

Warning:

Taking passengers on a flight

- You need at least 3 takeoffs and 3 landings as PIC during last 90 days on same type of airplane

Diving

- 12h wait for altitudes < 8000ft
- 24h wait for altitudes > 8000ft

Alcohol

- Light drinking: wait 12h
- Heavy drinking: wait 24h

Illness/surgery

- Local sedation: 12h wait
- Complete sedation: 24h wait

Immediate inform 'FOD Luchtvaart' in case of:

- > 12h in clinic
- Surgery
- Serious injury
- Use of pills
- Use of glasses
- Pregnancy
- After >21 days illness

VFR

- magnetic compass
- chrono
- altimeter
- airspeed indicator
- mode S transponder

Basic IFR

- pitot heat
- inclinometer
- artificial horizon
- directional gyro
- suction meter
- inside temp + OAT
- variometer

Flying over water

< 50 NM of coast or outside gliding distance of land:

- life jacket

>100 NM (SE) or >200 NM (ME)

- life jacket
- inflatable raft
- flares
- ELT

Flight in formation

- VMC required
- Agreement between PICs
- ATC-permission needed when landing/takeoff in formation

Rules

- 1. Rules of country of registration
 - 2. Rules of country that you fly in
- If the rules of the country you fly in are more strict, use these rules

General equipment & documents

- First Aid kit
- Fire extinguisher
- 1 Seat / person + safety belt

Documents:

- Aircraft journal
- Aircraft registration
- Radio permit
- Airworthiness certificate
 - o noise certificate
 - o Weight & balance
 - o Pilot information Handbook
 - o Interception signals
 - o Safety markings & placards
- Pilots medical + flying license + identity card + pilots journal
- Passenger list / cargo list
- Actual Charts
- Maintenance documents: NOT ON BOARD!

Spare fuses

Nightflight

- Navigation lights
- Min. 1 landing light
- Instrument lights
- Passenger light
- 1 electrical torch / crew member
- Flight FROM and TO a night flight equipped airport
- Navigation flight
 - o in controlled area: listen to ATC clearances
 - o outside controlled area: 3500 or 4500 ft MSL (hem. rules)
 - o Between 2200-0459h: > FL050
- Visibility ≥ 5 km
- cloud base ≥ 1500ft
- ATC permission required
- Flight plan required

Oxygen

- > 10000 ft (for crew + ≥ 10% of passengers if > 30 min)
- > 13000 ft (for passengers+crew)

Fuel

Recommended spare fuel: 45 min!

Acrobatic flights (ie spins, stalls, ...)

- VMC required
- Not above cities, industries, crowds, dangerous areas, controlled airspace
- Always ≥ 2000 ft AGL
- Visibility ≥ 5km when ≤ 3000ft MSL

Flight crew: safety belt always on! Passengers can only be recommended to leave their safety belts on.

Air to ground signals

During daylight	rock wings
During darkness	flash landing or navigation lights 2 times

Nothing of the above = not understood

Transponder codes

7700	Emergency (distress frequency: 121,500 MHz or 243 MHz) To end an emergency: radio "CANCEL DISTRESS"
7600	Squawk 7600 means: "Lost Communications" - First use squawk 7700 during 1 minute to draw attention - Radio: "TRANSMITTING BLIND DUE TO RECEIVER FAILURE" - Controlled / Non controlled area: <ul style="list-style-type: none"> o Land as soon as possible o Keep flying in VMC! o Notify ATC after landing o Close flight plan if necessary o Do NOT enter controlled airspace!
7500	Hijack
7000	VFR (unless given another code by ATC)

