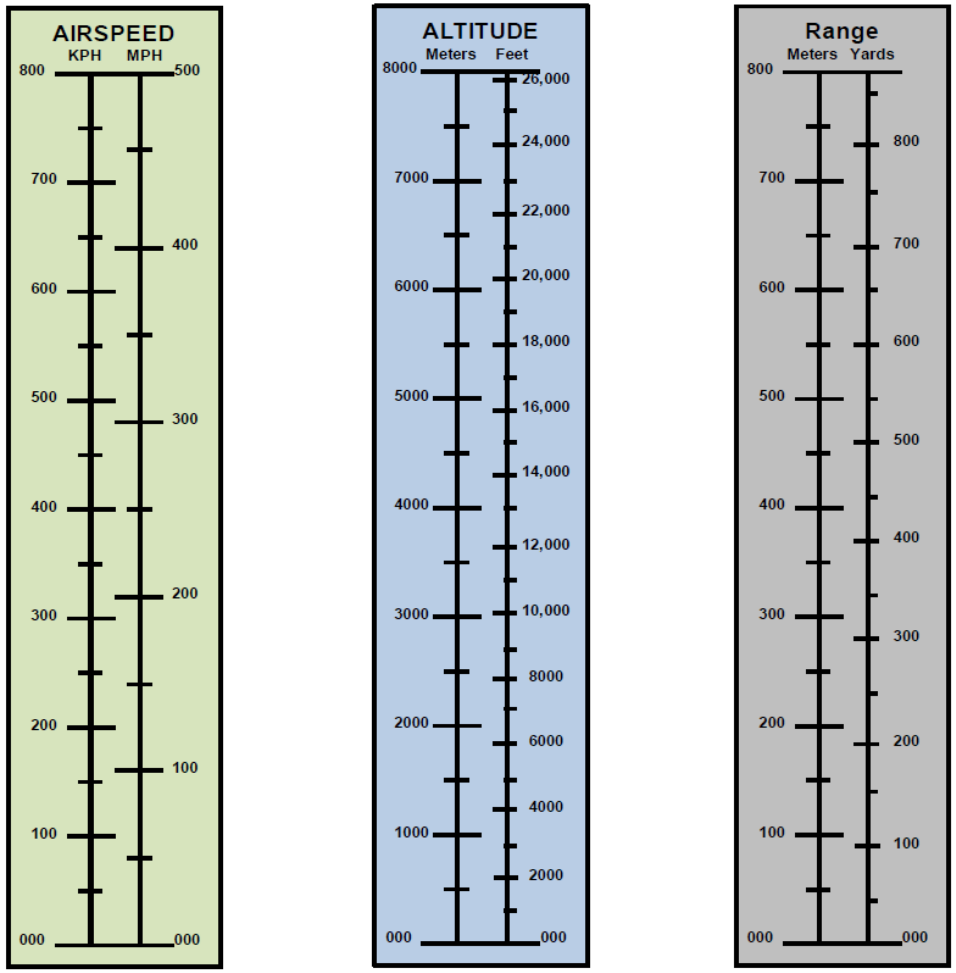
Fuel Tanks	Capacity	Quantity	Tot Capacity
Inner	140 gals	2	280 gals
Outer	94 gals	2	188 gals

THREE THREE

Fuel planning will be further elaborated in the "BOMBING TUTORIAL" section.

PART 9: AIRCRAFT PERFORMANCE

ONE **CONVERSION DATA** ONE



International Civil Aviation Organization International Standard Atmosphere							
Temperature		Altitude Above Sea Level		Atmospheric Pressure			Mach 1
°F	°C	feet	meters	inches Hg	mm Hg	psia	mph
59	15	SL	0	29.92	760	14.70	761
55	13	1000	305	28.86	733	14.17	758
52	11	2000	610	27.82	706	13.67	755
48	9	3000	914	26.82	681	13.17	752
45	7	4000	1219	25.84	656	12.69	750
41	5	5000	1524	24.90	632	12.23	748
38	3	6000	1829	23.98	609	11.78	745
34	1	7000	2134	23.09	586	11.34	742
31	-1	8000	2438	22.22	564	10.92	740
27	-3	9000	2743	21.39	543	10.51	736
23	-5	10000	3048	20.58	523	10.10	734
5	-15	15000	4572	16.89	429	8.29	720
-13	-25	20000	6096	13.75	349	6.75	706
-31	-35	25000	7620	11.10	282	5.45	693
ONE							ONE

P-8 COMPASS TUTORIAL

- Using the magnetic compass and the gyro is quite useful to know where you are going.
- The gyro indicator itself does not indicate your heading. You need to set it manually in order to translate what the magnetic compass is telling you. You must set up your magnetic compass first by adjusting the “course setter” instrument on top of it, and once you can read your heading from your compass, THEN you set your gyro to reflect the compass’ reading. Sounds complicated? It’s not. We will see why in the next slide.
- Typically, you set your compass and gyro on the ground. It is not the kind of stuff you want to do when you are flying 20,000 ft over France.
- High-G manoeuvers can decalibrate your gyro and give you a wrong reading. Be aware that once you start a dogfight, your gyro can give you readings that don’t make sense. It’s normal: it is one of the real-life drawbacks of this navigation system. The same issue is also recurrent in today’s civilian acrobatic prop planes.

PART 10: COMPASS TUTORIAL

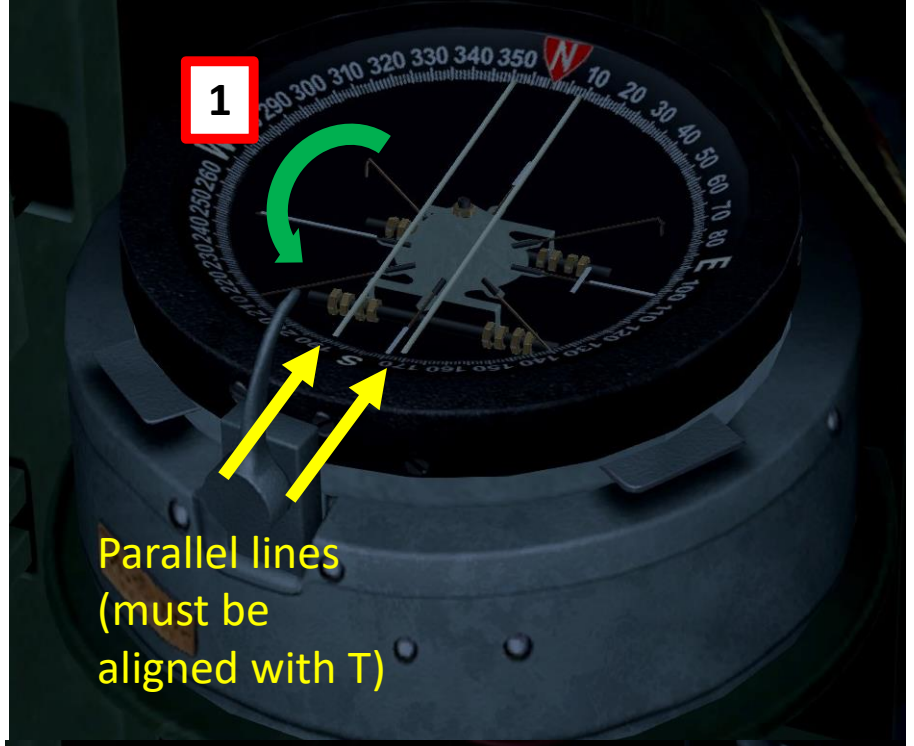
HOW TO SET UP YOUR GYRO & COMPASS

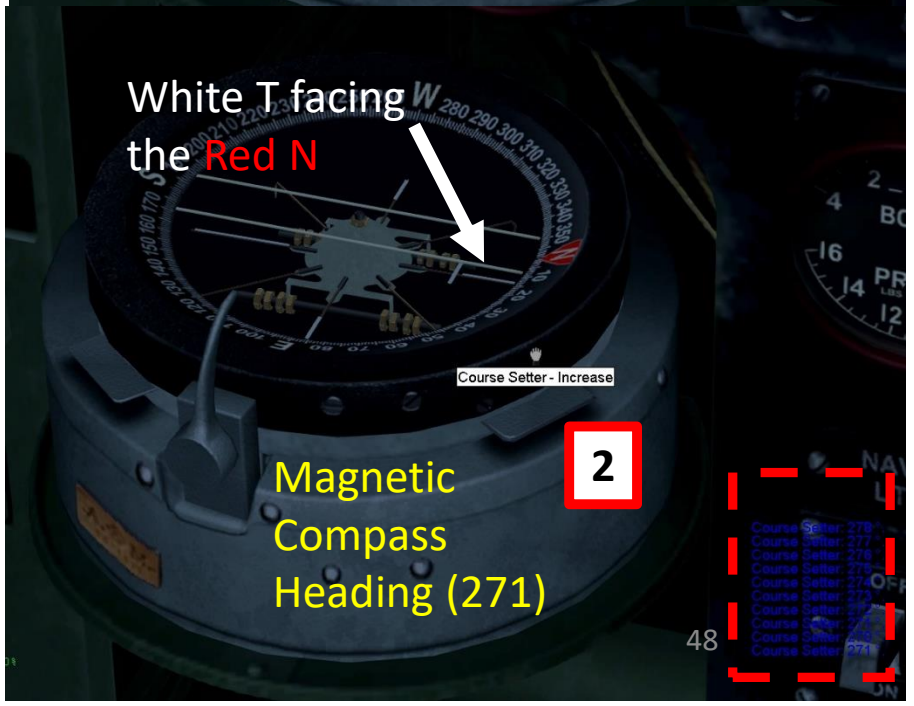
1. The white T on your **P-8 magnetic compass** indicates magnetic North. You always use that as a reference. It is hard to see because of the control column hiding part of it.

