



**THE PAN
EUROPEAN
APPROACH**

**LIGHT UAS :
The European Approach**

By Peter van Blyenburgh



Interim WG on Light UAS

Instigated by UVS International

**THE PAN
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22 Participants

- **Austrocontrol, Austria**
- **CAA, Belgium**
- **CGArm, France**
- **EADS DS, France**
- **Gates Technology, France**
- **Honeywell, Czech Rep.**
- **IVW (CAA), Netherlands**
- **Nimbus, Italy**
- **SurveyCopter, France**
- **University of Ljubljana, Slovenia**
- **West Wales UAV Centre, UK**
- **Barnard Microsystems, UK**
- **CAA, UK**
- **CybAero, Sweden**
- **European Air Sports Assn.**
- **Ghent University, Belgium**
- **HighEye, Netherlands**
- **LFV (CAA), Sweden**
- **Novadem, France**
- **UAS Consulting & Services, France**
- **UVS International**
- **Eurocontrol**

2 Observers

- **FAA, USA**

- **RTCA SC203, USA**

4 One day meetings

Start: Sept 2007

End: Jan 2008



Objectives

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Undertake initial work for EUROCAE WG73 in order to make it possible to effectively tackle the elaboration of proposed standards for Light UAS (<150kg).

Prepare a guidance document for EUROCAE WG73 on how to accomplish the aforementioned taking into account the financial & time & personnel limitations of the small and medium-sized industry & enterprises (SMI & SME) that constitute the backbone of the small UAS community.

- Review the Joint JAA/Eurocontrol UAS Task Force Final Report;
- Identify & group the currently existing regulatory documents;
- Produce a list of required Terms & Definitions;
- Identify the regulatory work re SUAS currently ongoing in Europe;
- Describe the current European market situation re SUAS for all applications;
- Identify the relevant European stakeholders;
- Propose a basic document describing the best way forward;
- Propose an initial work plan.

IWGLUAS ceased to exist after it delivered its recommendations in Feb 2008 and

IWGLUAS participants

Become

WG73 SG4 LUAS participants



International UAS Activity

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974 Systems - 369 Producers - 57 Countries

Algeria	★			
Argentina	★	■	■	
Australia	★	■	■	
Austria		■	■	
Bahrain	★			
Belgium	★	■	■	
Botswana	★			
Brazil			■	■
Bulgaria	★	■		
Canada	★	■	■	
Chile		■	■	
China (PR)	★	■	■	
Colombia	★		■	■
Croatia			■	■
Czech Rep.	★	■	■	
Egypt	★			
Equator		■	■	
Finland	★	■	■	
France	★	■	■	

Germany	★	■	■	
Greece	★	■	■	
Hungary	★	■	■	
India	★	■	■	
Indonesia	★		■	■
Iran	★	■	■	
Israel	★	■	■	
Italy	★	■	■	
Japan	★	■	■	
Jordan	★	■	■	
Malaysia	★	■	■	
Mexico	★	■	■	
Netherlands	★	■	■	
New Zealand		■	■	
Norway		■	■	
Pakistan	★	■	■	
Poland	★	■	■	
Portugal			■	■
Qatar	★			

Romania	★	■	■	
Russia	★	■	■	
Serbia			■	■
Singapore	★	■	■	
Slovenia		■	■	
South Africa	★	■	■	
South Korea	★	■	■	
Spain	★	■	■	
Sri Lanka	★			
Sweden	★	■	■	
Switzerland	★	■	■	
Syria	★			
Taiwan	★	■	■	
Thailand	★		■	■
Turkey	★	■	■	
UAE	★		■	■
UK	★	■	■	
Ukraine	★	■	■	
USA	★	■	■	

★ = UAS in Inventory

■ = Producing Countries

■ = Ongoing R&D

■ = Future Producers?

