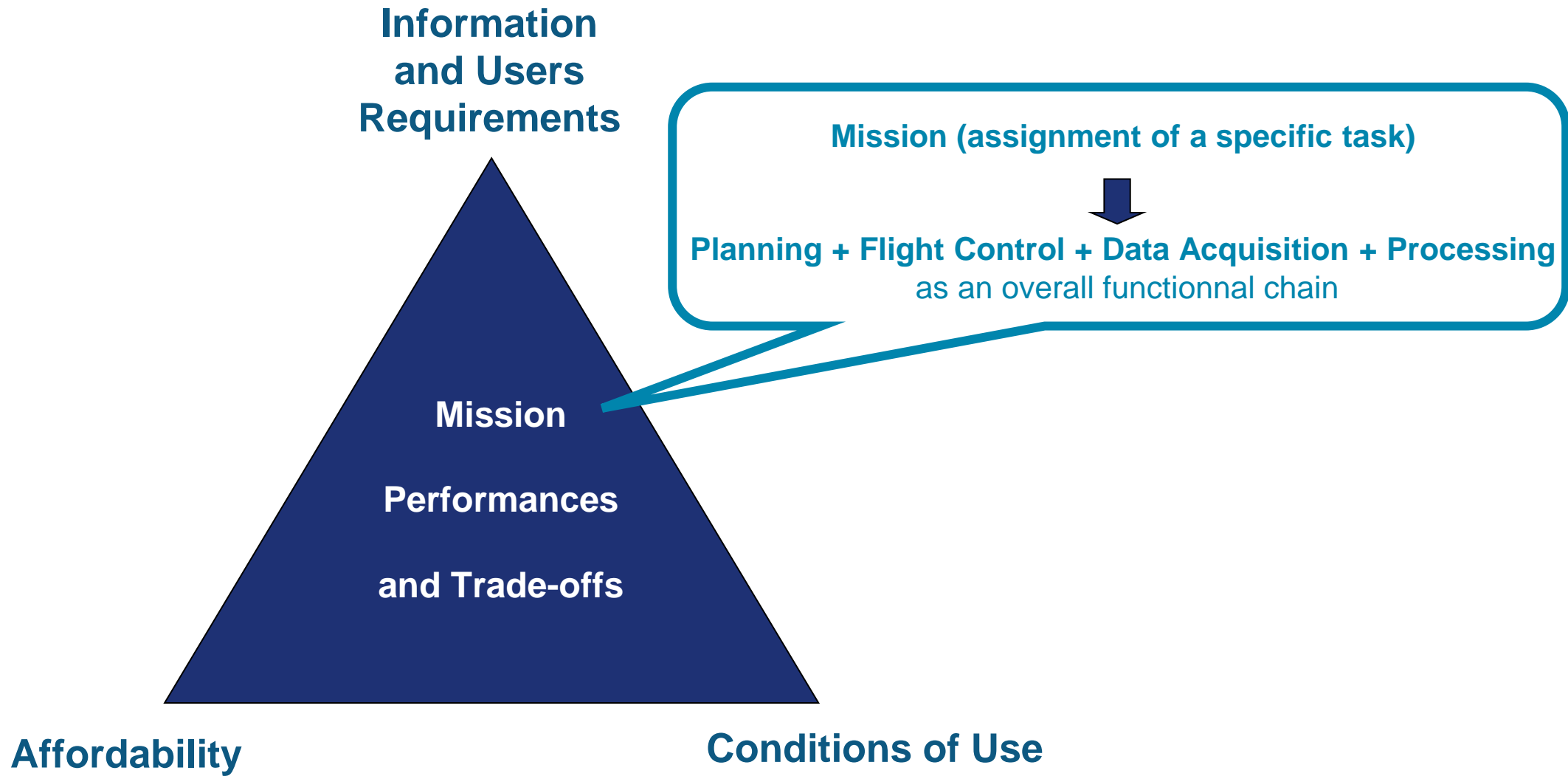


Complémentarité des drones et des autres systèmes *Complementarity of RPAS and other systems*

