DCS guidebook by Torque

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Speeds

In aviation, there are various speeds that pilots need to be aware of:

Indicated Airspeed (IAS):

This speed is directly read on the anemometer and is commonly used for speed changes or formation flying among pilots.

True Airspeed (TAS):

This speed represents the actual speed of the aircraft in relation to the air it is passing through. It is important to note that for every thousand feet above sea level, the true airspeed is approximately 2% higher than the indicated airspeed. For example, at 10,000 feet, the actual speed is about 20% faster than what is displayed on the anemometer in IAS. This is due to the decrease in air density as altitude increases.
Certain aircraft, particularly those equipped with gas turbine engines, are capable of achieving higher True Airspeeds at greater altitudes. This is because their engines operate more efficiently at higher altitudes.

Groundspeed (GS):

Refers to the speed at which an aircraft is moving relative to the ground. It is calculated by adjusting the True Airspeed for wind conditions. For example, if an aircraft has a True Airspeed of 100 knots and is experiencing a tailwind of 20 knots, its ground-speed would be 120 knots.

Mach:

Is when an object travels faster than the speed of sound. Under normal, dry conditions with a temperature of 20°C (68 °F), Mach 1 corresponds to 667 knots or 1,235 km/h (767.40 mph).

An aircraft is considered supersonic when it surpasses Mach 1. When an aircraft exceeds Mach 1, it creates a shock wave at the front known as a sonic boom. Due to its speed, an observer will only hear the sonic boom after the aircraft has passed, with the sound of the jet engines following the supersonic boom.

As a point of reference, a standard Air-to-Air missile typically travels at around Mach 3.

Speed is typically measured in knots **(knots)** equal to one nautical mile per hour or kilometres per hour **(km/h),** with Russian and Swedish aircraft using the latter unit of measurement. To convert knots to km/h, simply multiply the number of knots by 2 and then subtract 10% from the result.

Knots	Kilometers per hour	Knots	Kilometers per hour
100knots	185kph	300knots	556kph
110knots	204kph	310knots	574kph
120knots	222kph	320knots	593kph
130knots	241kph	330knots	611kph
140knots	259kph	340knots	630kph
150knots	278kph	350knots	648kph
160knots	296kph	360knots	667kph
170knots	315kph	370knots	685kph
180knots	333kph	380knots	704kph
190knots	352kph	390knots	722kph
200knots	370kph	400knots	741kph
210knots	389kph	410knots	759kph
220knots	407kph	420knots	778kph
230knots	426kph	430knots	796kph
240knots	444kph	440knots	815kph
250knots	463kph	450knots	833kph
260knots	482kph	460knots	852kph
270knots	500kph	470knots	870kph

Altitude

Altitude or elevation is typically measured in feet ([ft]) or meters ([m]), depending on the aircraft. Russian and Swedish aircraft commonly use meters as their unit of measurement. To convert feet to meters, simply divide the number of feet by approximately 3 (the exact conversion factor being 3.2808).

Foot (ft)	Meter (m)
100	30.48
200	60.96
300	91.44
400	121.92
500	152.4
600	182.88
700	213.36
800	243.84
900	274.32
1000	304.8
2000	609.6
3000	914.4
4000	1219.2
5000	1524
6000	1828.8
7000	2133.6
8000	2438.4
9000	2743.2
10000	3048
11000	3352.8

Foot (ft)	Meter (m)
12000	3657.6
13000	3962.4
14000	4267.2
15000	4572
16000	4876.8
17000	5181.6
18000	5486.4
19000	5791.2
20000	6096
21000	6400.8
22000	6705.6
23000	7010.4
24000	7315.2
25000	7620
26000	7924.8
27000	8229.6
28000	8534.4
29000	8839.2
31000	9448.8
33000	10058.4
35000	10668

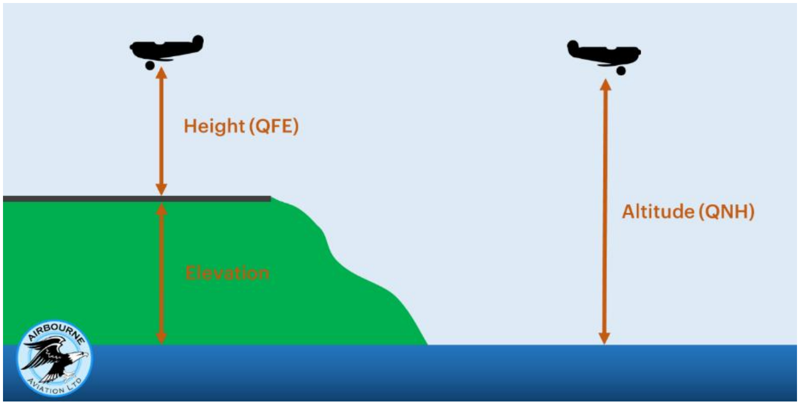
Radar Altimeter and Barometric Altimeter :

The radar altimeter utilizes radar waves to accurately measure aircraft elevation. This device can be programmed to trigger an alarm if the aircraft descends below a predetermined threshold. The primary function of the radar altimeter is to prevent collisions with the ground, ensuring safe and efficient flight operations.

The barometric altimeter utilizes atmospheric pressure to calculate changes in altitude.

The units of measurement for this pressure are inches of mercury (**inHg**) or Hectopascals (**hPa**), which are equivalent to millibars (**mb**).
Russian aircrafts specifically use millimetres of mercury (**mmHg**).
These four digits are crucial for setting the barometric altimeter accurately.

IThe **QNH** or **QFE** must be adjusted.



The **QFE** represents the current atmospheric pressure at the airfield, while the **QNH** is the atmospheric pressure adjusted to sea level. It is important to note that these values are influenced by various factors such as temperature and wind, making them specific to each location and variable.