World total 47

World total 42

World total 49

World total 8

Europe 16

Europe 22

Europe 21

Europe 3

LUAS = 88/113 Producers in Europe

Austria	Schiebel	Germany	EADS Deutschland	Serbia	EMA
Belgium	FlyingCam		EMT	Slovenia	Utva Aircraft Ind.
	Gatewing		Imar Navigation		AvioTech
	Verhaert		Mavionics	Spain	C-Astral
	VITO		MicroDrones		Aerovision
Bulgaria	Aviotechnica		Rhienmetall DE		Airview
Croatia	Defence Res. Est.		SIM Security		Aitem
	Soko		UAV S&S		EADS
Czech Rep.	VTUL à Pvo	Greece	EADS 3 Sigma		INTA
Finland	Patria	Hungary	HI Aero		SRC
France	ABS AeroLight	Italy	A2Tech	Sweden	UAV Navigation
	Aeroart		Aermatica		CybAero
	Aerodrones		Alenia Aeronautica		Saab
	Alcore Ind.		CIRA	Switzerland	SmartPlanes
	Bertin Ind.		Internat.Aviation Supply		Aeromedia
	Dassault Aviation		Nautilus		Aeroscout
	EADS DS		Nimbus		Skive Aviation
	ECT Industries		Selex Galileo		MiniZepp
	Euro MC		UTRI		RUAG Aerospac
	Flying Robots	Netherlands	Dutch Space		SwissCopter
	Gates Techno.		E-Producties	UK	Swiss UAV
	Infotron		HighEye		Autonomous Vehicles
	KYU Microdrones		UAV Europe		BAE Systems
	Novadem	Norway	CE Stephanson		CyberFlight
	Onéra		ET-Air		Dragonfly Air Syst.
	PixAir		Norut IT		FanWing
	PolyAvionics		ProxFlyer		GFS Projects
	PR Automation		Scandicraft		Kestrel Aerospace
	PY Design		Simicon		Lindstrand Techn.
	Sagem	Poland	AF Inst.of Techn.		MagSurvey
	Sirehna		Res.&Devlp Centre		Meggitt
	SurveyCopter		WB Electronics		Merlin ISC
	Technisolar	Portugal	Uni. Of Porto		QinetiQ
	Vertivision		Minho		Roke Manor
Germany	AirRobots	Romania	Centrul de Invetica		Selex S&AS
	Diehl BGT Def.		Electromecanica		SkyShips
					Tasuma
					Thales
					U-Tacs
					VTOL Technologies
					Warrior



Quantity of UAS Models Produced in Europe

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	LUAS	UAS	Total		LUAS	UAS	Total
Austria		2	2	Netherlands	6	1	7
Belgium	1		1	Norway	5	2	7
Bulgaria	1		1	Poland	4		4
Croatia		3	3	Portugal	2	1	3
Czech Rep		1	1	Romania	1	1	2
Finland	1		1	Serbia	3	1	4
France	34	22	56	Slovenia	4	1	5
Germany	22	9	31	Spain	8	3	11
Greece		1	1	Sweden	1	3	4
Hungary	1		1	Switzerland	8	2	9
Italy	11	9	19	UK	30	15	45

European Total	Light UAS	143
	UAS	77



WHAT SHOULD BE DONE ?

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LIGHT UAS in EUROPE

Should be the Nr 1 Priority

They are here NOW

- ◆ INDUSTRY (Products & Services) = PRINCIPALLY SMIs & SMEs
- ◆ **Traditionally not recognized UAS stakeholders (commercial RC & model aircraft communities) should be involved**
- ◆ **European CAAs should agree on a common approach (JARUS)**
- ◆ National approaches with co-operation between:
 - **Industry (producers & services)** - **CAAs** - **Air Nav. Service Suppliers**
 - **Government Authorities** - **Academia** - **Stakeholder Organizations**
- ◆ National associations & Working Groups & Centres of Competence **to be used to organize national inputs**
- ◆ **EUROCAE should federate players around a common approach (SG4)**
- ◆ **A common terminology in English should be defined**
- ◆ **Minimize travel & out-of-country meetings**



