

Air Law

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IAEA

International Atomic Energy Agency

Aviation Regulations

- International Civil Aviation Organisation (ICAO)
- Convention on International Civil Aviation
 - also known as the Chicago Convention
 - 7 December 1944 by 52 States.
 - Current 190 Contracting States
 - Japan 8 September 1953
- ICAO UAS Circular 328 2011
 - Unmanned Aircraft Systems (UAS)
 - http://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf

ICAO UAS 328

- Civil aviation has to this point been based on the notion of a pilot operating the aircraft from within the aircraft itself and more often than not with passengers on board. Removing the pilot from the aircraft raises important technical and operational issues, the extent of which is being actively studied by the aviation community.
- The safe integration of UAS into non-segregated airspace will be a long-term activity with many stakeholders adding their expertise on such diverse topics as licensing and medical qualification of UAS crew, technologies for detect and avoid systems, frequency spectrum (including its protection from unintentional or unlawful interference), separation standards from other aircraft, and development of a robust regulatory framework.

Aircraft

- ICAO Annex I : An aircraft is:
- *“Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth’s surface”*
- Rotary wing normally referred to as a helicopter
- Multiple rotors - multicopter, **hexa-copter**

UAS Principles

- **EQUIVALENCE**
 - to manned aviation: capabilities and treatments
- **TRANSPARENCY**
 - to Air Traffic Service (ATS) providers and other air users
- **PROPORTIONATE**
 - and appropriate regulatory requirements

UAS ⇒ RPAS

- Remotely Piloted Aircraft Systems
 - ICAO UAS 328 Chapter 3
 - RPAS are Piloted - albeit remotely
 - control of an aircraft from a pilot which is not on board the aircraft
- RPAS are Aircraft
 - not toys, or models which are exempt from Convention
- RPAS operate within existing legislation
- RPAS have no special privileges

Key RPAS Factors w.r.t. Visual Line of Sight (VLOS)

Scope	Comment / Action expected
Endangering the safety of an aircraft	Recognition that every aircraft that operates is a threat to others if safe separation is not maintained
Endangering the safety of a person or property	Aircraft crashes have an impact on third parties not involved in the flight operation and their safety should be assured
Fatigue of crew	Fatigue of crew is required to be addressed by the operations manual (see Human Factors)
Power to prohibit or restrict flying	National Authority restrictions on operations at any time or place due to operational or other needs such as emergencies and disasters

General Rule

- An aircraft shall not be operated in a manner so as to endanger life or the property of others
- The operator, pilot and crew are responsible for the operation of the RPAS.

RPAS Risk Mitigation Factors

Factor	Effect
Airspace Segregation	Airspace segregation ensures separation of the UAS operation from other airspace users and third parties. Risk of Collision, AIRPROX or separation infringement is eliminated, except in the case of incursion by other airspace users into segregated airspace, or uncommanded excursion by the aircraft.
Visual Line-of-Sight	Operation within the unaided direct line-of-sight of the aircraft pilot (accepted as within 500m horizontally and at a height not exceeding 400ft vertically above the surface) permits the Remote Pilot to respond to an avoid other airspace users.
Low Aircraft Mass	Aircraft mass below a specified limit reduces risk to other airspace users and third parties, by reducing maximum kinetic energy damage potential below a significant level.