Marshaller hand signals

Signs of the marshaller should be interpreted independent of his/her position



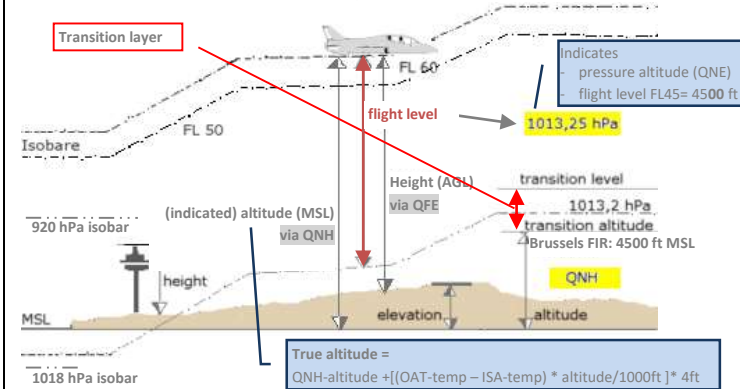
Altitudes

Non controlled areas

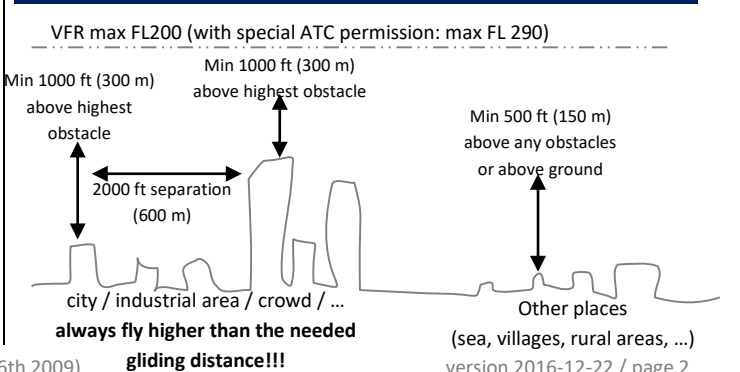
- o ≤ 3000 ft AGL
 - Height: free
 - Altimeter setting: free, recommended QNH
- o > 3000 ft AGL and ≤ transition altitude (4500 ft MSL):
 - Height: follow hemispherical cruising rules VFR: 3500 or 4500 ft MSL in class F G, IFR rules in class B C D E
 - Altimeter setting: regional QNH
- o > transition altitude (4500 ft MSL):
 - Height: follow hemispherical cruising rules (IFR in class B C D E, VFR in class F G)
 - Altimeter setting: 1013,25 hPa

Controlled areas

- o ≤ 3000 ft MSL
 - Follow ATC-directions
- o > 3000 ft MSL and ≤ transition altitude (4500 ft MSL):
 - Height: follow ATC directions, use hemispherical cruising rules (IFR in class B C D E, VFR in class F G)
 - Altimeter setting: QNH
- o > transition altitude and < transition level:
 - NO horizontal flights allowed
- o ≥ transition level:
 - Height: follow ATC directions, use hemispherical cruising rules (IFR in class B C D E, VFR in class F G)
 - Altimeter setting: 1013,25 hPa



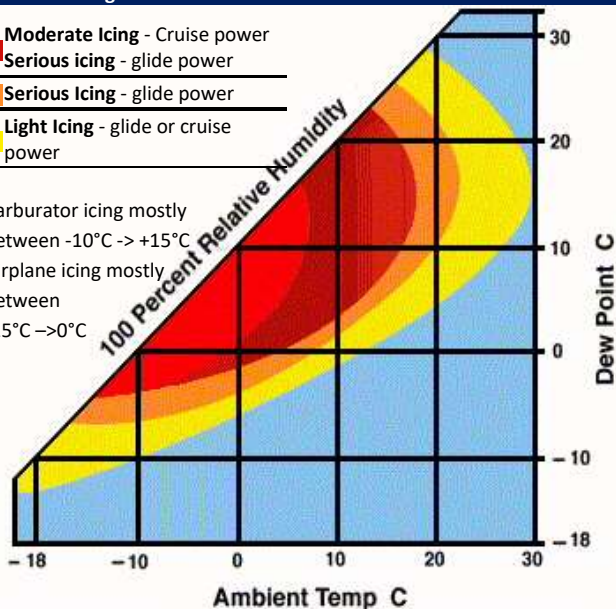
Minimum Safe altitude



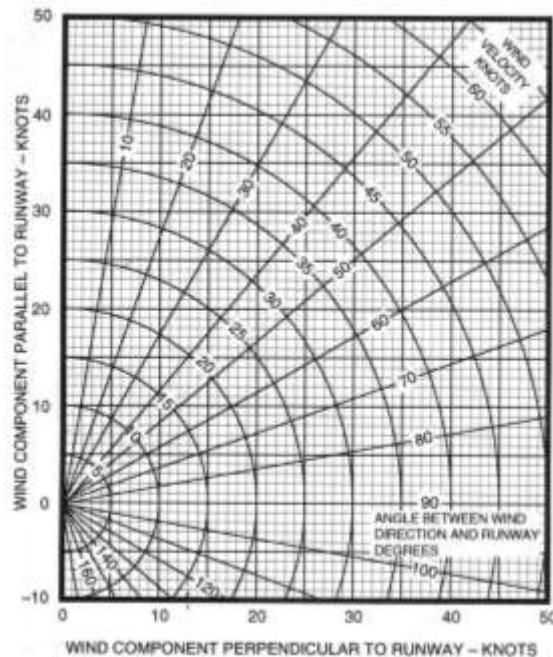
Carburator Icing Conditions

- Moderate icing - Cruise power
- Serious icing - glide power
- Serious Icing - glide power
- Light Icing - glide or cruise power

Carburator icing mostly between -10°C -> +15°C
 Airplane icing mostly between -15°C -> 0°C



Head and tail wind components



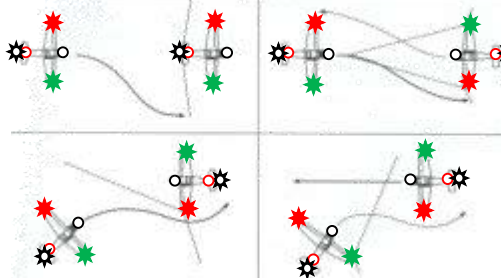
Fahrenheit to Celcius conversion



Lights & rules "of the road"

