

Metodología y técnicas aplicables a Robots-RPAS para su puesta en el mercado y operaciones seguras

Julián Galleo Yagüe
ALTER TECHNOLOGY TÜV NORD

Robótica y sistemas no tripulados para aplicaciones de seguridad
Madrid, 2 de Diciembre de 2016



ENERGY



IT



MOBILITY



HEALTH AND NUTRITION

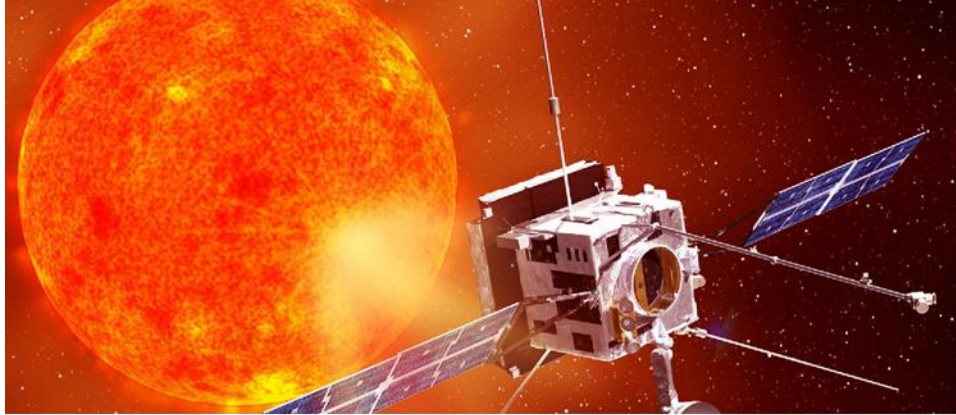


NATURAL RESOURCES



AEROSPACE & ELECTRONIC

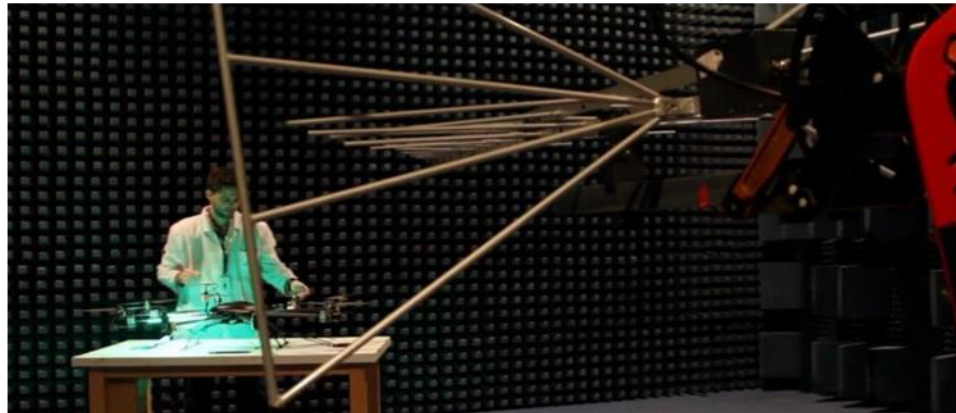
ALTER TECHNOLOGY TÜV NORD (ATN)



- **Microelectronics, optoelectronics and MEMS for high reliability & high-tech fields**



