ARTES Application Workshop

SINUE

Satellites enabling the Integration in Non-segregated airspace of UAS in Europe

Feasibility Study on the Use of Satellites for the Integration of UAS in the European Airspace

ESTEC, April 6th 2011

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SINUE Project: Objectives

- Determine the **feasibility and the overall planning** for a **UAS mission** to demonstrate:
  - The integration into non-segregated airspace of UAS using satellite communications and navigation for C2, S&A and ATC relay,
  - The added value of satellite communications for high data rate payload links to such a mission.

- Provide a detailed investigation into the **viability** of such selected solution in view of future services development based on UAS supported by satellite systems.

- Identify the **investments necessary** in the future and the **next steps** required in **technical and regulatory terms** to effectively establish such a service solution and provide an associated **roadmap** in support of specific civil/security/military services development.

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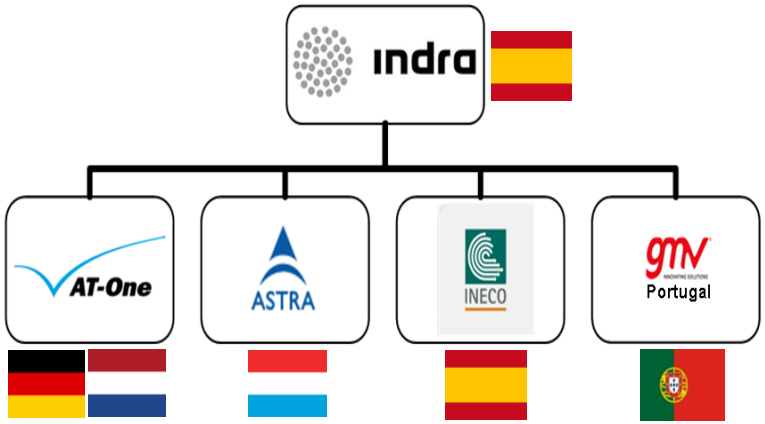
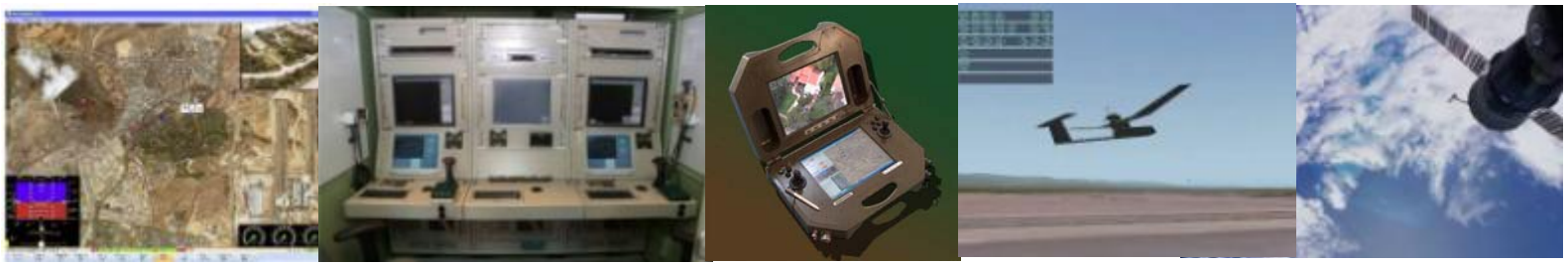
CONSORTIUM PRESENTATION

- Solid Consortium from different countries of the European Union.
- The Partners of the Consortium bring together the required expertise areas, in order to build the most appropriate team for all necessary competences:
  - UAVs
  - ATM
  - Satellite technologies
  - Regulatory framework