Model Aircraft

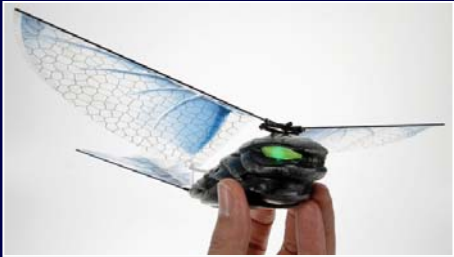
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Recreational Purposes

Important Stakeholder

Toys

Model Aircraft (<20-25 kg & >20/25 & <150kg)



Very Large Model Aircraft (> 150 kg)



LIGHT UAS in EUROPE

- ◆ **Matrix regarding** European rules & regulations for model aircraft
 - ◆ Review of the Joint JAA/Eurocontrol UAS TF Final report
 - ◆ On-line library of regulatory docs = www.uvs-info.com
 - ◆ List of current & potential applications
 - ◆ **Identification of the European stakeholders:**
 - **Industry (products & services)** - **CAAs** - **Air Nav. Service Suppliers**
 - **Government Authorities** - **Academia** - **Stakeholder Organizations**
 - ◆ **List of agreed Terms & Definitions**
 - ◆ **Light UAS segmentation, phased approach and definition of the initial work to be undertaken**
-
- ◆ **Proposal to use a “sanitized” version of UK CAA’s CAP722 as the baseline document around which to bring the European CAAs together with the intent to start work towards a harmonized approach.**



Potential Governmental Non-Military UAS Applications

Customs Authorities

Coastal patrol
On-shore border patrol
EU maritime surveillance
EU on-shore border patrol

Civil Security

Avalanche survivor search
Coastal water surveillance
Maritime search & rescue
EU Civil Security
Maritime surveillance

Regional Fire Brigade

Forest fire surveillance
National Fire Brigade
Forest fire surveillance
Natural disaster monitoring

Civil Security & National Police

Contamination measurement
Systematic search ops
Natural disaster monitoring
Emergency medical/food supply

Police Authorities

Information gathering (in buildings)
Special ops, anti-terrorist
Urban law enforcement
Pre-intervention info gathering
Urban riot control
Perimeter defence
Hostile protest control
Criminal investigation (several days)
Surveillance of public gatherings
Road traffic surveillance
Delivery of non-lethal disabling means
Coastal border immigration control
Ship lane surveillance
Permanent police surveillance
Land border immigration control
Maritime immigration control
EU land border immigration control

Environmental

Local science missions
Atmospheric measurements
Wild game surveillance
Fishery control
Ozone measurements
Weather assessment
Crop monitoring
Sandbank shift measurement
Glacier & ice cap monitoring

Contractor Supplied Flight Services

Training
Terrain mapping
Aerial photography
Monument inspection
Network comms relay
(small theatre)
Network comms relay
(large theatre)
Emergency comms
network

The seeds of a totally
new service industry ?



USEP Study

Security & Environmental UAS Applications

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Detailed generic application scenarios defined in discussions with potential EU non-military government users

Governmental non-military applications	
- Customs Authorities	4
- Police Authorities	18
- Civil Security	9
- Environmental	9
- Flight Services (supplied by civil flight service providing companies)	7
Total of Scenarios	47

**Light
UAS**

0
9
3
7
4
23

For USEP report & scenarios see: 2007 UAS Yearbook & www.uvs-info.com



Current UAS Applications

Scientific Applications

- Climate monitoring
- Marine mammal monitoring
- Cryospheric research (Arctic/Antarctic)
- Glacier & ice cap monitoring
- Iceberg surveillance & tracking
- Atmospheric chemistry measurements
- Atmospheric radiation measurements
- Open ocean research support
- Land/forestry research
- Ice pack patrol
- Plant growth vigour mapping
- Salt water infiltration detection
- Crop monitoring
- Volcano monitoring
- Aerial pollution monitoring
- Aerial photogrammetry
- Coastal zone studies
- Coastal mapping
- Vegetation identification
- Invasive species identification & analysis
- Wildlife census
- Thermal building imaging (heat wastage)