2. Align the red N on the white T by clicking on the course setter until both yellow-ish bars are parallel with it the white T. You will obtain a resulting "course" from the course setter (which is the blue text that pops up on your screen). Keep that number in mind. In our case, the number is a heading of 271. However, in order to take into account the effects of magnetic declination, you need to add 10 degrees to get the geographic north. For now, consider that your current heading is 281 degrees.

3. Set your directional **gyro compass** by clicking on the rotary knob to reflect the corrected heading obtained on your magnetic compass. In our case, set the gyro to 281. You will see the blue numbers pop again. You can use them as a way to fine tune your gyro.

4. And that's it! You will now be able to use your gyro compass to orient yourself. If your gyro accumulates error after high-G manoeuvers, you can try to re-set it using steps 1 to 3.





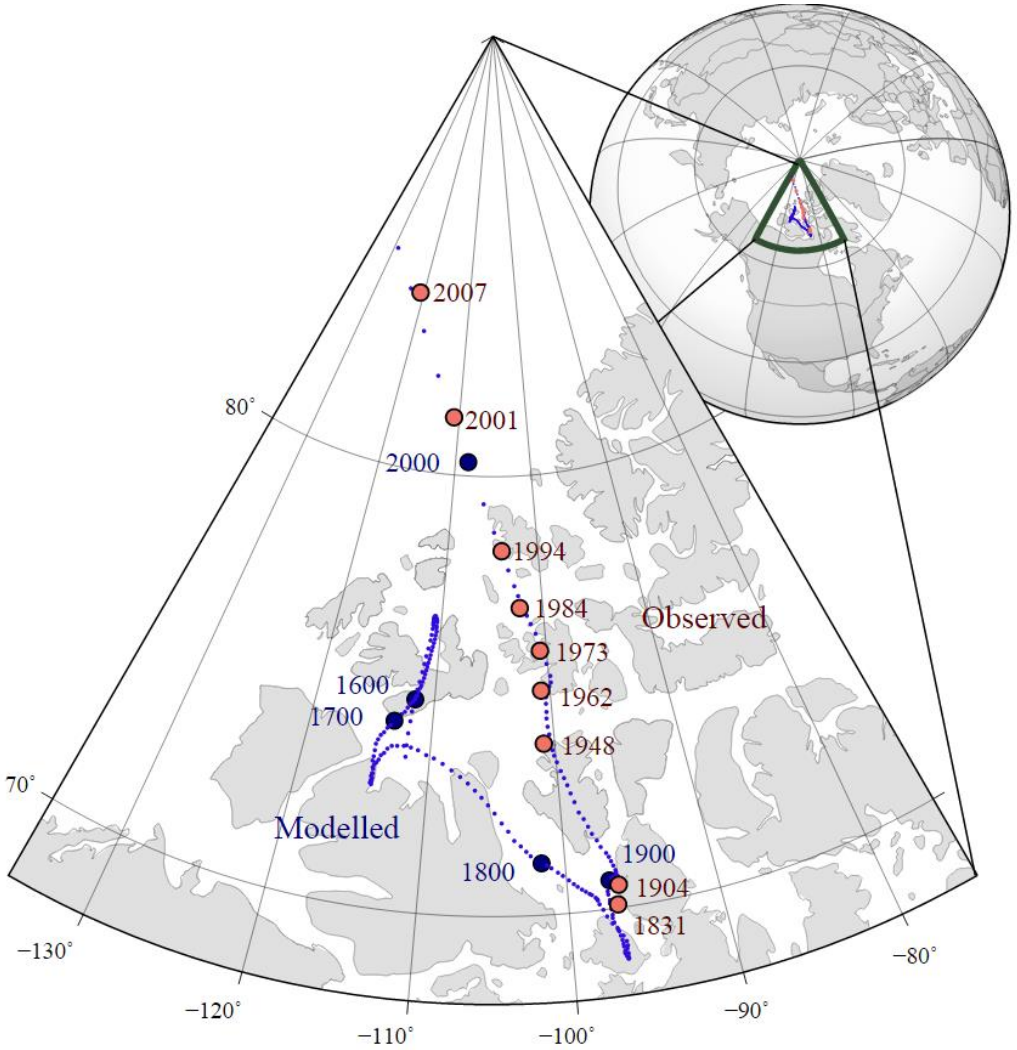
PART 10: COMPASS TUTORIAL

About Magnetic Declination

The direction in which a compass needle points is known as magnetic north. In general, this is not exactly the direction of the North Magnetic Pole (or of any other consistent location). Instead, the compass aligns itself to the local geomagnetic field, which varies in a complex manner over the Earth's surface, as well as over time. The local angular difference between magnetic north and true north is called the magnetic declination. Most map coordinate systems are based on true north, and magnetic declination is often shown on map legends so that the direction of true north can be determined from north as indicated by a compass.

This is the reason why in Cliffs of Dover, the magnetic compass needs to be “adjusted” to take into account this magnetic declination of the magnetic North pole (which is actually modelled in the sim, which is pretty neat).

In 1940, the magnetic declination required an adjustment of 10 degrees and 8 minutes. We round that to 10 deg.



The movement of Earth's north magnetic pole across the Canadian arctic, 1831–2007

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL - INTRO

- Bombing is one of the most complex and rewarding features of flight simulators. The bomber pilot has a thankless job, yet bombing is an art form in itself.
- This tutorial will be for high-altitude bombing as it encompasses all aspects of bombing and navigation.
- Bombers should work as a team. Not only with other bombers, but with fighter escorts as well to keep them alive.
- The mind of a bomber pilot is a patient and organized one. If you fail to plan your mission properly, you certainly plan to fail and end up in a smoldering pile of ashes.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL - INTRO

- A bombing operation can be separated in 6 phases:
  1. Planning the mission
  2. Takeoff and assembly of bomber force
  3. Rendezvous with fighter escorts
  4. Fly to target
  5. Bombing run
  6. Return to Base
- We will explore phases 1, 4 and 5 together.

PART 11: BOMBING TUTORIAL

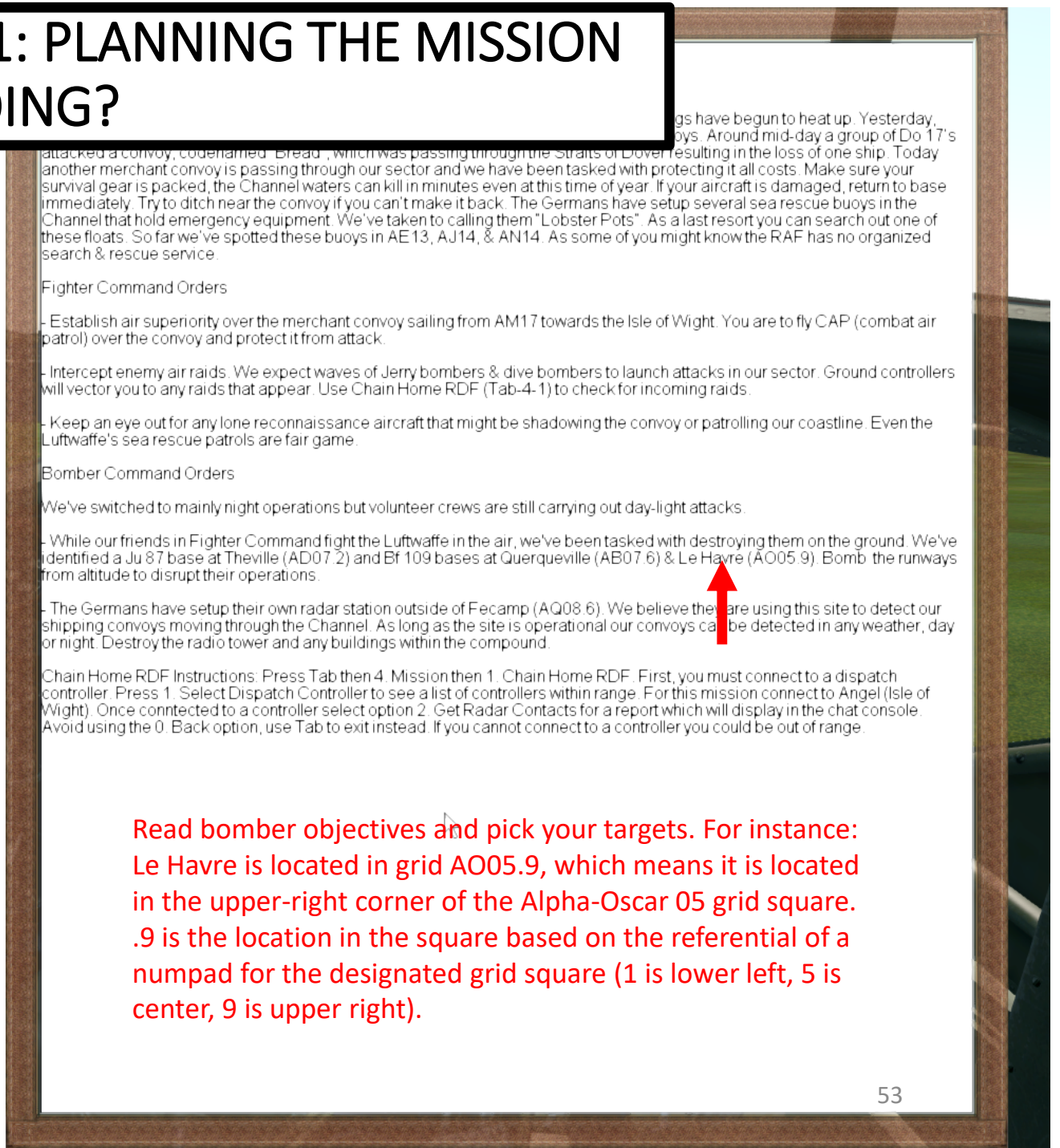
BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION

- Before you even take off, you need to make sure you know the following:
  1. Where am I?
  2. Where am I going?
  3. How much fuel do I need?
  4. What am I doing?
  5. How am I doing it?
  6. What can help me?
  7. What can kill me?
  8. How do I get home?
- Once you have all that stuff figured out, THEN you can takeoff.
- The following example will show you a typical mission planning.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION WHERE AM I? WHERE AM I GOING?

- Reading the bomber objectives always helps to find a high-priority target.
- You can look at the bombing objectives in the mission briefing (can be accessed via aircraft selection menu or by right-clicking, opening the map, right-clicking on the map and choosing “Briefing”).
- **Le Havre will be our target for today and we will be spawning from Shoreham.**



gs have begun to heat up. Yesterday,
oys. Around mid-day a group of Do 17's
attacked a convoy, codenamed "Bread", which was passing through the Straits of Dover resulting in the loss of one ship. Today another merchant convoy is passing through our sector and we have been tasked with protecting it all costs. Make sure your survival gear is packed, the Channel waters can kill in minutes even at this time of year. If your aircraft is damaged, return to base immediately. Try to ditch near the convoy if you can't make it back. The Germans have setup several sea rescue buoys in the Channel that hold emergency equipment. We've taken to calling them "Lobster Pots". As a last resort you can search out one of these floats. So far we've spotted these buoys in AE13, AJ14, & AN14. As some of you might know the RAF has no organized search & rescue service.

Fighter Command Orders

- Establish air superiority over the merchant convoy sailing from AM17 towards the Isle of Wight. You are to fly CAP (combat air patrol) over the convoy and protect it from attack.

- Intercept enemy air raids. We expect waves of Jerry bombers & dive bombers to launch attacks in our sector. Ground controllers will vector you to any raids that appear. Use Chain Home RDF (Tab-4-1) to check for incoming raids.

- Keep an eye out for any lone reconnaissance aircraft that might be shadowing the convoy or patrolling our coastline. Even the Luftwaffe's sea rescue patrols are fair game.

Bomber Command Orders

We've switched to mainly night operations but volunteer crews are still carrying out day-light attacks.

- While our friends in Fighter Command fight the Luftwaffe in the air, we've been tasked with destroying them on the ground. We've identified a Ju 87 base at Theville (AD07.2) and Bf 109 bases at Querqueville (AB07.6) & Le Havre (AO05.9). Bomb the runways from altitude to disrupt their operations.

- The Germans have setup their own radar station outside of Fecamp (AQ08.6). We believe they are using this site to detect our shipping convoys moving through the Channel. As long as the site is operational our convoys can be detected in any weather, day or night. Destroy the radio tower and any buildings within the compound.

Chain Home RDF Instructions: Press Tab then 4. Mission then 1. Chain Home RDF. First, you must connect to a dispatch controller. Press 1. Select Dispatch Controller to see a list of controllers within range. For this mission connect to Angel (Isle of Wight). Once conntected to a controller select option 2. Get Radar Contacts for a report which will display in the chat console. Avoid using the 0. Back option, use Tab to exit instead. If you cannot connect to a controller you could be out of range.

Read bomber objectives and pick your targets. For instance: Le Havre is located in grid AO05.9, which means it is located in the upper-right corner of the Alpha-Oscar 05 grid square. .9 is the location in the square based on the referential of a numpad for the designated grid square (1 is lower left, 5 is center, 9 is upper right).

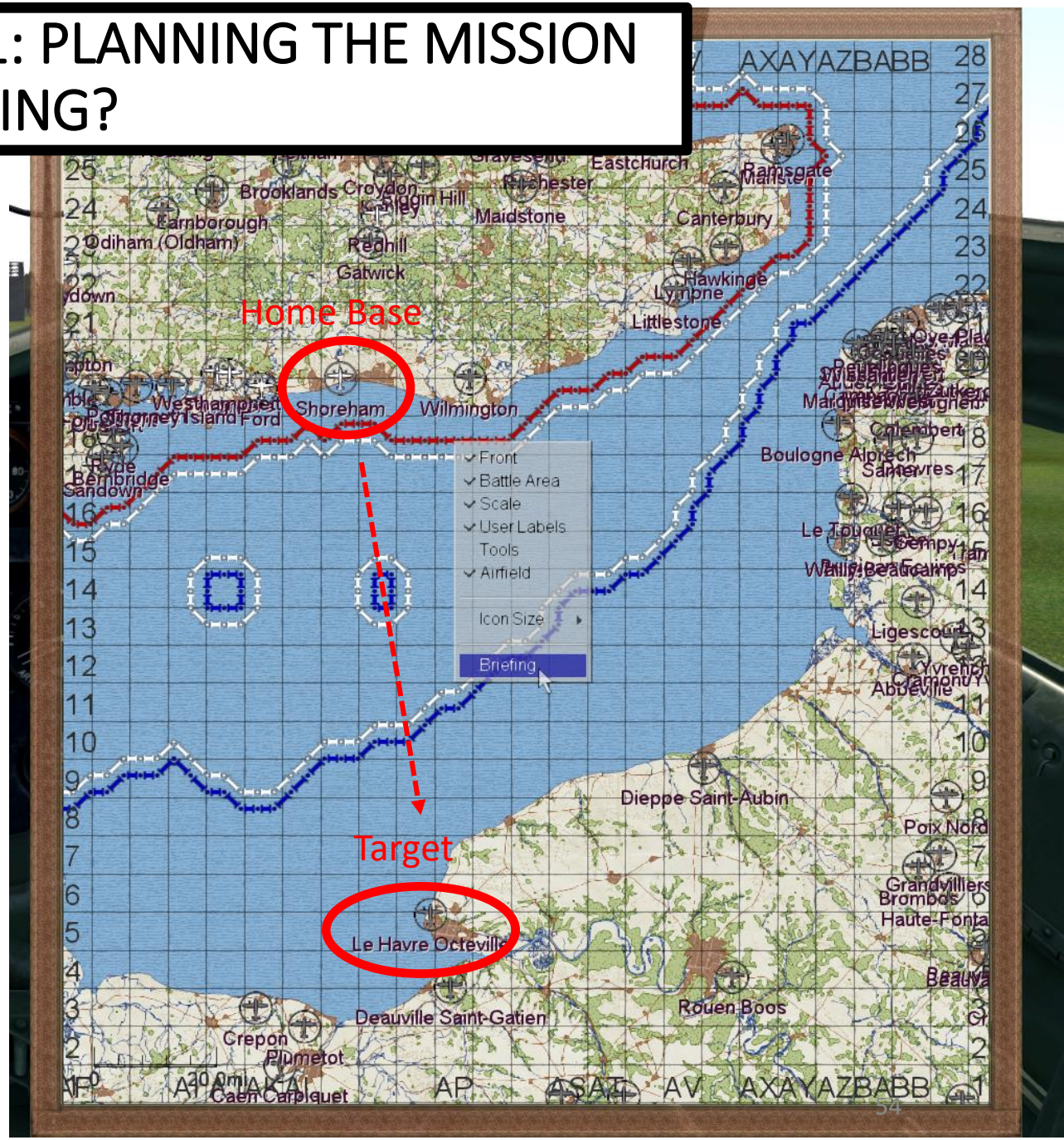
PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
WHERE AM I? WHERE AM I GOING?

- Good! We now have a target (Le Havre airfield), and we decided that we would spawn at Shoreham.
- Now, it is time to figure out how we get there and drop them cabbage crates. We need a heading and a distance.
- Open your map and select (left click) your Protractor tool to obtain your heading to target.

While map is selected, open up your "Tools" menu (right click) and use your protractor to find the correct heading.

Left-Click on the protractor icon.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
WHERE AM I? WHERE AM I GOING?