For civil aviation, there is a third option for adjusting the altimeter known as the **QNE**. This value is utilized for high-altitude flights to ensure a consistent reference point for all aircraft regardless of their geographical location.

When an aircraft surpasses a certain altitude limit, we refer to it as **Flight Levels** and adjust our altitude accordingly. This adjustment is necessary because we are then set to the **QNE**, which is a standardized value of **1013 hPa**, **29.92 inHg**, or **759.81 mmHg**.

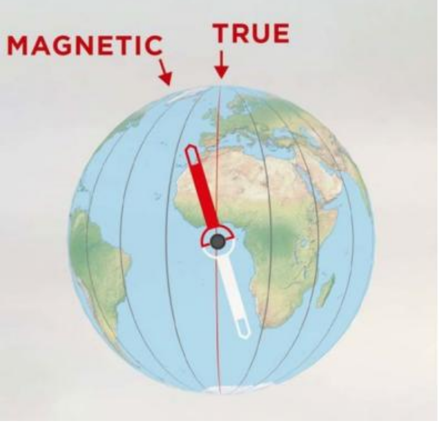
For instance, in regions like North America and Europe, the transition altitude is typically set at **18000 feet** (5500 meters). Therefore, when flying at this altitude, we would be at **Flight Level 180** (**FL180**).

NATO/USA military pilots utilize the **Angels** to designate altitude. Angles **10** corresponds to an altitude of **10000 feet**.

Magnetic North and True North

True North, also known as **Geographic North** or **Geodetic North**, is the northern axis of the Earth where the meridians of a map converge.

On the other hand, **Magnetic North** refers to the location on the Earth's surface that attracts its magnetic field. Unlike **True North**, **Magnetic North** does not align perfectly and its position changes over time. The variance between Magnetic North and True North is referred to as Declination or Variation.



Airplane compasses always indicate the direction of **Magnetic north**.

The value of variation in the North is not consistent; it varies depending on the location and is depicted on air navigation charts.

Runways are assigned numbers from **01** to **36**, which correspond to their direction in relation to true north (01° to 360°).

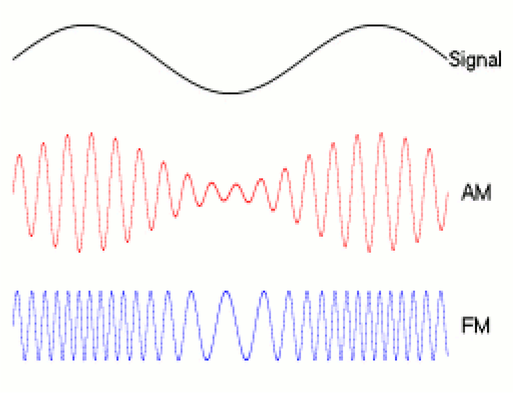
Radios

In aviation, two types of radios Very High Frequency **(VHF)** and Ultra High Frequency **(UHF)** are utilized, along with two types of modulations **FM** and **AM**.

Modulation

Modulation is the process of adjusting a signal (whether it be voice or data) in order to transmit it more effectively across a given distance.

Two common methods of modulation are Amplitude Modulation (**AM**) and Frequency Modulation (**FM**).



UHF vs VHF

When it comes to hardware, **VHF** and **UHF** radios are quite similar, with the main difference being the length of their antennas. **VHF** antennas are typically larger than **UHF** antennas.

Despite their similarities, VHF radios and UHF radios offer distinct advantages. It's not a matter of one being superior to the other.

Historically, planes have utilized both UHF and VHF radios, but during the Second World War, VHF radios were the standard.

Modern airplanes are equipped with multiple radios, allowing for the configuration of various frequencies. However, it's important to note that radio communication is not like a phone call, only one user can transmit on a frequency at a time. If one user is transmitting, others must wait until the frequency is clear before speaking. This is typically done by pressing and holding the **PTT** (**Push-to-talk**) button on the radio.

VHF DCS radio:
This type of radio frequency can be used with FM or AM modulation.

VHF AM => from **116.000 MHz** to **151.975 MHz**

VHF FM => from **30,000 MHz** to **76,000 MHz**

UHF DCS radio:
Only AM modulation is used for this type of frequency.

UHF AM => from **225,000 MHz** to **399,975 MHz**

Distances

In aviation, distance is typically measured in nautical miles (**NM** or **nmi**), like in marine, and space navigation.

1 NM = 1,852 km = 6076 ft

Aircraft outside of the NATO alliance, such as Russian or Swedish aircraft, measure distances in kilometers (km). However, the Swedes use a unit of measurement known as the Scandinavian mile (**mil**), for longer distances.