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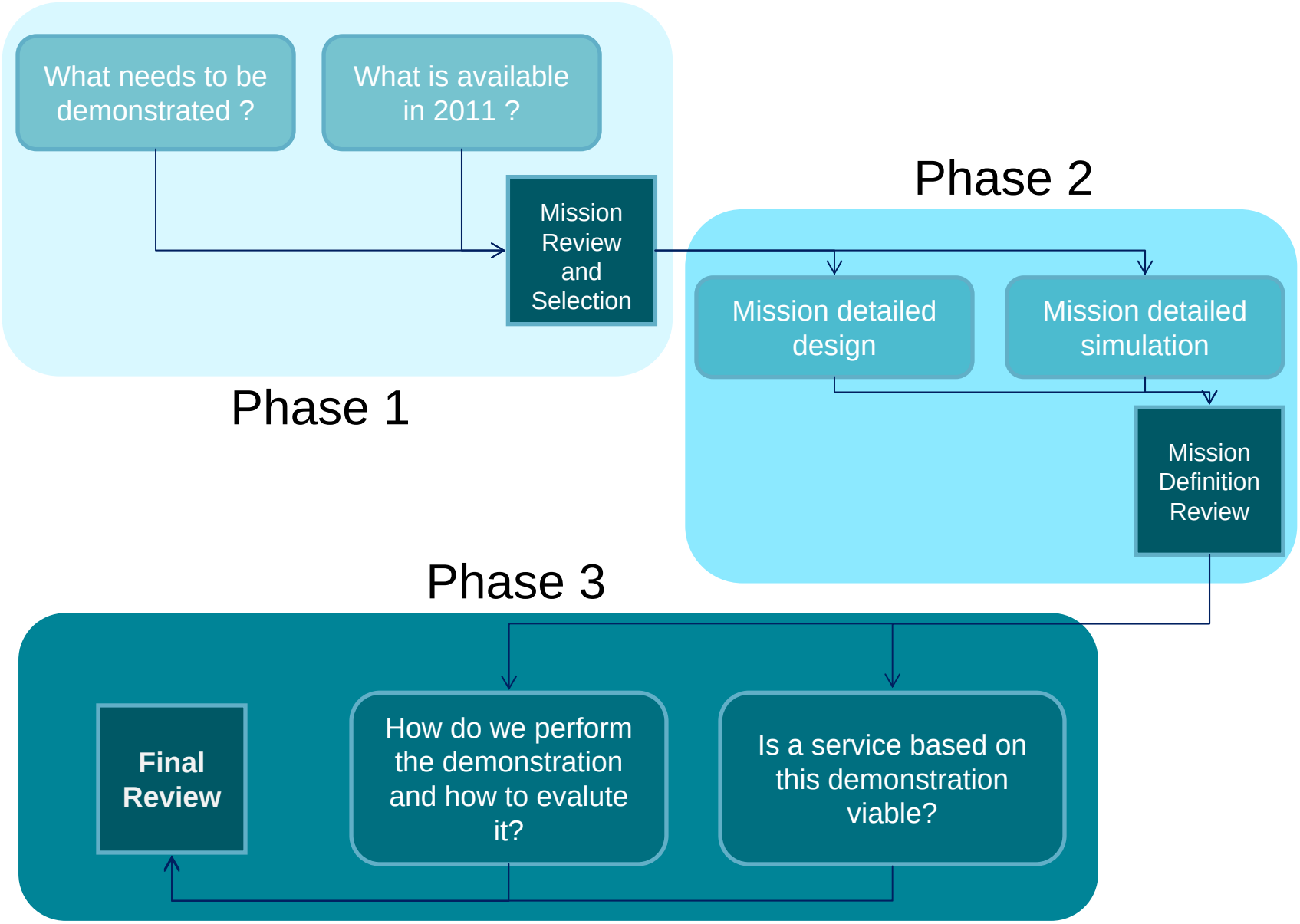
STUDY LOGIC


What needs to be demonstrated ?
What is available in 2011 ?
Mission Review and Selection
Phase 1
Phase 2
Mission detailed design
Mission detailed simulation
Mission Definition Review
Phase 3
Final Review
How do we perform the demonstration and how to evalute it?
Is a service based on this demonstration viable?

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TARGET APPLICATIONS

- Maritime Surveillance & Coastguard
- Border Surveillance/Control
- Civil Security and Law Enforcement
- Infrastructure monitoring/surveillance: Oil and Gas, Electricity Networks…
- Disaster management and Mitigation
- Fire fighting
- Earth Observation and Remote Sensing
- Monitoring: Agriculture, Forestry and Fisheries
- Communications and Broadcasting

User needs and mission selection approach

Users needs

SPAIN

- Xarxa RESCAT – Rescue Network
- Servei Metereologic de Catalunya
- Guardia Civil
- Ejército del Aire