1) Click and hold left mouse button on Shoreham and drag a vertical line. Once line is parallel with the North, release mouse button.
2) Click and hold left mouse button on Shoreham and drag a line to Le Havre Airfield. Once line is crossing the center of the airfield icon, release mouse button.
3) A heading number should pop next to Shoreham. Remember this number. In our case, we get 169 degrees.
4) In case your target is West (to the left) to your home base, the number that pops up will not be your heading. The proper heading will be <u>360 minus the number that popped up</u>. In our case, the proper heading will be a 169 Geographic (map) Heading.
5) Since the heading we obtained on the map is geographic and not magnetic, the **magnetic course** we will need to follow on our compasses is **169 + 10 = 179 deg**. This is the heading we will follow on our magnetic compass. We added 10 degrees to take into account magnetic declination as shown in previous compass navigation tutorial.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION WHERE AM I? WHERE AM I GOING?

- We now know our target: Le Havre. We must know how high it is to take into account target elevation when we will be bombing.
- You can use the LOFTE tool available on ATAG: theairtacticalassaultgroup.com/utils/lotfe7.html
- A tutorial on how to use this tool is available in Chuck's Blenheim High Altitude Bomber Guide 2.0 available here: https://drive.google.com/open?id=0B-uSpZROuEd3MDEwaDZXdmNSdnM&authuser=0
- One quicker way to do it is to get the airfield's altitude directly from the list on the next page made by Ivank.
- LOFTE's values tend to vary from point to point: values you get from this tool are an approximation that must sometimes be taken with a grain of salt.
- Le Havre's altitude in the table is 96 m (314 ft), while on the LOFTE tool it is 79 m (240 ft).
- Because my example is recycled from a previous guide using the LOFTE tool to get the altitude, (and since I'm too lazy to bother changing it) we will use a target elevation of 79 m for Le Havre.

PART 11: BOMBING TUTORIAL

IL2 STURMOVIK CLIFFS OF DOVER AIRFIELD ELEVATIONS

UK AIRFIELDS

Bembridge	13m	43ft	Manston	44m	14ft
Biggin Hill	179m	587ft	Netheravon	119m	390ft
Boscombe Down	127m	417ft	North Weald	80m	262ft
Canterbury	51m	167ft	Northolt	37m	121ft
Croydon	101m	331ft	Old Sarum	79m	259ft
Eastchurch	7m	23ft	Portsmouth	1m	3ft
Farnborough	77m	253ft	Ramsgate	47m	154ft
Ford	1m	3ft	Reading	46m	151ft
Gatwick	60m	197ft	Redhill	24m	79ft
Gosport	1m	3ft	Rochester	130m	426ft
Gravesend	63m	207ft	Rochford	10m	33ft
Hamble	20m	66ft	Ryde	52m	171ft
Harewell	120m	394ft	Salisbury	131m	430ft
Hawkinge	158m	518ft	Sandown	21m	69ft
Heathrow	23m	75ft	Southhampton	9m	30ft
Hendon	50m	163ft	Tangmere	12m	40ft
Heston	30m	98ft	Thorney Island	1m	3ft
Hornchurch	10m	33ft	Upavon	147m	482ft
Kenley	174m	571ft	Watchfield	100m	328ft
Larkhill	114m	374ft	West Hampnett	21m	69ft
Lee On Solent	10m	33ft	White Waltham	36m	118ft
Littlestone	22m	72ft	Willimington	22m	72ft
Lympne	100m	328ft	Yatesbury	170m	558ft
Maidstone	84m	275ft			

IL2 STURMOVIK CLIFFS OF DOVER AIRFIELD ELEVATIONS

FRENCH AIRFIELDS

Abbeville	61m	200ft	Guines	46m	151ft
Achiet Grevillers	127m	417ft	Haute Fontaine	180m	590ft
Amiens Allonville	89m	292ft	Horm Elingen	161m	528ft
Amiens Glisy	59m	194ft	Hydrequent	78m	256ft
Aras St Liger	109m	358ft	Le Havre Octeville	96m	314ft
Arras	98m	321ft	Le Touquet	1m	3ft
Audembert	42m	138ft	Licescourt	70m	230ft
Barly	122m	400ft	Marquise West	24m	79ft
Barly	112m	367ft	Merville calonne	9m	30ft
Beamont Le Roger	139m	456ft	Monchy Briton	150m	492ft
Beauvais Nivllers	120m	394ft	Montdidier	108m	354ft
Beauvais Tille	99m	325ft	Oye- Plage	2m	7ft
Berk	1m	3ft	Persan Beaumont	42m	138ft
Bernay St Martin	161m	528ft	Peuplinguess	101m	331ft
Bolsjean Ecuires	57m	187ft	Pihen	96m	315ft
Brias	150m	492ft	Plumetot	40m	131ft
Brombos	191m	627ft	Poiy Nord	171m	561ft
Bulougne Alperch	69m	226ft	Querqueville	1m	3ft
Caen Carpiquet	61m	200ft	Rezy Norrent fontes	94m	308ft
Caffiers	112m	367ft	Rosieres En Santifer	82m	269ft
Calais Marck	2m	7ft	Rouen Boos	140m	459ft
Carquebut	20m	197ft	Roye Amy	83m	272ft
Champ Les Guines	75m	246ft	Samer	61m	200ft
Colembert	198m	649ft	Sempy	120m	394ft
Coquelles	13m	43ft	St Inglewert	129m	423ft
Cramont Yurtench	121m	397ft	St Omer Arques	29m	95ft
Crecy	141m	462ft	St Omer Clairmarrias	9m	29ft
Creil	101m	331ft	St Omer Wizennes	78m	256ft
Crepon	59m	194ft	Theville	135m	443ft
Deanville St Gatien	140m	459ft	Tramecourt	126m	413ft
Desures	200m	656ft	Wailly Beauchamp	51m	167ft
Dieppe	101m	331ft	Wissant	21m	69ft
Estree	80m	262ft	Yvrench	110m	361ft
Grandvilliers	180m	590ft	Zuterque	36m	118ft

NOTES

To determine Map QNH. Park on the airfield. Set Altimeter to read the values above. Pressure sub scale is now set to correct QNH for the map.

SC/JG_Ivank Oct 2012

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW MUCH FUEL DO I NEED?

- The heavier you are, the slower you are and the more vulnerable you are.
- Calculating your required fuel is easy.
- We know our max range for Max Takeoff weight (@ 60% fuel) is about 300 miles.
- Use the "Map Tool Ruler" to get our target's range. Le Havre is about 100 miles away from Shoreham. Since we plan to return to base, we add another 100 miles. We can add about 15 miles for loitering time, assembly and rendezvous with fighters. We have a grand total of 215 miles.
- To fly for 215 miles at 2400 RPM at 240 mph, we simply multiply our max takeoff fuel load (60 %) by the ratio of the distance we need to fly on the maximum range @ max takeoff weight (300 miles):
- 60 % * 215 miles / 300 miles = 43 % fuel. That is what we need.

MAX RANGE

- The Blenheim has 4 fuel tanks: 2 inner tanks (which are filled first) and 2 outer tanks. With a full bomb load (1000 lbs), the maximum fuel load you can carry is about 60 % (approx. 280 gal, so just about enough to completely fill your inner tanks without having to use fuel for the outer ones).
- With Full Rich (strong) mixture for a boost setting of +3.5 PSI and a RPM of 2400, you consume approx. 112 gals/hour. Assuming you are going at 240 mph in level flight (a fairly reasonable assumption), you can fly for about 2.5 hours at MAX Takeoff Weight. This means that you have a range of about 300 miles, or about 480 km.

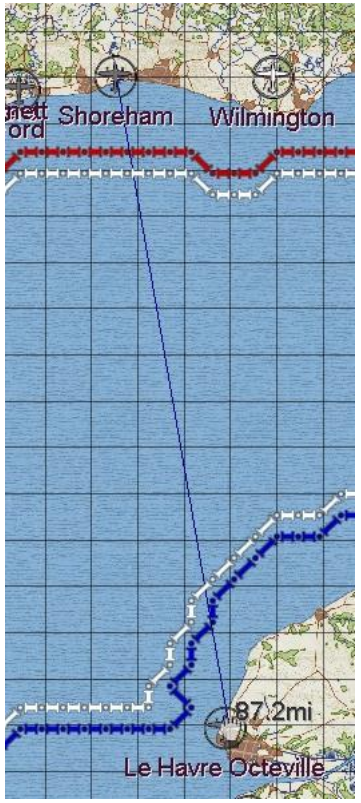
FUEL CONSUMPTION

	gals/hour @ 10k Feet		RPM			
	Mixture	Boost	2400	2200	2000	1900
	WEAK	+1 PSI	75	70	65	
		0 PSI	69	65	61	58
		-1 PSI	66	62	58	54
		-2 PSI	61	57	53	49
		-3 PSI	56	52	48	45

Mixture	Boost	RPM	gals/hr
NORMAL	+5 PSI	2650	146
	+3.5 PSI	2400	112
	+ 1.5 PSI	2400	90

Fuel Tanks	Capacity	Quantity	Tot Capacity
Inner	140 gals	2	280 gals
Outer	94 gals	2	188 gals

Left click and drag from point A to point B to get a distance.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION WHAT AM I DOING?