1 mil = 10 km = 32808 ft = 5.40 NM

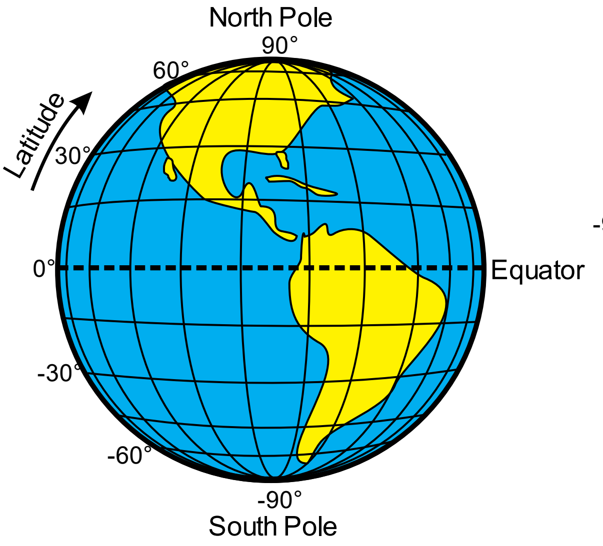
Navigation

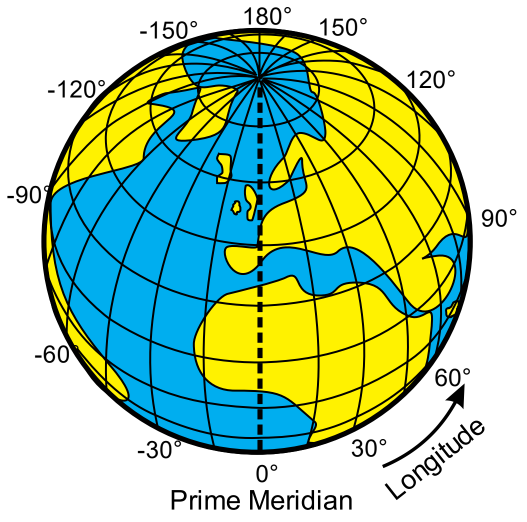
On the globe, the precise location or geographical coordinates are determined by **Latitude** and **Longitude**. In aviation, we refer to **Northing** and **Easting**, which involves assigning a number in relation to the north and another in relation to the east.

Latitude measures how far north or south a location is from the equator, with **0 degrees** at the equator and **90 degrees** at the poles (-90 degrees in the south to 90 degrees in the north).

Longitude, on the other hand, measures how far east or west a location is from the Prime Meridian or Greenwich Meridian, with 0 degrees at the Prime Meridian.

These values are expressed in:
Degree = °
Minute = '
Second = "





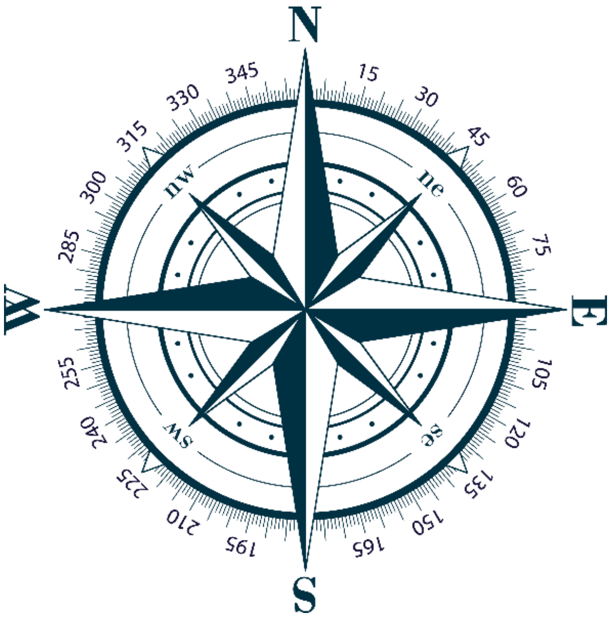
An example for a specific point in the city of Geneva:
46°12'15.1" N
6°09'03.6" E

There are numerous methods to effectively navigate a map and reach a desired destination. See next pages.

Visual navigation with compass and map

Visual navigation is a fundamental skill that is widely recognized and understood. By utilizing a compass, individuals can determine their course and orient themselves on a map, with geographic north typically positioned at the top of the map.
Alternatively, one can also rely on physical or topological landmarks, such as lakes, mountains, or cities, to aid in navigation. For further information on the distinction between Magnetic North and True North, please refer to the corresponding chapter.

It is essential to memorize the values of the compass.
0° = North.
90° = East.
180° = South.
270° = West.



In both water navigation and aviation, **headings** are essential for guiding boats and aircraft. **Headings** are numerical values on the compass that indicate the direction in which a vessel or aircraft is traveling.

The term "**azimuth**" is not commonly used in aviation, even though it refers to the same concept. This term is typically used by ground troops, who are not as skilled in navigation as us aviators, who are considered the elite of the armed forces.

The watch face too serves as a tool to indicate direction. For instance, **6 o'clock**, it signifies a heading of **180°** on the compass.

Waypoints navigation

Waypoint navigation involves following predetermined points displayed in the aircraft. These points are typically pre-recorded before takeoff using the DCS Mission Editor, or manually entered into the aircraft using Northing and Easting coordinates.

INS+GPS navigation (EGI)

In today's modern world, the **GPS** system has become a household name, providing us with precise location information on a map. However, many may not be aware of its predecessor, the Inertial Navigation System (**INS**). The **INS** is a gyroscopic system used to track the movements of aircraft, but it requires calibration on the ground for several minutes to determine the exact starting coordinates of the plane.

A cutting-edge advancement in navigation technology is the Embedded GPS/INS (**EGI**) system, which combines the capabilities of both **GPS** and **INS**. This innovative system offers enhanced accuracy and reliability by leveraging the strengths of each individual system. By integrating GPS's real-time positioning data with INS's precise movement tracking, EGI provides a comprehensive solution for navigation needs.

Radio Navigation

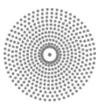
Aircraft rely on radio signals emitted by ground stations or other aircraft to navigate to specific points. By utilizing its radio acquisition system, which is the same equipment used for communication, an aircraft can track the signal and determine the distance to the transmitter if there is a data link established between the aircraft and the transmitter.

ADF radio navigation

The Automatic Direction Finder (**ADF**) utilizes the aircraft's radio communication system to receive navigation signals. **ADF** beacons, each with a unique frequency, are depicted on aviation charts. To confirm reception of the correct beacon, a Morse code signal consisting of three audible letters is transmitted to the pilot.