PORTUGAL

- APRAM – Portos da Madeira
- FAP – Força Aérea Portuguesa

GERMANY

- German Ministry of the Interior (Federal Police)
- Dutch Royal National Police Services
- Cost Action IS0802: Unmanned Aerial Systems in Atmospheric Research

SWEDEN

- SSC (Swedish Space Cooperation)

Baltic Sea

Canary islands

Corsica

Germany

SELECTION CRITERIA

Mission selection criteria

- Experience with similar UAS related initiatives / missions
- End user interest and commitment
- Stakeholders' needs and requirements
- Mission and operational aspects
- Environmental aspects
- Integrated Logistics Support
- Cost
- Social impact and benefit

UAS selection criteria

- Maturity
- Safety
- Performances and Payload
- ILS "Footprint"
- Cost
- "Europeanality"
- Information availability

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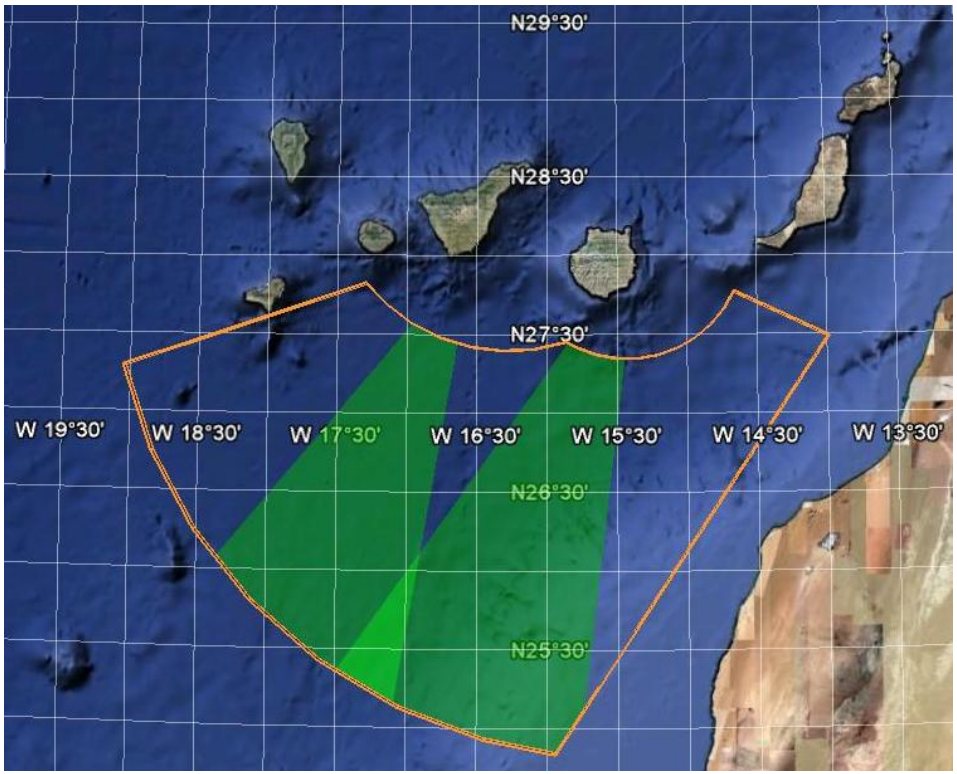
Selected mission: Canary Islands



- Users: Guardia Civil and Spanish Air Force
- Mission: border control

Patera

Cayuco

Rubber boat

Selected UAV infrastructure

HERON 1

Dimensions	Wing	Span	16.60 m
		Area	13.00 m^2
		Aspect Ratio	21.2
	Fuselage Length		5.20 m
	Overall Length		8.50 m
	Overall Height		2.30 m
	Payload bay volume		0.80 m^3
	Wheel Track		3.10 m

Weights	Max. Take off Weight (MTOW)	1100 Kg
	Operative Empty Weight (OEW)	600 Kg
	Max. Fuel Weight	430 Kg
	Max. Payload Weight	250 Kg
	Max. Useful Load Weight	500 Kg

Selected Satellite infrastructure

The requirements for both the payload control forward link and the mission data return transmission follow:

Forward:

64 kbps achieved using 5 orthogonal carriers of 12.75 kbps each.