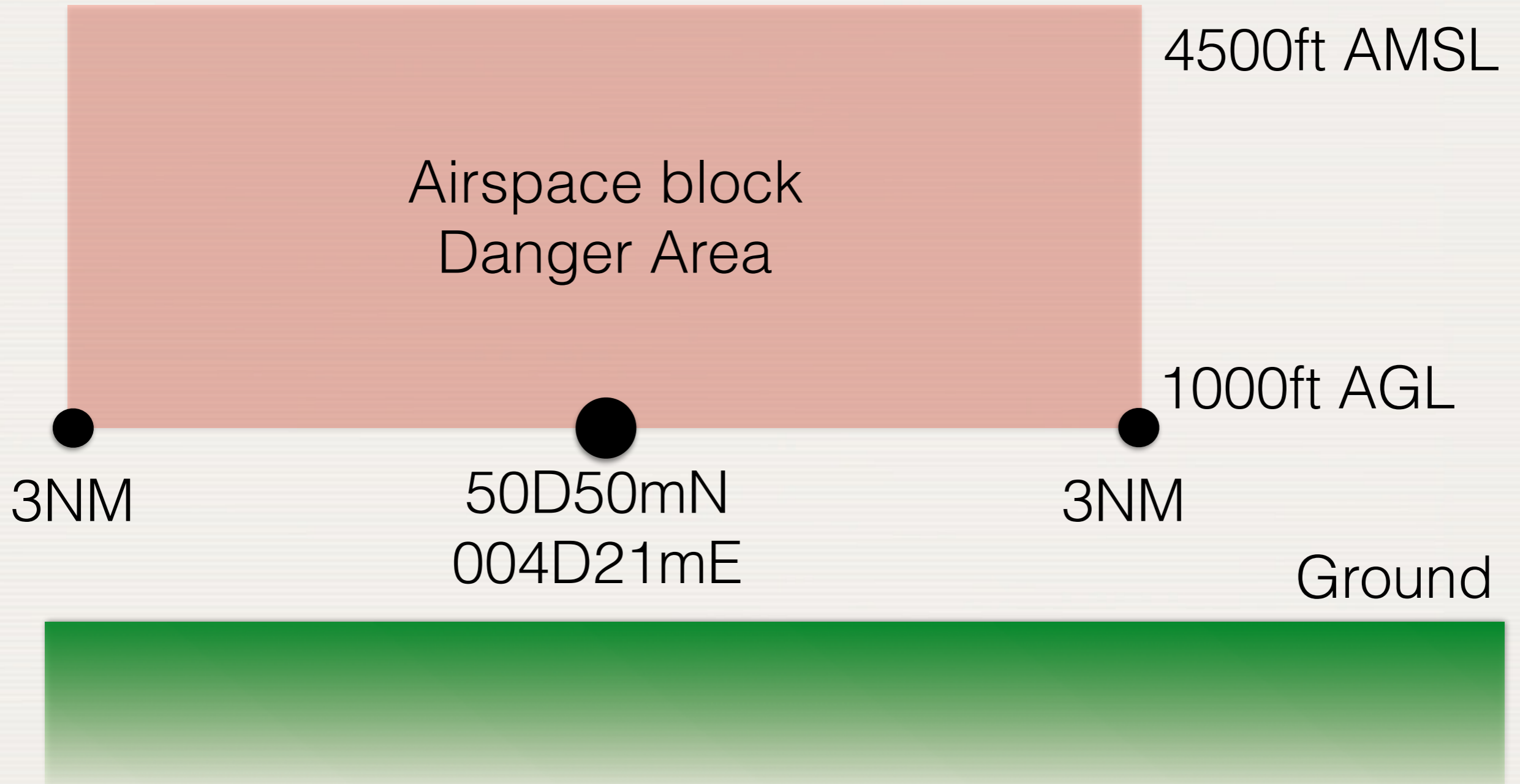
Rules of the Air

- In the beginning... no radio
- Regulations set based on visual observations
- VFR - Visual Flight Rules
- IFR - Instrument Flight Rules
- Even under IFR e.g. controlled airspace, the eye is still part of the risk assessment when considering collision avoidance

General Rules

- The Pilot in Command (PIC) is responsible for the conduct of the flight in accordance with the rules of the air.
- The PIC should therefore plan the flight before it takes place
- Certain Areas in the air have a different legal position. These areas are defined by lateral, longitudinal limitations or by radius and height limitations

Prohibited, Restricted and Danger Areas



Prohibited, Restricted and Danger Areas

- **Prohibited Area:** Forbidden to enter unless special authorisation is obtained
 - ICAO indicator **P**
- **Restricted Area:** Restricted or limited for certain operations or aircraft except if special authorisation is obtained. Special rules can be installed
 - ICAO indicator **R**
- **Danger Area:** Dangerous for air safety, access possible with permission or at own risk or special rules
 - ICAO indicator **D**

Avoidance of Collisions

- The remote pilot or his observer must ensure a good look out to detect other potential airspace users in order to avoid collisions, regardless of the type of flight, flight conditions or airspace class
- Possible collisions include not only unmanned and manned but between to RPAS in a VLOS environment

Proximity

- An aircraft is not to be operated so close to another aircraft so as to create a collision hazard
- This means that a pilot performing a flight near another RPAS operator should coordinate with the PCI of the other system

Right of Way

- Right of way means the right to proceed without alteration of course.
- The aircraft that has the right of way is required to maintain its heading and speed, and observe the other aircraft while the risk of collision exists
- PIC encountering another aircraft should obey the right of way

Giving Way

- Any aircraft that is obliged to keep out of the way of another aircraft must not pass over or under, or in front of that aircraft, unless it is well clear and takes into account the effect of wake turbulence
- This rule is a procedure that makes it clear for RPAS pilots that they should stay away from other RPAS if a sudden movement takes place.

Heads-on Approach

- When two aircraft (or RPAS) are head-on and there is a danger of the risk of collision, both parties should **turn to the right**.
- A PIC or observer should assess the situation properly. Turning to the right could cause a threat if the RPA is not observed by the other airspace user.