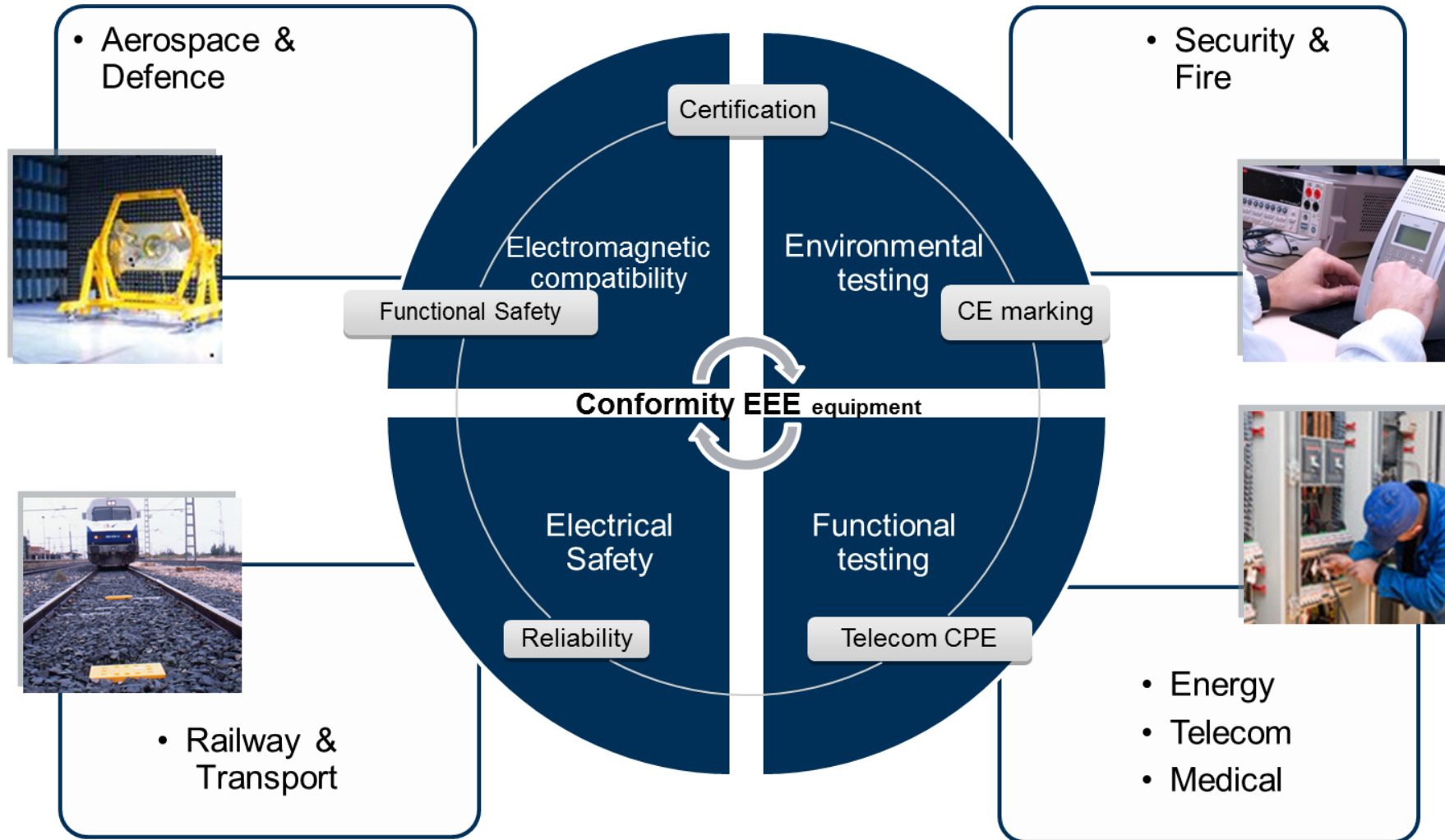
- **Equipment & systems testing**
- **Certification & engineering**



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ATN: ENGINEERING, TESTING & CERTIFICATION



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ATN: ENGINEERING, TESTING & CERTIFICATION

- Accredited CERTIFICATION BODY (EN 17065:2012): N°107/C-PR261
- European NOTIFIED BODY (NB 2031)
 - EMC Directive: 2014/30/EU Electromagnetic compatibility
 - RED Directive: 2014/53/EU Radio
- Accredited TESTING LABORATORY (EN 17025:2005)
 - Scope: N° 345/LE808
 - MIL-STD-461 (EMC) / 810 (Environmental)
- RTCA/DO-160

