



RPAS INTEGRATION INTO EU AIRSPACE

**INTERNATIONAL CONFERENCE  
On CIVIL RPAS OPERATIONS**



Experimental flights and demonstration activities under  
IT-CAA permit to flight of the HERO VTOL-RPAS  
and application within SESAR/INSuRE Project framework

Vincenzo Mirra  
Sistemi Dinamici, Italy

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The RPAS HERO is a 150 Kg helicopter-based Light RPAS representing the VTOL RPAS state-of-the-art for Sistemi Dinamici (SD).

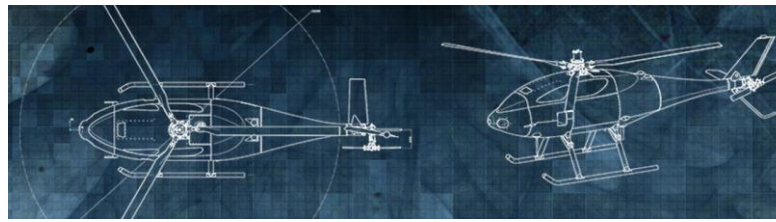
HERO has been fully designed and manufactured by SD under both civil and military user-cases requirements being developed and tested in conformity of the IT-CAA (ENAC) L-RPAS regulation. This allows a system delivery fully compliant with customer and airworthiness requirements, enabling the operators to cope with the different applications scenario incorporating automatic capabilities and redundant safety features which help to ensure a successful mission.

This presentation follows that of last June mainly focused on the regulatory scenario in which HERO has been developed, while aim of this new work is to provide a view of the operative scenario in which the HERO RPAS is currently operated for experimental flights and demonstration activities under the ENAC permit to flight.

Besides, in the framework of the INSuRE SESAR, it will be presented an update of the demonstrative application of the safe integration of HERO into a non-segregated airspace working into very close coordination with the ATC service provider (in cooperation with ANS-CR, Czech Republic National Service Provider).

- SD-150 HERO VTOL RPAS overview and **system capabilities**
- **Regulatory scenario** as for airworthiness requirements compliance to rules and methods agreed with the IT-CAA and CR-CAA for HERO experimental flights campaign into LKTB, Brno airspace – May 2015
- SESAR JU – INSuRE project: Flight test campaign for demonstration and validation of the safe **RPAS integration** within the air-traffic controlled airspace. The implemented simulation scenario will be presented together with the plan of the simulation exercises to be performed on January 2015.
  - Approach to Civil RPAS operation: the INSuRE application within SESAR JU

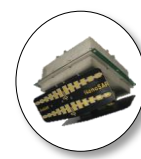
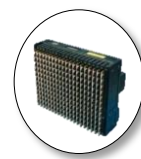




Dimensions	
Main rotor diameter	3500 mm / 138 in
Length	3300 mm / 130 in
Height	1180 mm / 46½ in
Width	1030 mm / 40½ in
Weight	
Maximum takeoff weight (MTOW)	150 kg / 330 lb
Empty Weight	100 kg / 220 lb
Payload	50 kg / 110 lb

Performance	
Endurance	5 hours with 15 kg payload
Operational ceiling	4000 m / 13100 ft
Maximum takeoff altitude	3000 m / 9850 ft
Max cruising speed	184 kph / 100 kts
Max endurance speed	90 kph / 50 kts

System Features	
Engine	50 hp, 2-stroke engine
Fuel	Gasoline or heavy fuel (JP5/8, JetA/A1 CWI version)
Navigation	Triple-redundant flight control system Triple-redundant INS Triple-redundant GPS
Take-off / landing	Vertical take-off / landing
Ground control station	STANAG-4586 compliant Multi UAV command & control Network-centric MIL-STD-810
Payload data link	Up to two full HD digital videos
C&C data link	STANAG-4586 compliant Full dual redundant
Data link range	100 km LOS



# SD-150 HERO Applications

The SD-150 HERO offers two modular payload bays (underbelly and nose) which can integrate different payloads in order to fulfill various mission capabilities.