Spread Spectrum (Spreading Factor: 31)

QPSK Modulation

Code Rate: 1/2 + Reed Solomon (123/107)

QoS target performance: 10-8 (BER)

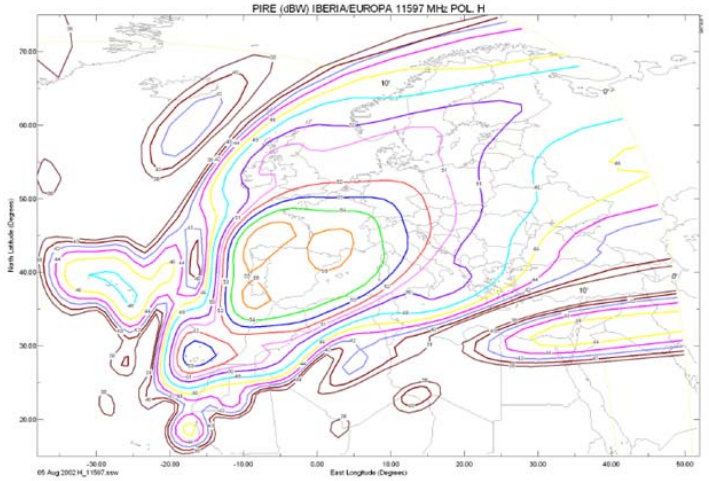
Return:

4 Mbps

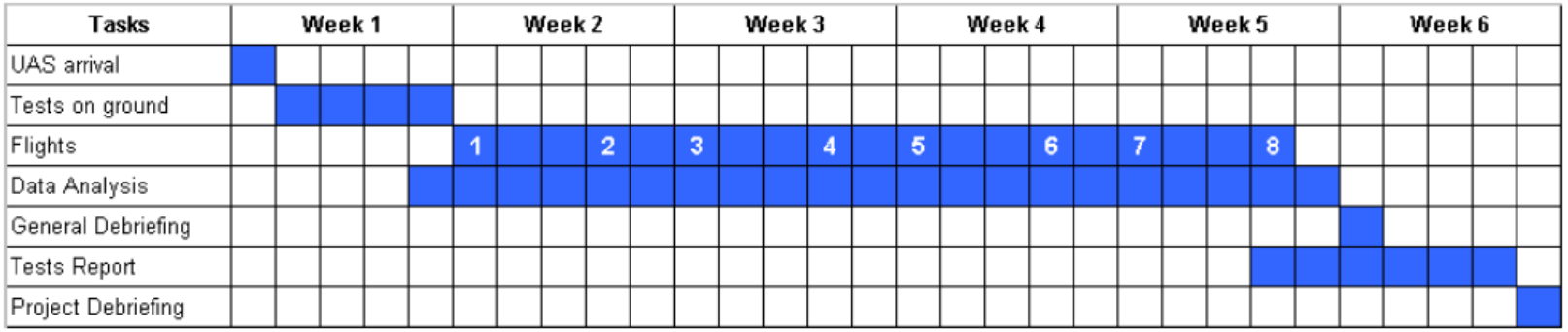
QPSK Modulation

Code Rate: 1/2 + Reed Solomon (208/192)

QoS target performance: 10-8 (BER)



