Certification of RPA

An overview of the approach to certifying RPA systems

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AC</td>
<td>Aircraft</td>
</tr>
<tr>
<td>AIS</td>
<td>Aeronautical Information Services</td>
</tr>
<tr>
<td>AMC</td>
<td>Acceptable Means of Compliance</td>
</tr>
<tr>
<td>AMP 03</td>
<td>Instructions for the type inspection and certification of Bundeswehr UAVs</td>
</tr>
<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
</tr>
<tr>
<td>ATS</td>
<td>Air Traffic Service</td>
</tr>
<tr>
<td>Cat.</td>
<td>Category</td>
</tr>
<tr>
<td>CVFR</td>
<td>Controlled VFR</td>
</tr>
<tr>
<td>CS</td>
<td>Certification Specification</td>
</tr>
<tr>
<td>EASA</td>
<td>European Aviation Safety Agency</td>
</tr>
<tr>
<td>EUROCONTROL</td>
<td>European Organisation for the Safety of Air Navigation</td>
</tr>
<tr>
<td>FAA</td>
<td>Federal Aviation Administration</td>
</tr>
<tr>
<td>FARs</td>
<td>Federal Aviation Requirements</td>
</tr>
<tr>
<td>FMS</td>
<td>Flight Management System</td>
</tr>
<tr>
<td>GCS</td>
<td>Ground Control Station</td>
</tr>
<tr>
<td>HB</td>
<td>Hot air Balloon</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organisation</td>
</tr>
<tr>
<td>i.e.</td>
<td>id est [lat.] <em>that is</em></td>
</tr>
<tr>
<td>IFR</td>
<td>Instrument/ Instrumental Flight Rules</td>
</tr>
<tr>
<td>INOUI</td>
<td>Innovative Operational UAS Integration (European Research Project)</td>
</tr>
<tr>
<td>JAA</td>
<td>Joint Aviation Authorities</td>
</tr>
<tr>
<td>JAR(s)</td>
<td>Joint Aviation Requirements</td>
</tr>
<tr>
<td>Kg</td>
<td>Kilogramme(s)</td>
</tr>
<tr>
<td>Kts</td>
<td>Knots</td>
</tr>
<tr>
<td>KJ</td>
<td>Kilo Joule(s)</td>
</tr>
<tr>
<td>LACAC</td>
<td>Latin American Civil Aviation Commission</td>
</tr>
<tr>
<td>LTF</td>
<td>Luftfahrttauglichkeitsforderung (Bundeswehr airworthiness requirements)</td>
</tr>
<tr>
<td>m</td>
<td>metre</td>
</tr>
<tr>
<td>m²</td>
<td>metre(s) square</td>
</tr>
<tr>
<td>MTOW</td>
<td>Aircraft Maximum Take-Off Weight</td>
</tr>
<tr>
<td>m/s</td>
<td>Metre(s) per second</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organization</td>
</tr>
</tbody>
</table>
1.1 Source of supply for LTF 1550 – 001

After informal request in written, LTF 1550 - 001 can be supplied by:

Wehrtechnische Dienststelle für Luftfahrzeuge –
Musterprüfwesen für Luftfahrtgerät der Bundeswehr (WTD 61)
Flugplatz
85077 Manching
Germany
1.2 Introduction

Today, Remotely Piloted Aircraft, formerly known Unmanned Aerial Vehicles exist in a wide range from a micro-light model aircraft to the size of an airliner. Fixed wing aircraft, rotary wing aircraft, lighter than air vehicles and various types of powerplant are known. Although manned aviation is something really complex to understand, we have been familiar with it for a century. Remotely Piloted Aircraft are now entering this complicated game. In several aspects, they are completely different from their manned “colleagues” but they have to be operated within a system that has been developed and approved over the course of a century.

During this century of evolution, the need to make flying safer is a history of tragedies and lost lives. Every event has shown that there is something to be improved, and this has indeed been done. Operational procedures, airworthiness requirements and supplementary educational needs have arisen mainly as a result of former tragedies.

Today's airworthiness requirements are much more precise than those issued sixty years ago. Just as knowledge about aircraft has become something common, new technologies have been knocking on the door seeking to become incorporated into the existing system. As the need to have something new became evident, certifying agencies have had to think about how these new elements should be verified.