- Gyro stabilized EO HD – IR gimbals
- Synthetic aperture radar (SAR)
- LIDAR
- Photogrammetry system
- Communication relay
- AIS Transponder
- ADS-B Transponder
- Signal intelligence (SIGINT) system
- Communication intelligence (COMINT) system



## Civil

- Pipeline and power line inspection
- Mining applications (prism positioning and early warning)
- Pollution control
- Wildlife, field and vegetation monitoring
- GIS (mapping and surveys)
- Flight inspection



## Homeland Security

- Border control
- Disaster assessment
- Law enforcement
- Fire prevention



## Military

- Communication relay
- FOB protection
- Route clearance
- Coastal control
- Support for naval operations

- 2013, Sept., 20: 1<sup>st</sup> HERO Delivery Outcome
- 2013, Nov., 26: 1<sup>st</sup> HERO ENAC PtF



2013

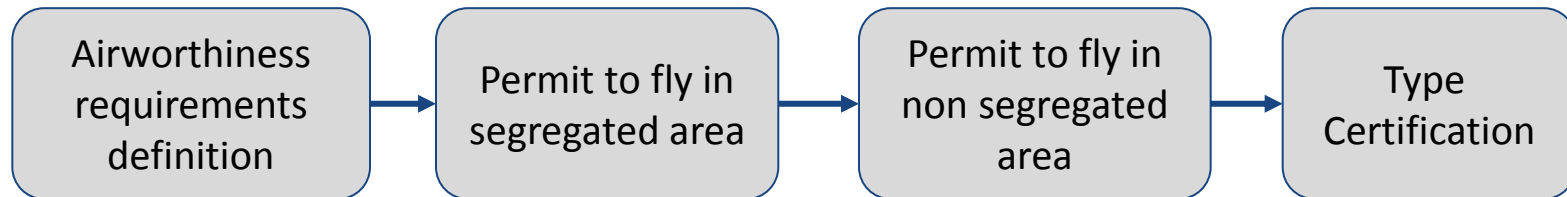


2014 (PtF1)

- Apr., 30: 2<sup>nd</sup> ENAC PtF
- Jul., 16: 3<sup>rd</sup> ENAC PtF
- Nov., 7: 4<sup>th</sup> ENAC PtF

**Ongoing: new request to IT-CAA for one year (2015) PtF for demonstration (PtF2)**

## "Requirement driven" Design Approach



Selection of airworthiness requirements from both civil and military specification:

- Civil (EASA/ENAC/JARUS)
  - EASA CS.VLR, "manned" very light rotorcraft (MTOW < 600 Kg)
  - Regolamento SAPR ENAC
  - CS-LURS applicable to Light Unmanned Rotorcraft Systems with Light take-off weights not exceeding 750 kg
- Military NATO/IT-AIRFORCE
  - STANAG 4703 (2012), applicable to RPAS con MTOW < 150 Kg
  - STANAG 4586 applicable to communication protocol for GCS