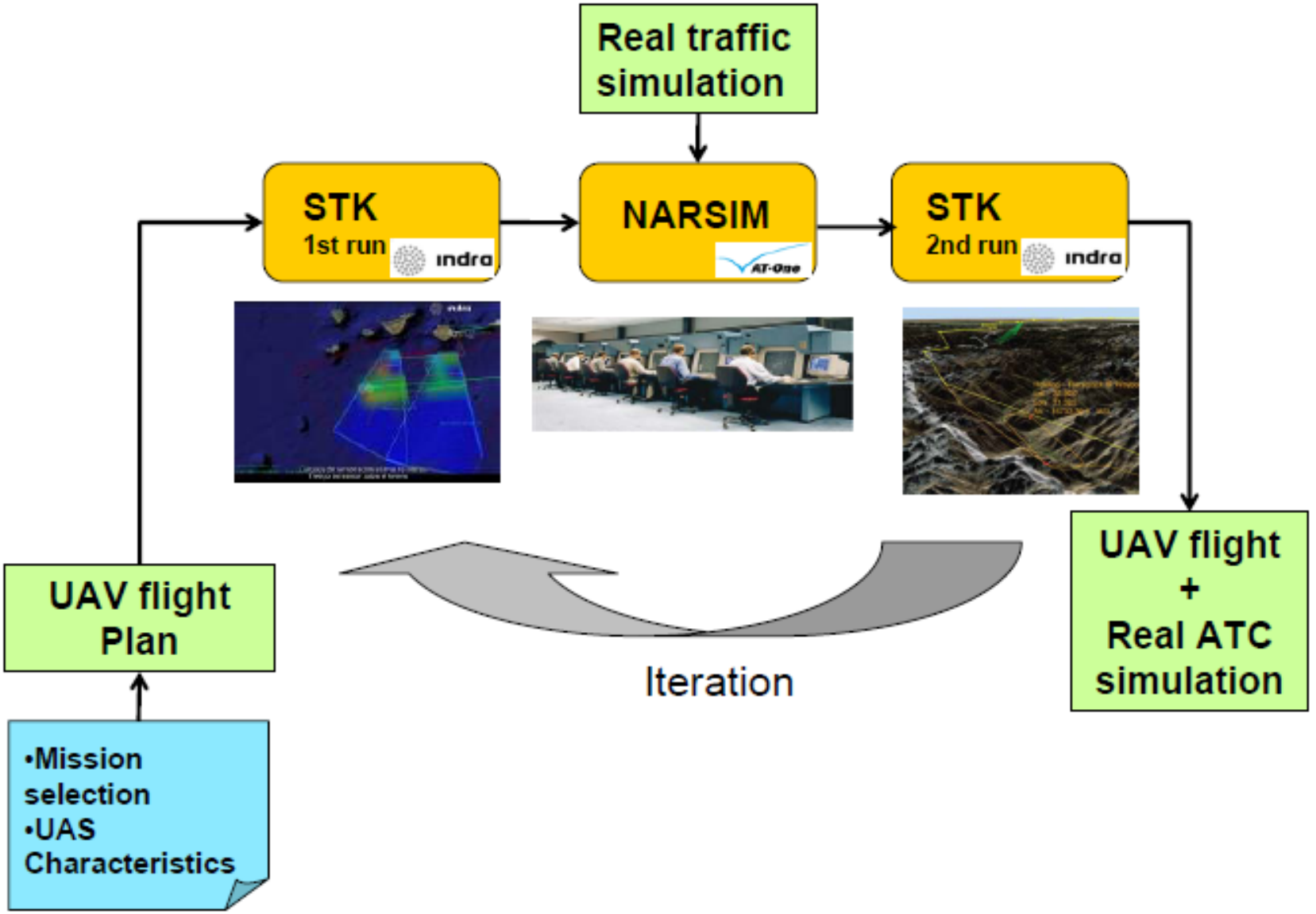
Mission schedule



The activities are formed by:

- 1 day for coordination of UAS arrival to demonstration area
- 4 days of tests on ground (i.e. Communications, GDT, GCS, aircraft)
- 4 weeks of flights, 2 per week (Monday and Thursday)
- 4 weeks of data analysis from all collected data during demonstration
- 1 day, after all flights have be performed, for a general debriefing
- 6 days for making a whole tests report
- 1 day for a final project debriefing

