

How to choose the correct Altitude/Flight Levels for your flight

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This tutorial will explain which Altitude or Flightlevel will be the correct one for your flight. The main rule for choosing an altitude or flightlevel is

As fast as possible as high as possible

For this there is a simple explanation: airmolecules are one of the necessary values for flight dynamics. Airmolecules are producing the lift and you need lift for your flight. As faster you're going (relatively to the air, TAS=True Airspeed) the more lift is produced. On the other hand these airmolecules are producing drag. So we have to look to reduce the amount of drag for our flight to reduce the fuel consumption and to get a higher speed with less fuel using. Due the fact that the airmolecules per volume of air are reducing the higher you are pilots are looking to get as high as possible for their flights. But please note that this achievement can't be expanded to unlimited due the aircraft configurations.

So ... based on the main rule a pilot has to look for his suitable cruising altitudes/flightlevels. These altitudes/flightlevels are depending on several criteria:

- Weight of the aircraft in each stage of the flight
- Aircraft configurations
- **Level Rules**

In this tutorial we're looking only for the Level Rules which are essential for flight planning. Due the fact that each pilot is using a different aircraft, loads and so on we won't look for the first two criteria.

Different airspaces

First there has to be said that the world airspaces are separated in different airspaces:

- Low altitude
- High altitude

Each country has set up two main airspaces. Low and high altitude airspaces. The transition between these airspaces are varying from country to country. Here are just some examples:

Country	Low altitude airspace	High altitude airspace
Germany	surface – FL245	FL245 – FL600
USA	surface – 18000 ft	FL180 – FL600
Australia	surface - 10000 ft	FL100 – FL600
UK	FL070 – FL245 (not included)	FL245 – FL600
Russian Fed.	0000 m – 7800 m	8100 m – unlimited

Usually in each airspace is always only one existing airway system. For the lower it's called „Lower Airways“ (for example (B146) and for the upper airspace airways are called „Upper Airways“ (with prefix „U“, for example UL607)

If a pilot wants to use both airways he has to make sure to be in the correct airspace for his airway. So if he wants to go via a lower airway he has to stay in the lower airspace and to be in upper airspace when using the upper airways.

Exception:

Climb on departure or descent on arrival

This means that when a flightplan shows DVR UG1 KONAN UL607 and the flight is departing from EGLL and the aircraft won't have reached upper airspace when passing DVR it's allowed to file and use UG1 even if the aircraft is in upper airspace (the same on descent)

But now back to the decision on choosing an altitude or Flightlevel. The main thing on choosing your altitude or flightlevel is your flight direction. For a flight departing EGLL (London-Heathrow) and arriving KJFK (JFK-airport, New York) it will be a westbound flight. A flight departing EGLL and arriving LOWW will be an eastbound flight. So the main thing is to look for the main direction of your flight. Is it a westbound or an eastbound flight??

Different separation airspaces:

It would be too easy if looking for the direction of your flight would be all on choosing the altitude/FL. There are different airspace systems around the world.

Region	Airspace Systems
Europe	RVSM (reduced vertical separation minima)
Australia	RVSM (reduced vertical separation minima)
Russian Fed.	Metric
NAT (North Atlantic Tracks)	MNPS with special RVSM
Spain, Portugal, France	North/South RVSM
Rest of the world	Standard ICAO

General Notice:

Except in metric system airspace the vertical separation between two aircraft is 1000 ft from FL 060 to FL 290. So two aircraft going in same direction are separated by 2000 ft.

RVSM – Reduced Vertical Separation Minima:

RVSM airspace is from FL290 to FL410, above it is Standard ICAO again. Separation between aircraft (aircraft has to be RVSM-approved) is 1000 ft. So each flight direction is separated by 2000 ft on standard QNH/Altimeter. Below FL290 separation between each aircraft is 1000 ft too. (For more details about RVSM see <http://www.eur-rvsm.com/>)

Metric System:

The Russian Federation is using a metric system. All flights are leveled on meters. Vertical separation between two aircraft is 300 m from altitude 900 meters to altitude 8100 meters, 500 meters separation from altitude 8100 meters to altitude 12100 meters and a separation of 1000 meters from altitude 12100 meters to altitude 16100 meters. Below is a chart which altitudes have to be used. (For more information how to fly in Russian Federation airspace see <http://vatrus.net.ru/>)

Westbound Flights (heading 180° - 359°)		Eastbound Flights (heading 360° - 179°)	
Separation 1000 m (meters)			
<i>FL</i>	<i>Meters</i>	<i>FL</i>	<i>Meters</i>
		528	16100
495	15100		
		463	14100
430	13100		
		397	12100
Separation 500 m (meters)			
381	11600		
		364	11100
348	10600		
		331	10100
315	9600		
		299	9100
282	8600		
		266	8100
Separation 300 m (meters)			
256	7800		
		246	7500
236	7200		
		226	6900
217	6600		
		207	6300
197	6000		
		187	5700
177	5400		
		167	5100
157	4800		
		148	4500
138	4200		
		128	3900
118	3600		
		108	3300
098	3000		
		089	2700
079	2400		
		069	2100
059	1800		
		049	1500
039	1200		
		030	900

Note:

If unable to copy metric numbers advise ATC and use correspondening FL numbers in hundreds of feet. Simple conversions of metric numbers **not allowed**.

