

## Drones- Threat and Error Management (D-TEM)

## The Threat

The term “drone” is widely used to describe a multi blade unit capable of flight which may be a threat to aviation, however this is like saying all “birds” are a threat to aviation which over the years has led to the industry accepting that some “birds” are a greater threat than others. The aviation industry does not have the resource and would be unable to effectively police the ban on all “drone flight” and therefore needs to target its resources.

### Categorising the threat

#### Category 1- Drones flown by a controller using line of sight control



**Toy Drones;** these are 4-5 blade battery powered units capable of flight inside a house or back garden with a range of up to 150m weighing less than 50 grams. They are widely available on the internet and come complete with controller ready to fly.

They are a low threat because

- Operational range limits altitude
- Construction and weight limits potential collision damage

They do have the benefit of being easy to fly and encouraging people into the joy of flight.



**Intermediate Drones;** these are 4-8 blade battery powered units capable of flights of 20 minutes duration with a range of 1000m and weigh up to 750 grams. They are widely available on the internet and come complete with controller ready to fly.

They are a very high threat because

- Operational range allows conflict with aircraft
- Construction and weight will cause potential collision damage
- Purchasers often have no knowledge of aviation



**Professional Drones;** these are 4-8 blade battery powered units capable of flights of 30 minutes duration with a range of 2000m and weigh up to 1500 grams. They are widely available on the internet and come complete with controller ready to fly.

They are a medium threat because

- Operational range allows conflict with aircraft
- Construction and weight will cause potential collision damage
- Purchasers usually have knowledge of aviation and the cost of the unit encourages the users to seek help and training



**Racing Drones;** these are 4-8 blade battery powered units capable of flights of 10 minutes duration with a range of 1000m and weigh up to 300 grams. They are widely available on the internet and come complete with controller ready to fly.

They are medium threat because

- Operational range allows conflict with aircraft
- Construction and speed (in excess of 80km/hr will cause potential collision damage)
- Purchasers have knowledge of aviation and the cost of the unit encourages the users to seek help and training. They are generally flown on courses at organised events.



### **Category 2- Drones/Model aeroplanes flown by a controller using first person view (FPV)**



Nearly all drones and model aircraft can be converted to first person view. This is where the flyer operates the model using the traditional two stick remote control however in addition the flyer is either wearing goggles or looking at a screen. The image the flyer is looking at is transmitted from a camera on the model.

#### **FPV Toy Drones;**

They are a low threat because

- Operational range limits altitude
- Construction and weight limits potential collision damage



#### **FPV Intermediate Drones;**

They are an extremely high threat because

- Operational range allows conflict with aircraft
- Construction and weight will cause potential collision damage
- Purchasers often have no knowledge of aviation or the capability of the model
- Often the camera transmission will continue to generate an image after the control range has been exceeded



#### **FPV Professional Drones;**

They are a high threat because

- Operational range allows conflict with aircraft
- Construction and weight will cause potential collision damage
- Purchasers usually have knowledge of aviation and the cost of the unit encourages the users to seek help and training. However the capabilities of the drones are not often fully understood by the flyer



### FPV Racing Drones;

They are medium threat because

- Operational range allows conflict with aircraft
- Construction and speed (in excess of 80km/hr will cause potential
- collision damage
- Purchasers have knowledge of aviation and the cost of the unit encourages the users to seek help and training. They are generally flown on courses at organised events.
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**FPV Model Aircraft;** these are models which have been converted by the flyer to be operated on FPV. They range from foam model training aeroplanes weighing around 700 grams to full gas turbine models weighing 8-10 kilos capable of speeds of 100+ kmph

They are generally made by experienced modellers who convert their models from equipment widely available on the internet

They are a high threat because

- Operational range allows conflict with aircraft
- Construction and speed will cause potential collision damage
- Purchasers generally have knowledge of modelling and mainly fly at British Model Flying Association (BMFA) model flying sites.
- The cost of the model encourages the users to seek help and training.
- The flyer does not fully understand the capabilities of the model fitted with FPV and can easily lose control



## The Error

Apart from Toy drones and FPV toy drones all other categories are a potential threat to aviation if the model flyer doesn't understand the operation of the model and the aviation pilot doesn't understand that apart from a very large models, avoidance is almost impossible in flight.

Model flyers do not always realise how busy the skies are and how easy it is for the model to reach altitudes that can cause conflicts. They also do not understand where and how airspace restrictions operate.

Aviation pilots do not always realise where BMFA model flying sites operate and that "Drones" can be at any place, at any altitude (up to 300 m generally) at any time.

Because of the large numbers of drones and FPV models already sold the holes in the Swiss cheese of an accident are completely lined up and at this stage only the model flyer and the aviation pilot are left to stop an accident.

## Management

Safe drone operation requires all users of the skies to jointly engage in an effective management program. Legislators must encourage Drone and FPV manufacturers to control and educate the purchasers of any other than toy drones. Aviation manufacturers should conduct test to quantify the effects of drones on a collision. Legislators should not be afraid to take action against rouge drone distributors who should be held liable in the event of an accident. The threat is clear and present and the following steps are needed

- Aviation Manufacturers to provide data to define the true danger of a collision between an aircraft and a drones of various weights
- Legislation to be written to limit the sale and control of high threat drones and FPV's
- Drone manufacturers to incorporate limitations set by legislation into the equipment
- Drone and FPV Distributors to educate purchasers in training requirements and availability
- Mandatory training of high threat drone and FPV flyers
- A network of training centres, possibly industry wide sponsored, where standardised training can be given
- The plethora of various existing drone qualifications be amalgamated into a cohesive, standardised, workable training course designed by individuals from all areas of model and aviation industry.

Some areas of the management of the skies are being reviewed however to protect BEA aviation pilots and LHC flyers in the meantime the following steps should be taken.

BEA aviation Pilots.

- Be aware drones are difficult to see. They are the greatest threat up to and including circuit height. Keep a good look out and be prepared to take avoiding action, a turn will give the quickest aircraft movement and avoid impact into the windshield. Report any conflict via SMS immediately.
- Look on the BMFA website <https://bmfa.org/Clubs/Find-a-Club> to see if any clubs are on your route. Do not fly low level over any model site.
- A lot of uncontrolled drone flights happen over events. If you see an event on the ground make sure you have sufficient height to overfly or fly around the event.
- Operating at an airfield out of hours now has the increased risk of uncontrolled drones.
- Drop into LHC, <http://www.lhcmmodelshop.co.uk/> and speak to the manager about drones and ask for a demonstration. Encourage your students and owners to do likewise.
- Take advantage of educating drone owners you come in contact with about the difficulties you face in trying to see and avoid uncontrolled drones
- Take part and encourage clubs, schools or societies to hold meetings and talks on drone operations



#### LHC Flyers

- LHC is unable to supply anything other than toy drones unless the purchaser has received a briefing from our shop manager.
- All drones operated at LHC must be in line of site at all times and not be flown above 100m high.
- All drone racing to be conducted on the designated racing area
- All drone flyers are encouraged to go and talk to BEA pilots at any of the 6 bases across the UK at <http://www.heliair.com/>
- Carefully read and follow the safety information provided with your drone