Simulation methodology



Simulation results

Video

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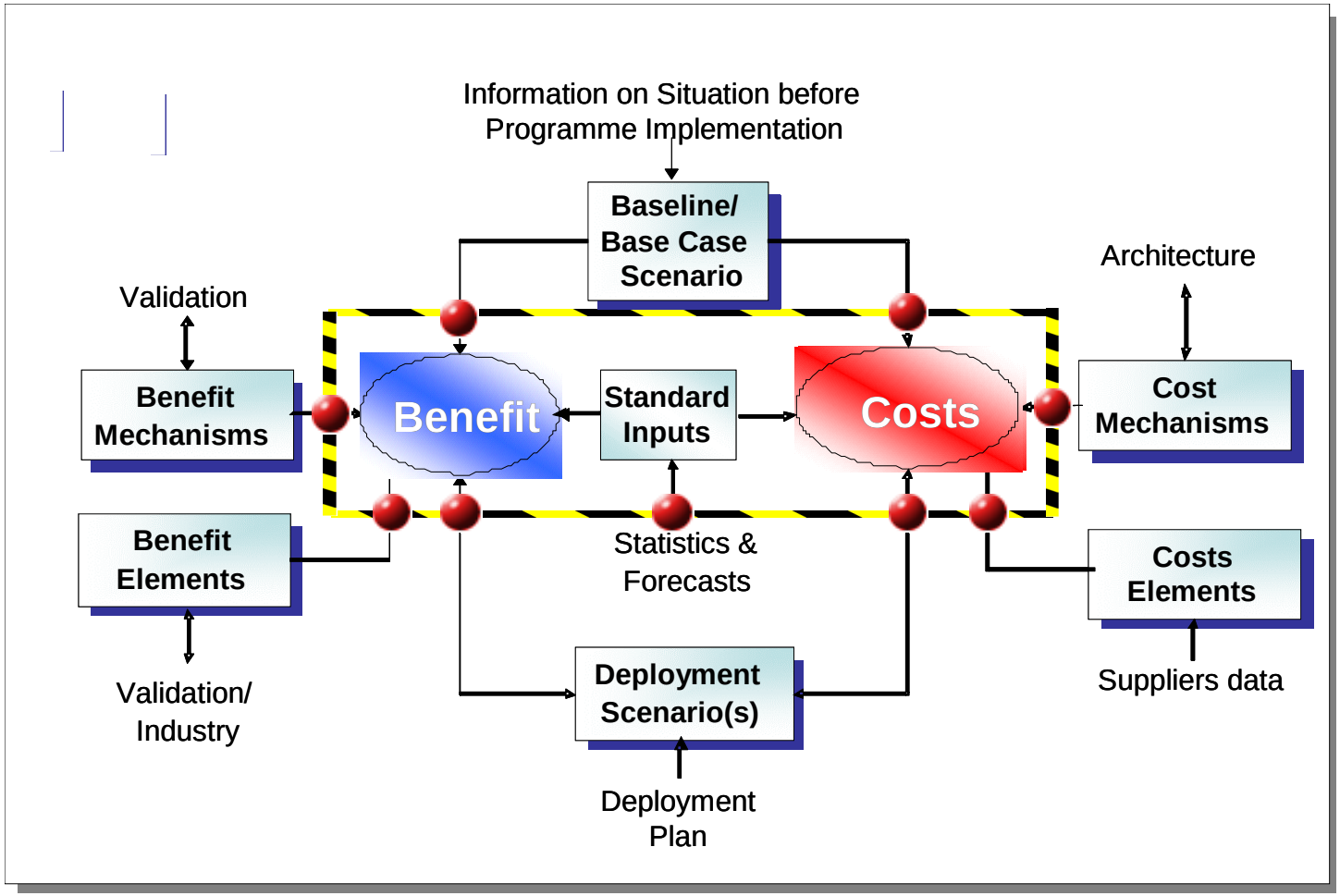
Our Methodology
Cost Benefit



Results: Economical analysis

QUANTITATIVE BENEFITS

	P3-ORION VS HERÓN 1		
Reduction of Operatinal Cost	Hight	Medium	Low
Personnel	4389	3990	3591
Fuel Consumption	5201	4728	4255
Maintenance Cost	23100	21000	18900

	FOKKER F-27 VS HERÓN 1		
Reduction of Operatinal Cost	Hight	Medium	Low
Personnel	415,25	377,5	339,75
Fuel Consumption	2032,8	1848	1663,2
Maintenance Cost	9240	8400	7560

QUALITATIVE BENEFITS

- **No crew onboard**
- capabilities due to the use of **SATCOM systems**.
- **Increment of endurance.**
- **Modern technology payload**
- End-user will gain **leading experience**
- Go further when planning future missions in **dull, dirty and dangerous environments.**

