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INOUI

INNOVATIVE OPERATIONAL UAS INTEGRATION

Instrument: STREP (Specific Targeted Research Project)

Thematic Priority: AERO-2005-4.g Open Upstream Research

INOUI UAS TERMS & TERMINOLOGY

Revision of the document: V 1.1


Approval Status

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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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P R E F A C E

The INOUI team is supporting the approach to base terms and definitions concerning UAS on ICAO definitions for manned aviation. Therefore the following list of INOUI terms & terminology is referring as much as possible to existing ICAO definitions and is also listing some terms and explanations being used in manned aviation (e.g. “pilot”).

The UAS Study Group within ICAO (UASSG) was established in 2007. The work of UASSG is organised in several subgroups, finally creating ICAO Circular, Annexes, SARPs and PANS - a process expected to last many years. A preliminary draft concerning terminology was discussed in autumn 2009. According to ICAO UASSG this draft can not be considered as complete or stable at this point in time.

The following INOUI list is focussing on UAS-specific terminology. For terminology regarding aviation and the ATM system in general we refer the reader to the published ICAO definitions.


The list was compiled to provide a first reference, to create discussions and to collect results. The INOUI team also invites the public to comment and to suggest additions. We will maintain the list during the duration of the INOUI project.

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Document Change Log				
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0.9	18/08/2009	DFS (Marita Lintener)	All	Updates
0.91	25/08/2009	DFS (Marita Lintener)	All	Integrated comments of ONE (Claude Le Tallec)
1.0	14/09/2009	DFS (Marita Lintener)	All	Integrated comments of INOUI team review, i.e. DFS Stefan Tenoort, Hans de Jong. Integrating the definitions of EASA UAS Policy Statement E.Y013-01.
1.1	12/10/2009	DFS (Marita Lintener)	All	Integration draft definitions ICAO UASSG, Meeting and Terminology drafts, September 2009, and updates WG 73 definitions from draft document WG 73_v13a


Reference List		
Index / Title	Reference	Date
ICAO	ICAO – International Civil Aviation Vocabulary, esp. ICAO Doc 9713 (3rd edition)	01/01/2007
ICAO UASSG	ICAO UASSG Meeting Minutes and draft terminology (to be further evaluated)	September 2009
ICAO UASSG at UVS International Conference 2009	UVS International Conference 2009, Conference Proceedings and UVS International Yearbook 2009/10.	June 2009
WG 73	EUROCAE Working Group 73, draft version terminology, UAS_005.13a	22/09/2009
UVS International	>Terms and Definitions<, yearly published by "UVS International", Yearbook, esp. Editions 2008/09 and 2009/10	June 2009
EASA Airworthiness Certification of Unmanned Aircraft Systems (UAS)	EASA Document E.Y013-01 Policy Statement - Airworthiness Certification of Unmanned Aircraft Systems (UAS)	25/08/2009
Proposals for the Regulation of UAS in Common Airspace	Anna Mazutti, Proposals for the Regulation of UAS in Common Airspace, , Article in Air & Space Law, Volume 34, abridged version also published in UVS Yearbook 2009/10	2009