# HERO – Process Compliance

IT-CAA Investigation for authorization to fly

System assessment performed by a dedicated team of 6 specialists

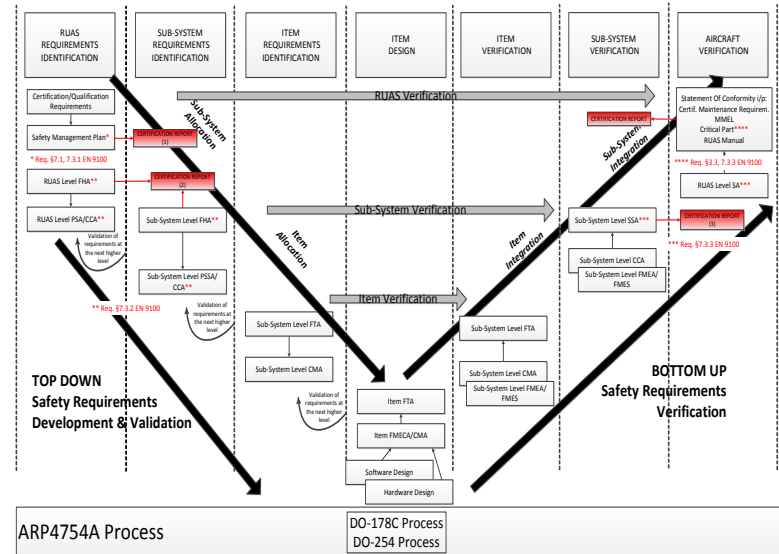
Risk Assessment

Safety

System FHA for risk mitigation

Acknowledgment and Authorization of RPAS pilots

Liason with CAA



Design & Development

Supply Management

Manufacturing

Quality Management

RTCA-DO-160 or MIL-STD-810  
RTCA/DO-178C

System Testing / Qualification

Aeronautical Standard AS/EN-9100



**IDS** (*Ingegneria Dei Sistemi S.p.A* ), coordinator of the consortium and responsible for:

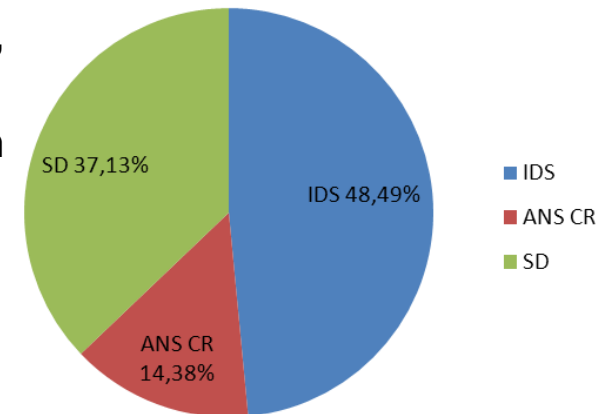
- Project Management
- Operation Concept Design
- Facilities Adaptation
- Simulation Campaign

**ANS CR** (*Air Navigation Services of the Czech Republic*), responsible for:

- Operational Platform (LKTB Brno-Turany) and ATC system adaptation
- ATC procedures and compliance with national regulations
- Safety Assessment

**SD** (*Sistemi Dinamici S.p.A*), responsible for:

- Planning, management and conduction of demonstration flight test campaign with the VTOL RPAS **SD-150 HERO**
- RPAS Operator: systems and pilot to perform flight trials



## Civil RPAS Integration into non-segregated airspace

**Objective** of the project is to implement a set of Validation and Demonstration activities addressing the safe RPAS integration into non-segregated airspace.

The aim is to demonstrate the feasible operational management of the RPAS, piloted by an on-ground UCS, evaluating:

- ✓ interaction with other aircrafts in a non-segregated airspace,
- ✓ operational aspects in implementing nominal ATC procedures,
- ✓ safety aspects to be assessed to allow safe integration in controlled airspaces,
- ✓ human factor aspects addressing both pilot and ATCOs workload and reactions.



- Flight trials and technology based on CPDLC, ADS-B and TCAS
- Flights in CTR and TMA LKTB (BRNO airspace)
- Strong implication of the ANSP
- Close coordination between the civil RPAS operator and Air Traffic Control services



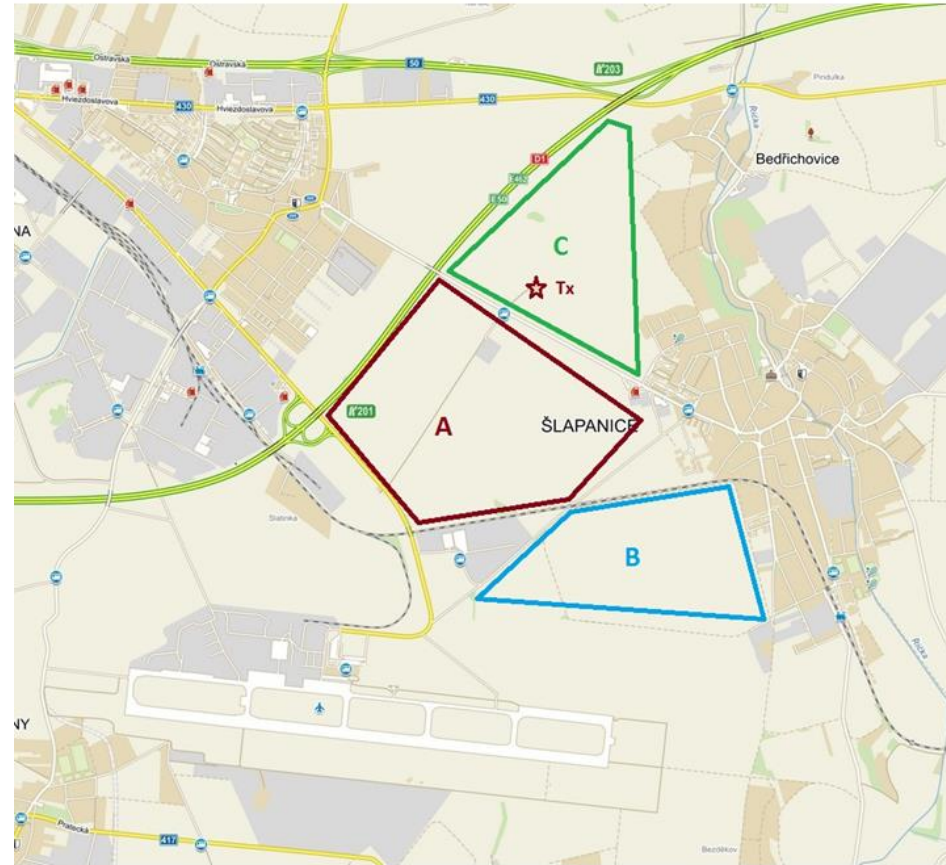
### Simulation Campaign (planned Jan. 2015):