- Always fly at a safe distance of other aircraft: avoid coming to close
- Aircraft that are overtaken, should not change speed or direction

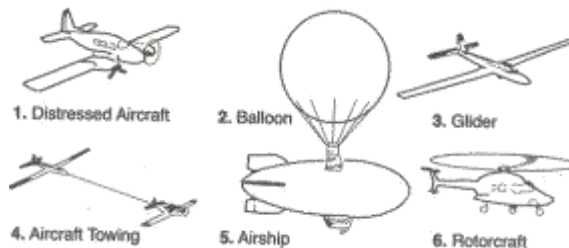
○	Rotating beacon	Always on!
—	Flash lights	On unless danger of dazzling by strobe lights
★	Navigation lights	On between SS -> SR
○	Landing lights	On when maneuvering to and from airport



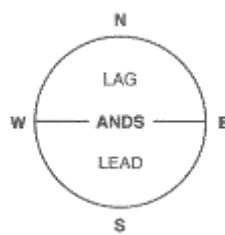
VFR Right of way priority

When two aircraft are converging at approximately the same level, the aircraft that has the other on its right shall give way, except as follows:

- power-driven heavier-than-aircraft shall give way to airships, gliders and balloons
- airships shall give way to gliders and balloons
- gliders shall give way to balloons
- power-driven ACFT shall give way to aircraft which are seen to be towing other aircraft or objects
- An aircraft in landing (unless this aircraft is a glider or an aircraft in emergency) must give priority to a lower flying aircraft
- Aircraft in final always have priority



Compass errors



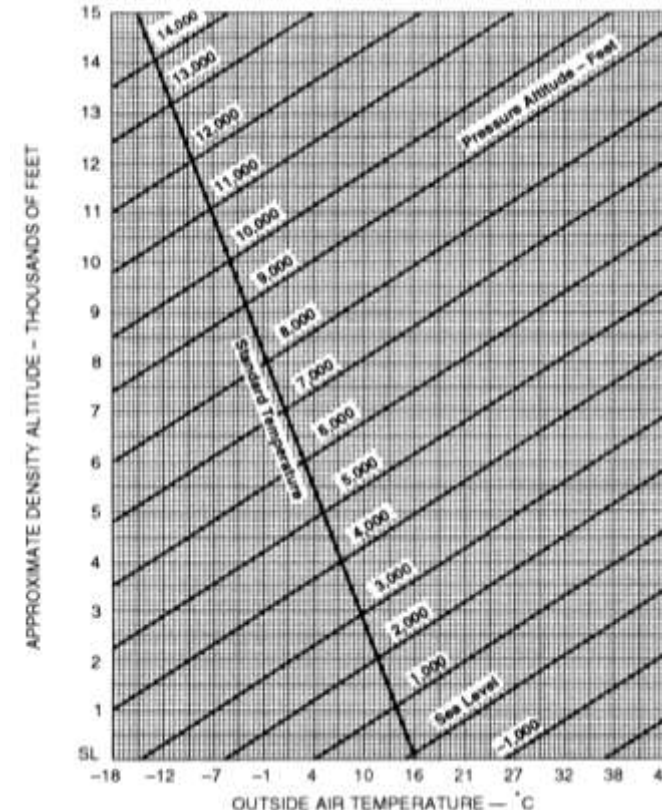
- **When moving W->E or E->W:**
 ANDS: Accelerate North, Decelerate South
- **Never see North, always see South:**
 Turning from a heading of north, the compass lags behind:
 - E->N = 90°->360°: stop at 030°
 - W->N = 270°->360°: stop at 330°
 Turning from a heading of south, the compass leads:
 - E->S = 90°->180°: stop at 210°
 - W->S = 270°->180°: stop at 150°

ISA-atmosphere (= at MSL: 1013,25 hPa, 15°C, dry air, ρ_{MSL}= 1,225^{kg/m³})

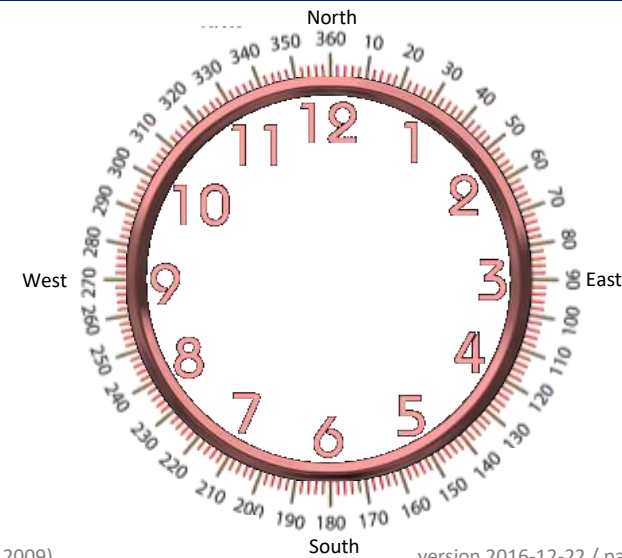
-1 hPa ≈ -30 ft (valid ≤ 5000 ft MSL) | +1000 ft ≈ - 2 °C (if ≤ 36000 ft MSL)