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Acronym	Abbr. (if any)	Definition	Source
Aircraft		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 surface.	ICAO
Air Traffic Control Communications Equipment		All equipment permitting dialog between the UAS crew and air traffic control	UVS International
Airworthiness for UAS		The condition in which the UAS conforms to its type certificate and is in condition for safe operation. In Europe EASA published the E.Y013-01 for UAS under Agency's responsibility. See details there. <i>Definition "Certify as airworthy" of ICAO:</i> <i>To certify that an aircraft or parts thereof comply with current airworthiness requirements after maintenance has been performed on the aircrafts or parts thereof.</i>	EASA E.Y013-01 ICAO
Automatic		The execution of a predefined process without human intervention.	WG 73
Autonomous		Not controlled by others or outside forces. Independent judgment. => <i>Concept of autonomous mode under discussion within ICAO UASSG</i>	WG 73 acc. to RTCA SC203 ICAO UASSG
Autonomy		The ability to execute processes or missions using integral decision capabilities.	WG 73, based on EASA source
Beyond Line Of Sight	BLOS	=> <i>see Beyond Visual Line of Sight</i>	
Beyond Visual Line Of Sight	BVLOS	Beyond visibility. => <i>See Visibility</i>	Based on ICAO
Beyond Radio Line Of Sight	BRLOS	BRLOS applies to a condition where direct wireless communication is not possible because of signal attenuation or other factors. => <i>See Radio Line of Sight (RLOS)</i>	WG 73
Certification		Legal recognition by the certification authority that a product, service, organization or person complies with the requirements.	WG 73, EUROCAE ED
Collision Avoidance		Preventing the aircraft from colliding with any other vehicle or object (in the air as well as on the ground). => <i>see See & Avoid, Sense & Avoid, Detect & Avoid</i>	INOUI
Command Link		A communication link through which instructions are passed, in the context of UAS from the Ground Control Station to the UA.	INOUI, based on WG 73
Communication Link		Analogue, digital or optical channel through which information is sent and received.	WG 73
Command & Control Link	C2 Link	A link between the remotely piloted aircraft and the pilot station for the purposes of managing the flight	ICAO UASSG
Control Station	CS	One or more facilities or devices from which a UA is controlled => <i>Term currently under discussion at ICAO UASSG</i> => <i>See definitions of "Pilot Station" and "Remotely Piloted".</i> => <i>There may be more than one control station as part of a UAS. Piloting of a UA is done from a CS</i> <i>UVS International 2009: A facility or device(s) from which a UA is controlled for all phases of a flight</i>	INOUI ICAO UASSG UVS International

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Data Link		A digital wireless communication channel through which structured digital data is sent and received => A term referring to all interconnections to, from and within the UAS. It includes control, communication and payload links.	WG 73 / original definition
Data link communications		A form of communication intended for the exchange of messages via data link	ICAO
Detect & Avoid		Term often used in synonym to "sense and avoid" for unmanned aircrafts. Collision Avoidance for UAS similar to "see and avoid" for manned aviation. The UA shall be able to detect and avoid another (airborne) object. EASA E.Y013-01 uses "Detect & Avoid" as the respective reference term. Detect & avoid includes aircraft, obstructions and other objects, weather, terrain and obstacles. The separation and collision avoidance capabilities shall thus be able to: <ul style="list-style-type: none"> • Detect and avoid traffic during air and ground operations; • Detect and avoid all airborne objects, including gliders, hang-gliders, paragliders, microlights, balloons, parachutists etc; • Avoid hazardous weather and maintain compliance with VFR; • Detect and avoid terrain and other obstacles; • Perform equivalent functions, such as maintaining separation, spacing and sequencing that would be done visually in a manned aircraft. => see See & Avoid => see Sense & Avoid System	INOUI, based on several sources
Down Link		Direct or indirect communication link from the UA to a control/pilot station or other receiver	Based on WG 73 and UVS International
Equivalent Level Of Safety	ELOS	An evaluation, often subjective, of a UAS and/or operation to achieve a level of UAS risk to people and property equivalent to that posed by manned aviation.	Based on WG 73 (WG 73 based on based on Access 5 HALE Concept of Ops)
Ground Station		Synonym often used for Ground Control Station => See Control Station (CS) and Pilot Station	common
Latency		The time incurred (or delay) between the time of an event and the time it is detected at a remote location (the latter minus the former).	WG 73, based on DO-289
Launch and Recovery Element		A facility or device(s) from which a UA is controlled during launch and/or recovery. There may be more than one launch and recovery element as part of a UAS	EASA, also applied by WG 73
Launcher		A mechanical facility used to launch an UA that is not capable of conventional take off	WG 73 / original definition
Level of Autonomy		The relative extent or level of the ability to execute processes or missions using on-board/local system decision capabilities. => See Autonomy	WG 73 / original definition