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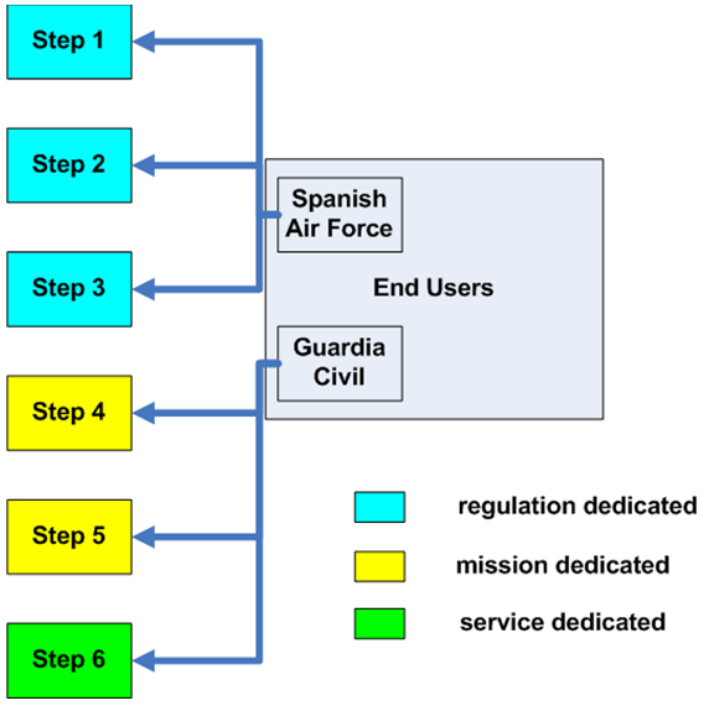
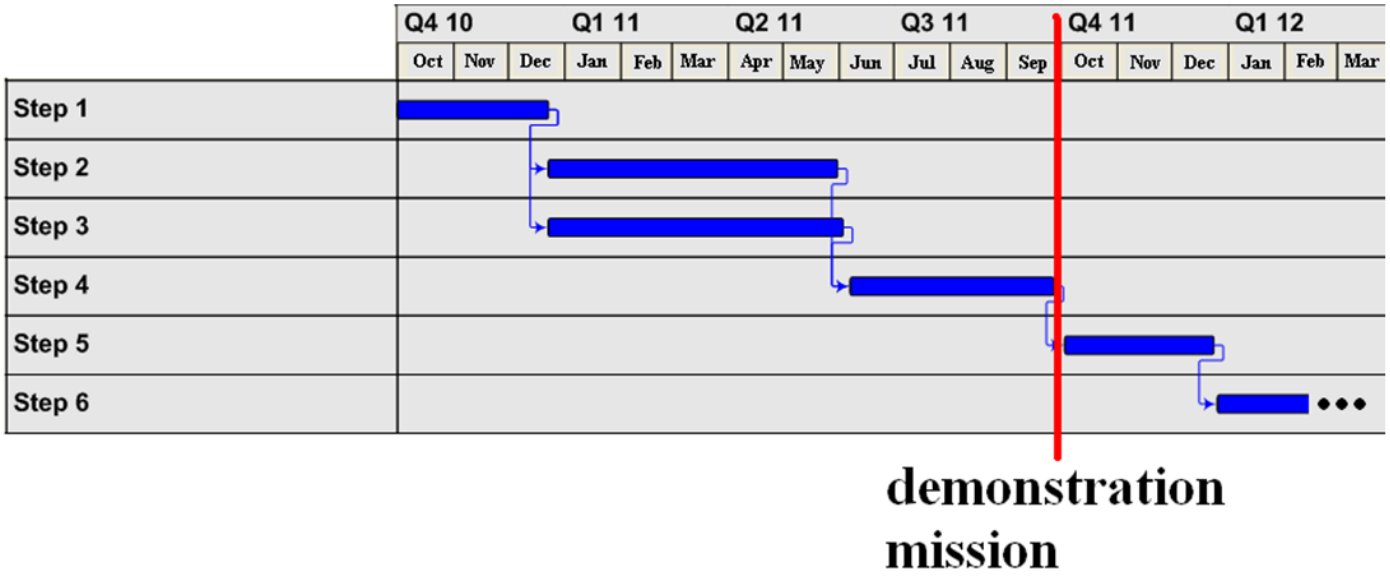
Conclusions
Roadmap





Conclusions

It has been defined the way for a feasible mission:

- List of actions to deploy a demo during the next year
- List of contacts to be involved to prepare the mission
- Selection of a mature UAV
- Covering real technical and operational requirements collected from the end-users interviewed
- The UAV is managed inside ATC and non-segregated airspace
- All mission has been simulated over different failures scenarios to prove the safety procedures
- Cost/benefit assessment has been performed

This mission will be used to demonstrate its technical and cost wise feasibility for other users and applications


FUKUSHIMA NUCLEAR ACCIDENT
An Update Log
Credit: Google Earth

Thanks for your attention

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