An arrow or pointer on the compass indicates the direction of the **ADF** beacon. Simply follow the arrow to navigate towards the beacon.

The international symbol of an **ADF** beacon on maps:



TACAN radio navigation

The Tactical Air Navigation (**TACAN**) system is comparable to the Automatic Direction Finder (**ADF**), but it offers additional features such as the ability to display the range, which indicates the distance of the aircraft from the beacon, or even the time required to reach it.

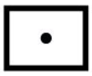
Similar to the **ADF**, the **TACAN** system uses an arrow to indicate the direction to the desired location. In the example provided below, the distance to the beacon in miles is displayed at the top left of the screen. A trajectory correction, represented by the straight line of the arrow, may be necessary to align with the runway, although the specifics of this correction will not be discussed in detail here.

The international TACAN symbol on the maps:

RSBN radio navigation

Russian aircraft are equipped with the **RSBN** (**РСБН**) short-range navigation radio system, which is comparable to the NATO/USA **TACAN** system.

The **RSBN** symbol (**РСБН**) on maps:



ARC navigation

The Russian **ARC** system (**АРК**) is comparable to the American **ADF** system, with both utilizing the same symbol on maps.

Civil aviation relies on **VOR** (VHF omnidirectional range) and **DME** (Distance Measuring Equipment) for navigation, which are similar to **ADF** and **TACAN** systems. However, let's leave the discussion of civilian equipment to the enthusiasts of Microsoft Flight Simulator.

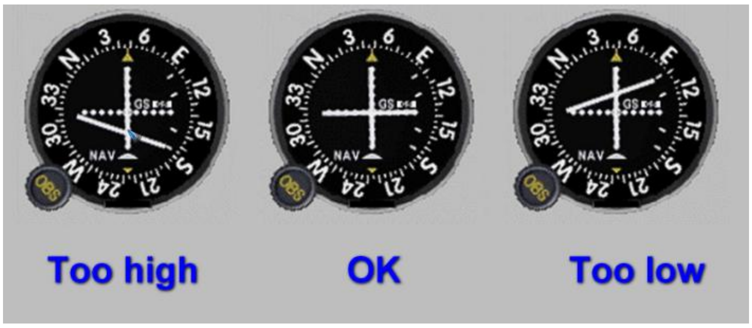
Navigation to landing :

During times of low visibility or when pilots are unable to see the runway, landing aid systems play a crucial role in assisting or even taking control of the aircraft to ensure a safe landing..

ILS or ALS

The Instrument Landing System (**ILS**) utilizes radio signals to assist in guiding aircraft to the ground. Typically, the **ILS** is depicted by two lines in a compass - one horizontal and one vertical - in either yellow or white. The pilot is required to align the aircraft in such a way that these lines intersect, forming a cross.

Similarly, the Automatic Landing System (**ALS**) functions in the same manner as the **ILS**, with the exception that the aircraft is guided to the ground automatically while on autopilot.



Inside the cockpit

The cockpits of planes and helicopters do not follow a standardized layout like most cars. The location of buttons and controls that can be adjusted by the pilot varies depending on the type of aircraft. Despite this variability, switches and buttons are typically organized by their functions. For instance, all the switches related to lighting are grouped together on a panel within the cockpit.

In the case of high-fidelity aircraft in DCS, which are fully interactive with the use of the mouse, it is crucial to familiarize yourself with the specific locations of controls and buttons in order to effectively operate the aircraft.

Engine starts (Jet)

To start a jet engine, the following components are required:

a) Proper airflow through the jet engine.
b) A consistent fuel supplies.
c) A heat source to facilitate ignition, typically provided by an electric current source.

It is important to note that there are two distinct types of aircraft to consider in this chapter: those equipped with Auxiliary Power Units (**APU**) and those without.

The Auxiliary Power Unit (**APU**) is a compact engine utilized to generate power on aircraft, allowing them to operate various systems such as electricity, pneumatic pressure, and hydraulics while the main engines are not running. Once the main engines are functioning properly, the **APU** is shut down as it becomes unnecessary. The aircraft systems are then sustained by the main engines.

Aircraft lacking **APU**, typically older models or those designed for lighter weight, must be linked to an external power source for electricity and pneumatic pressure in order to initiate operations.

Without APU It is therefore the ground crew who connects the external generator to the aircraft on the tarmac:

You will need to familiarize yourself with the engine start procedure for each aircraft. For those who prefer a quicker option, there is an auto-start feature available or see keys bindings.

However, the fundamental philosophy of starting a jet will remain consistent across all aircraft. Below, I will outline the steps that are common to all:

Aicraft APU-equipped :

1) Turn on the batteries
2) Turn on the fuel supply
3) Turn on the APU
4) Initiate engine start (start button)
5) Wait for it to take **rpm** (revolutions per minute)
6) Throttle to idle (uncage throttle)
7) In the case of a twin-engine jet, repeat points 4 to 6 for the second engine.

Aicraft lacking APU

1) Ask the ground crew to connect the power cable (electric)
2) Ask the ground crew to connect the pneumatic pressure (air)
3) Turn on the batteries
4) Initiate engine start (start button)
5) Wait for it to take **rpm** (revolutions per minute)
6) Throttle to idle (uncage throttle)
7) In the case of a twin-engined aircraft, repeat points 4 to 6 for the second engine.
8) Ask the ground crew to disconnect everything (power and air)

Final point: Certain aircraft have the capability to restart their engines mid-flight in case of an emergency.

