

UAV SAFETY OBJECTIVES & WEIGHT CATEGORIES

**UAV2002
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Report Documentation Page

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NAVDROC

- **NAVDROC**

Study to check "pertinence" of each JAR VLA, 23 & VLR paragraph for UAV application
EuroUVS was in charge of the NAVDROC study with the following subcontractors :

Dassault-Aviation	JAR 23
SAGEM	JAR VLA
THALES	JAR VLR

- **NAVDROC CONCLUSIONS & RECOMMENDATIONS**

UAV SAFETY OBJECTIVES & WEIGHT LIMITATIONS

ADAPTATION OF "JAR OPS" TO UAV

GROUND STATION & COMMUNICATIONS

UAV INSERTION IN THE FUTURE ATM

JAR LUAV & UAV REGULATIONS

UAV SAFETY OBJECTIVES & WEIGHT LIMITATIONS

- **NAVDROC DISCUSSION**

- Difficulty to write some "regulation paragraphs" due to the lack of UAV safety objectives
- Need for a UAV "AC FAR 23-1309-1C" (oriented to protect on ground people)
- Weight limits of JAR regulations are not adapted to UAV
- UAV safety objectives must provide a protection consistent with the protection provided by the civil or military aircraft.

- **ON GROUND CRASH VICTIMS**

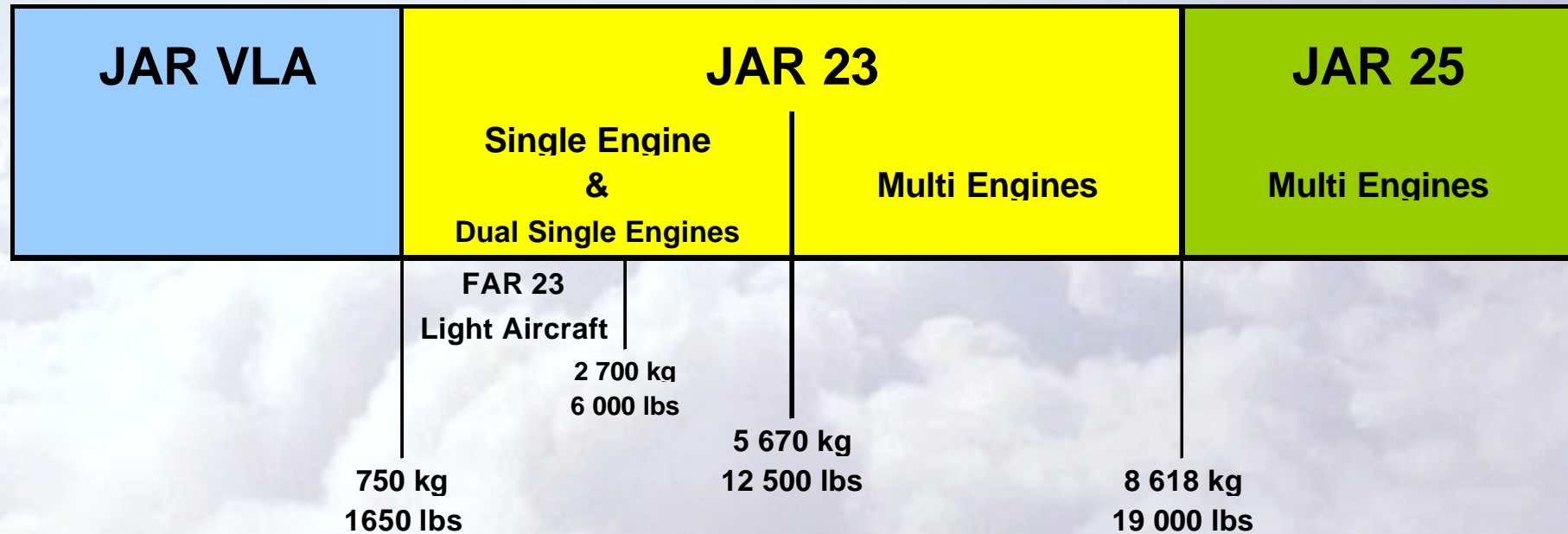
- Determination of lethal surface
- Experience of civil and military aircraft crashes

- **WEIGHT LIMITS**

- Determination of weight limits for each certification category

CIVIL REGULATIONS

CIVIL AIRCRAFT JAR / FAR REGULATIONS



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CIVIL AIRCRAFT

AIRCRAFT CATEGORIES	Catastrophic failure	Aircraft loss	
		Technical	Statistics
FAR 25 Aircraft	1E-09	1E-07	3E-07
FAR 23 Commuters	1E-09	1E-07	1E-06
FAR 23 >6000 lbs reciprocating	1E-08	1E-06	5E-06
FAR 23 <6000lbs turbine	1E-07	1E-06	1E-05
FAR 23 <6000lbs reciprocating	1E-06	5E-06	2E-05
Military Aircraft	1E-07	1E-05	5E-05