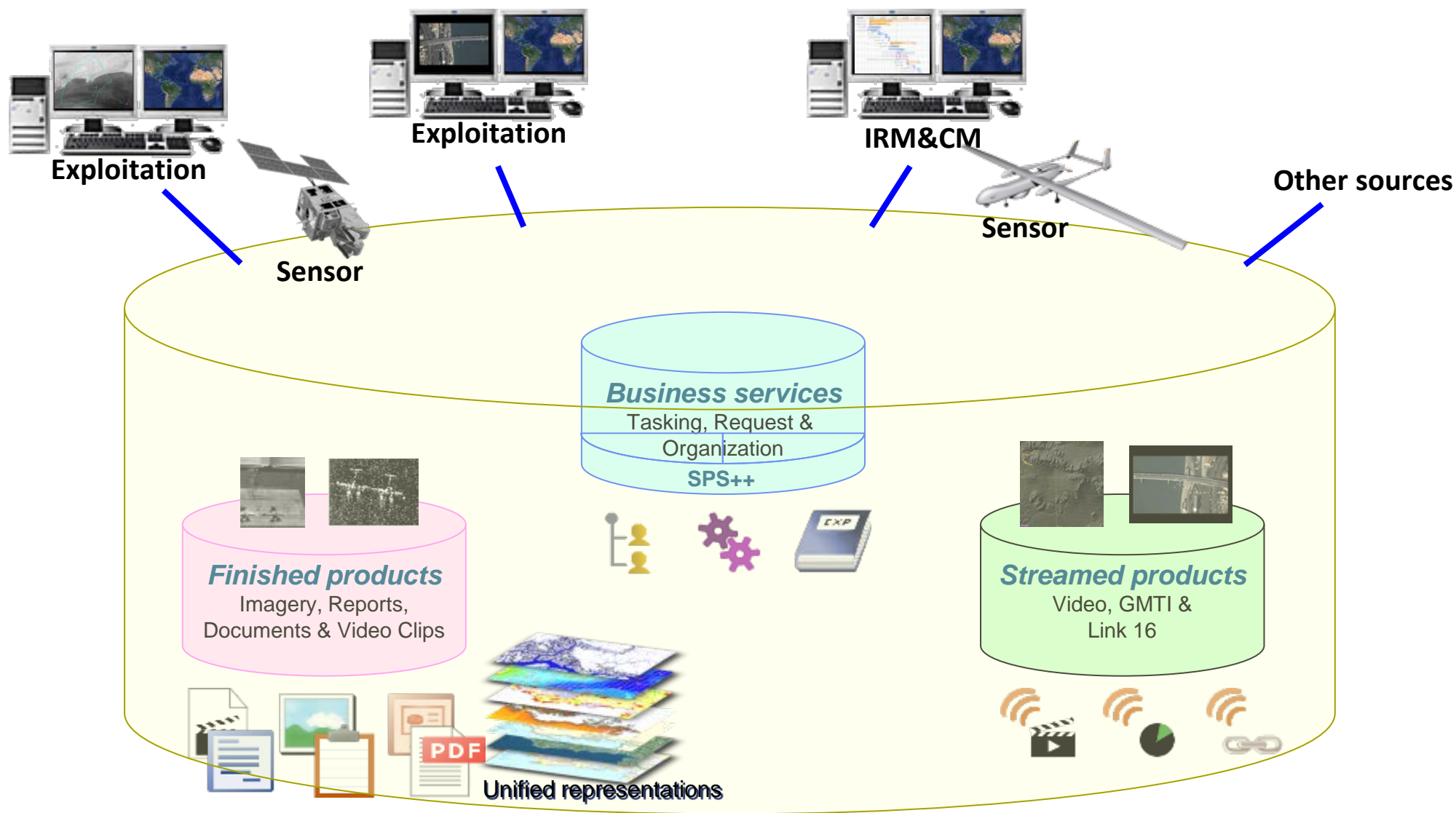
Present and Future of civilian RPAS
AAE & 3AF workshop, november 2014

by Gilles Grenier,
VP Engineering & Innovation, Airbus Defence & Space

Need of framework to compare and combine solutions



Military “lessons learnt”: **multisensor** tasking, exploitation, fusion and data exchange supported by standards and unified representations