Piston engine starts

Starting piston engines can be summarized in the following steps:

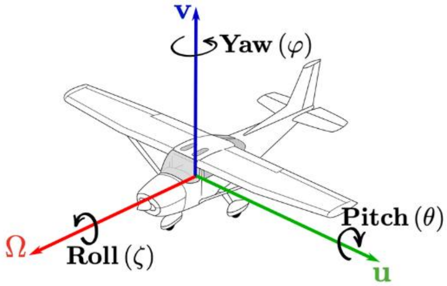
1) Turn on the batteries
2) Pump the fuel into the engine (either manually or a button)
3) Activate ignition coils (both magneto)
4) Turn on the fuel supply
1) Initiate the engine start (start button or propeller launch system)
2) Change the air/fuel mixture (Mix) from the start position to normal operation

Flight Controls

When beginners consider the flight controls of an airplane, they often envision the joystick as the primary control. However, the reality is more intricate than that simplistic view. In addition to the joystick, there are also the throttle and rudder controls to consider. The combination of the throttle and joystick controls is commonly referred to as HOTAS, which stands for "hands on throttle-and-stick.

An aircraft can move on 3 axes in addition to moving forward:

Pitch = Up or down displacement.
Roll = The aircraft "rolls" on itself.
Yaw = Moving to the left or right.



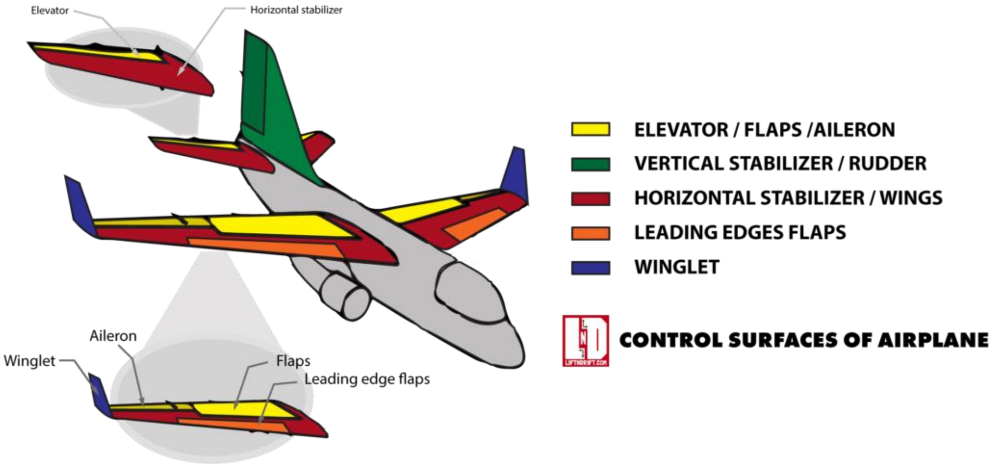
The joystick is responsible for controlling the **Pitch** and **Roll** of the aircraft, while the pilot's feet operate the rudder pedals to control the **Yaw** axis. For instance, when the pilot needs to move the aircraft to the right, he push with his right foot and simultaneously move his left foot back.

In some aircraft, the rudder pedal also functions as the left and right wheel brakes, similar to a car pedal that is pressed with the toes.

Additionally, there is the fourth axis, which is the throttle control used to propel the aircraft forward. In fighter jets, the throttle control is always located in the left hand of the pilot. Therefore, both right-handed and left-handed individuals must use the joystick with their right hand.

Control surfaces

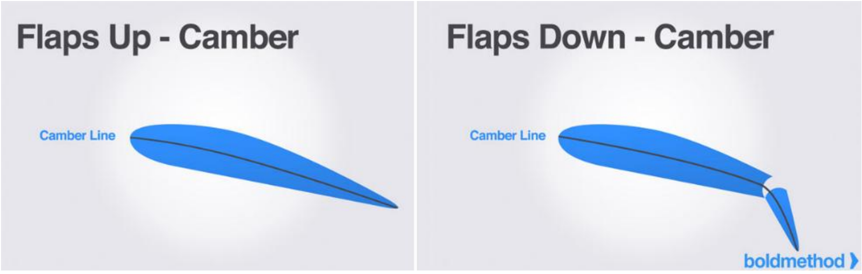
Below is an example of the different control surfaces of an aircraft.



<u>Flaps:</u>

Flaps are a crucial component found on nearly all aircraft. While some flaps are automatically controlled by the aircraft, it is typically the pilot who is responsible for adjusting them.

The flap, located on the underside of the wings, is a detachable section that plays a vital role in controlling the aircraft's lift and drag.



Flaps are used to reduce the speed of the aircraft while increasing lift.
At take-off, as a rule, the flaps are half down and on landing they are completely at the bottom. In standard flight the flaps are closed or UP (top position).

Trim :

Trim is a crucial aerodynamic or mechanical system that ensures an aircraft's control surface remains in a position that allows for proper balance during flight. When the trim is accurately adjusted, the aircraft is able to maintain its desired attitude in the air, resulting in the cancellation of control column forces. This allows the pilot to release the controls, enabling the aircraft to fly straight and level.

In modern aviation, some aircraft, like the FA18 and F16, are equipped with automatic trim systems. However, these systems are still adjustable by the pilot to suit specific flight conditions.

Typically, pilots adjust the trim using a small 4-way Chinese hat located on the joystick. This allows for precise control over the aircraft's trim settings.

Helicopters:

Helicopters are a unique and fascinating aspect of aviation, standing out as a world apart from fixed-wing aircraft. While they do share some characteristics with traditional airplanes, helicopters are far more complex in their design and operation. When flying forward at a high speed, a helicopter is piloted much like an airplane. However, the differences between the two become apparent in other phases of flight.

Helicopter Flight Controls

Flight controls in helicopters are similar to those in airplanes, as previously explained. However, there are some key differences to note. One major distinction is the throttle control, which is operated using a motorcycle-type handle on a collective lever located on the left-hand side of the pilot.