Density altitude = pressure altitude corrected for non ISA-temperatures

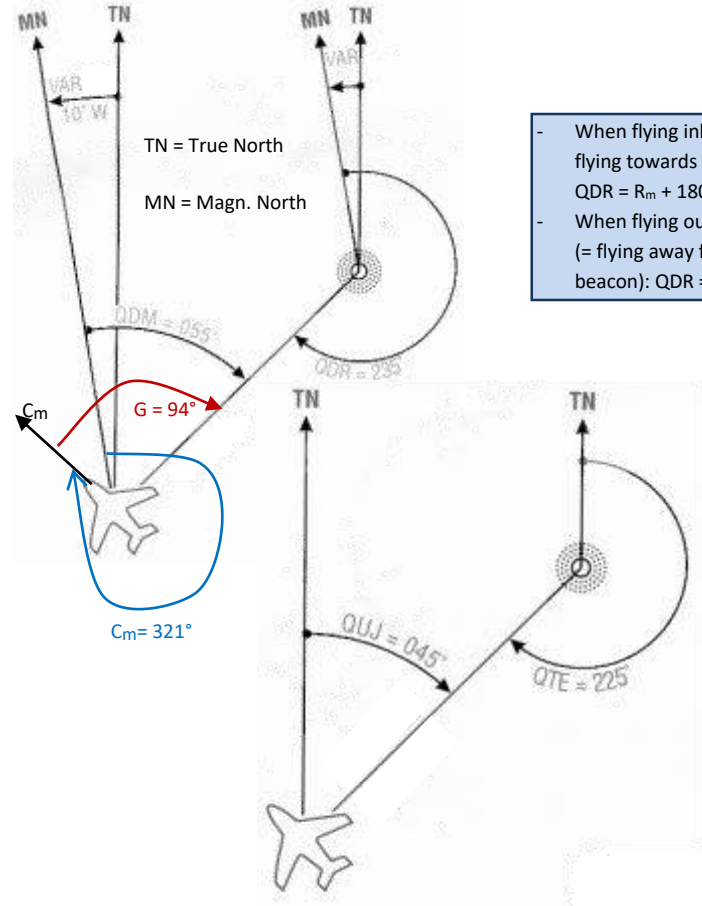
$$\text{density altitude} = \text{pressure altitude} + [(\text{OAT-temp} - \text{ISA-temp}) * 120 \text{ ft}]$$



Compass headings & clock readings



- Formulas**
- Bernouilli: $p_{tot} = p_{stat} + p_{dyn} = p_{stat} + \frac{1}{2} \rho v^2$
 - Boyle gas law: $(p \cdot V) / T = C_{te}$
 - Lift $L = \frac{1}{2} \rho v^2 S C_L(\alpha)$
 - Drag $D = \frac{1}{2} \rho v^2 S C_D(\alpha)$
 - Lift to drag ratio $L/D = \text{distance flown} / \text{height}$
 - AVGAS fuel = 0,72 kg/l = 6 lbs/US Gal
 - Oil = 0,9 kg/l
 - Wing loading = total weight airplane / wing area
 - Wing aspect ratio = wingspan / mean chord
 - Wing area = wingspan * mean chord
 - Centripetal force = $m \cdot v^2 / r$
 - Load factor $n = \text{resultant lift} / \text{total real weight}$
 - Load factor & minimum speed: $v_s = v_{s1} \cdot \sqrt{n}$
 - Speed radio waves = 300 000 km/s
 - length of a radio wave (m) = 300 000 000 m/s / frequency (Hz)
 - Distance transmission radio waves (NM) = $\{1,23 \cdot \sqrt{\text{height (ft)}}\} + 10\%$
 - Moment of force = force applied * distance from the axis of rotation
 - Climb gradient (%) = climb rate (fpm) / IAS (kts)
 - Rate one turn = 2 min / 360° = 3° / sec
 - Angle of bank in a rate one turn $\approx \text{TAS} / 10 + 7$



- When flying inbound (= flying towards beacon): $QDR = R_m + 180^\circ$
- When flying outbound (= flying away from beacon): $QDR = R_m$