FAR 23 AC23-1309-1C

UAV VERSUS JAR 23 AIRCRAFT

Fatal Crash Probability one victim per million of flight hours

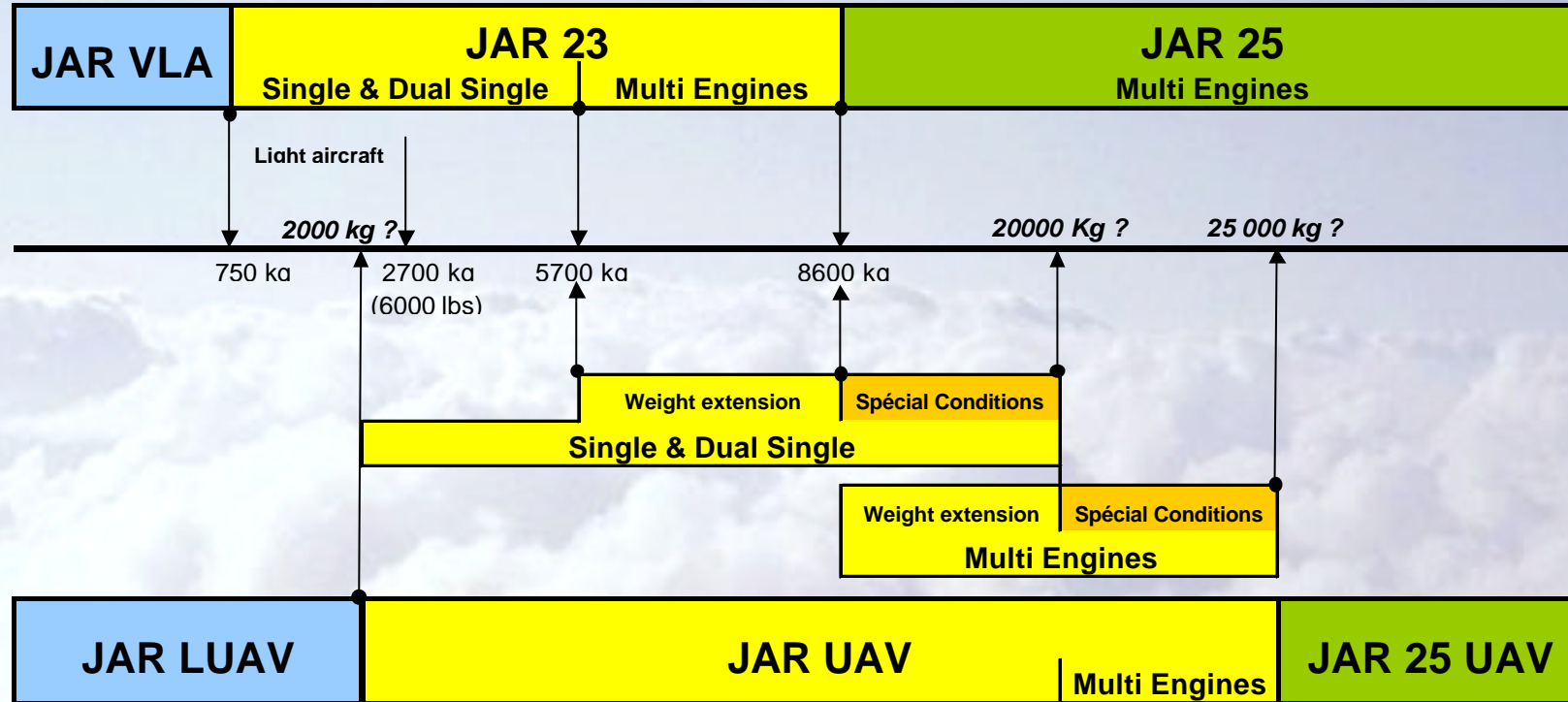
Category	Weight kg	W/S kg/m ²	Lethal S. m ²	Crash Victims	Crash Prob	FAR JAR 23 Equivalent Aircraft
UCAV	25000	400	1293	0,2586	4,E-06	1,E-06 FAR 23 Commuter
HALE	20000	200	702	0,1404	7,E-06	5,E-06 FAR 23 Single engine
HALE	8600	200	400	0,0800	1,E-05	1,E-05 FAR 23 < 6000 lbs turbine
MALE	5700	100	192	0,0383	3,E-05	2,E-05 FAR 23 < 6000 lbs reciprocating

population density corresponding to two times France population density

Figures are for information only

WEIGHT LIMIT TARGET

CIVIL AIRCRAFT REGULATIONS



UAV REGULATIONS

Figures are for information only

JAR UAV CATEGORIES



	2 000 kg to 5 700 kg	5 700 kg to 8 600 kg	8 600 kg to 20 000 kg	20 000 kg to 25 000 kg	> 25 000 kg
Uncontrolled Crash	2E-05	1E-05	5E-06	1E-06	3E-07
Global technical failure	5E-06	1E-06	1E-06	1E-07	1E-07
Catastrophic Failure	1E-06	1E-07	1E-08	1E-09	1E-09

Figures are for information only

PURPOSES OF THE NEW STUDY

- **DEFINE SAFETY OBJECTIVES**

- Enough conservative to provide protection to on ground people
- Not too much conservative to allow UAV development
- Consistent with civil & military aircraft safety objectives
- Might be a function of population density (operational limitations)

- **DETERMINE WEIGHT LIMITS OF UAV CATEGORIES**

- JAR LUAV

- JAR UAV

- Single Engine

- Multi Engines