EASA
European Aviation Safety Agency

EASA Task Force
Drone Collision with manned Aircraft

Stakeholder workshop

June 20, 2016
Eric DUVIVIER

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Press Releases

04 MAY 2016

EASA creates task force to assess the risk of collision between drones and aircraft

- *Review all relevant occurrences*
- *Analyse the existing studies*
- *Study the vulnerabilities of aircraft*

At the end of July, it will publish its results and will organise a workshop with stakeholders

OBJECTIVES

- Assessment to focus on the **current situation in terms of threat and existing mitigation means**
- Determine if any conclusions can be already drawn
- Provide meaningful recommendations for further research needed to address the issue.

No or limited time to do additional research or detailed technical assessment

Task Force Composition

- Manageable and Efficient working group,
  - the number of participants in the TF has been kept to a small number
- The TF includes EASA experts & EU A/C Industry representatives to cover:
  - Aeroplanes & Rotorcraft
  - Engines & Propellers

But the TF will consult!

Overall Approach

- Part of a global Safety Risks Management process:

Hazards identification

- Severity

Task Force Work

Risks assessment

- Severity vs likelihood

Decision-making

- Actions to mitigate the risks

Overall Approach

No Drone Zone

level/altitude restrictions

Visual Line Of Sight

Design limitations

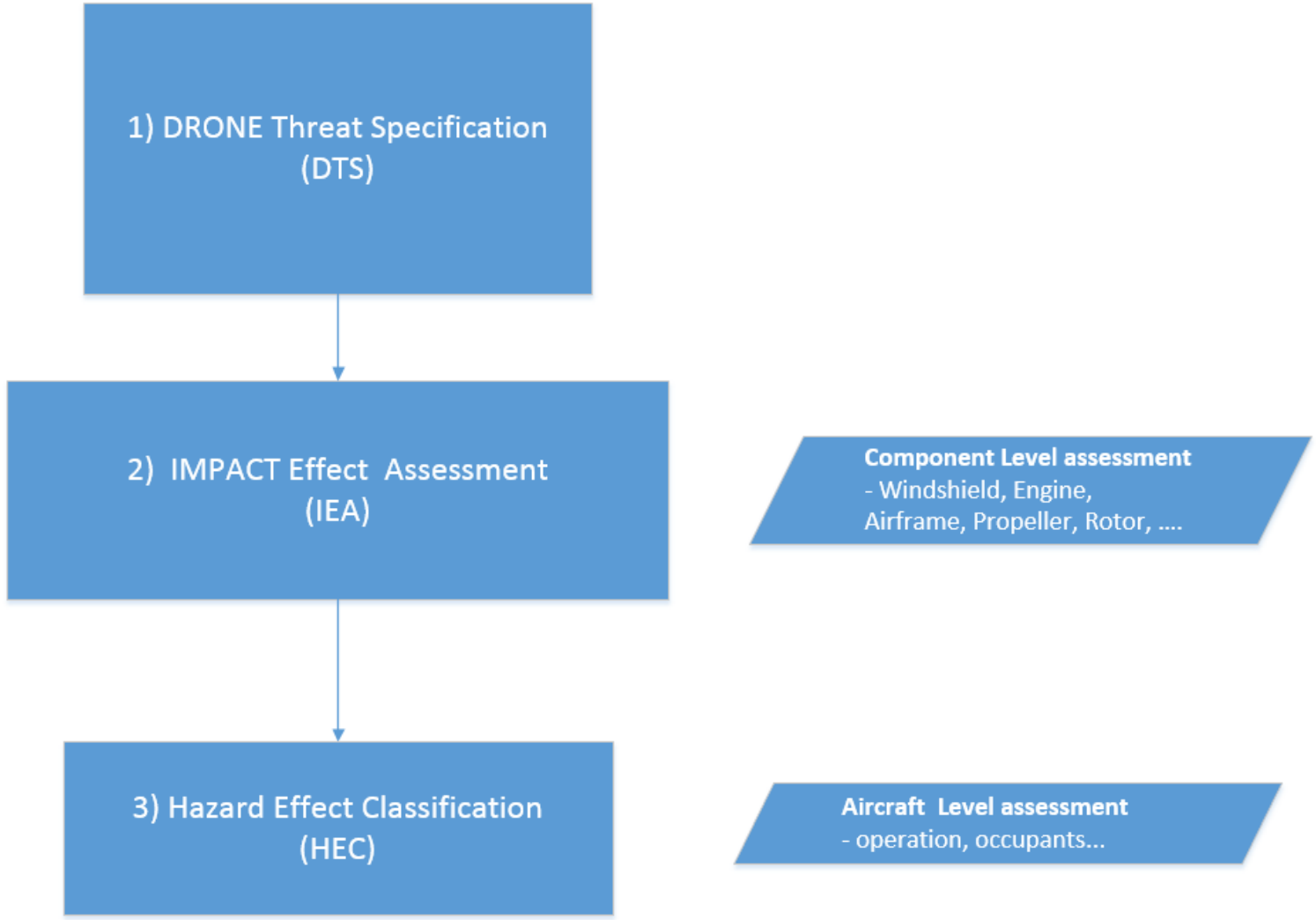
(geo fencing, altitude, weight…)

drone pilot training / education

Collision

For us PROBABILTY of IMPACT = 1 !