Right technology, right place,
right information, right person and right time

Some PROs and CONS of main civil systems classes

Source	PROs	CONS
Satellites	Mature information processing Existing infrastructures, recently up-dated (ie SPOT6, PLEIADE, SENTINELL...) World accessibility (ie no airspace integrat., no flight restriction over dense urban areas) Wide area mapping @ medium resolution	Data access vs Response time Low variety of payloads Now permanent observation Meteo sensitive
High Altitude Platform (HASP, balloons, ...)	Permanent and flexible observation No (or nearly no) airspace integration	Non mature technologies Limited power Meteo sensitive
Fixed Wings aircraft	Versatile missions with heavy and high power payloads, with variety of observation angles Fast ferry flight and data acquisition Large variety of operators & platforms	« Man in the loop » limits flight conditions (ie time, systematic mapping, severe environment exposure)
Helicopters	Flexible flight path, close to infrastructures Stationary flight for long and precise inspection Large variety of operators & platforms	Idem Fixed Wings AC with additional Integration capability restrictions, lower cruise speed,
Mini-UAVs/RPAS	Close observation, inc. in severe environment Low meteo influence on observation perfos Multisensor acquisition (# manned AC & Helicos)	Limited power and payload integration capability, Range, coverage Airspace and MET restrictions (ie high winds)

Helicos missions - Some features



Horizontal and close distance observation



Manual operation of Integrated payload with GPS/IMU: **light and flexible**



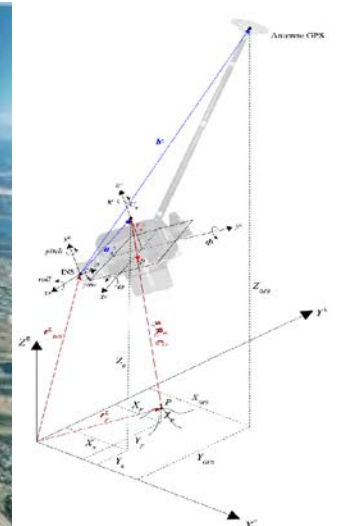
⚡ Sensor geometry, alignment and synchronization with GPS/IMU may lead to image distortion in case of unstable flight

Fixed wings missions - Some attractive features



R406

Large variety of platforms,
from low cost of operations
to high end payload integration

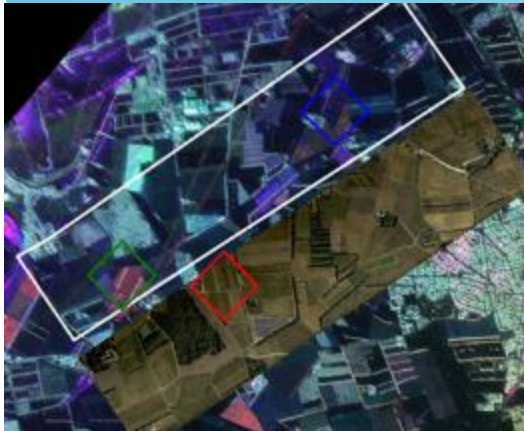


Multi-sensor/multimission

Stable flight and easy integration with GPS/IMU

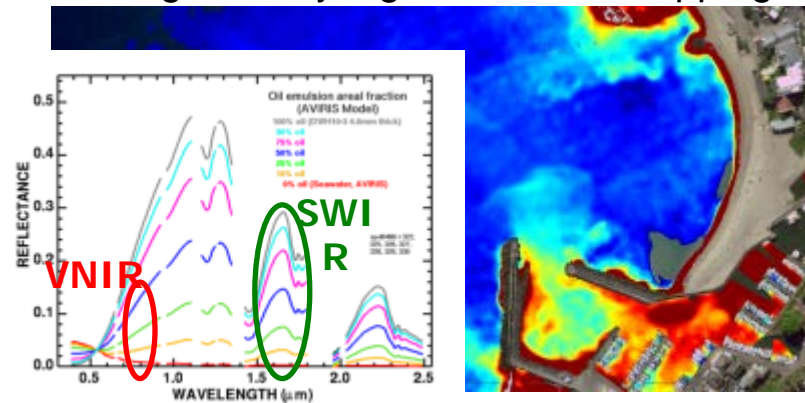
High to very high resolution mapping of **large/long areas**

Falcon with 2 pods # 100kg



SAR band P +
hyperspectral

(Biomass monitoring,
under-foliage detection,
etc..)