Starting from the need to make this subject easier to understand and to handle, aircraft and their related equipment were divided into several different types and categories. Their related requirements have been connected to these different categories. This simple connection eased the situation both for the designers and for the certifying agencies.

As it now appears, that unmanned aerial vehicles are close to entering civil operations, the need for certification has raised the question whether the same approach with different types and categories may help the designers and certifiers just as it did some decades ago for manned aviation.

It is the aim of this white paper to explain that existing military certification experience has not been sufficiently taken into account for certifying civil systems. This paper highlights a national way of certifying military UAS in Germany and compares this procedure to the common, civil way of certifying aeronautical products.
2 Systematic approach

2.1 Comparison of manned and unmanned operation

The overall target of ensuring safe operation of manned aircraft is met by different means which are focussed both on the aircraft and on the people on board. The underlying idea behind this is, if the crew is well, they will operate the aircraft safely within its approved envelope. If so, this safe operation prevents danger to third parties both in the air and on the ground.

In general, they only have to keep airspeed and attitude within the allowed limits, prevent collisions and navigate the aircraft from airport to airport.

For unmanned AC, the situation is quite different. In nearly every known RPA, the Flight Management System is in charge to keep the right speed and attitude. But does the FMS have any information about the weather and its related phenomena? The crew is not on board and the current weather situation may be second-hand information, this should be taken into account. As there is no operating crew on board, nobody on board has to be protected from structural failure. However, mathematical models in order to more or less approach an existing risk – level are based upon structural integrity of the RPA.

The integrity of an RPA is necessary in order to protect people and property on the ground.

As the crew of a manned aircraft is responsible for “see and avoid”, this problem becomes really hard to solve for a RPA. Every pilot has to undergo a medical test at different intervals of time. It depends on what kind of aircraft he is going to operate. Every test includes the eyes of the pilot. During his education, every student has to learn the procedures and their legal background in theory and he learns how to carry out the manoeuvres in practice. Supplementary information either from ATC or from special equipment helps the crew to become clearly informed about their current situation. (Situational awareness).

Again, as there is nobody on board an RPA, the word “see” from the term “see and avoid” should be replaced by the word “sense” or "detect" for RPA. This is proposed in the new ICAO Annexes as adaptation for UAS. If the RPA is operated together with manned AC, the capability of avoiding a mid-air collision must be assured in all cases – by all involved actors.

The means of preventing mid-air collisions are intended to protect people on board other aircraft and, secondly to protect third parties on the ground.

To sum up, the structural needs of RPA and manned AC are almost similar; many automatic functions are to be seen in the same way. The need of keeping the person responsible as reliably informed as if he or she were in the aircraft’s cockpit leads to the question about the “system” which replaces the man / machine system of manned aviation.
Leaving the aircraft, the remaining components of the system are the control station and the data link. The data link or the data links are needed for the transmission of command and control data between control station and aerial vehicle, and if the airspace requires, for communication. It may be a “line-of-sight link” or a “beyond-line-of-sight link”.

These data links must be safe and preferably secure. They must permit the linkage between AC and GCS for the desired operation, and should allow transfer of the required data at the necessary rate and with an acceptable delay. If we have to talk about “links” in a manned AC, one link may be seen between the pilot’s eyes and the instrument panel. Another link may be identified between his or hers sensorial capabilities and special signals from the AC in different situations. Examples are the wobbling stick while approaching stall speed, or visible smoke inside or outside the cockpit. If we have to act with a communication link, in most cases the RPA will act as a relay between ATC / ATS and the control station. Things to remember when using some relay for transmission are the possibility of becoming “blocked out” and the delay time between sending and receiving. The communication between manned aircraft and the ground or other aircraft will be direct in the case of normal operation. Relay communication will only be used if some station is out of range.

The control station itself should give the operator the possibility of becoming informed about any necessary status of the aerial vehicle. This requires situational awareness including the information about where and how the AC is. As techniques are moving forward, the display must not necessarily be a copy of a conventional cockpit with all the analogue dials of the past. The GCS looks in many cases much more like an ATC working station with supplementary information about the aerial vehicle(s) which is or are currently under control. But control of a RPA implies command. Therefore the means of executing these commands have to be added. The same applies to communication devices.
2.2 The system

The RPA system is different by nature from a manned system. Certain functions and decisions which are normally carried out by the crew on board now have to be transferred to the system (i.e. the FMS), or to the control station – regardless of where its location will be during operation. The information between control station and the RPA is provided by data-link.