Overall Approach



Drone Threat

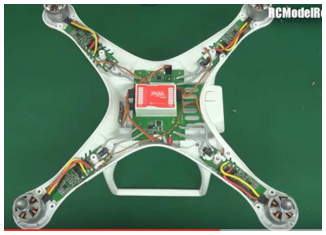
- OPEN CATEGORY only (<25 kg)
- Drone Threat Modelization : Simplified
  - **Mass-market** study and
  - **Key Critical Component** concept
- Validation of the assumptions: Limited
  - **In-service events data**
  - **Published Research & Studies**

Drone Threat

Essential parameters considered:

- **Frangibility**
  - tendency of the drone to break up into fragments
- **Kinetic Energy** involved in the impact
- **Penetration** capability of some components

Drone Threat



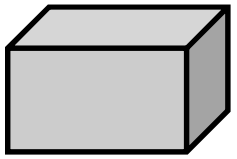
Frangible,

Low density Body

Weight & Volume of the Complete Drone

Less frangible, ductile, Medium Density Elements

Battery, Camera,



Stiff & Sharp, not frangible

High Density Elements

Motor

Impact Effect Assessment (Component)

- Limited Zones of impact
  - Single and Front Impact (except side impact for Tail Rotor)
  - No secondary Impact
  - Most Critical Areas

Retained	Not Retained
Windshields Nose Areas leading edges (including slats) trailing edges (flaps) Engines (excluding reciprocating engines) Main and Tail Rotors Propellers Landing gears & landing gear doors ….	Fuselage and windows (side impact only considered for Tail rotor) Reciprocating engines Transmission (main and tail rotor) APU and ECS Air Intakes Ailerons, rudders, elevators and spoilers External probes, small antennas, wipers Hoist …..

Impact Effect Assessment (Component)

- Estimation of Effects @ Component Level: Drone Threat against:
  - Specific Threats assessed in Certification (Bird, Ice, Hail)
  - Other Certification & Industry Design Standards
  - Existing Research conclusions
  - In-service collision data

Components	Requirement	Title	Threat Category	Threat Specification	A/C Conditions	Pass/Fail Criteria
CS23 Commuter						
Windshield	CS 23.775(h)	Windshields and Windows	Bird	Bird 0.91 kg (2 lbs)	VFE	continued safe flight and landing,
CS23 High Performance and Jets						
Windshield	By Special Condition CRI typically	Windshields and Windows	Bird	Bird 0.91 kg (2 lbs) Tested on W Screen.	VFE	continued safe flight and landing,
Airframe	By Special Condition CRI typically	Bird Strike	Bird	0.91 kg by analysis on A/F critical areas only	Worst Case	continued safe flight and landing,
CS25 Large Aeroplane						
Complete Aeroplane	CS 25.631	Bird strike damage	Bird	4 lbs	VC at sea-level or 0·85 VC at 2438 m (8000 ft),Vc	continued safe flight and landing
Empennage	FAR 25.631	Bird strike damage	Bird	8 lbs	Vc	continued safe flight and landing
Windshield	CS25.773b4	absence of openable windows	Sever Hail	multiple 2 inch ice balls impact (ANSI/ASTM F 320-10)	approach & landing	it is shown that an area of the transparent surface will remain clear sufficient for at least one pilot to land the aeroplane safely in the event

Hazard Effect Classification (A/C)

Hazard Effect Classification at Aircraft level

Hazard Classification	1 (most severe)	2	3	4	5 (least severe)
Effect on A/C	Normally with hull loss	Large reduction in Functional capabilities or safety margins	Significant reduction in Functional capabilities or safety margins	Slight reduction in Functional capabilities or safety margins	No effect on operational capabilities or safety
Effect on Occupants (excluding. Flight Crew)	Multiple fatalities	Serious or fatal injury to a small number of passengers or cabin crew	Physical distress, possibly including injuries	Physical discomfort	Inconvenience
Effect on Flight Crew	Fatalities or incapacitation	Physical distress or excessive workload impairs ability to perform tasks	Physical discomfort or a significant increase in workload	Slight increase in workload	No effect on flight crew
Effect on Operations	Total loss of separation. Total loss of control, mid-air collision, flight into terrain or high speed surface movement collision.	Large reduction in separation or a total loss of air traffic control for a significant period of time	Significant reduction in separation or significant reduction in air traffic control capability.	Slight reduction in separation or slight reduction in air traffic control capability. Significant increase in air traffic controller workload.	Slight increase in air traffic controller workload.

Questionnaire

- Detailed and self explanatory
- Will be sent today!
  - Aircraft Industry: For ACTION
    - EU, US, Canada and Brazil (~60)
  - NAA, FAA, TCCA: For INFO
  - OTHERS (Operators, Drone Industry, Associations): For INFO
    - Only when interest has been expressed.
- Very short deadline: Responses by July 3!

EASA
European Aviation Safety Agency

Need more Information of Clarifications? Please contact us:

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Thank You

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Drone Threat

Drone Class	Threat Type	Element	Weight (g)	Density (kg/m3)	Dimensions (mm) / Typical Shape	Quantity	Max speed (m/s)	Zd-max (m)	Zd-lim (m)
Large	Tl	Drone	3500	-	450x450xx301	-	20	5000	500
	Tm	Battery	670	2000	Parallelepiped	1			
	Th	Motor	106	4000	Cylinder	4			
Medium	Tl	Drone	1500	-	290x196x290	-	20	5000	500
	Tm	Battery	462	2000	Parallelepiped	1			
	Th	Motor	56	4000	Cylinder	4			
Small	Tl	Drone	500	-	328x382x89	-	18	1000	150
	Tm	Battery	130	2000	Parallelepiped	1			
	Th	Motor	15	4000	Cylinder	4			
Harmless	Tl	Drone	250	-	200x200x140	-	18	1000	150
	Tm	Battery	65	2000	Parallelepiped	1			
	Th	Motor	7.5	4000	Cylinder	4			