- Navigation**
- Abbreviations:**
- R_w = true route (route = course = track)
 - R_m = magnetic route (route = course = track)
 - R_c = compass route (route = course = track)
 - D_c = drift correction ($D_c = WCA = \text{Wind Correction Angle}$)
 - drift $D \approx -D_c$
 - o if drift has negative sign: wind is blowing from the right side
 - o if drift has positive sign: wind is blowing from the left side
 - C_w = true cap (cap = heading)
 - $C_w_backtrack = C_w \pm 180^\circ + 2 \cdot D$ (use the sign of D!!)
 - $R_w_backtrack = C_w_backtrack - D$ (use the sign of D!!)
 - C_m = magnetic cap (cap = heading)
 - $C_m_backtrack = C_m \pm 180^\circ + 2 \cdot D$ (use the sign of D!!)
 - $R_m_backtrack = C_m_backtrack - D$ (use the sign of D!!)
 - C_c = compass cap (cap = heading)
 - V = variation (when: West or Left = - sign, East or Right = + sign)
 - d = deviation (when: West or Left = - sign, East or Right = + sign)

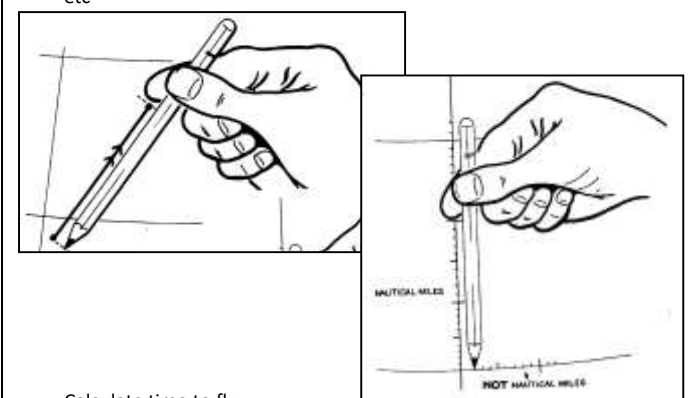
- Conversions**
- perform the calculations in the direction of the arrows, otherwise change signs!
 - Conversion of directions This doesn't really exist!
- | | | | | | |
|------------------|-------------------|----------------|-------------------|----------------|-------------------|
| $D_c \downarrow$ | $\frac{R_w}{C_w}$ | $\leftarrow V$ | $\frac{R_m}{C_m}$ | $\leftarrow d$ | $\frac{R_c}{C_c}$ |
|------------------|-------------------|----------------|-------------------|----------------|-------------------|
- Conversions of bearings**
- | | | |
|--|--|---|
| QDM
from airplane
reference: magn. N
indicates R_m | $\leftarrow \pm 180^\circ \rightarrow$ | QDR
from ground station
reference: magn. N
indicates the radial |
| $V \downarrow$ | | $V \downarrow$ |
| QUJ
from airplane
reference: true N
indicates R_w | | QTE
from ground station
reference: true N
gives line of position on map |
- **Relative bearing G**
 - o Reference: longitudinal axis of airplane
 - o $QDM = C_m + G$
 - o $QUJ = C_w + G$

- Calculations**
- **EET** = Estimated Elapsed Time
= distance (NM) / ground speed (kts) * 60
 - **Fuel consumption** = Fuel flow * EET / 60
Always add a safety margin of 45 min spare fuel!!
 - **PNR** = Point of No Return
 - o depends on endurance (takes into account: TAS, wind, spare fuel and quantity of fuel)
 - o Time to PNR = $(\text{endurance} \cdot GS_{back}) / (GS_{out} + GS_{back})$
 - o Distance to PNR = time to PNR * GS_{out}
 - **PET** = Point of Equal Time = Critical point
 - o Depends on distance between the 2 points (takes into account: wind)
 - o Distance to PET = $(\text{distance} \cdot GS_{back}) / (GS_{out} + GS_{back})$
 - o Time to PET = distance to PET / GS_{out}
 - **Route error** (°, valid if $\leq 15^\circ$) = error (NM) / flown distance (NM) * 60
 - **Correction for route error** (°) = - route error * 2
OR = - sum of the 2 route error angle

- Diversion planning**
- Sketch the track line and determine the track direction using a VOR-rose, protractor, etc.
-
- Assess the wind angle (= angle between the longitudinal axis of the aircraft and the wind direction)
 - Calculate maximum drift: $(\text{wind speed} \cdot 60) / \text{TAS}$
 - Determine the portion of maximum drift by using the table below:

Wind angle	Portion of max drift / portion of wind speed
000°	0
010°	1/6
015°	1/4
020°	1/3
030°	1/2
040°	2/3
045°	3/4
050°	5/6
060° or more	1

- Calculate (90° - wind angle), look up the portion of wind speed (using the table above) and apply the result to the wind speed
- Work out the ground speed: $\text{TAS} \pm \text{wind component}$
- Measure the diversion distance with a pencil and meridian, a protractor, etc



Calculate time to fly

Ground speed	Factor to determine the needed flying time in minutes
60 kts	1
70 kts	6/7
75 kts	4/5
80 kts	3/4
90 kts	2/3
100 kts	3/5
110 kts	6/11
120 kts	1/2

Flying from high pressure area to lower pressure area or flying from hot to cold, always look out below

Higher altitude / temperature / humidity -> lower density -> lower pressure
 Lower altitude / temperature / humidity -> higher density -> higher pressure