ENTITY

- INDEPENDENT
- IMPARTIAL
- CONFIDENTIAL

INTERNATIONAL RECOGNITION

- NIST: National Institute of Standard and Technology (USA) - EMC
- NATA: National Association of Testing Authorities (AUSTRALIA) – EMC and Safety
- RRA: Radio Research Agency (SOUTH KOREA) - EMC



European
co-operation for
Accreditation



CERTALARM



**ALTER TECHNOLOGY TN
CONFORMITY ASSESSMENT
BODY**

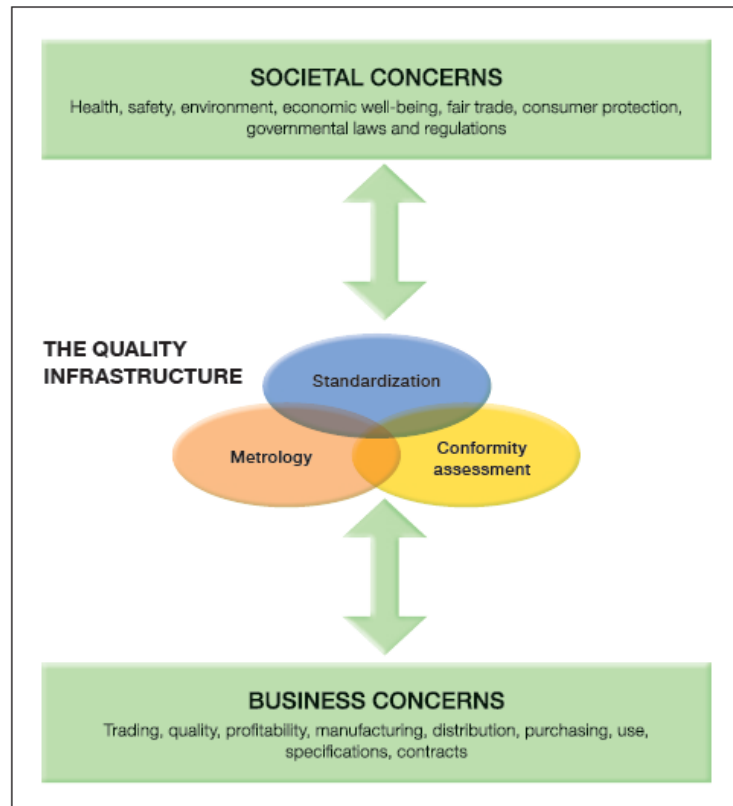
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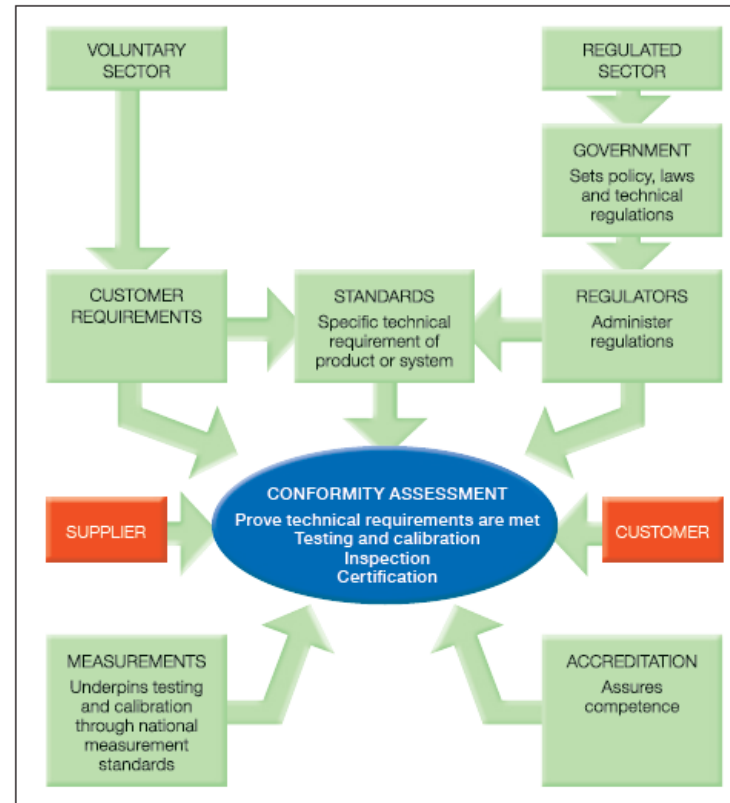
- The role of conformity assessment in the quality infrastructure and its importance to trade capacity building and economic development