So the operating system which we have to talk about consists as a minimum of:

- The aerial vehicle
- The control station
- The data-link

To operate the RPA in the same way as to a manned aircraft, there is the need to have the following functionalities or subsystems:

- The absence of the crew on board raises the need for a different set of possibilities to command the aircraft, and to control it. For this reason, the RPA needs a safe, sometimes secure and, if required, redundant command and control link to the control station.

- As ATC communication is a major factor for safety and a need within different classes of airspace, a RPA will need a safe communication link; if required, that link should be redundant. As there is nobody on board, the manoeuvres will be carried out by the flight control-system.

- As everybody needs to know how and where to go, a navigation system will be necessary for RPA too.

- The existing emergency procedures are mostly published in the rules of the air, but they assume the presence of a pilot on board. An RPA therefore should have a qualified and accepted emergency system which is able to carry out its operation on the occurrence of any kind of system error or system failure without causing catastrophic accidents to third parties.

- Depending on the weather conditions, a detection system, redundant if required, could be necessary.

- The ability to make on-board decisions based on the collected data is nothing new for aviation, but as there is no pilot on board to make decisions, this will be done by a computer. In other cases it must be done by the pilot in command. He needs to have the ability to command special functions from the control station, if the “on-board intelligence” is not sufficient to make the right decision. (Information - assessment, trouble shooting). This feature includes the possibility of retasking the aircraft, command mission changes or safety/emergency procedures, or flying the aircraft actively, in “real time” if requested. (“Real time capability”.)
Also, with respect to human nature, the workload of the individual crewmember must be taken into account. As a direct function of the mission’s duration, a crew rotation after a certain time will be necessary, for example, like for the crew of an airliner flying long range or personnel in ATC centres.

2.3 Airworthiness requirements and categories for manned aircraft

In order to allow an efficient procedure for certifying that a certain type of air vehicle is airworthy, the certifying agencies work with categories to find the right regulation. Every type of air vehicle comprises categories and sub-categories with their dedicated Certification Specification (CS).

The following picture shows the different types of manned AC

The following table shows the airworthiness requirements for manned aircraft in Europe, whereas the type of the aircraft and the MTOW are the main aspects to be considered. The types are much more precisely divided into different airworthiness categories, (see 3rd column)
<table>
<thead>
<tr>
<th>Type of aircraft</th>
<th>Regulation</th>
<th>Airworthiness category</th>
<th>Weight limitation</th>
<th>Special remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeroplanes</td>
<td>CS – VLA</td>
<td>Very Light Aeroplanes</td>
<td>$\leq 750$ kg MTOW</td>
<td>Vso $\leq 45$ kts Roc $\geq 2$ m/s</td>
</tr>
<tr>
<td>CS – 23</td>
<td></td>
<td>Normal, Utility, Acrobatic Aeroplanes</td>
<td>$\leq 5700$ kg MTOW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commuter Aeroplanes</td>
<td>$\leq 9000$ kg MTOW</td>
<td>2 engines, propeller required</td>
</tr>
<tr>
<td>CS – 25</td>
<td></td>
<td>Large Aeroplanes</td>
<td>$\geq 5700$ kg MTOW</td>
<td>2 engines or more required</td>
</tr>
<tr>
<td>Rotorcraft</td>
<td>CS – VLR</td>
<td>Very Light Rotorcraft</td>
<td>$\leq 600$ kg MTOW</td>
<td>No turbine, etc. $\leq 2$ seats VFR day</td>
</tr>
<tr>
<td>CS – 27</td>
<td></td>
<td>Small Rotorcraft</td>
<td>$\leq 2700$ kg MTOW</td>
<td></td>
</tr>
<tr>
<td>CS – 29</td>
<td></td>
<td>Large Rotorcraft</td>
<td>$\geq 2700$ kg MTOW</td>
<td></td>
</tr>
<tr>
<td>Sailplanes and Powered Sailplanes</td>
<td>CS – 22</td>
<td>Sailplanes</td>
<td>$\leq 750$ kg MTOW</td>
<td>Acrobatics possible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Powered Sailplanes</td>
<td>$\leq 850$ kg MTOW</td>
<td>Acrobatics possible with engine &quot;off&quot; Only one engine Sink rate: $\leq 1$ m/s</td>
</tr>
<tr>
<td>Lighter than air</td>
<td>CS – 31 HB</td>
<td>Hot air balloons</td>
<td></td>
<td>a) heated air b) mixed (Rozière)</td>
</tr>
</tbody>
</table>