- Verify civil RPAS integration in a complex traffic environment
- Verify multiple RPAS impact in airport capacity
- Test multiple RPAS control by a single pilot

### Flight Campaign (planned May 2015):

- Verify the interaction capabilities between RPAS and ATC during different flight phases
- Test the impact of RPAS activities (on ground and airborne) on a manned aircraft
- Verify the RPAS execution of a GNSS departure procedure
- Verify the ATC procedures for coordinating RPAS with the other aircraft
- Verify Detect & Avoid algorithm and RPAS pilot behavior

- All flights will be carried out in CTR (up to FL 125) and TMA LKTB to ensure full control over all operations involved.
- RPAS will be always separated from other traffic, except agreed manned light aircraft.
- Permanent two-way communication on frequency 119.6 TWR or APP 127.35 is mandatory.
- VHF communication is required for clearance.
- RPAS operator will carry a mobile phone as a backup for the communication.
- East apron at LKTB will be used for RPAS take-offs and landings.

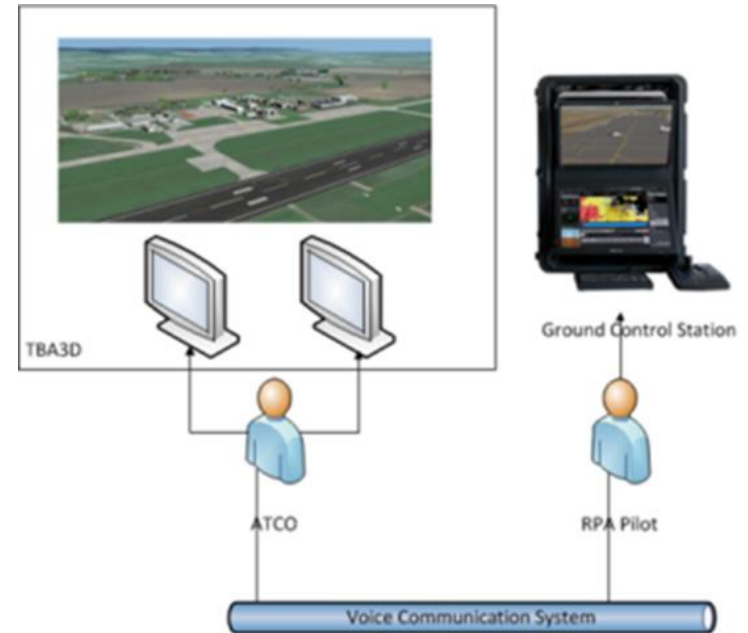


Demonstration Areas near the Brno airport (Alfa, Bravo and Charlie areas)

INSuRE foresees 4 Simulation Exercises, each with a set of runs associated to the achievement of the relevant exercise objectives.

The high level objectives to be evaluate in simulation exercises:

- interaction and co-operation between RPAS pilot and ATCOs in a non-segregated area (all Exercises);
- safe integration of RPAS with other manned traffic during ground and airborne maneuvering (Exercise 2);
- safety level of the Detect & Avoid system and RPAS behavior in a conflict situation (Exercise 3);
- adaptation implemented on the Detect & Avoid subsystem for the RPAS simulator to receive ADS-B data (Exercise 3);
- complex scenario of RPAS integration in civil traffic (Exercise 4).