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Acronym	Abbr. (if any)	Definition	Source
Light UA	LUA	<p>An unmanned aircraft with a maximum take off mass of less than 150 kg.</p> <p>⇒ Light UAS: An unmanned aircraft system comprising one or several LUA</p> <p><i>Classification was made in the respective EC regulation that unmanned aircraft with an operating mass of no more than 150kg are an exempted category for the regulation, leading to the conclusion that UAS with UA > 150 kg MTOW have to comply with the airworthiness regulations to be established by the EU agency.</i></p>	<p>EU / EASA</p> <p>Aircraft classification based on Reg. (EC) n. 216/2009</p>
Line of Sight	LOS	<p>1 – A straight line between two points</p> <p>⇒ See <i>Visual Line of Sight (VLOS) and Visibility</i></p>	Based on ICAO
Loiter		To remain within a given volume of airspace.	RTCA SC203, also applied by WG73
Mission Scenario		A descriptive unfolding of all the relevant features and activities connected with a particular type of mission	WG 73 / original definition
Model aircraft		A remotely piloted aircraft, which carries no persons or cargo on board and is used for recreational purposes.	ICAO UASSG
Modes of Operation for UAS		<p>The various ways in which unmanned aircraft systems are configured to achieve mission objectives.</p> <p>⇒ WG 73: <i>The following are recognised modes of operation: Fully autonomous / Semi autonomous / Tele-operation / Remote Control.</i></p> <p>⇒ Term “autonomous” currently under discussion within ICAO UASSG</p>	<p>WG 73, based on several sources</p> <p>ICAO UASSG</p>
Non Line Of Sight	NLOS	<p>Where the straight line path between two points is obstructed</p> <p>⇒ see <i>Line of Sight (LOS)</i></p>	WG 73, based on ICAO
Operator		<p>A person, organization or enterprise engaged in or offering to engage in an aircraft operation.</p> <p>⇒ <i>The legal entity operating a Unmanned Aircraft System</i></p> <p>⇒ see <i>UAS Operator</i></p>	ICAO
Payload		All elements of the aircraft which are not necessary for flight but are carried for the purpose of fulfilling specific mission objectives.	DefStan 00-970/1-Part 9, also applied by WG 73 and UVS International
Payload Link		A data link for up-linking command instructions to the UA payload and down-linking payload data, which is not critical to the safe operation of the UAS.	UVS International
Pilot		<p>To manipulate the flight controls of an aircraft during flight time.</p> <p>⇒ <i>Person in physical control of the aircraft.</i></p> <p>⇒ See <i>UA pilot</i></p>	ICAO

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Pilot-in-command	PIC	The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight. Often synonym used: Flyer in command => <i>See UA pilot-in-command</i>	ICAO
Pilot station		The station at which the pilot manages the flight of the aircraft => <i>Can either be on board or remotely located which, in the case of an remotely piloted aircraft, is the equivalent to the cockpit of a manned aircraft.</i> => <i>Remotely-piloted: Control of an aircraft from a pilot station which is not on board the aircraft.</i> => <i>Term preferred currently under discussion within ICAO UASSG, to be used instead of Control Station</i>	ICAO UASSG
Radio Line- of-Sight	RLOS	A direct point-to-point contact between a transmitter and a receiver	ICAO UASSG
Remotely Piloted Aircraft		=> <i>An aircraft where the flying pilot is not on board the aircraft. Term under discussion within ICAO UASSG</i> => <i>See UA and UAS</i>	ICAO UASSG
Remotely Piloted Aircraft		A system consisting of one or more remotely piloted aircraft, one or more pilot stations and the required command and control links as well as any other system elements as may be required.	ICAO UASSG
See & Avoid	S&A	The principle of the capability of a pilot of a manned aircraft to see traffic which may be a conflict, evaluate flight paths, determine traffic right-of-way, and manoeuvre to avoid collision.	Based on ICAO. See also WG 73 and RTCA
Sense & Avoid		=> <i>Adaptation of the See & Avoid principle for manned aviation to unmanned aviation.</i> The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action to comply with the applicable rules.	INOUI ICAO UASSG
Situational Awareness	SA	The perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the future. In generic terms the three levels of situational awareness are Level 1 - Perception, Level 2 - Comprehension, and Level 3 - Projection. There is both individual and group or team situational awareness. Applied for UAS: The set of terms used to delineate the general considerations necessary to characterize adequate SA for UAS are Information, Intelligence and Mode of Control.	WG 73, based on several sources, particularly DefStan 00-970/1-Part 9. Based on Mica R. Endsley
Status Link		Communication link through which status information is passed Typically used to refer to the 'downlink' from an unmanned aircraft to a control station	WG 73 / original definition
Type certificate		A document issued by a Contracting State to define the design of an aircraft type and to certify that this design meets the appropriate airworthiness requirements of that State.	ICAO