All these airworthiness categories are intended to help to identify the applicable airworthiness requirement, but as these regulations have been created for “manned aviation”, it is obvious that they cannot be used as they stand for RPA systems. Based upon CS – 23, a modified CS for UAS, the USAR has been proposed for military application. On NATO level, it became a widely accepted and formed the basis for the STANAG 4671.

Only those paragraphs dealing with identical elements of manned and unmanned aircraft have been taken into account. The remaining paragraphs became modified or completely replaced by new requirements.
2.4 Airworthiness requirements and -standards for unmanned aircraft systems

2.4.1 Military categories and the background

Today’s RPA exist in a tremendous variety from a micro-light model aircraft to the size of an airliner. Fixed wing aircraft, rotary wing aircraft and various types of powerplant are known. As the number of RPA systems increases, so also do the national requirements for them and definitions regarding what a RPA will be. These requirements are mostly published by military agencies since airworthiness standards for the type inspection of military RPA are much further developed than civil standards – even if still using the short term UAV for them.

As airworthiness requirements for RPA systems are based only on little experience, and a wide range of uncertainty about what may occur, the focus here is mostly set on safety objectives. This uncertainty is reflected within the safety factors for nearly every case of a possible failure. This leads directly to an acceptable level of safety.

What does a “level of safety” mean for RPA systems within this context? The most popular answer is: “To prevent hazard to third parties”, whether they are in the air or on the ground.

In Germany, the history of certification requirements for RPA is traceable back into the mid seventies, while the first detailed specification was called “ML- Order Nr. 20, from 1992, replaced by AMP 03, Instructions for the type inspection and certification of Bundeswehr UAVs” published in 1999. It is based up on the “Airworthiness and Certification Rules for Bundeswehr Aircraft and Aeronautical Equipment”. In 2002 this document was replaced by Airworthiness Requirements LTF 1550-001 which is today available in its second edition – also in English. The document isn’t classified and is available. The document divides UAS into three categories. These categories and the related requirements are defined as different levels of hazard. The idea behind this is to find out different areas where people and properties are present or are not.

**Category 1:**
The operation of Category 1 UAVs is permitted solely within specially designated military practice areas or prohibited areas with designated flight restriction areas.

**Category 2:**
Category 2 UAVs are permitted to take off from and land within specially designated military practice areas or prohibited areas with designated flight restriction areas. Flight routes between take-off and landing are limited to designated flight restriction areas, which may be outwith prohibited areas.

**Category 3:**
The operation of Category 3 UAVs in Airspace A – G in accordance with ICAO Instrument or Visual Flight Rules is permitted outwith military practice areas, military test sites, and designated flight restriction areas.
These requirements are much more focused on the specific needs of an RPA system. Within the “historical” context, they allowed either new designs as well as safe operation by using the “procedure” of flying in reserved airspace to prevent collisions instead of waiting for technical solutions to become invented.

The following table gives an overview regarding the present requirements of LTF 1550-001.

<table>
<thead>
<tr>
<th>Overview of German military certification regulations</th>
<th>Need for Type certification</th>
<th>Need to apply airworthiness requirements</th>
<th>Need for an individual flight certificate</th>
<th>Application of civil regulations for operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerial vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 1</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Category 2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Category 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GCS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 1</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Category 2</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Category 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Data link</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 1</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Category 2</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Category 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
For a better understanding of the table, it is necessary to know that LTF 1550-001 is on the one hand valid for the complete system and a Type Certificate is required for aircraft, together with GCS and Data Link. On the other hand, the requirements are defined for military RPAS and not for civil operation in general. This leads to the question as to whether it may be sufficient for civil operated RPA to use the same approach or whether there is a need for a more precise definition.

2.4.2 Hazard visualisation

Thinking about a hazard analysis may lead to the answer that more factors will influence the rate of hazard and should be identified.