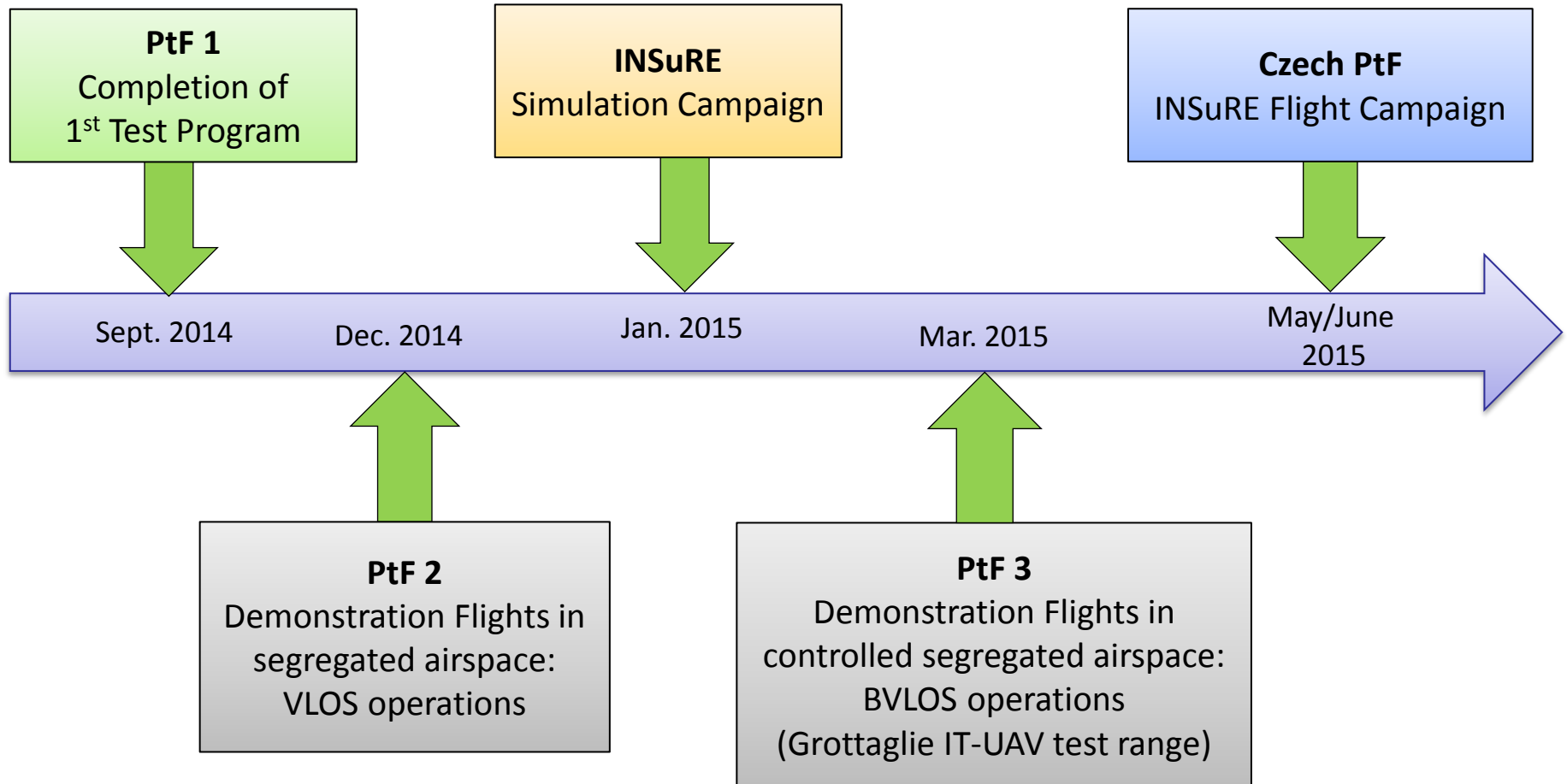
- Preliminary flight trials: performed on ground on the airport site for system integrity check (**Objective 1**)
- 1<sup>st</sup> flight trials set (2 Flights): will allow the comparison between the designed/simulated and flown path in a temporary closed controlled airspace (**Objective 2**)
- 2<sup>nd</sup> flight trials set (2 Flights): repetition of the first campaign in a non-segregated airspace with two aircrafts (RPAS and a light aircraft) flying the same controlled environment (**Objective 2**)
- 3<sup>rd</sup> trials set (2 Flights): will evaluate a Detect and Avoid manoeuvre in a temporary closed controlled airspace where the RPAS and a light aircraft are operating simultaneously (**Objective 3**)

Each flight will last about 30 minutes.

Planned time slot for flight trials execution is May/June 2015.



# INSuRE Roadmap to Flight Campaign



## Ing. Vincenzo Mirra

Quality & Certifications  
Department Manager

Phone: +39 050 9914436

e-mail:

[v.mirra@sistemidinamici.com](mailto:v.mirra@sistemidinamici.com)

## Ing. Mauro Frosoni

UAV  
Business Unit Manager

Phone: +39 050 9914422

e-mail:

[m.frosoni@sistemidinamici.com](mailto:m.frosoni@sistemidinamici.com)

## Ing. Giancarlo Nobile

Aeromechanics Department  
INSuRE Project Manager

Phone: +39 050 9914421

e-mail:

[g.nobile@sistemidinamici.com](mailto:g.nobile@sistemidinamici.com)



Via E. Calabresi n.24  
56121 Pisa - Italy

[www.sistemidinamici.com](http://www.sistemidinamici.com)

Fax: +39 050 9914412