Figure 1 – The role of the quality infrastructure



- ISO/IEC 17000 defines CONFORMITY ASSESSMENT as : demonstration that specified requirements relating to a product, process, system, person, or body are fulfilled

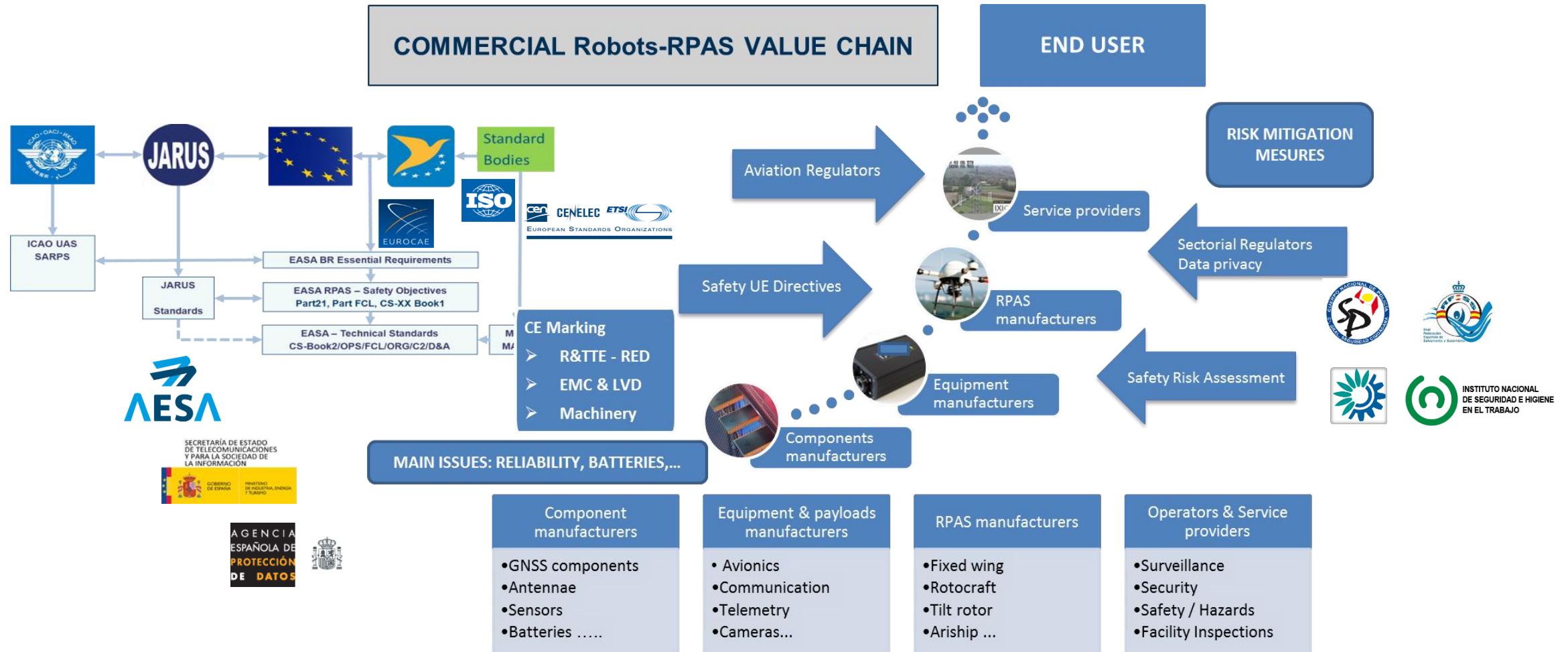
Figure 2 – Example of a conformity assessment model