In a first approach, factors for the possible hazard for third parties on the ground are:

- The kinetic energy in the case of an impact affecting the amount of damage and lethal area
  - Structural integrity in case of an accident
  - Size and speed
  - Mitigation factors could be an On-board recovery system or/and the Capability of reaching pre-selected crash sites or alternate airfields

Factors for the possible hazard for third parties in the air are:

- Capabilities of the AV
  - Speed
  - Type of data-link
  - Collision avoidance equipment

- Flight rules and weather conditions
  - ATC / ATS
  - Related equipment

In combination, these factors may lead to a three dimensional picture of possible hazard areas what is shown on the next page. Understanding the kind of operation that is envisaged as well as the environment for the operation may be a good chance of defining suitable means to reduce possible risks. This may lead to realistic and fair conditions for certifying unmanned systems for civil use according to ICAO principles.
This illustration shows different qualities of hazard that may occur under different circumstances. For example, in the “red corner” we may see that the highest level of hazard will be if a “low capability” RPA is operated over a city in uncontrolled airspace under VFR with a high kinetic energy in the case of an impact and a large lethal area.

2.4.3 Using external know – how for rule making

Based upon the results of the JAA - EUROCONTROL Task Force on UAVs, the European Certification Agency EASA made the approach with its “Advanced notice of proposed Amendment 16 /2005”, what became widely commented by nearly every involved stakeholder. This activity resulted into a huge number of comments, where EASA with its limited resources was kept busy for a while.

To fulfil the tasks under currently existing budget constraints the approach was chosen to task a standardisation organisation with defining standards as a basis for
further rulemaking. Today this working group is still engaged with defining possible standards for EASA to support EASA’s policy on certification of RPAS. This long process is due to the fact, that contribution to the standardisation organisation is on voluntary basis, in other words, there must be enough money in the companies, to finance this contribution over an undefined period of time. If other commitments have been found more urgent, this contribution will have to be shifted on the time line….

This working procedure of delegating some work to volunteers may be seen as a highly economic approach to get what is needed nearly for free. However, since no real contract exists there is a danger that results may be outdated the day they become published.

Another European approach of national certification authorities was to take the existing certification rules and to tailor them as a framework for those unmanned systems below 150 kg. (These systems are not under the responsibility of EASA).

If 150 kg are now seen as a natural differentiation between unmanned aircraft to become certified by authorities like the FAA or EASA while anything below is treated as “light – system”, the use of traditional requirements like part 23 or CS 23 seems to be a questionable approach.

The danger occurs, if airworthiness requirements or certification specifications for manned aircraft are chosen as a certification basis for unmanned systems by just only looking at the maximum Take off Weight. In order to achieve “quick wins”, many proposals in the past promoted exactly this approach. However, the minimum weight for applying these requirements has never been asked! As an example, nobody would ask to apply standards for some kind of a B 747 to get some kind of a Piper Super - Cub certified! The same is for “Microlights”, which are certified to different standards as Part 23 or CS – 23 in Europe and elsewhere.

The traditional approach to fulfil airworthiness requirements is based upon proven design, best practices and known solutions. It mostly ends up with aircraft of any kind that looks like previous models… (Every airliner looks like an airliner, every helicopter like a helicopter, etc).

As furthermore the actual level of safety in civil aviation is a result of a worldwide standardised approach of using standardised requirements for every involved actor, the selection of applicable requirements must be holistic and done with caution.

But what about complete new technical solutions, where no example is given in traditional requirements?

As explained in previous sections, the certification has to be conducted for a system where necessary sub – systems are located on the ground and in addition, far away from the aircraft. The need for a data link in combination with the distance between the aerial vehicle and the responsible operator inside of the control station creates the need for a different approach to achieve the required level of safety. Knowing well, that also existing airworthiness requirements do not prevent the applicant from diverting from traditional ways of showing compliance with a certain requirement, the
system composition of UAS is much more than diverting from a proven way which is
published in AMC and guidance material.

This leads directly to the question, why should not the experience of certifying military
UAS be considered here? The approach of Germany as to be seen in section 2.4.1,
is mature meanwhile. More than 40 Years of experience may be judged as a reliable
foundation for assessing the results.