Priority, Emergency Landing

- RPAS have **no** priority over any other aircraft type
- An aircraft that is aware that another aircraft is compelled to land shall give way to that aircraft

Visual Flight Rules

- VFR - Visual Flight Rules
 - When weather permits, a pilot can navigate by vision and not using instruments or ATC to maintain separation or collision avoidance.
 - The pilot is mainly responsible for his own separation according to the weather conditions and airspace classification
 - Must have suitable Visual Meteorological Conditions (VMC)
 - Criteria on next slide

ICAO VMC Criteria

Airspace Class	A,B,C,D & E	F	G
	Controlled	Uncontrolled	
		Above 900m (3000ft) AMSL or above 300m (100ft) above terrain, whichever is higher	At and below 900m (3000ft) AMSL or 300m (1000ft) above terrain, whichever is higher
Distance	1500m horizontally 300m (1000ft) vertically		Clear of clouds and in sight of the surface
Flight visibility	5km below 10000ft AMSL		5km

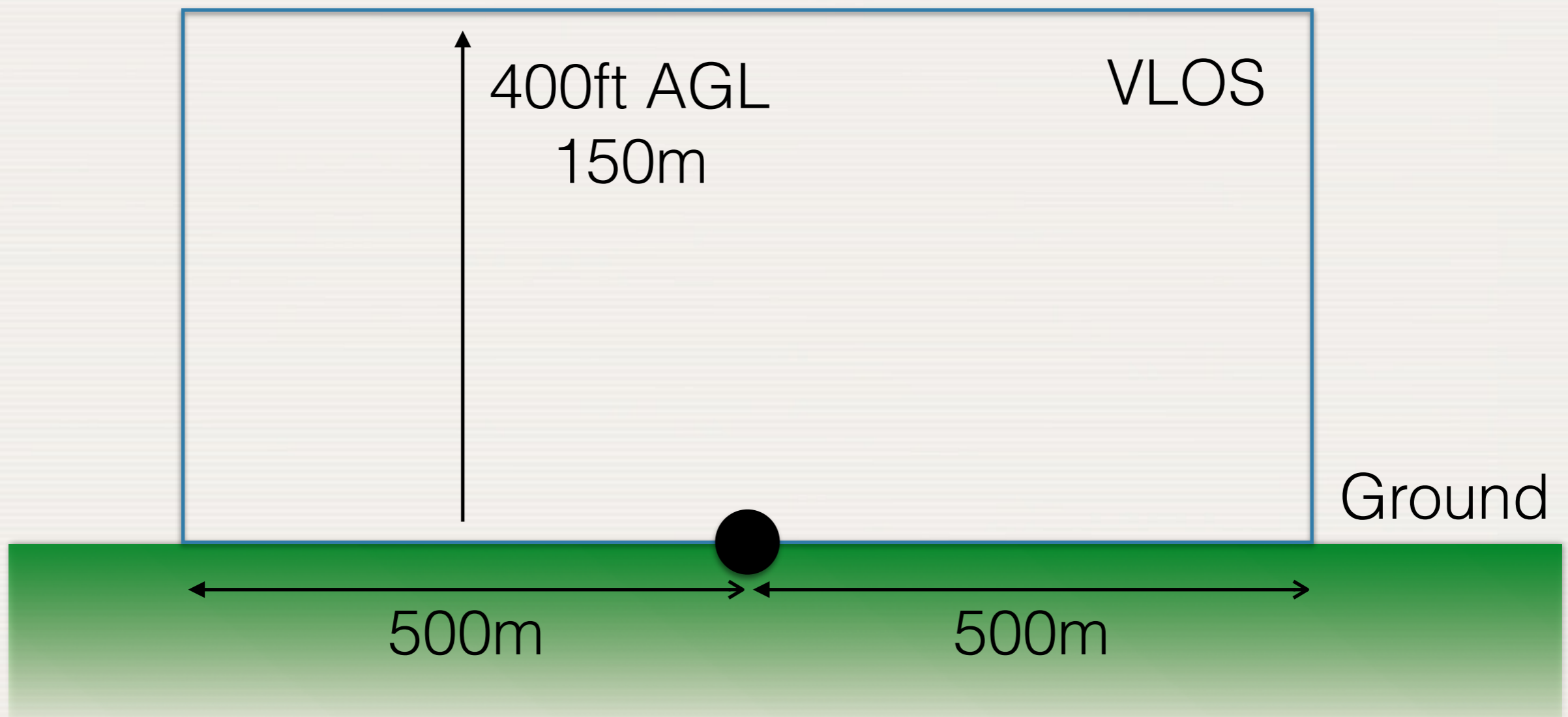
Minimum Heights (this is why the UAV!)