Security Related Applications

- Border surveillance (IL, USA)
- International summit surveillance (CA, FR)
- Road traffic surveillance (CH)
- Sea lane surveillance (BE)
- Regional surveillance (IL-Gaza & Occupied Terr.)
- Aerial crowd surveillance (CH, CN, ZA)
- Forest fire surveillance (HU, USA)
- Natural disaster site surveillance (CN, IN)
- Experimentation (AT, AU, BE, CA, CH, CN, CZ, ES, FR, DE, ES, IT, MY, NL, SG, PT, SE, SI, ZA, UK)

Contractor Supplied Flight Services

- Operational (flight) training
- Terrain mapping
- Agricultural insecticide spraying
- Agricultural fertilizer dispensing
- Crop monitoring
- Critical infrastructure inspection
- Historical monument inspection
- Magnetic field survey
- Survey of drilling sites for oil & gas industry
- Oil & gas pipeline monitoring
- Forest fire operations support
- Aerial mineral exploration
- Aerial photography & video
- Cinematographic aerial shots & special effects
- Advertising (light-than-air UAS)(indoor & outdoor)



EUROPEAN STAKEHOLDERS

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Civilian Orgs

- GD Enterprise
- GD TREN
- GD Research
- EASA
- EUROCONTROL
- JAA

Multi-Nat. Orgs

- AEA
- CANSO
- EARTO
- ERA
- EREA
- EUGIN
- Eurocockpit Assn
- Euro Air Sport Assn
- IATA
- IFALPA
- IFATCA
- IOPA
- SESAR ExecCom
- SESAR J.U.

Military Orgs

- EDA – Euro. Defence Agency
- EMAAG - Euro Military Aviation Authorities Group
- JMAG - Joint Military Airworthiness Group
- NATO:
 - FINAS (USAR)
 - JCG UAV
 - JAPCC
 - NATMC
- OCCAR

Existing Multi-National Tech. Platforms

- ACARE
- ERTRAC
- EUROP

National Orgs

- Min. of Transport
- Min. of Interior
- Min. of Defence
- Air Navigation Service Providers
- CAAs
- Model A/C Assns
- Technology Platforms
 - ASTRAEA, UK
 - NIMUP, Netherlands
 - Pégase, France
 - PLATINO, Spain

Industry

20 out of 27 Countries

Prof. Orgs & WGs

- ASD
- EUROCAE WG73
- (Multi)-National WGs
 - UAV DACH
 - UAV Germany, DE
 - former Castor, Sweden
- National Assns:
 - AVBS, Czech Rep.
 - PEMA UAV, Portugal
 - UAVS, UK
 - UAS Norway
 - UVS France
 - Ass. of Aerospace Universities, UK

Research

- Competence poles & Centres of excellence
- Academia



EUROPEAN INSTITUTIONAL UAS-RELATED ACTIVITIES

ACADEMIC

NATIONAL:

- Belgium
- Bulgaria
- Czech Rep.
- France
- Germany
- Greece
- Italy
- Netherlands
- Poland
- Portugal
- Romania
- Slovenia
- Spain
- Sweden
- Switzerland
- UK