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Unmanned Aircraft	UA	<p>An aircraft which is designed to operate with no human pilot onboard</p> <p>=> <i>Term under discussion within ICAO UASSG: Might be replaced by Remotely Piloted Aircraft to reflect the status of the aircraft as being piloted by a pilot who is not on-board the aircraft.</i></p> <p>=> <i>Formerly used term: UAV – Unmanned aerial vehicle</i></p>	<p>several sources</p> <p>ICAO UASSG</p>
Unmanned Aircraft System	UAS	<p>An Unmanned Aircraft System (UAS) comprises individual system elements consisting of an “unmanned aircraft”, the “control station” and any other system elements necessary to enable flight, i.e. “command and control link” and “launch and recovery elements”. There may be multiple control stations, command & control links and launch and recovery elements within a UAS.</p> <p>=> <i>Term under discussion within ICAO UASSG: Might be replaced by Remotely Piloted Aircraft System: A system consisting of one or more remotely piloted aircraft, one or more pilot stations and the required command and control links as well as any other system elements as may be required.</i></p>	<p>EASA, E.Y013-01</p> <p>ICAO UASSG</p>
Unmanned Aerial vehicle	UAV	<p>Unmanned Aerial Vehicle (UAV)</p> <p>=> <i>Obsolete term. See UA</i></p>	<p>common</p>
UAS Crew	UAS-c	<p>Any person assigned to perform duties during the operation and maintenance of the UAS.</p> <p>=> <i>UAS-cm: UAS crew member</i></p>	<p>WG 73, derived from DefStan 00-970/1-Part 9</p>
UA Pilot		<p>The individual directly in control of the flight of the aircraft (UA).</p> <p>The UA Pilot may have direct control of more than one UA.</p> <p>UVS International: “The person in direct control of the UA, whilst the engine is running and responsible to the UAS Commander”.</p> <p>=> <i>see Pilot, Pilot-in-command and UA Pilot-in-command</i></p>	<p>Based on ICAO, EASA, WG 73, UVS International</p>
UA Pilot-in-command		<p>A suitably qualified person responsible for the safe and environmentally compatible operation of a UAS during a particular flight and who has the authority to direct a flight under her/his command.</p> <p>The UAS pilot-in-command may also fulfil the UAS flyer/pilot function.</p> <p>=> <i>See Pilot-in-command</i></p>	<p>Based on WG 73, based on EASA</p>
UAS Operator		<p>The legal entity operating an Unmanned Aircraft System.</p> <p>Also: The legal entity approved for the operation of a UAS.</p> <p>=> <i>Of high importance for the regulations concerning the liability for damage as a consequence of UAS use</i></p> <p>=> <i>see Operator</i></p>	<p>Several sources, based on ICAO</p>
Up-Link		<p>Direct or indirect communication link to the unmanned aircraft</p>	<p>WG 73 based on UVS International</p>

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Visual Control		<p>Method of control and collision avoidance that refers to the flyer or observer having an uninterrupted view with human eyesight of the unmanned aircraft and the airspace around it in order to avoid collision.</p> <p>Corrective lenses (spectacles or contact lenses) may be used by the flier or visual observer.</p>	WG 73 based on UVS International
Visual Line of Sight	VLOS	<p>The maximum distance that the flight crew is able to maintain separation and collision avoidance under the prevailing atmospheric conditions with the unaided eye (other than corrective lenses).</p> <p>=> <i>See Visibility</i></p>	ICAO UASSG
Visibility		<p>Visibility for aeronautical purposes is the greater of:</p> <p>a the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background</p> <p>b the greatest distance at which lights in the vicinity of 1000 candelas can be seen and identified against an unlit background</p>	ICAO (Doc 9713)
Visual Range		The maximum distance that an object can be seen under the prevailing atmospheric conditions with the unaided eye (other than corrective lenses)	ICAO UASSG