Weather chart symbols – Wind signs

	Thunderstorm		Rain
	Tropical cyclone		Snow
	Severe line squall		Widespread blowing snow
	Hail		Shower
	Moderate turbulence		Severe sand or dust haze
	Severe turbulence		Widespread sandstorm or duststorm
	Marked mountain waves		Widespread haze
	Light aircraft icing		Widespread mist
	Moderate aircraft icing		Widespread fog
	Severe aircraft icing		Freezing fog
	Freezing precipitation		Widespread smoke
	Drizzle		Volcanic eruption

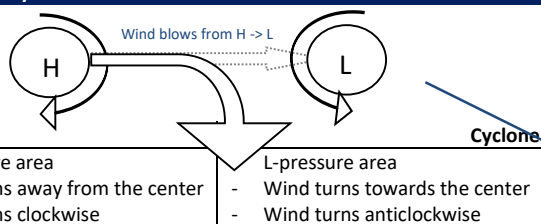
	Wind blowing from 000°/10 kts	Reference= true North If the wind is given by ATC, the reference is magnetic North
	Wind blowing from 270°/5 kts	
	Wind blowing from 90°/50 kts	

Belgian military meteo colour codes

Colour code	Horizontal Visibility	Height of lowest SCT, BKN or OVC cloud layer	
BLU	≥ 8 km	≥ 2500 ft	VFR
WHT	5 - 7 km	1500 – 2400 ft	
GRN	3,7 – 4,9 km	700 – 1400 ft	Special VFR
YLO	1,6 – 3,6 km	300 – 600 ft	
AMB	0,8 – 1,5 km	200 ft	
RED	< 0,8 km	< 200 ft	
BLACK	Airport out of service due to other reasons than clouds or visibility		

If two colour codes are stated: the airport is active, if only one colour code is stated, the airport is closed...

Anticyclone & Cyclone



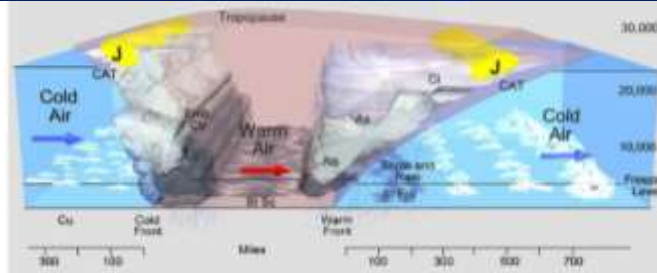
Anticyclone

- H-pressure area
- Wind turns away from the center
- Wind turns clockwise

- L-pressure area
- Wind turns towards the center
- Wind turns anticlockwise

	Warm air mass	Cold air mass
What?	Air is warmer than the ground (the air mass is cooled from below)	Air is colder than the ground (the air mass is warmed from below)
stable/unstable?	stable	unstable
visibility	poor	Good (except during showers)
flying conditions	calm	expect turbulence gusty winds
cloud types	stratiform	cumuliform
precipitation	Possible fog If any: continuous light rain/drizzle	showers possible expect thunderstorms

Warm & Cold Fronts



	Before Warm Front	At Warm Front	In Warm Sector	At Cold Front	After Cold Front
Pressure	↘	= / ↘	= / ↘	↑	↗
Wind speed	↑	=	max	Strong turbulent	turbulent
Wind direction	S-SW -> S-SE	-> SW	SW	-> W-NW	W-NW
Temperature	↗	= / ↗	=	↓	variabel
Rel humidity	↗	high	high	high	variabel
Clouds	Ci-> As /Ac -> Ns -> Sc/St	Ns / St	St / Sc	Ns/St/Ac /As	Cu/TCu/ Cb
Weather	Virga -> -RA / RA / snow	RA / +RA /snow	-RA/ -DZ/ -SN (poss BR/FG)	RA/RASH poss GR, TS, SN	Variable poss GR/TS/ SN
Visibility	good -> moderate (-RA) -> poor/bad (RA/SN)	Poor / bad	Poor / bad	Poor / bad but ↗ after CF	Very good (except during rain)



- flying towards a cyclone, results in a drift to the right
- flying towards an anticyclone, results in a drift to the left

- Compared to the wind at 0 ft AGL (ie 270/20), the wind at 2000 ft AGL generally has a direction of 270+30° and speed of 20+30 kts
 - when the wind blows in your back, the cyclone is at your left hand

- Fog**
- Advection fog
 - o Required conditions: moist, warm air over cold surface or cold air over moist, warm surface, +/- 5-10 kts wind
 - o May occur any time, can be very persistent
 - Radiation fog
 - o Required conditions: moist air, few clouds, 2-6 kts wind
 - o Occurs mostly during night or morning, especially in H-pressure area and during winter