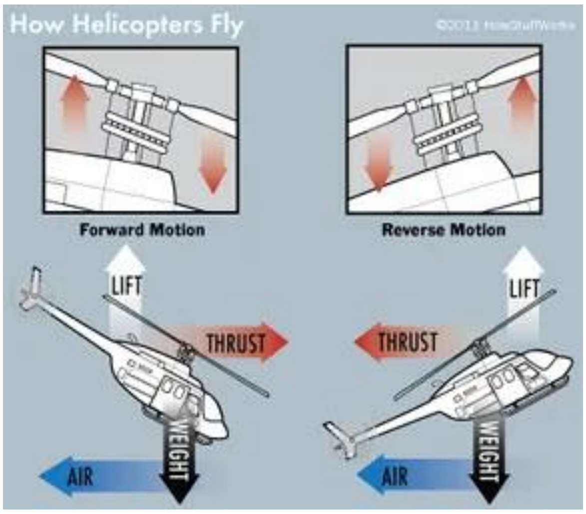
In most helicopters, the throttle, which controls the engine speed, is typically operated using a handle that is turned similarly to a motorcycle. The throttle control is usually set at a specific position when starting the engines and remains unchanged throughout the flight. This is due to the presence of a governor in most helicopters, which automatically adjusts the power output as needed.

In a helicopter, the pilot uses his left hand to control the **collective** lever. This lever is moved up and down to adjust the helicopter's altitude. By raising the **collective**, the pilot can lift the helicopter higher, while lowering it will cause the helicopter to descend.
The **collective** lever adjusts the angle of the rotor blades, similar to how a controllable-pitch propeller works on a propeller plane.

During hovering, the collective is responsible for controlling the vertical trajectory of the helicopter. The angle of all the blades is determined by the position of the **collective**, which in turn affects the lift generated by the rotor. Lift is a dynamic force produced by the speed of the blades, allowing the aircraft to ascend.

While the **collective** manages the helicopter's vertical movement, the **cyclic** (Joystick) is utilized to navigate forward, backward, or laterally by adjusting the position of the rotor.

When the **cyclic** is pushed forward, the helicopter moves in a forward direction but simultaneously descends, requiring an increase in **collective** to maintain altitude. Conversely, pushing the **cyclic** backward slows the helicopter down and results in an increase in altitude.



Flying a helicopter is more intricate than piloting an airplane due to the constant management of flight controls. Unlike airplanes, helicopters have the ability to move backwards, sideways, and hover in place.

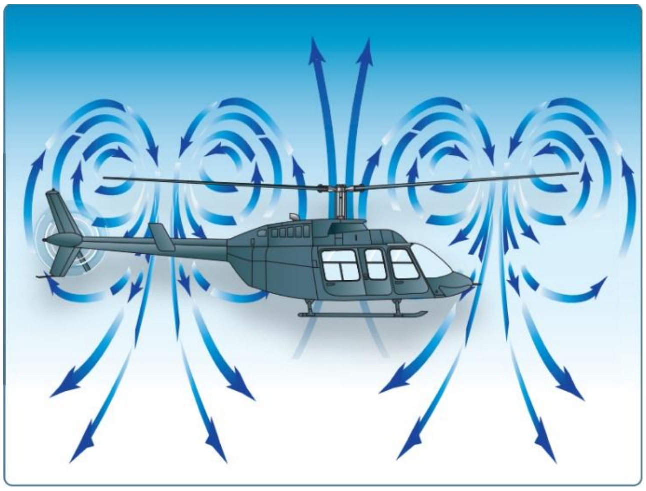
Describing the art of helicopter piloting is a challenging task that requires practice and skill. One fundamental rule that all helicopter pilots adhere to is the continuous monitoring of the **Vertical Speed Indicator** (**VSI**). This instrument provides crucial information to the pilot regarding the aircraft's vertical movement, indicating whether it is ascending or descending and at what rate in feet per minute.

This aircraft is commonly found on airplanes, however, a helicopter pilot must always keep it in sight.

VRS vortex ring state :

One crucial concept that is not widely known is the **Vortex Ring State** (**VRS**) phenomenon.
VRS is a hazardous aerodynamic condition that can occur during helicopter flight when a vortex ring system surrounds the rotor, causing a substantial loss of lift.

This phenomenon can cause the helicopter to plummet to the ground rapidly!



Helicopters often encounter the phenomenon when attempting to glide out of ground effect without maintaining accurate altitude control, conducting downwind approaches, or when airspeed is below effective translational lift.

VRS typically occurs during the phase of decreasing speed in preparation for a hover or landing, making it a leading cause of helicopter crashes aside of enemy missiles :)

Avoiding **VRS** depends on the specific helicopter being used, but as a general rule, pilots should be mindful of the vortex created by their rotor blades. During low-speed phases, pilots should avoid descending too quickly, aiming to keep the Vertical Speed Indicator (**VSI**) below 500 feet per minute (approximately 2.54 meters per second for Russian helicopter).

Helicopter trim:

Just like airplanes, helicopters also require trimming in order to establish a stable flight position and reduce the pilot's workload. This allows the pilot to avoid constantly exerting pressure on the flight controls.

The trim can be activated or deactivated. The **cyclic** is free to move when the trim is not activated but is forced to remain in a fixed position when activated.

Weapons

In this chapter, we will explore the various weapons that are available in DCS. For a comprehensive list and detailed information on each weapon, please visit the following website:
https://dzsek.github.io/dcsdb/#/aircraft

Cannons (gun)

Aircraft are equipped with a variety of powerful cannons, akin to the machine guns of the sky. The caliber of these cannons varies depending on the model of the aircraft, ranging from 20mm to 30mm. One of the most renowned cannons is the GAU-8/A Avenger, found on the A10 aircraft, which boasts a caliber of 30mm.