- Now that we know where we are and where we are going and how much fuel we need, we need to know what we will be doing.
- We will load up **4 X 250 lbs** bombs with 1 sec fuse. See the Weapons and Armament section to know more.
- Our bombing altitude will be 17,000 ft. We could go as high as 24,000 if we wanted to.
- Why do we ask ourselves this question? Simply because the challenge of a bomber pilot is the sheer workload behind it. You are doing by yourself the task that took two dedicated guys or more to do. Therefore, our goal is to reduce the workload as much as possible by doing as much as we can on the ground so we can concentrate on what's going on during the flight rather than prepare our instruments in a hurry.
- In a bomber flight, generally half the guys do not know how to use a bomb sight: they simply drop their bombs on the bomber lead's command. Keep in mind that having a bomber lead is not enough to have a proper mission: fighter interceptors always go for the bomber lead because odds are that he is the most experienced bomber pilot. Good bomber operations generally have a second or a third leader to take No. 1's place in case he gets shot down or runs into engine trouble.
- If you have 9 guys flying for an hour to get to a target that are waiting on your command to drop their bombs, you better make sure that you know where you're aiming…
- Therefore, it is important to know at what speed and what altitude you plan to do your bomb run so you can set up your bombsight in advance. I usually set my bombsight when I am on the ground. This way, you just need to make small adjustments when you get to target rather than set everything up in a hurry.
- You will need your target elevation to set up your bombsight properly.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW AM I DOING?

- Here is why you need to take into account target elevation in your bombsight:
- Pressure altitude and Height are related to one another, but keep in mind that they are two completely different things.
- Height is the vertical physical distance between your aircraft and the ground. Pilots often refer to height as “AGL” (Above Ground Level).
- Pressure altitude is the altitude measured using a pressure datum reference. Pilots often refer to altitude as “AMSL” (Above Mean Sea Level). Pressure Altitude reading can vary based on meteorological conditions.
- Bombsight height setting can be determined by simply reading the altimeter and substracting the target elevation (assuming the altimeter pressure altitude was set correctly for the pressure conditions in Home Base).
- The bombsight height, in our case will be our altimeter altitude (17,000 ft) minus the target elevation (240 ft). The bombsight height will have to be set at more or less 16,760 ft. Keep in mind that the altitude can change due to many factors and that your bombsight height is AGL, and will always require you to substract target elevation to be accurate.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW AM I DOING IT?

ALTITUDE: 17,000 ft AMSL

ABOVE SEA LEVEL

The bombsight height, in our case will be our altimeter altitude (17,000 ft) minus the target elevation (240 ft). The bombsight height will have to be set at more or less 16,760 ft. Keep in mind that the altitude can change due to many factors and that your bombsight height is AGL (above ground level), and will always require you to substract target elevation to be accurate.

NOTE: the max bombsight altitude for the Blenheim IV is 20,000 ft.

BOMBSIGHT HEIGHT
16,760 ft AGL

TARGET ELEVATION: 240 ft

SHOREHAM
ALTITUDE: 0 ft AMSL

ENGLISH CHANNEL
ALTITUDE: 0 m AMSL

LE HAVRE
ALTITUDE: 240 ft AMSL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW AM I DOING?

- Caution: our altitude and speed set on the bombsight will **not** be the values read on the altimeter and airspeed indicators.
- We have already seen why the bombsight height must be the altitude value read on the altimeter minus the target elevation.
- **Indicated Airspeed** (IAS) is the speed you read on your airspeed indicator. It is driven by your Pitot tube and a barometric static port. Air pressure varies with altitude (the higher you go, the less air there is). IAS is corrected for the surrounding air pressure but **not** for air density.
- **True Airspeed** (TAS) is indicated airspeed corrected to take into account air density (which, like we said, depends on your current altitude).
- The bombsight requires a True Airspeed input, **not** an indicated airspeed.
- Fortunately, there is an interpolation table available in the Cliffs of Dover manual to help you get an approximation of TAS. We will see how to use this table in the next page.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW AM I DOING?

We will aim for an indicated airspeed (IAS) of 200 mph (read on the airspeed gauge) at an altitude of 16,760 ft.

1) Pick the appropriate row for IAS (200 mph)
2) Pick the appropriate columns for nearest altitudes (16,000 and 18,000 ft)
3) Take note of the TAS values in the table 255 mph and 263 mph)
4) Because the TAS values are close enough and that bombsight airspeed only goes into increments of 10, we can approximate the resulting TAS value to approx. an average value of **260 mph**. It is not the exact value, but in our case, it should work.

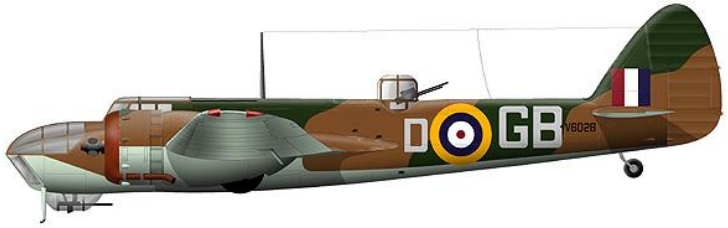
Imperial (speed in mph, altitude in feet)

Feet / Mph	3,000	6,000	8,000	10,000	12,000	14,000	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000
150	157	164	169	174	180	185	191	197	203	210	216	223	230	237
200	209	218	225	232	240	247	255	263	271	280	288	298	307	317
225	235	246	253	261	270	278	287	296	305	315	325	335	345	356
250	261	273	282	290	299	309	319	329	339	350	361	372	384	396
275	287	300	310	319	329	340	350	361	373	385	397	409	422	435
300	313	327	336	346	357	367	378	390	401	413	426	438	451	465
325	339	354	364	375	386	398	410	422	435	448	461	475	489	504
350	365	381	392	404	416	428	441	454	468	482	496	511	527	542
375	391	408	420	433	446	459	473	487	501	516	532	548	564	581
400	417	434	446	459	472	485	499	514	528	543	559	575	591	608
425	442	460	473	487	501	515	530	545	560	576	592	609	627	644
450	468	487	501	515	530	545	561	577	593	610	627	645	663	682
475	495	515	529	544	559	575	592	609	626	644	662	681	700	720
500	521	542	557	573	589	606	623	641	659	678	697	717	737	758

PART 10: BOMBING TUTORIAL

PRESUME ONE FACTOR, ALTITUDE OR TAS, IS CORRECT AND THE OTHER INCORRECT. BOMB TRAJECTORY WILL BE AFFECTED.

ALL BOMBSIGHTS IN THE SIM USE TRUE AIRSPEED (TAS). DO NOT CONFUSE TAS WITH IAS – INDICATED AIRSPEED, WHICH IS WHAT YOU READ ON YOUR INSTRUMENTS.



1. **INPUT TAS TOO LOW, PLANE IF FLYING FASTER THAN INPUT AIRSPEED**
2. **INPUT ALTITUDE TOO LOW, PLANE IS FLYING HIGHER THAN INPUT ALTITUDE**

BOMBS OVERSHOOT TARGET

CORRECT ALTITUDE AND TAS INPUT

BOMBS FALL SHORT OF TARGET

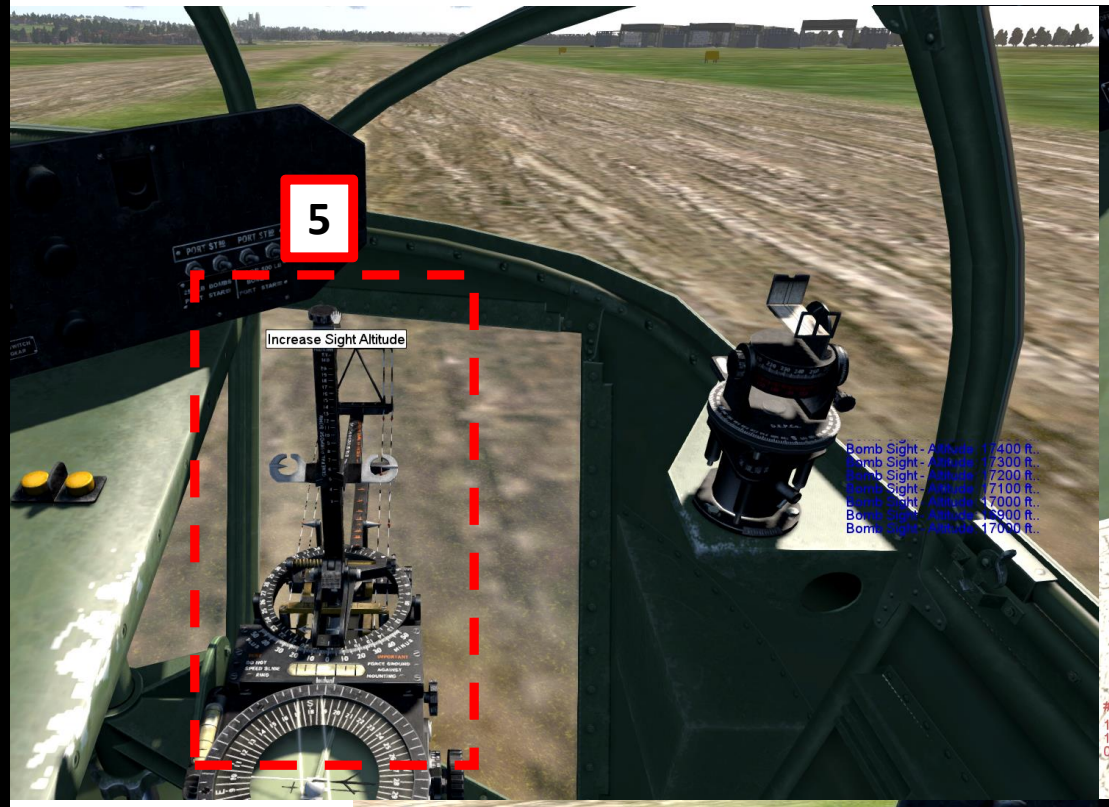
1. **INPUT TAS TOO HIGH, PLANE IF FLYING SLOWER THAN INPUT AIRSPEED**
2. **INPUT ALTITUDE TOO HIGH, PLANE IS FLYING LOWER THAN INPUT ALTITUDE**