MULTI-NATIONAL

NATIONAL

Austria	CAA & Min. of Interior
Czech Rep	Min. of Transport & CAA
Finland	- FDF & CAA - Artic Test Range
France	- DGA-CEV - USAR-FW - USAR-VTOL - DGA (MoD) UAV-REG - DGAC (CAA) NAVDROC - Min. of Interior - Pégase
Germany	- BWB-WTD - DFS - Min. of Transport - UAV DACH - UAV Germany NTP
Italy	- DGAA & ENAC
Netherlds	- CAA - NIMUP NTP - RNLAF
Norway	UVS Norway
Slovenia	Uni. Of Ljubljana
Spain	PLATINO NTP
Sweden	- FMV & CAA UAV Vision - Saab & LFV Castor
Switzerl.	- CAA & Swiss AF - Min. of Interior
UK	- ASTRAEA NTP - CAA-DAP CAP722 - DoT & NATS - Min. of Interior - MoD-DPA - ParcAberporth - RAF UAV Battle Lab - UAVS Association

MULTI-NATIONAL

ASD	ASG - UAV WG
CANSO	UAV WG
EARTO	
EASA	A.NPA
EC-DGTREN	INOUI Programme
EC-DGEnter	Market Study
ECAP	Certification Group
EDA	- C&C + S&A studies - Staff rqmt study - UAS Roadmap
EMAAG	
EUROCAE	WG-73 on UAS
Eurocontrol	- ANT - UAV-OAT TF
Eurocontrol	Experimental Centre
ICAO	Formal WG on UAS
IWGSUAS	
JAA/Eurcontrol	UAV TF
JMAG (now includes ETAP)	
NATO	- AG7 FINAS - FINAS-USAR-ST - JAPCC - NATMC - RTO
SESTAR	
USEP	Security & Environt

NTP = National Techn. Platform



JARUS

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Joint Authorities for Rulemaking on UAS

International coordination group initiated & chaired by CAA The Netherlands

Objective

Definition of a common and harmonised set of airworthiness, operational and airspace requirements for Light UAS.

CAA Participants

Austria
Belgium
Czech Rep.
France
Germany
Italy
Malta
Netherlands
Norway
Spain
UK

Observers

EASA
EUROCONTROL

Coordinated With

CASA, Australia
Transport Canada
FAA, USA

Feeds Inputs To

ICAO

Deliverable

A single set of draft airworthiness, operational and airspace requirements, accepted by participating countries. These draft requirements will be available to industry and other UAS stakeholders for consultation.

Outreach

All European & non-European CAAs can join



International Coordination Council

International advisory group initiated by UVS International

Objective

- Within the framework of UVS International's Global Access Initiative:
- Contribute to increasing international awareness of UAS-related matters;
 - Give national & multi-national working groups the possibility to make their voice heard globally;
 - Increase the dual-directional flow of information in all regulatory matters between all ICC members;
 - Be instrumental to organize and supply national inputs to international working groups, or other UAS-related international efforts;
 - Contribute to standards work within EUROCAE WG73 SG4 on Light UAS.

Current Participants

European Air Sports	Korea UVS, S. Korea	PLATINO, Spain
RCAPA, USA	UAS Norway	UATAR, Australia
UAV-DACH (AT/CH/DE/NL)	UAVS, UK	UVS Canada
UVS France	UVS International	

Coordination

The start-up of the ICC was coordinated with the JARUS.



ICC

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International Coordination Council

Principal

- Open to the international Light UAS (<150 kg) community;
- No single organization dominates;
- Increase the flow of information to all;
- Promote international coordination, cooperation & understanding.

Drivers

- Implement the recommendations produced by the Interim Working Group on Light UAS;
- Permit the international Light UAS community to contribute in a significant way to the standards work concerning Light UAS within the framework of EUROCAE WG73 SG4;
- Create a structure & methodology permitting SMEs & SMIs to contribute without over-stressing their personnel, time & financial limitations;
- Permit the national entities to elaborate their contribution in their national languages & supply national opinion papers in English.