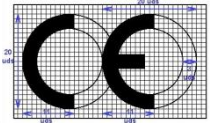
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ATN: CONFORMITY ASSESSMENT – REGULATORS REQUIEREMENTS

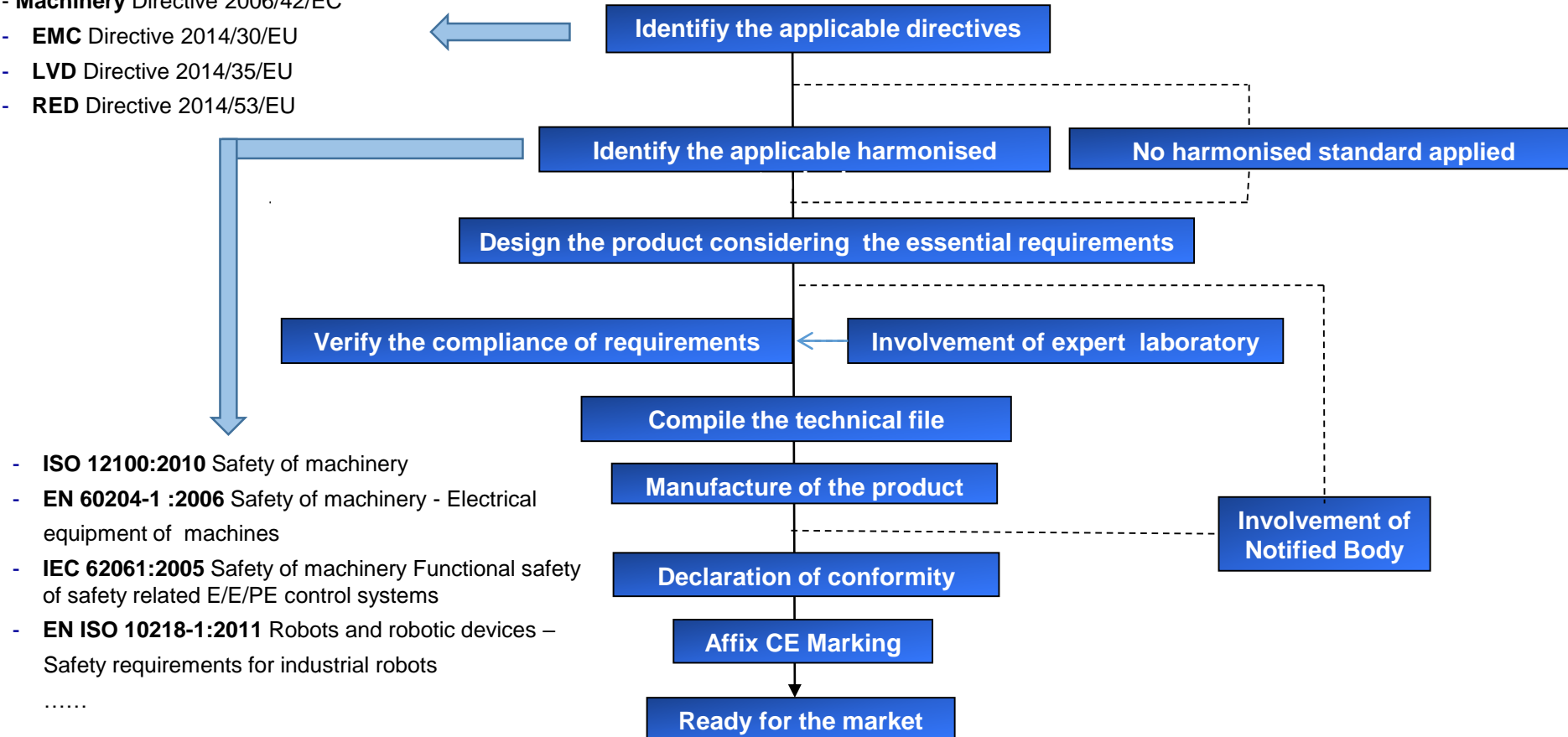


- **CE Marking:** Key indicator of a product's conformity with **EU regulation**
 - Compliance with essential requirements of EU technical regulations (Directives)
 - That compliance has been demonstrated throughout relevant conformity assessment procedures
- **Functional Safety : Safe Robots-RPAS Design**
 - Part of the overall safety relating to the Equipment Under Control (EUC) and the equipment control systems that depends on a system operating correctly in response to its inputs
 - Functional safety is achieved designing a **Safety-Related System (SRS)** to carry out a Safety Function at a reliability indicated by the **Safety Integrity Level (SIL)**
- **Specific Operation Risk Assessment (SORA):** Relative to a **Safe Operation**
 - Each **specific aviation risk** needs to be analyzed and mitigated through a **safety risk assessment**
 - A safety risk assessment shall be performed, **covering both the drone and the operation**, identifying all the risks related to the specific operation, and proposing **adequate risk mitigation measures**
- **Dual-USE export controls**
 - The trade in dual-use items – goods, software and technology that can be used for both civilian and military applications and/or can contribute to the proliferation of Weapons of Mass Destruction (WMD) – is subject to controls to prevent the risks that these items may pose for international security



Robot-RPAS CE Marking: Standard procedure

- Machinery Directive 2006/42/EC
- EMC Directive 2014/30/EU
- LVD Directive 2014/35/EU
- RED Directive 2014/53/EU



- ISO 12100:2010 Safety of machinery
- EN 60204-1 :2006 Safety of machinery - Electrical equipment of machines
- IEC 62061:2005 Safety of machinery Functional safety of safety related E/E/PE control systems
- EN ISO 10218-1:2011 Robots and robotic devices – Safety requirements for industrial robots
-

