

Meteorology

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Good Weather Information

- Accurate weather forecasts play a vital role in all aviation activity
- It is required by law in many countries that aircraft operators obtain all necessary weather information in order to plan and conduct a flight safely

Adverse Weather Conditions

- All aircraft flying at lower altitudes are vulnerable to adverse weather conditions because of a combination of factors
- These include
 - light structures
 - basic instrumentation
 - limited training of pilot in adverse conditions
 - available support from ATC and Met Services
- Pilot error is by far most common cause of crashes
- Weather related pilot error the greatest share of these

Adverse Weather Conditions

- Important to know:
 - where to get good weather information
 - how to interpret it
 - how to relate it to the flight and the aircraft

Air Density, Pressure and Temperature

- An aircraft needs a certain amount of air to fly in order not to stall.
- At height two significant things happen:
 - air gets thinner - work harder to generate lift
 - air gets colder - air is denser and water leaves the air and can form ice crystals
 - observed, effects are weight and lift efficiency
 - also for X6 LiPo batteries suffer efficiency losses in the cold
- In hot temperatures effect is as air gets thinner
- Payload effects == flight time effects

Cloud Formations: Low Level

- Low Level = below 2000m
- Most common / relevant
 - Cumulus (Cu): Brilliant white to grey, dense detached clouds. Forms clumped or heaped shapes. Fields of Cu often have bases at all the same level
 - Cumulus congestus: crowded field of cumulus or greater vertical extent. May produce rain.
 - Cumulonimbus(Cb) huge towering cloud, dark base and white sides. Associated with heavy rain, thunderstorms and hail. FREQUENTLY has an anvil shaped top

Cumulonimbus

- Form in moist atmospheres
- Spring and Summer
- Can arrive overhead from clear skies in a few minutes
- Often occur in advance of cold front
- Severe weather - heavy rain, strong wind, thunderstorms, hail
- To be avoided

Wind

Beaufort Wind Scale	Mean Wind Speed		Limits of Wind Speed		Wind descriptive
	Knots	m/s	Knots	m/s	
0	0	0	<1	<1	Calm
1	2	1	1-3	1-2	Light Air
2	5	3	4-6	2-3	Light Breeze
3	9	5	7-10	4-5	Gentle Breeze
4	13	7	11-16	6-8	Moderate Breeze
5	19	10	17-21	9-11	Fresh Breeze
6	24	12	22-27	11-14	Strong Breeze
7	30	15	28-33	14-17	Near Gale
8	37	19	34-40	17-21	Gale
9	44	23	41-47	21-24	Severe Gale
10	52	27	48-55	25-28	Storm
11	60	31	56-63	29-32	Violent Storm
12	-	-	64+	33+	Hurricane

Wind

- Wind direction usually expressed in terms of the direction from which it originates
 - e.g. northerly blows from the north to the south
- Wind speed measured by anemometer
- For small UAS operating in Beaufort 6 is a challenge (!!)
- Gusts are short bursts of high wind speeds
 - defined as maxima exceeds the lowest observed wind speed over 10mins by 10knots
 - Major challenge for RPAS

Turbulence

- Refers to disturbed or rough air whose movement is disordered
- Turbulence will have an effect on an aircrafts flight path but will allow the aircraft to maintain its flight path
- One of the most common causes of low level turbulence is the disturbance of air as it flows over the irregularly shaped surfaces, such as buildings or hills: mechanical turbulence
- Thermal turbulence is generated from hotspots

Turbulence

- Found in and around significant cloud developments
- Around well developed cloud formations down draughts can occur
- Severe phenomena can be wind shear
- Hills and mountains disturb the wind flowing over them
- On the leeward or downward side strong down draughts can literally fling an aircraft onto the slope
- Beware of disturbed air:
 - under the multicopter
 - near objects

END of METEOROLOGY



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