Weather phenomena

INTENSITY or PROBABILITY	QUALIFIER	DESCRIPTOR	WEATHER PHENOMENA				
			PRECIPITATION	OBSCURATION	OTHER		
1	2	3	4	5			
-	Light	MI Shallow	DZ Drizzle	BR Mist	PO	Dust/Sand Whirls	
		BC Patches	RA Rain	FG Fog	SG	Squalls	
	Moderate (No Quashter)	DR Low Drifting	SN Snow	FU Smoke	FC	Funnel Cloud	
		BL Blowing	SG Snow Grains	DU Dust	SS	Sandstorm	
+	Heavy	SH Showers	IC Ice Crystals	SA Sand	DS	Duststorm	
		TS Thunderstorms	PL Ice Pellets	HZ Haze			
VC in the Vicinity	FZ Freezing	GR Hail	PY Spray				
	PR Partial	GS Small Hail or Snow Pellets	VA Volcanic Ash				
		UP Unknown Precipitation					

Cloud types & abbreviations

0/8 coverage	Sky Clear	SKC	These notations do not influence landing/takeoff visibility rules!
1/8-2/8 coverage	Few	FEW	
3/8-4/8 coverage	Scattered	SCT	
5/8-7/8 coverage	Broken	BKN	From this point you can speak of a cloud ceiling (ie visibility rules for landing & takeoff)
8/8 coverage	Overcast	OVC	

> 17000 ft	Cirrus [Ci]	Cirrocumulus [Cc]	Cumulus [Cu]
> 7000 ft	Cirrostratus [Cs]	Altostratus [As]	Cumulonimbus [Cb] strong vertical develop
	Nimbostratus [Ns]	Altostratus [As]	
	Stratus [St]	Stratocumulus [Sc]	Stratocumulus [Sc] DANGEROUS!!

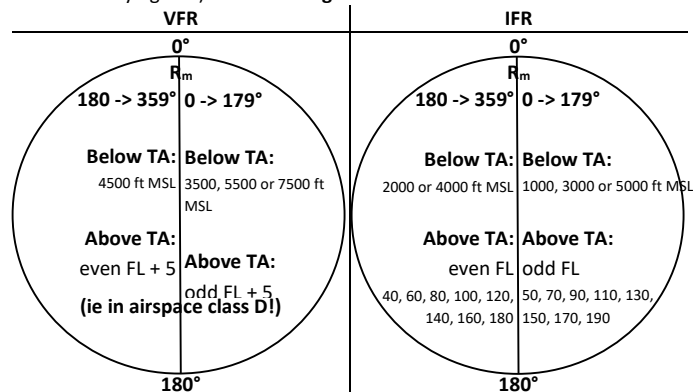


Airspace classification

Class		controlled				uncontrolled			
		A	B	C	D	E	F	G	
separation	IFR		- IFR from IFR - IFR from VFR	- IFR from IFR - IFR from VFR	IFR from IFR	IFR from IFR	IFR from IFR as far as possible	no separation	
	VFR		- VFR from VFR - VFR from IFR	- VFR from IFR - Special VFR from other Special VFR and from IFR (only in a CTR and when cleared by ATC!!!!) - NO VFR from VFR!!	VFR: no separation!!!				
VFR services			Control	Control for separation of VFR from IFR Traffic info between VFR (avoidance advice on request)	Traffic information between VFR and IFR (avoidance advice on request)	Traffic information as far as practical	Flight information		
VFR speed limit			No speed limit	Max 250 kt IAS (below FL100)					
VFR ATC clearance required?				Yes			No		
VFR 2-way radio required?				Yes			No		
VMC minima		VFR Not Allowed	Visibility: - ≥ 5km when below FL100 - ≥ 8km when at or above FL100 Distance from clouds: - ≥ 1500m horizontally - ≥ 300m vertically					At or below 3000 ft MSL or 1000 AGL: - Remain clear of clouds - Visibility ≥ 5 km - Remain in sight of ground	
Hemispherical rules				IFR			VFR		

Hemispherical cruising rules (in EBBU FIR)

- Valid above 3000 ft AGL up to 30000 ft (not included)
- NOT under ATC-control (class D E F G): VFR hemispherical cruising rules
- Under ATC control (class B C): IFR hemispherical cruising rules (even when flying VFR) **UNLESS ATC gives clearance at another altitude or FL.**



Takeoff and landing visibility rules

Airport without ATC	Airport with ATC
Visibility: ≥ 1,5 km (circuit training) ≥ 5 km (nav flight) Cloud base: ≥ 500 ft AGL Remain clear of clouds Stay in sight of ground	Ground visibility ≥ 5 km Cloud base: ≥ 1500 ft AGL Special VFR - Only in CTR during the day - Only for takeoff / landing in a CTR - Visibility & cloud base rules depend on ATC but are never less than: o 1500 m ground visibility o Clear of clouds o In sight of ground/water - In special VFR you always get ATC!