Among the most commonly used cannons is the M61 Vulcan 20mm, utilized in aircraft such as the F16, FA18, and F15. However, there are numerous other models available, including the Colt Mk 12 cannons on the A4 Skyhawk and the M39 on the F5 Tiger. Each of these cannons plays a crucial role in the firepower and capabilities of their respective aircraft.

The difference in performance will be determined by the total carrying capacity, the speed of shots, and the type of ammunition used.

There are several types of ammunition available for use:
- AP (Armor-Piercing): Designed for the destruction of armor, tanks, buildings, etc.
- TP (Target-Practice): Intended for target training purposes.
- HEI (High-explosive incendiary): Used for the destruction of aircraft and contains explosive and incendiary components.
- CM (Combat mix): A combination of AP and HEI ammunition for versatile use.

Tracers are a special type of ammunition that leaves trails of light using pyrotechnic powder. This feature helps in tracking the movement of the ammunition and aids in aiming. For example, AP-T stands for Armor-Piercing Tracer ammunition.

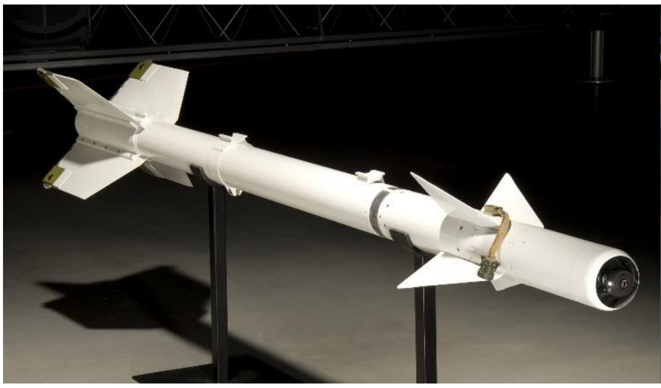
The color of the light trail can vary, red, yellow, or green.

It is important to note that only 1 in 5 or even 1 in 10 rounds may be traced, so it is not advisable to solely rely on the light trails to determine the number of cartridges that have been fired.

Interestingly, WWII planes were designed with the unique feature of having fewer tracer rounds towards the end of the magazine. This was done to alert the pilot that there were only a limited number of rounds remaining.

Air to Air Missiles

Missiles everyone knows what they are! But there are several types:




Infrared guided missiles (Fox2):
These missiles are equipped with sensors that are designed to detect and lock onto the heat emitted by reactors. AIM-9 Sidewinder for the USA.

R-73 Vympel Вымпел (**Archer**) for Russia.
R-27 Vympel Вымпел (**ALAMO**) for Russia.
R-60 Vympel Вымпел (**APHID**) for Russia.
R.550 Magic II for France.

Radar guided missiles directed by the aircraft that fired them (Fox1):
This type of missile establishes communication between the missile and the aircraft that fired them, the "lock" or targeting is done by the aircraft's radar.

AIM-7 Sparrow and for the USA.
R-27 Vympel Вымпел (**ALAMO**) for Russia.
530 Super Matra for France.

Semi or fully autonomous radar-guided missiles (Fox3):
These missiles are fully or partially autonomous. Once launched, they are equipped with an integrated radar system to guide them to their target.

AIM-120 AMRAAM and AIM-54 Phoenix for the USA.
R-33 Vympel Вымпел (**AMOS**) for Russia.
MICA for France.

Air to Ground Missiles

There are numerous varieties of Air-to-Ground missiles, each designed with specific destruction objectives and ranges in mind. These missiles can be categorized into distinct groups based on their intended use and capabilities.

Anti-ship:
When it comes to ship destruction, size and power are key factors. Unlike torpedoes, missiles are airborne and pack a powerful punch.
RGM-84 Harpoon for the USA
KH-29 Kedge for Russia.

Television guidance:
Utilizing a television image, the pilot is able to pinpoint and lock onto their targets. By viewing the television image through the missile camera, the pilot can accurately select their target from the images displayed.
AGM-65 Maverick for the USA.
KH-59 for Russia.
Etc…

optical Infra rouge:
Equivalent to television guidance missiles but with infrared images

Laser guided missile:
They are guided by a laser pointed by the aircraft itself.

S-25 for Russia.
9A4172 Vikhr for Russia.
Kh-25 Karen for Russia.
Kh-29 Kedge for Russia.
Etc…

SEAD Suppression of Enemy Air Defenses Missile:
Missile that captures and targets a source of radar emission to destroy it.
Specially designed to destroy **SAM** sites.

AGM-88 HARM for the USA.
Kh-25MP for Russia.
Kh-58 for Russia.

JSOW/ Decoy Missile:
Missile that hovers like a glider without propulsion.
They are used either to pass themselves off as planes in order to deceive radars, or to launch bombs over a very long distance.

AGM-154 JSOW for the USA.
ADM-141 TALD for the USA.
etc…

GPS, Inertial, Datalink, Imaging Infrared Missile:
These American missiles mainly use almost everything to be guided. They are very long-range missiles.
It uses GPS, communication with other planes, infrared, etc…

AGM-84E SLAM for the USA.
Etc..

Bombes

As for missiles there are a huge number of types of bombs.
I describe here only a small part of them.

General Purpose Bomb or dumb bomb:
These are the conventional bombs that we all know. No guidance or special ability.