NAT – North Atlantic Tracks (MNPS with special RVSM):

On NAT all flightlevels from FL310 up to FL400 are used in each direction. So separation for aircrafts going same direction is 1000 ft. Let us have a look at the standard description for using a NAT:

R COLOR 47/50 50/40 53/30 54/20 DOGAL BABAN
EAST LVLS 320 330 340 350 360 370 380 390 400
WEST LVLS NIL
EUR RTS WEST NIL
NAR N45B N49A-

- R is the track designator which has to be filed in the flightplan
- COLOR 47/50 50/40 53/30 54/20 DOGAL BABAN is the route for the NAT
- EAST LVLS 320 330 340 350 360 370 380 390 400 indicates the usable FL for this NAT. So NAT R is an eastbound route and all FL's from FL320 to FL400 may be used. Pilots have to be at a legal FL for the following airspace when leaving a NAT. This means that for an eastbound flight the aircraft has to be on an eastbound RVSM-FL when leaving the NAT and an aircraft flying westbound has to be on a standard ICAO-FL for a westbound flight when leaving the NAT into Canadian or U.S. airspace.
- WEST LVLS NIL indicates that this NAT can't be used for a westbound flight
- EUR RTS WEST NIL indicates that there are no Europe Routes for westbound flights
- NAR N45B N49A- are computer check indicators. (not avbl for FS)

For more informations about flying in North Atlantic airspace see
<http://www.natroutes.glideslope.de/>

North-South RVSM at Spain, Portugal and France

Due the fact that most of the airways in these three countries are north-south directed the whole airspace structure for altitudes/FL's are set to north-south as well. For northbound flights even FL's should be used and for southbound flights odd-flightlevels. So here the pilot has to look for the general flightdirection regarding to north or south equivalent to the other west-east routes. (For usable altitudes/FL's see the chart at the end)

When leaving one of the three airspaces into standard RVSM airspace the pilot has to be at the proper altitude/FL for the new airspace.

Standard ICAO:

For all other countries the standard ICAO airspace is in effect (pls note that some other countries are going to implement RVSM airspace in the future ... so please check at the national websites regularly for amendments)

Separation between aircraft below FL290 is 1000 ft and above FL290 the separation is 2000 ft. Hereby the pilot has to look for west-east direction of the flight again. For westbound

flights he has to choose even numbered altitudes/FL's for eastbound flights odd altitudes/FL's. The transition at FL290 changes the route. Next available FL for eastbound flights above FL290 is FL330 then FL370 and so on. For westbound flights the next available FL is FL310 then 350 and so on. So aircraft going the same direction above FL290 are separated vertical by 4000ft.

Please see the chart below for a complete altitude/FL comparison between standard ICAO, RVSM, NAT RVSM and „North-South“ RVSM.

Standard ICAO		RVSM		NAT RVSM		„North South RVSM“	
Westbound	Eastbound	Westbound	Eastbound	Westbound	Eastbound	Northbound	Southbound
Heading 180°-359°	Heading 360°-179°	Heading 180°-359°	Heading 360°-179°	Heading 180°-359°	Heading 360°-179°	Heading 270°-089°	Heading 090°-269°
	FL610		FL610				FL610
FL590		FL590				FL590	
	FL570		FL570				FL570
FL550		FL550				FL550	
	FL530		FL530				FL530
FL510		FL510				FL510	
	FL490		FL490				FL490
FL470		FL470				FL470	
	FL450		FL450				FL450
FL430		FL430				FL430	
	FL410		FL410				FL410
		FL400		FL400	FL400	FL400	
FL390			FL390	FL390	FL390		FL390
		FL380		FL380	FL380	FL380	
	FL370		FL370	FL370	FL370		FL370
		FL360		FL360	FL360	FL360	
FL350			FL350	FL350	FL350		FL350
		FL340		FL340	FL340	FL340	
	FL330		FL330	FL330	FL330		FL330
		FL320		FL320	FL320	FL320	
FL310			FL310	FL310	FL310		FL310
		FL300				FL300	
	FL290		FL290				FL290
FL280		FL280				FL280	
	FL270		FL270	Please note: in real aviation there are OTS-periods where FL's are ranging from FL270 up to FL600 and a 1000 ft separation between aircrafts is in effect. For online flights coordinate your FL with ATC !!			FL270
FL260		FL260				FL260	
	FL250		FL250				FL250
FL240		FL240				FL240	
	FL230		FL230				FL230
FL220		FL220				FL220	
	FL210		FL210				FL210
FL200		FL200				FL200	
	FL190		FL190				FL190
FL180		FL180				FL180	
	FL170		FL170				FL170
FL160		FL160				FL160	
	FL150		FL150				FL150
FL140		FL140				FL140	
	FL130		FL130				FL130
FL120		FL120				FL120	
	FL110		FL110				FL110
FL100		FL100				FL100	
	FL090		FL090				FL090
FL080		FL080				FL080	
	FL070		FL070				FL070
FL060		FL060				FL060	
	(FL050)		(FL050)				
Red marked section is RVSM-System							