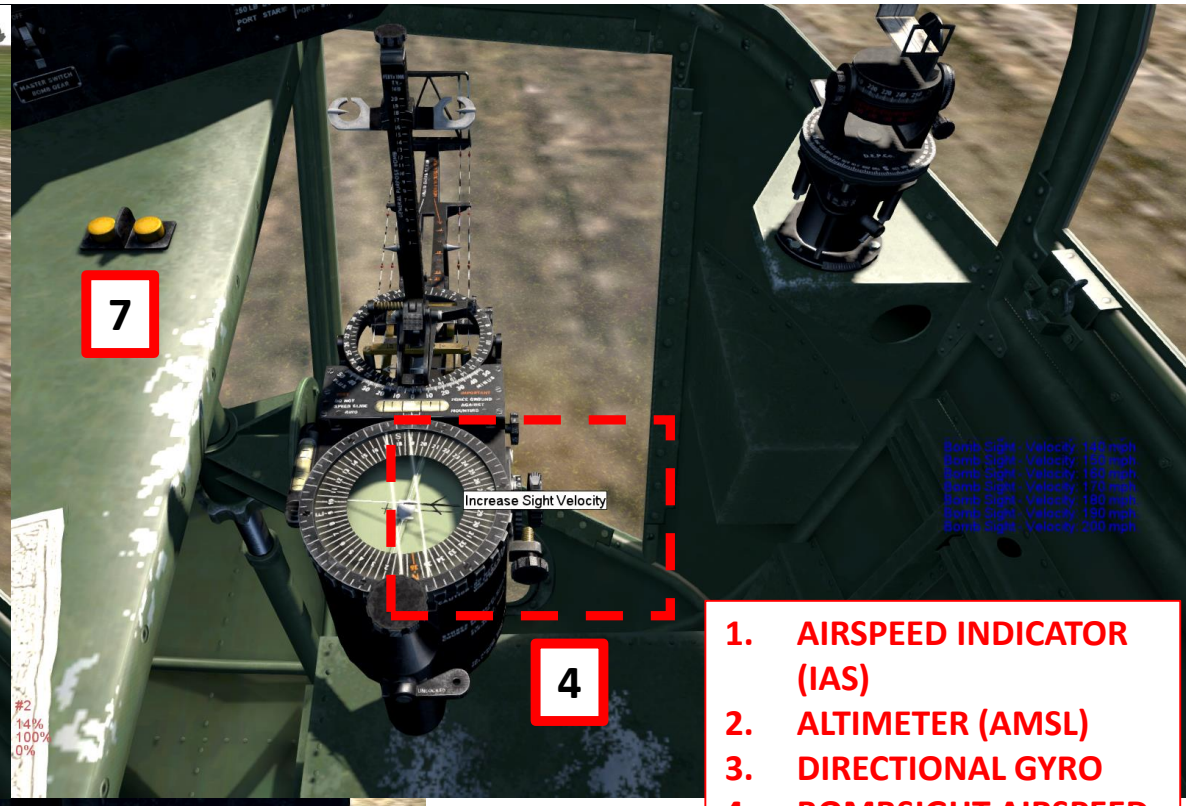
TARGET

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION
HOW AM I DOING?

Be smart: set up your bombsight in advance (set airspeed and altitude at which you want to bomb) while you are still on the ground. This will save you time and trouble. In our case, we will enter a bombsight airspeed of 260 mph and an altitude of 16,760 ft.





1. AIRSPEED INDICATOR (IAS)
2. ALTIMETER (AMSL)
3. DIRECTIONAL GYRO
4. BOMBSIGHT AIRSPEED INPUT (TAS)
5. BOMBSIGHT ALTITUDE INPUT (AGL)
6. BOMB DISTRIBUTOR MODE (SALVO/SINGLE)
7. DROP BOMBS

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL – PHASE 1: PLANNING THE MISSION WHAT CAN HELP ME OR KILL ME? HOW DO I GET HOME?

- WHAT CAN HELP ME OR KILL ME?
  - Know where your enemy patrol routes are, where battles usually take place and avoid these places when you are doing your flight plan.
  - Give fighter escorts a rendezvous point so they can link up with you and protect you.

- HOW DO I GET HOME?
  - In our case, we will simply do a 180 once we dropped our bombs and head back home.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

- Once we have taken off, we will follow a heading of 179 to Le Havre.
- You can use the compass traditionally to fly there manually, but you can also use the auto-pilot.
- The auto-pilot in the Blenheim is very similar to the one used in German bombers.
- In order to use the auto-pilot and know where you are going, you will need to set up your magnetic compass and directional gyro differently than shown in the P-8 tutorial section.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

- Set your course setter on your magnetic compass to a heading of 179.
- Align your aircraft until the two parallel lines with the white T are facing the red N on your compass. Once the T and the two // lines are parallel to each other, you are on course.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

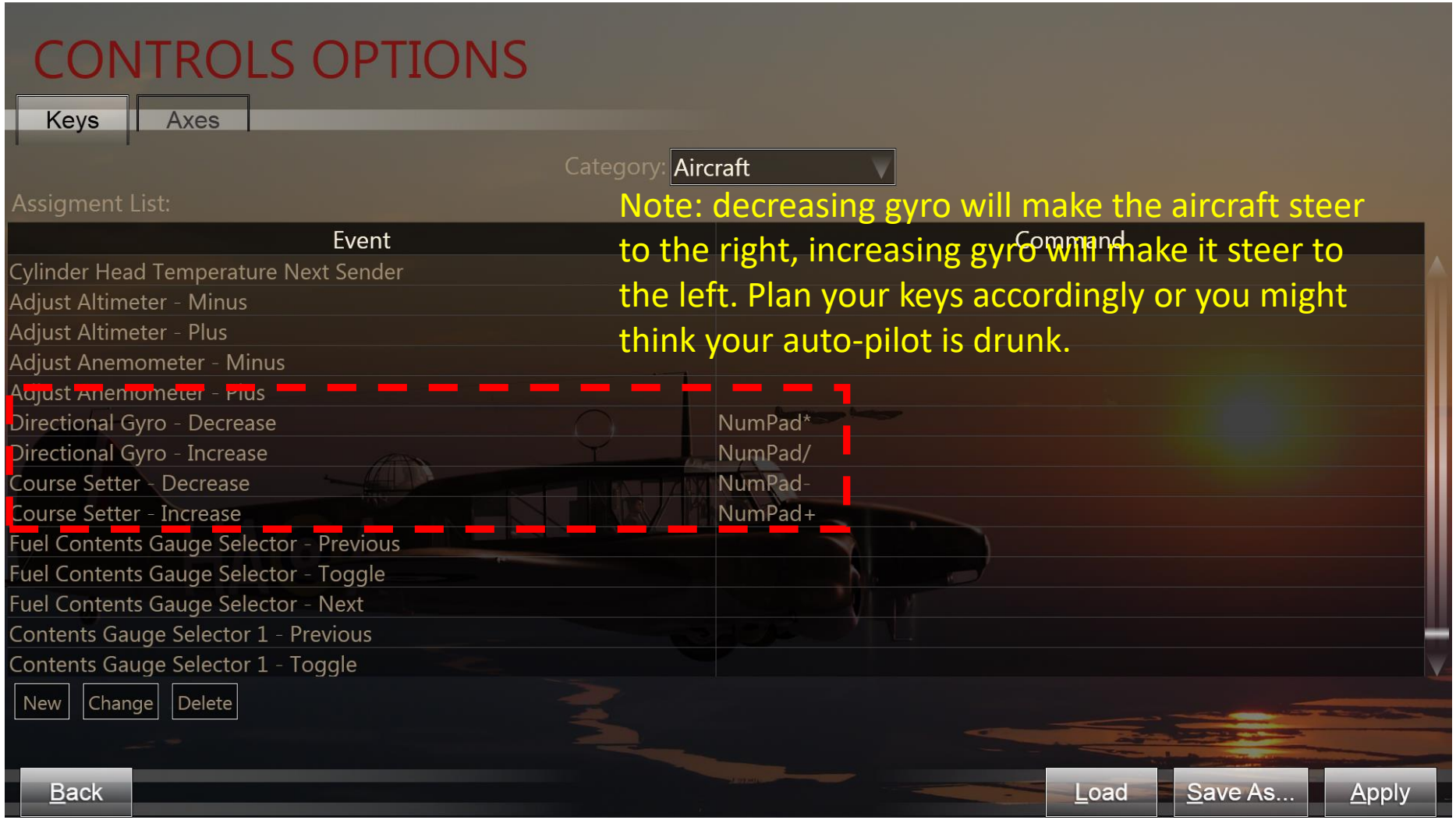
- There are two auto-pilot modes: Course Mode and Mode 22. Make sure you have mapped keys to cycle through these modes.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

- If you wish to control your aircraft while auto-pilot is engaged, you must do so by increasing or decreasing your directional gyro (make sure you have proper keys mapped first).