Mk 82 for the USA.
Mk 84 for the USA.
FAB-500 M-62 for Russia.
Etc…

High-drag Bomb:
These bombs are equipped with an air brake system to prevent horizontal movement. They are slowed down by either inflated balloons, parachutes, or metal parts that open.
This feature allows for quick and low-altitude deployment, making them highly effective in combat situations.

Mk 82 Air for the USA.
Mk 82 SnakeEye for the USA.

Anti-Runway Bomb:
Extremely perforating it generates a large crater to destroy the runways.

BetAB-500 for Russia.

Laser guided Bomb:
Bomb guided by a laser directly from the plane or by a ground team.

GBU-10 for the USA.
GBU-12 for the USA.
Etc…

Cluster Bomb:
Cluster bombs are munitions that detonate in the air, dispersing numerous smaller bombs onto the ground below. Among these smaller bombs are guided rockets, adding a precision element to their destructive capabilities.

CBU-97 for the USA.
CBU-87 for the USA.
RBK-500-255 for Russia.
Etc…

Training bomb:
Training bomb that melts smoke on impact in order to see where they have fallen.

BDU-33 for the USA.
Etc…

Rockets

Rockets are small, unguided missiles that travel in a straight line in the direction they are launched.

Their categories are listed below:

High Explosive (HE):
Mainly anti-infantry or light vehicles.

S-13-OF for Russia.
Hydra 70 for the USA.
Etc..

High Explosive Anti-Tank (HEAT):
Anti-tanks with penetrating capacity.

S-8-KOM for Russia.
S-5KO for Russia.
Mk 4 FFAR for the USA.

Smoke Marker (SM):
Used to mark targets with smoke.

S-8-TsM for Russia.

During World War II, as well as the Cold War and the Korean War, ancient rockets were utilized to effectively destroy enemy bombers. These rockets were specifically designed for air-to-air combat, showcasing their versatility and effectiveness in aerial warfare.

Terms and abbreviations

AAA = (Anti-aircraft Artillery) Non-missile anti-aircraft artillery.

ANGELS = Altitude in thousands of feet (ft).

Bandit = A known enemy.

Bingo = Low fuel (minimum to return to base).

Bogey = An unknown radar contact.

Bogey Dope = A request for bearing and range from the bogey of heading, speed and altitude.

Bullseye = A fixed point in the battlespace from which references are given.

BRAA = (Bearing for Range at Altitude and Aspect) The position of an aircraft, its distance and altitude.

BVR = (Beyond Visual Range) Combat mode or radar that allows to scan or lock a target beyond the ability to see it visually.

CAP = (Combat Air Patrol) Combat air patrol. Search and destroy enemy planes and helicopters.

CAS = (Close Air Support) Help from ground teams. Air support. Destruction of tanks etc...

COLD = The plane is moving away from you.

CSAR = (Combat search and rescue) Mission mainly by helicopter to recover ground troops and row them to safety.

CTLD = (Complete Transport and Logistics Deployment) Logistics transport mission.

FAC = (Forward Air Control) In a CAS mission it is the team or individual who assigns targets.

FARP = (Forward Arming and Refueling Points) Base, mobile airfield for helicopter or planes.

FLANKING = The plane is moving perpendicular to you.

Fox 1, 2, 3 = radio information indicating the launch of an air-to-air missile
1 = guided by the aircraft
2 = infrared homing
3 = radar homing.

HOTAS = (Hands on Throttle and Stick) Hands on the stick and throttle.

HOT = the aircraft is coming towards you

HUD = Head-up display.

IFF = (Identification, friend or foe) System that uses a transponder that listens for an interrogation signal and then sends a coded response that identifies the broadcaster. Used so as not to accidentally destroy a friendly aircraft.

INS = (Inertial Navigation System) A device using precise gyroscopes that allows the pilot to determine his position anywhere on earth within a few hundred feet.

Joker = Fuel status just above bingo.

JTAC = (Joint Terminal Attack Controller) Same as FAC. They also do laser pointing.

MAGNUM = Radio indication of the sending of an anti-radiation missile to destroy a SAM for example.

Mud = Machine on the ground for example SAM.

Nails = indication of an enemy radar threat (it tracks you, it is focused on you).

NATO = North Atlantic Treaty Organization. NATO planes are planes under the control of the alliance which is led by the USA. And have a common style of system and standardized "language".

Ordnance = munitions.

Painted = Scanned by radar.

Pickle = bomb dropped.

RTB = Return to base.

RIFLE = Radio indication of the sending of an air-to-ground guided missile.

RWR = (Radar warning receiver) system that detects radar waves and displays them on a dial in a top view relative to the aircraft. This is another system independent of the attack radar, it also allows to differentiate the types of emissions received by aircraft, boats, SAMs and even missiles.

RWS = (Range While Search) Radar mode that allows to track a target and have its exact range distance. Just like the TWS this mode allows to continue to scan but if we lock on to a target it tracks more strongly which will alert the enemy.

SAM = Surface-to-air missile or device used to send them.

SAR = Search and rescue.

SEAD = (Suppression of Enemy Air Defenses) Mission or type of missile that aims to destroy the anti-aircraft defiance of the enemy.

Spiked = Indication of an enemy radar threat (it scans you).

SHACK = Radio indication of the destruction of a ground target.

SPLASH = Radio indication of the destruction of an air target.

TACAN = (Tactical Aid to Navigation) Navigation aid that provides the bearing and distance between it and an aircraft.

Tally = Enemy in sight.

Texaco = Tanker aircraft.

TWS = (Track While Scan) Radar mode that allows you to track a target while continuing to scan the rest to have a better view of the situation. Also what allows you to have several targets for an attack on multiple targets. If you lock on a target with this mode the enemy is not alerted.

VSTOL = Very short takeoff.

VTOL = Vertical takeoff and landing.