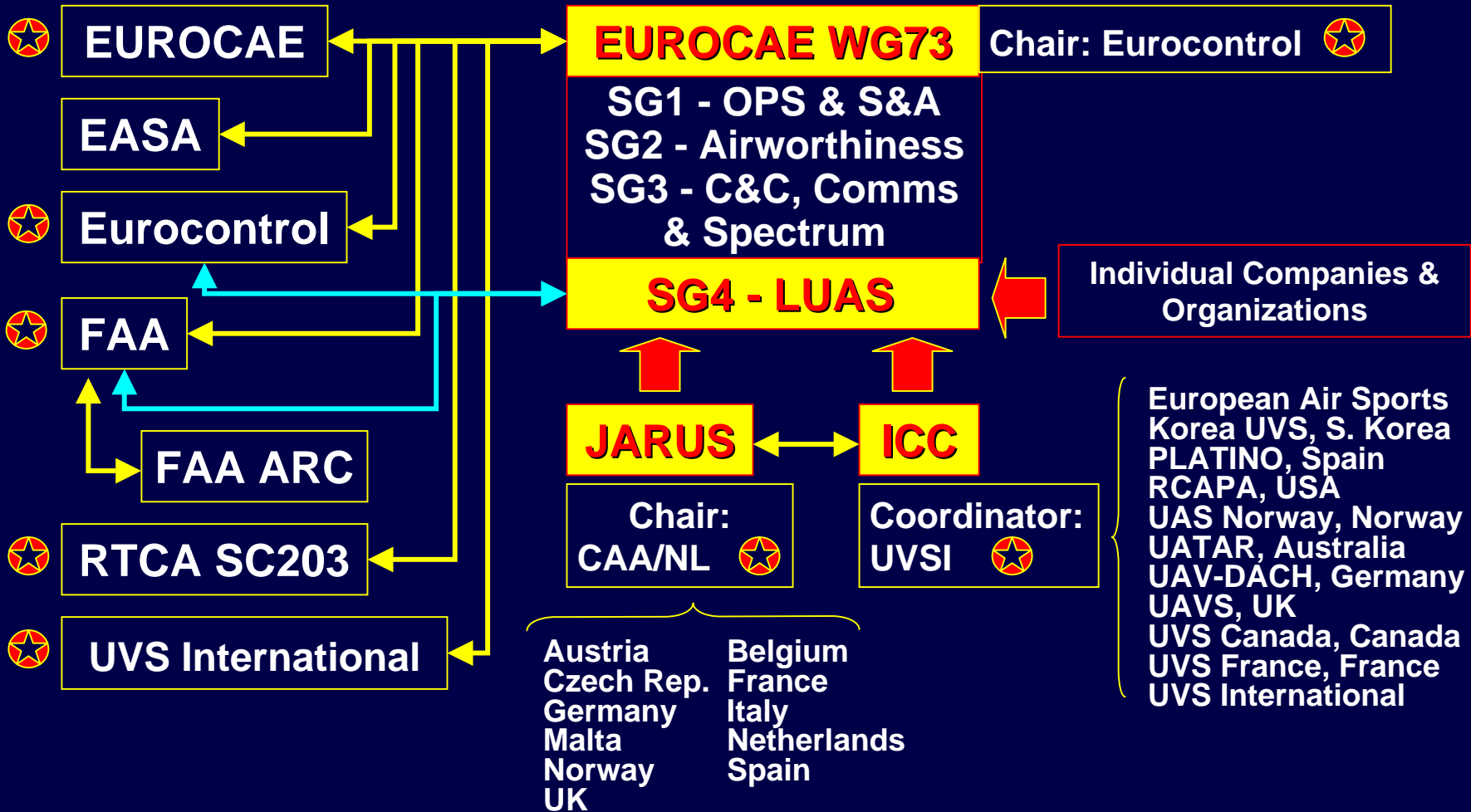
Harmonization

- The national position papers are harmonized in EUROCAE WG 73 SG4 on Light UAS;
- Each ICC member delegates one or several representatives to participate in EUROCAE WG 73 SG4 on Light UAS.