EBBU = Brussels FIR (Flight Information Region)

UIR	UAR	FL460	Class C up to FL660
	UTA		
FIR		FL 195	Class C (mil: Belga radar, civ: Brussels control)
		FL 95	- during night: class C (Brussels control) - during day: o during mil. OPS: class C (Belga radar) o other hours: class D (Brussels information)
		4500 ft MSL	- If no CTR/CTA/TMA: Class G (Brussels information) - In CTR: Class C
		North Sea	Belgium Luxembourg

Watch out for special areas (use AIP, AIP sup and NOTAM):

- TRA = Temporary Reserved Areas, ie. TRA 23
- P = Prohibited Areas, ie. EBPO2
- D = Dangerous areas, ie. EBD03
- R = Restricted areas, ie. EBR26

Remarks:

- CTR's and TMA's only exist during the time they are active!!
- Be aware of compulsory reporting points when entering/leaving the CTR/CTA
- Military CTR's and TMA's can be activated very fast!
Generally: even when NOT active, do not come within 2 NM and lower than 2500 ft MSL of military airports
- Make radio contact at least 5 min before entering a CTR/CTA/TMA/AWY

CTR (Belgium -> civilian: class C, military: class D) (Luxembourg CTR's: class D)

- Controlled Region
- From ground up to ... generally: 0 -> 2500 ft MSL
- Belongs mostly to a particular airport
- Radio contact name: tower, ground, delivery,

CTA

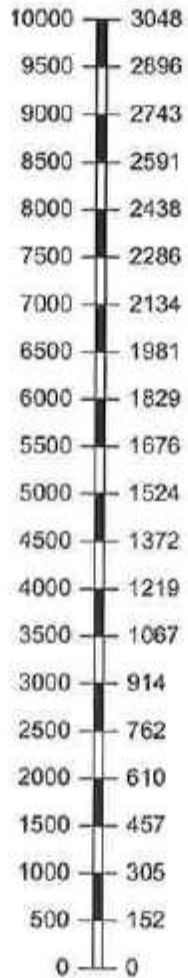
- Controlled Area generally: 2500 -> 4500 ft MSL
- CTA does not start from ground or water.
- TMA = Terminal Area (Belgium -> civilian: class C, military: class C) (Lille TMA's, Luxembourg TMA's: class D or E)
 - o Mostly on top of a CTR
 - o Radio contact name: approach (departure or arrival)
- AWY = Airway (Belgium -> airways: class C)
 - o Typical width: 10 NM, from 4500 ft MSL up to FL195
 - o Radio contact name: Brussels control
- CTA = Controlled Area (Belgium -> class C)
 - o Radio contact name: Brussels control

Establishing radio contact

- Make radio contact at least 5 min before entering the CTR/CTA/TMA/AWY
- Always give:
 - o Name of ATC unit (ie. Brussels information)
 - o Call sign (ie. OOBET)
 - o Type of aircraft (ie. C152)
 - o IFR/VFR (ie. VFR)
 - o Point of departure (ie. from EBKT)
 - o Destination (ie. to EBGB)
 - o Routing (ie. via AFI)
 - o Altitude / Flight level (ie. at 1000 ft)
 - o Position (ie. North West of Brussels CTR)
 - o Squawking code (ie. squawk 7000)
 - o ETA to CTR/CTA (ie. estimate AFI in 10 minutes)

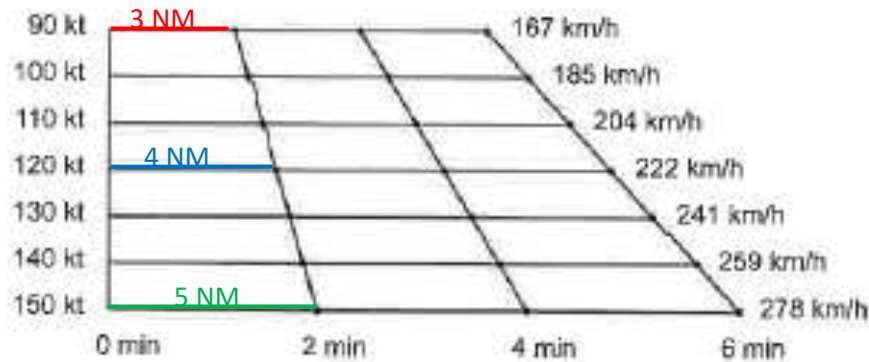
FEET-METERS-CONVERSION
FUSS-METER-KONVERTIERUNG
PIEDS-MÈTRES-CONVERSION

Feet / Fuß / Pieds Meters / Meter / Mètres



Aircraft performance influencers		
Condition	T/O (over 50 ft obst.)	Land (over 50 ft obst.)
Weight + 10%	1,20	1,10
Elevation + 1000 ft	1,10	1,05
Outside temp + 10°C	1,10	1,05
Dry grass	1,20	1,15
Wet grass	1,30	>1,35
Wet paved		1,15
2% slope	↗ 1,10	↘ 1,10
Tailwind 10% of Vr	1,20	1,20

SPEED CONVERSION
GESCHWINDIGKEITSKONVERTIERUNG
CONVERSION DE VITESSE



scale: 1:500 000

KOCH CHART