First of all, this approach gives much more freedom to the engineer to overcome
technical challenges, even the example of the required data link. Without previous
experience, the safety target approach allows to quantify the safety and to make a
judgement whether the result may be acceptable or not. But defining the right level of
safety is a challenge for all involved partners. To ask for a theoretical maximum value
like less than $10^{-7}$ per flight hour for an unintended crash of a 10 kg RPA to be flown
in a distance of less than 500 m from the eyes of a pilot is easily done, but it isn’t
helpful. It seems to be the fine art of hazard assessments to understand what is
really required to safeguard third parties without stopping technical evolution. For this
reason, the target values have been defined with caution and are achievable.

This statement about achieving this level of safety for RPA systems is based upon
more than ten years of personnel experience with the German military certification
procedures in various certifications programs including the systems from ~ 170 kg to
~1250 kg MTOW. It was surprising how this procedure could be applied to so
different systems without further problems.

The underlying safety philosophy behind seems to be the most useful. The need may
arise to explain that the “military wording” has to be translated for civil use. Different
categories and the use of restricted airspace are not too far away from issuing
“permits to fly” or to issue a TC with certain restrictions. It has to be understood that
collision avoidance is the reason here to substitute non existing technical solutions by
a known and suitable procedure. For civil use, other countries simply enlarged
separation minima to other air traffic as for planes with radio failure. The same is with
the requirement of using military practice areas for Take Off and Landing. Translated
into civil terms, the meaning is nothing else as to stay within a controlled environment
like every airfield is. This procedure may be a basis for a civil business case, even for
a limited time frame in order to achieve public acceptance for civil used RPAS. For
the large systems, (compared to category 3) cross border operation and use of
unrestricted airspace is foreseen.

The tailor made set of rules that will meet the requirements for a sustainable
operation of civil RPA in the future may be seen in STANAG 4671. Within this
document, the fusion of applicable civil requirements with the experience of military
certifications has already been done – by the military!

3 Summary

This white paper is written to explain that there are different ways of certifying
unmanned systems already existing in the world. Sharing the experience, the good
and the bad, may lead to a situation where the missing link between isolated
approaches may be found very quickly, even sometimes unexpectedly.
Today, there is an increasingly demand for flying RPA in “commonly used” airspace. Questions and problems have become more and more serious for manufacturers and operators throughout the world and no one has been able to solve them all. This situation has become unacceptable for manufacturers as well as for operators and the authorities involved.

Airspace integration of UAS is demanding and activities and studies like INOUI clearly identified that a harmonised effort is needed to achieve the goal. In any case, the interdependencies between operation, design and rulemaking could never become broken up by just one involved partner! As long as every operation will have to take place in a certain legal environment, this needs to be defined prior to invest into a certain system for later usage.

This harmonisation of efforts around the globe is possible today because of ICAO’s UASSG. Taking into account the certification experiences of military users during the past decades, there may be an unexpected way of preventing an expensive and time consuming learning curve for a safe use of civil UAS. Furthermore, if the situation occurs, that due to this opportunity the number of UAS inclines, necessary products enabling safe UAS operation may find their way into manned aviation with a tremendous possible effect on safety! In other words, if due to larger numbers of UAS sense and avoid technology becomes mature and cheaper, lots of accidents in the manned aviation may become prevented in the future.

3.1 Breaking the chains

As every design needs a specification for it, also the industry clearly needs to know for what kind of operational envelope they will have to design a product. As long as it is uncertain, whether a product may be sold in sufficient numbers to generate at a minimum a return of invest, no company will do it. But if such a business case becomes the starting point for rulemaking, there is a circular interdependency where only an initial governmental usage may break this chain.

A governmental case for operating Remotely Piloted Aircraft Systems, can easily be seen for governmental applications like supporting aerial fire fighting, disaster monitoring, maritime border protection and as to be seen in Japan during the last days to carry out dangerous reconnaissance missions under nuclear pollution may be a first attempt in boosting technology standards together with the protection of the environment.

The technology of unmanned – or remotely piloted aircraft comprises a lot of know-how, capabilities and chances because of the need to fly cross border much more often as perhaps in the past. It may support governmental approaches of generating high qualified jobs all over the world while at the same time safeguarding precious resources.

Integrating RPA into global Airspace may be seen as being only one piece in a large jigsaw puzzle, but even so there is a feeling that this work will be just as ambitious as NASA’s moon landing program.

NASA succeeded in the end, why don’t we?