EUROCAE WG73 SG4 on LUAS

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= WG73 Management Team



EUROCAE WG73 SG4 on LUAS

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UAS Segmentation

Non-Recreational

LIGHT UAS

Regulated by National CAA

Class I

Micro	MTOM <1,5 kg	Flight Alt. < 150 m AGL	< 500 m from pilot	Flight In Visual LOS
Grp A	MTOM >1,5 kg & <7 kg			
Grp B	MTOM > 7 kg & <20/25 kg			
Grp C	MTOM >20/25 kg & < 150 kg			

Class II

Micro	MTOM <1,5 kg	Flight Alt. > 150m AGL	> 500 m from pilot	Flight Beyond Visual LOS
Grp A	MTOM >1,5 kg & <7 kg			
Grp B	MTOM > 7 kg & <20/25 kg			
Grp C	MTOM >20/25 kg & < 150 kg			

UAS

National Operating Rules & EASA Certification

MTOM > 150 kg Incl. Optionally piloted aircraft	Flight Alt. > 150 AGL	> 500 m from pilot	Flight Beyond Visual LOS
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MTOM = Mean Take Off Mass

AGL = Above Ground Level

LOS = Line of sight



EUROCAE WG73 SG4 on LUAS

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UAS Segmentation

Non-Recreational

Light UAS

MTOM <150 kg

Regulated by National CAA

Class I
All Groups

- Visual LOS flight altitude control
- Visual LOS flight path control
- Outside of ATC
- Flight altitude: < 150m/400 ft AGL
- Max. flight dist.: < 500m from pilot
- Confined airspace
- Daytime VMC (visual meteorological conditions)

Class II
All Groups

Flight beyond visual LOS
and
Coordination with ATC
and
Rules of the Air apply
and
Which do not fall under Light
UAS Class I definition

Topics to be dealt with

- Operational approval including:
- Proof of safe flight
 - Approved documentation
 - Licensing & Training
 - Limitations, etc
 - Occurrence reporting mandatory

- Full set of regulations
- AOC
- Registration
- Certification of Airworthiness
- Licensed pilot
- Type certification
- Maintenance Part 66 & 145
- Approval of Design Org, & Production Org, or demonstration of capability



Light UAS Class I = The Priority

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Light UAS
Class I

**MTOM
< 150 kg**

- Visual LOS flight altitude control
- Visual LOS flight path control
- Outside of ATC (air traffic control)
- Flight altitude: < 150m/400 ft AGL
- Max. flight dist.: < 500m from pilot
- Confined airspace
- Daytime VMC (visual meteorological conditions)

Topics to be dealt with

- Operational approval including:
- Proof of safe flight
 - Approved documentation
 - Licensing & Training
 - Limitations, etc
 - Occurrence reporting mandatory

Micro	MTOM <1,5 kg	Flight In Visual LOS	
Grp A	MTOM >1,5 kg & <7 kg		
Grp B	MTOM > 7 kg & <20/25 kg		
Grp C	MTOM >20/25 kg & < 150 kg	Flight Altitude < 150 m Above Ground Level	< 500 m from pilot

Light UAS Class I offers significant international market potential

Minimal impact on Air Traffic Management (ATM)

Will permit confidence building with regulatory authorities



First SG4 Deliverable

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OBJECTIVE: Create a baseline guidance document around which to bring the European CAAs together & propose a harmonized approach to the operation of LUAS.

A “sanitized” version of UK CAA’s latest update of CAP722 has been reviewed and commented on by the ICC participants.

Consolidation of the received comments is currently taking place.

The consolidated document will then be reviewed by the members of JARUS & EUROCAE WG73 SG4 on Light UAS and a draft final document will be produced.

The draft final document will be submitted to JARUS & EUROCAE WG73 SG4 for final comments and the final guidance document will be produced.

The final guidance document will then be made available out to all European CAAs, as well as all other interested parties.

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