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

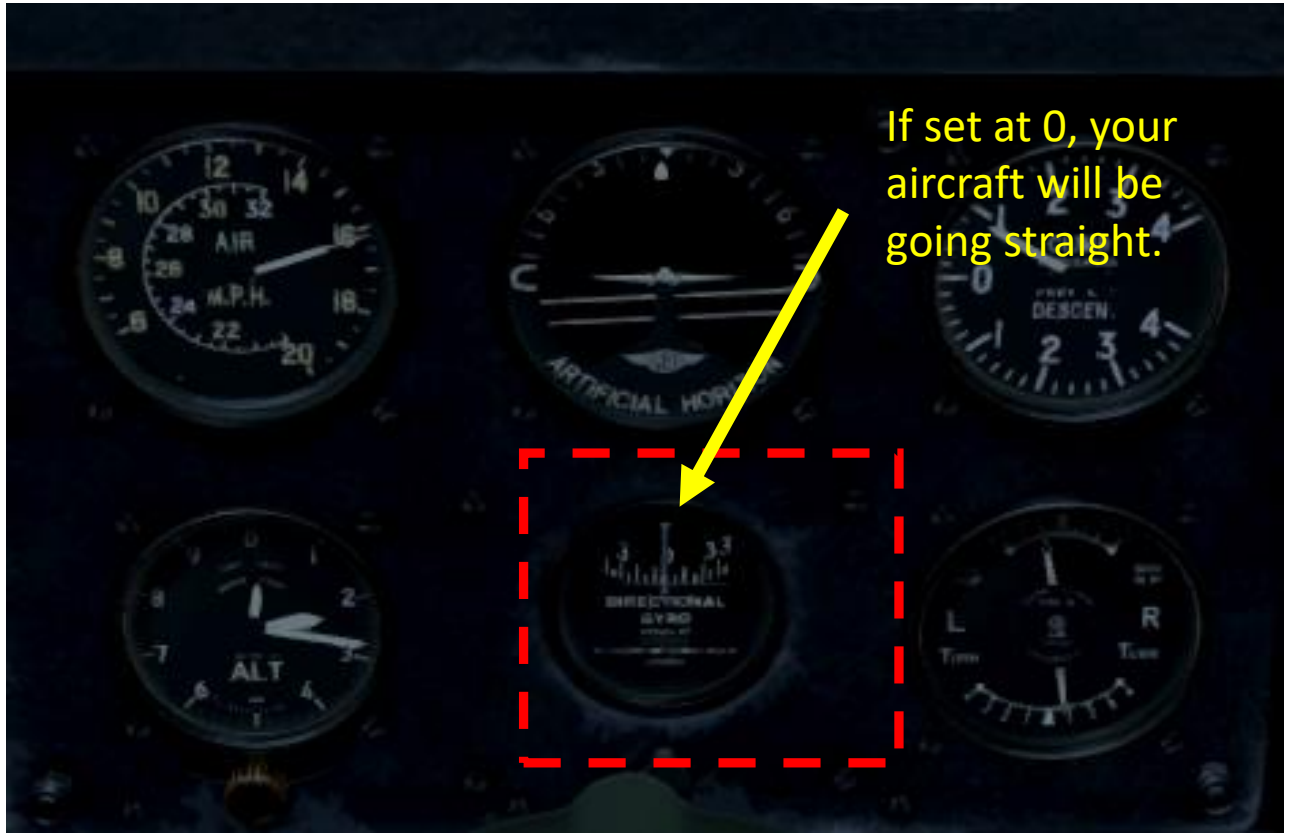
- **Course Mode** is a mode where auto-pilot takes over rudder control to make your aircraft travel following a given heading. You still have control over ailerons and elevator. Course mode is generally used when climbing or descending. In this mode, climb rate is better controlled through elevator trim rather than pure elevator input.
- **Mode 22 (Straight n' Level)** is a mode where auto-pilot takes over rudder, elevator and aileron controls to make your aircraft travel following a given heading. You will have no control over any of your control surfaces. Mode 22 is used when cruising or when level-bombing as this mode will want to make you stay level at a given heading.

  Note: Mode 22 will often make your aircraft go into a dive (-1000 ft/min approx) for approximately 1 minute. It is normal: the aircraft will try to gain speed in the process. You should lose from 1000 to 2000 ft after Mode 22 is engaged. The climb rate will eventually stabilize to "0". If you intend on bombing the target from 18000 ft, make sure you are 1000-2000 ft higher before you engage Mode 22.

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

- The auto-pilot works in a peculiar way since it is derived from the german auto-pilot code: the auto-pilot will consult your directional gyro, read your current heading and automatically steer the aircraft towards a gyro heading of 0. This “0” is not true North: it is your job to increase of decrease the directional gyro to make sure that your aircraft will be going on course. Usually, we set the course setter to find true North, and then we adjust the gyro to the value read on the compass. In this case, we are doing the opposite.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

EXPLAINING THE AUTOPILOT

- **Steps to set auto-pilot on a given course** (179 in our case)

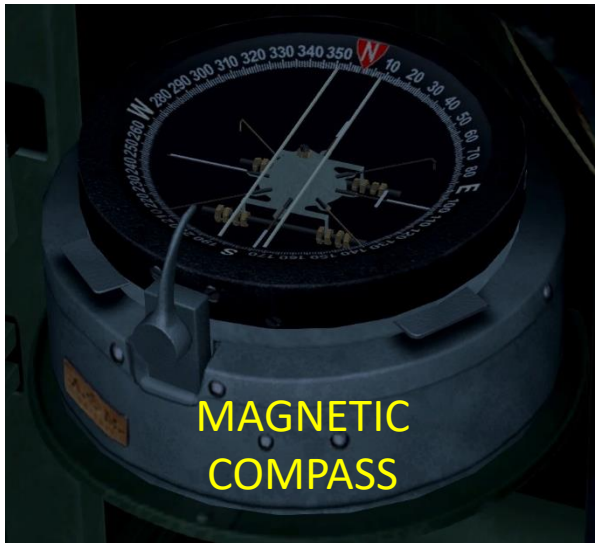
1. Fly the aircraft to make sure you are going into the correct heading 179 by consulting your magnetic compass (explained previously). Do not engage auto-pilot yet.
2. Once you are on course, increase or decrease your directional gyro to set it to 0.
3. Once gyro reads “0”, engage desired auto-pilot mode. The aircraft will behave differently based on the mode, but should continue going into your desired heading.
4. If your gyro does not indicate “0”, the auto-pilot will steer the aircraft until the gyro reads “0”.
5. You can make heading adjustments using your “increase/decrease gyro” keys mapped earlier. It gives you much better authority and precision when making course corrections. Keep an eye on the magnetic compass to make appropriate course corrections.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 4: FLYING TO TARGET

BLENHEIM AUTOPILOT OPERATION TABLE

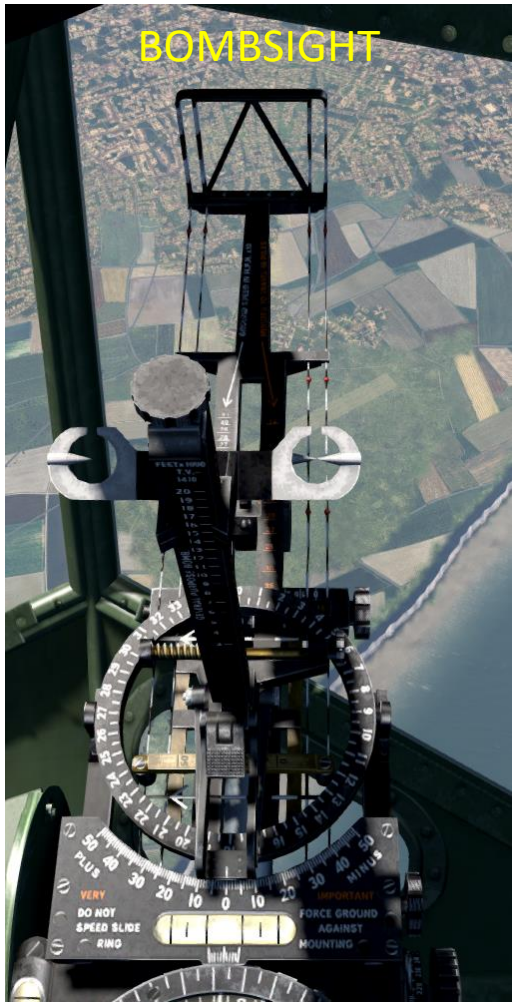
STEP	ACTION
1	SET A COURSE TO DESIRED HEADING USING THE COURSE SETTER
2	ALIGN AIRCRAFT WITH COURSE SETTER BY CONSULTING THE MAGNETIC COMPASS (WHITE “T”).
3	WHEN AIRCRAFT IS ALIGNED WITH COURSE SETTER, SET DIRECTIONAL GYRO TO “0” USING THE BOTTOM KNOB.
4	ENGAGE DESIRED AUTOPILOT MODE (COURSE MODE OR MODE 22)
5	WHEN AUTOPILOT IS ENGAGED, STEER AIRCRAFT USING THE “AUTOPILOT RIGHT” OR “AUTOPILOT LEFT” CONTROLS FOR BIG CORRECTIONS. STEER AIRCRAFT USING THE “DIRECTIONAL GYRO INCREASE/DECREASE” CONTROLS FOR SMALL COURSE CORRECTIONS. USING THE DIRECTIONAL GYRO IS USUALLY A BETTER WAY TO USE THE AUTOPILOT AS THE PILOT HAS BETTER CONTROL OVER HIS SHIP.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 5: BOMBING RUN