- No VFR when:
 - over congested areas of cities or assembly of persons at a height of less than 300m above the highest obstacle within a radius of 600m of the aircraft
 - Elsewhere at a height less than 150m above ground or water
- These minimums DO NOT APPLY to RPAS

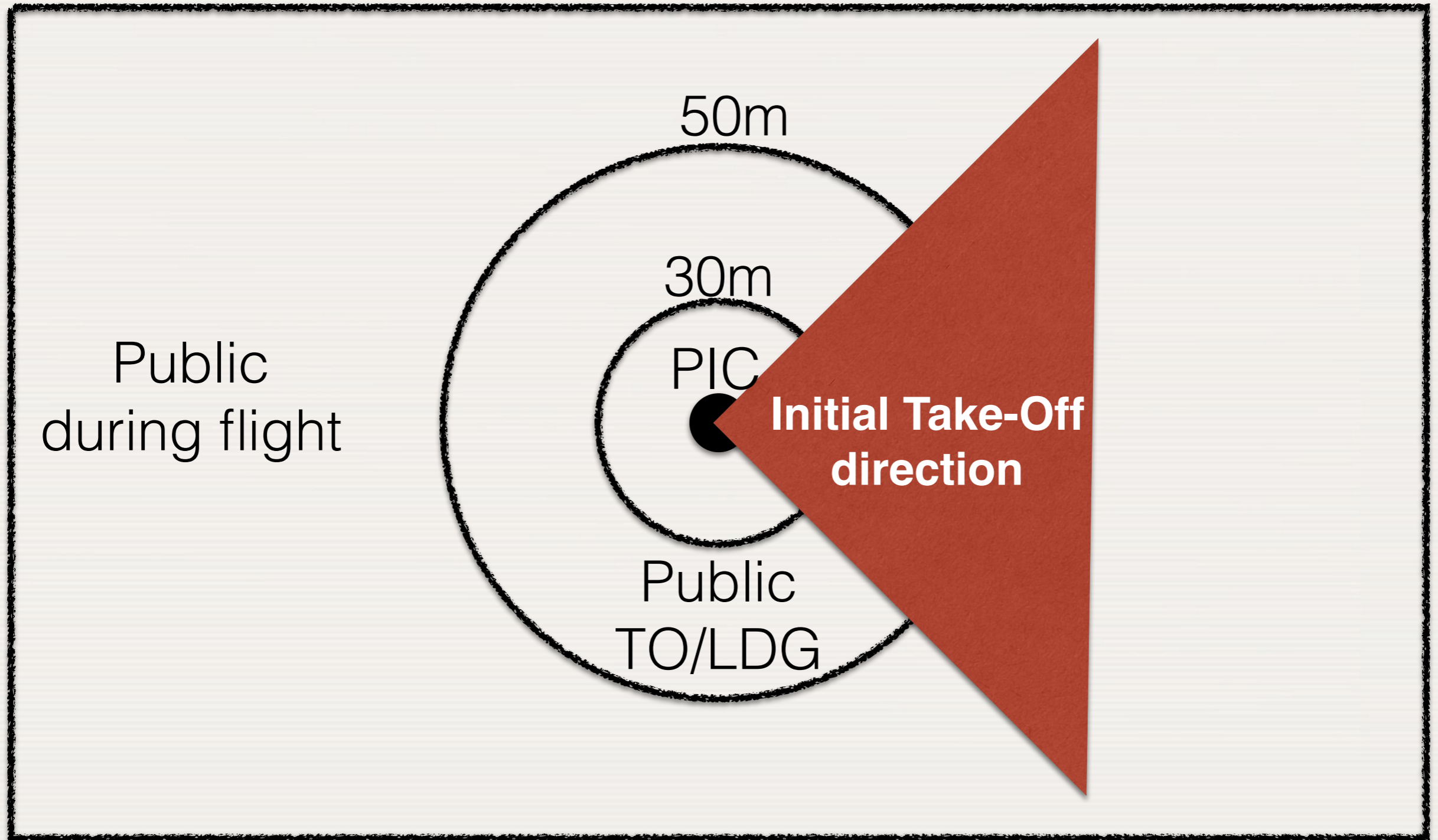
VLOS - Visual Line of Sight

- RPAS being flown visually
- Visual contact with aircraft
- Lookout for other users
- 40+ years of model aircraft flyers
- Introduction of the “bubble”
 - Lateral and height limitations

The Bubble



Operational Area



Notice To Airman NOTAM

- A Notice To Airman NOTAM contains significant permanent or temporary changes, possibly of a long duration, but at short notice
- e.g. Parajumping area
- e.g. Special RPAS zone

END of AIR LAW



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