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```

graph TD
    Start([Start]) --> Functions[Functions of the machine  
(definition of limits)]
    Functions --> Hazards[Hazards identification]
    Hazards --> Estimation[Risk estimation]
    Estimation --> Evaluation[Risk evaluation]
    Evaluation --> Decision{Has the risk been  
reasonably reduced?}
    Decision -- YES --> End([End])
    Decision -- NO --> Reduction[Risk reduction process]
    Reduction --> Functions
  
```

The flowchart illustrates the Risk Assessment Process. It begins with a 'Start' terminal, leading to a sequence of steps: 'Functions of the machine (definition of limits)', 'Hazards identification', 'Risk estimation', and 'Risk evaluation'. These steps are grouped within a dashed red box labeled 'Risk assessment'. A decision diamond follows 'Risk evaluation', asking 'Has the risk been reasonably reduced?'. If the answer is 'YES', the process ends at an 'End' terminal. If the answer is 'NO', the process moves to a 'Risk reduction process' box, which then loops back to the 'Functions of the machine' step. A dashed blue line also connects the 'Risk estimation' step to a 'Risk analysis' box outside the main flow.

Functional Safety
IEC 62061 Machinery (IEC 61508)
ISO 13849 Control Systems

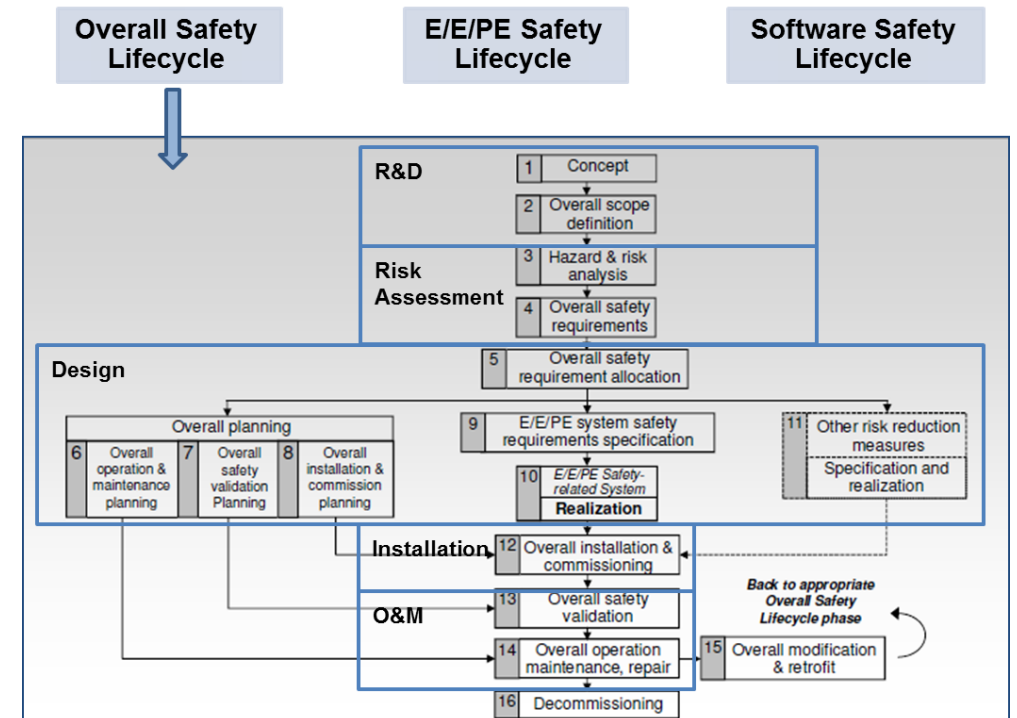
Protective measures implemented by the designer

Step 1: Inherently safe design measures

Step 2: Safeguarding and complementary protective measures

Step 3: Information for use

- Functional safety of electrical/electronic/programmable electronic (E/E/PE) safety-related systems
- An (E/E/PE) safety-related systems covers all parts of the system which are necessary to carry out the safety function:



Safe Robot-RPAS Operation

Where is the RISK?

- ✓ Specific Operations Risk Assessment
- ✓ Adequate Risk Mitigation Measures
- ✓ Acceptable Means of Compliance-AMC

AMC for:

- Communications systems
- Safe termination flight
- Geofencing systems



IP Grade
IK Grade
ATEX Directive
RoHS Directive



Vibration



Radiation

Electric & Magnetic Fields



Extreme Temperatures



Saline Environment



Acts of Illicit Interference



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- **Dual-USE export controls**

- **Council REGULATION (EC) No 428/2009** of 5 May 2009. Setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items, including software and technology
- **The International Traffic in Arms Regulations (ITAR)** and the **Export Administration Regulations (EAR)** are two important **United States** export control laws that affect the manufacturing, sales and distribution of technology