BLENHEIM BOMBSIGHT OPERATION TABLE HIGH ALTITUDE LEVEL BOMBING	
STEP	**ACTION**
1	ENGAGE AUTO-PILOT IN MODE 22 WHEN YOU HAVE SIGHT ON TARGET AND YOU ARE ALIGNED WITH IT. (SEE AUTOPILOT TABLE)
2	SELECT BOMB DISTRIBUTION MODE (SALVO/SINGLE).
3	CHECK AIRSPEED AND ALTITUDE IN THE BOMBARDIER SEAT.
4	CONVERT READ INDICATED AIRSPEED INTO TRUE AIRSPEED AND USE THIS VALUE FOR BOMBSIGHT AIRSPEED INPUT.
5	CONVERT ALTITUDE INTO HEIGHT (READ ALTITUDE MINUS TARGET ELEVATION) AND USE THIS VALUE FOR BOMBSIGHT ALTITUDE INPUT.
6	STEER THE AIRCRAFT USING THE DIRECTIONAL GYRO (SEE AUTOPILOT TABLE) UNTIL THE BOMBSIGHT RETICLE IS ON TARGET.
7	DROP ORDNANCE.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 5: BOMBING RUN

OTHER USEFUL COMMANDS (APPLICABLE TO BLENHEIM)	
DROP BOMBS	B
SWITCH CREW POSITION (BOMBARDIER/PILOT)	C
LEAN TO GUNSIGHT	JOYSTICK BTN (CUSTOM KEY)
COURSE AUTO-PILOT MODE - PREVIOUS	A
COURSE AUTO-PILOT MODE – NEXT	S
COURSE AUTO-PILOT ADJUST COURSE LEFT	L_CTRL+A
COURSE AUTO-PILOT ADJUST COURSE RIGHT	L_CTRL+S

This layout is created with ease of access in mind. Bombsight altitude, velocity and wind correction are already clickable on the sight itself. This layout should allow the user to go through everything he needs set up instinctively following the numpad from 0 to 9.

CAUTION: MAKE SURE THERE ARE NO CONFLICTS BETWEEN THESE KEYS AND OTHER CONTROLS. YOU WILL HEAR A "PING" WHEN YOU MAP A CONTROL IF THERE IS SUCH A CONFLICT.

CHUCK'S BOMBER NUMPAD (APPLICABLE TO BLENHEIM)			
NUM	/ INCREASE DIRECTIONAL GYRO	* DECREASE DIRECTIONAL GYRO	- DECREASE COURSE SETTER
7 BOMB DISTRIBUTOR MODE PREVIOUS	8 BOMB DISTRIBUTOR MODE NEXT	9 TOGGLE BOMB DISTRIBUTOR SHORT DELAY	+ INCREASE COURSE SETTER
4 DECREASE BOMB DISTRIBUTOR DELAY	5 INCREASE BOMB DISTRIBUTOR DELAY	6 INCREASE SIGHT DISTANCE	
1 DECREASE BOMB SALVO QUANTITY	2 INCREASE BOMB SALVO QUANTITY	3 DECREASE SIGHT DISTANCE	ENTER TOGGLE BOMBSIGHT AUTOMATION
0 SELECT BOMB BAY PREVIOUS		. SELECT BOMB BAY NEXT	

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 5: BOMBING RUN

So here is a quick reminder:

- ON THE GROUND

1. Set your predicted bomb run altitude and airspeed in your bombsight while on the ground.
2. Select desired distributor release mode (Salvo? Single?).
3. Unlike german bombers, you do not need to ARM your bombs. Just fly to target.

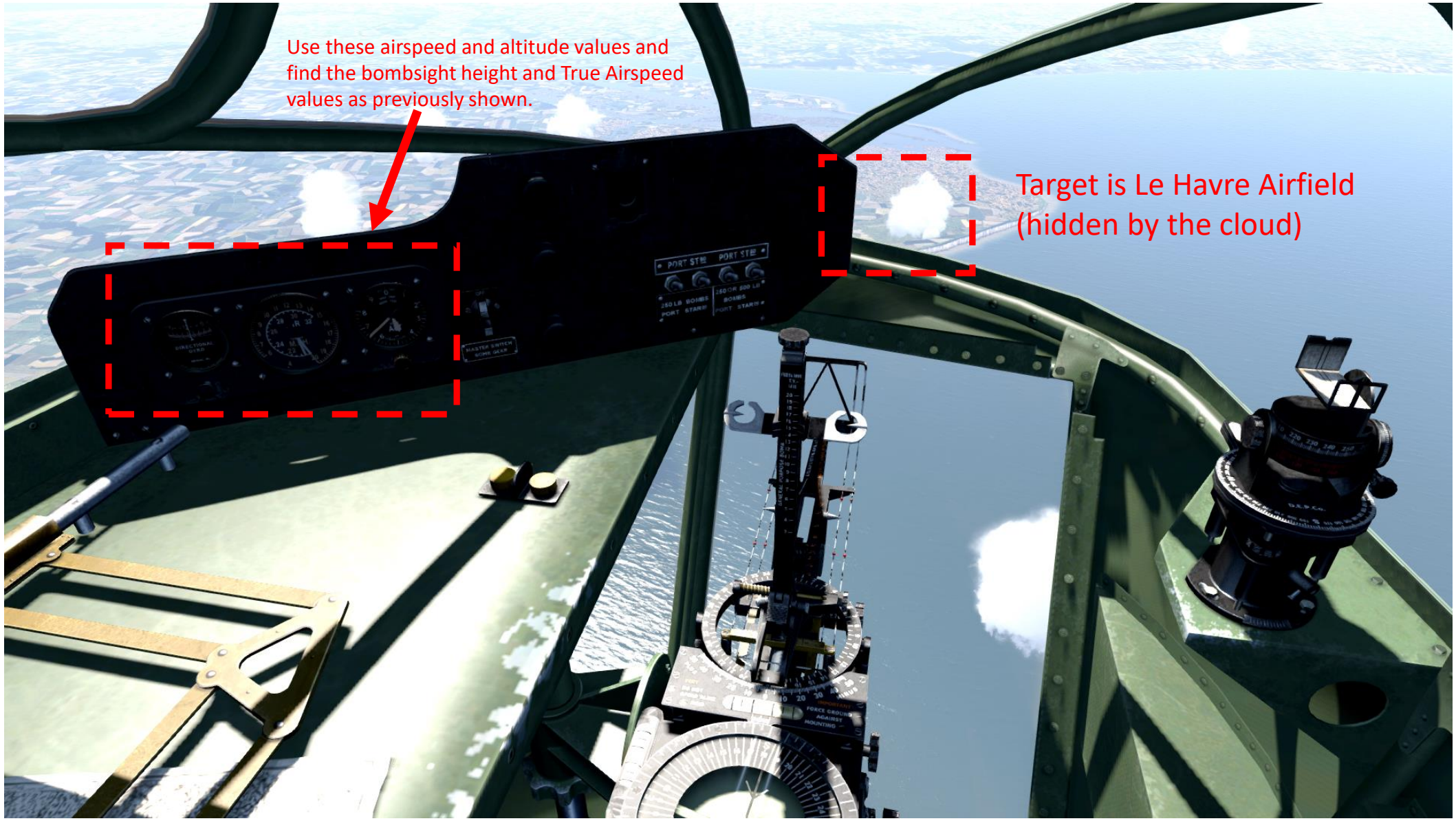
- IN THE AIR

5. Find target and reach targeted altitude and airspeed
6. Follow steps detailed in the BOMBSIGHT OPERATION TABLE.
7. Thanks to all the work you did on the ground, you will see that there is not a whole lot to do in previous step apart from putting your bombsight cursor on the target, adjust slightly bombsight airspeed & altitude and drop bombs when you are on target.
8. Go home for tea and figgy duffs.

PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 5: BOMBING RUN

We had set our bombing altitude to 17000 ft. Reach 19000 ft and engage “Mode 22” auto-pilot mode as seen in Phase 4. Make sure you have a correct heading. You should lose roughly 1000-2000 ft and gain back some airspeed: it is normal.



PART 11: BOMBING TUTORIAL

BOMBING TUTORIAL
PHASE 5: BOMBING RUN

- Switch to Bombardier position and set your bombsight altitude and airspeed values to those you read on your instrument panel. Remember to adjust these values for TAS (260 mph) and AGL (16,760) as shown in the Planning Phase of the tutorial.
- Make necessary course corrections with gyro input until you are aligned with your target.
- Select desired bomb distribution mode
- Lean to bombsight (same as lean to gunsight button) and align your bombsight reticle with your target.
- Drop your bombs and enjoy the fireworks.