Administrative, criminal sanctions could be applicable, apart from company loss of image in case of public judgement

ATN as highly involved in EEE components & equipment export control procedures, we had developed high accurate capabilities for the regulation and procedures for the DUAL USE management and applicable laws and sanctions

Exteriores se queja a Israel por regalar un dron español a Rusia

El Gobierno traslada su “preocupación” a las autoridades israelíes por la vulneración de la legislación que prohíbe reexportar tecnologías sensibles

MIGUEL GONZÁLEZ

Madrid - 26 NOV 2016 - 12:05 CET



El dron que España había vendido a Israel. / ALPHA UNMANNED SYSTEMS | EPV

El Gobierno español ha pedido explicaciones al israelí por la donación al primer ministro ruso, Dmitri Medvéded, de un dron que la firma española Alpha Unmanned Systems SL vendió a Israel. En una nota verbal a la Embajada israelí en Madrid, [el Ministerio de Exteriores](#) expresa su “preocupación” por el hecho de que se haya vulnerado la legislación que prohíbe reexportar estas tecnologías sensibles; más aún, a un país como [Rusia, sujeto a sanciones de la UE](#).

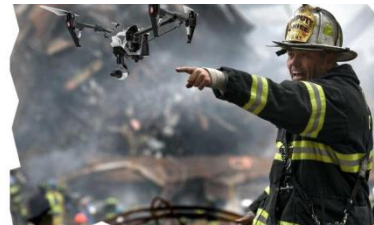
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ATN: CONFORMITY ASSESSMENT – EASA “PROTOTYPE”

EASA on Annex II – Product Legislation Framework

The **conformity assessment procedures** may range from a simple declaration of conformity by the manufacturer to a thorough verification based on full quality assurance for the manufacturer and assessment of the design of the product by a **conformity assessment body** notified by the Member State



SAFETY STARTS IN DESIGN PHASE

EUROPEAN DIRECTIVES

HARMONISED STANDARDS

DUAL USE

FUNCTIONAL SAFETY

CE MARKING

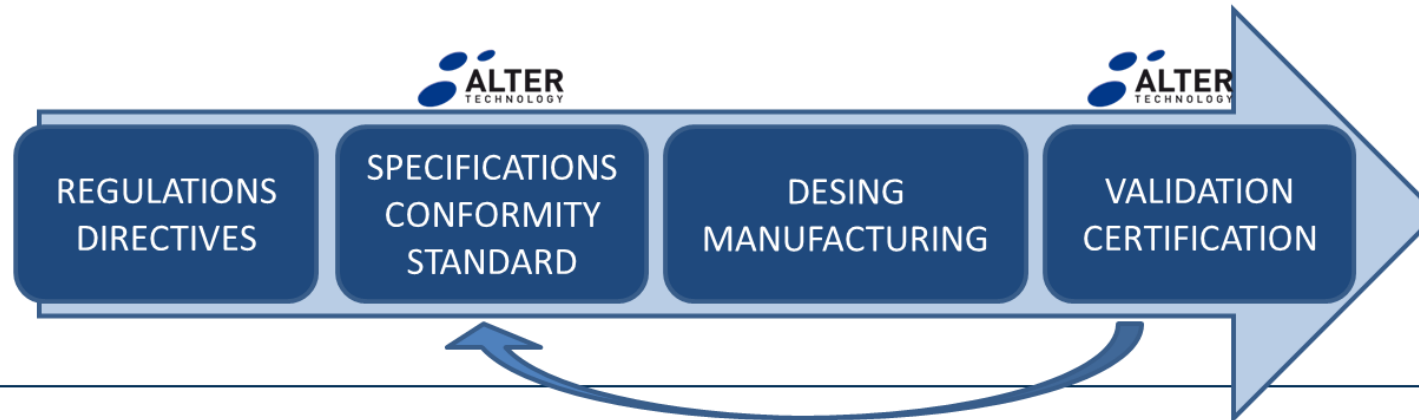
OPERATIONS RISK ASSESSMENT

ATN: CONFORMITY ASSESSMENT

H2020 WP 2017 - STANDARDIZATION process framework

Standardization, validation and certification of devices, products and systems for security applications. Technology Readiness Level (TRL) 6, 7,...

- **STANDARDIZATION.** Starting from the technical specifications, the definition of the essential requirements, test suite and verification procedures to develop a technical standard and the associated product conformity evaluation or certification scheme
- **VALIDATION / CERTIFICATION.** Conformity evaluation of electronic products, such as CE marking and other regulatory certifications or voluntary approvals according to EU Security industry requirements



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<https://www.youtube.com/playlist?list=PL1XbNXHAdTfzO9yjdXVV0kVvUmrfaSmH>

¡¡GRACIAS!!

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