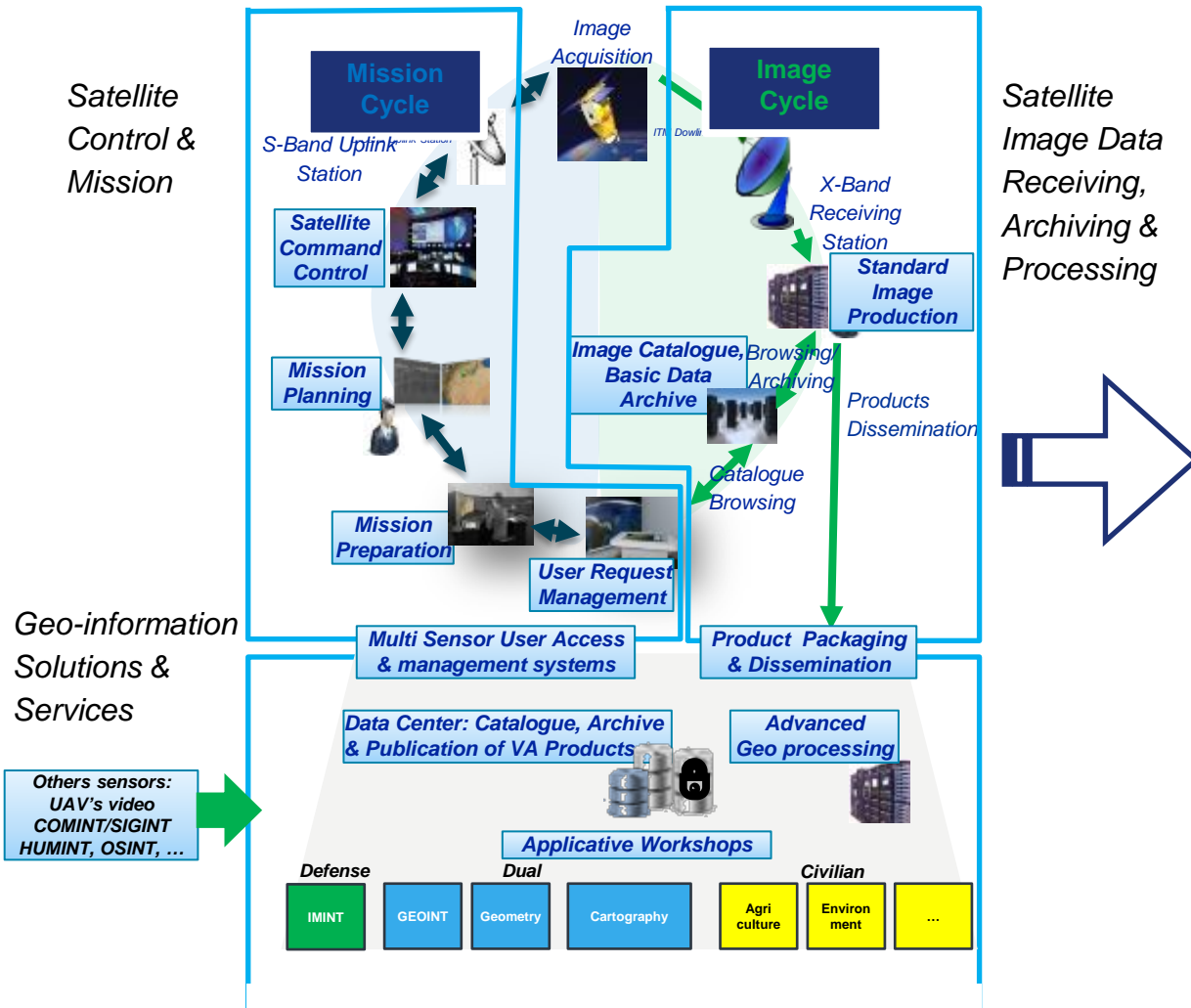


example:
(ie linescan +
hyperspectral+ lidar)
Hyperspectral
turbidity
monitoring

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A variety of civil/dual Satellite Imagery use cases boosted by new satellites (SPOT 6, PLEIADE, TerraSAR-X/TanDEM-X, SENTINEL...) and supported by mature processing & product delivery

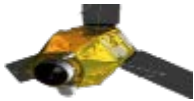
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Proven processings and Products packaging and dissemination are re-usable for RPAS



SAR Satellite



Optical Satellite



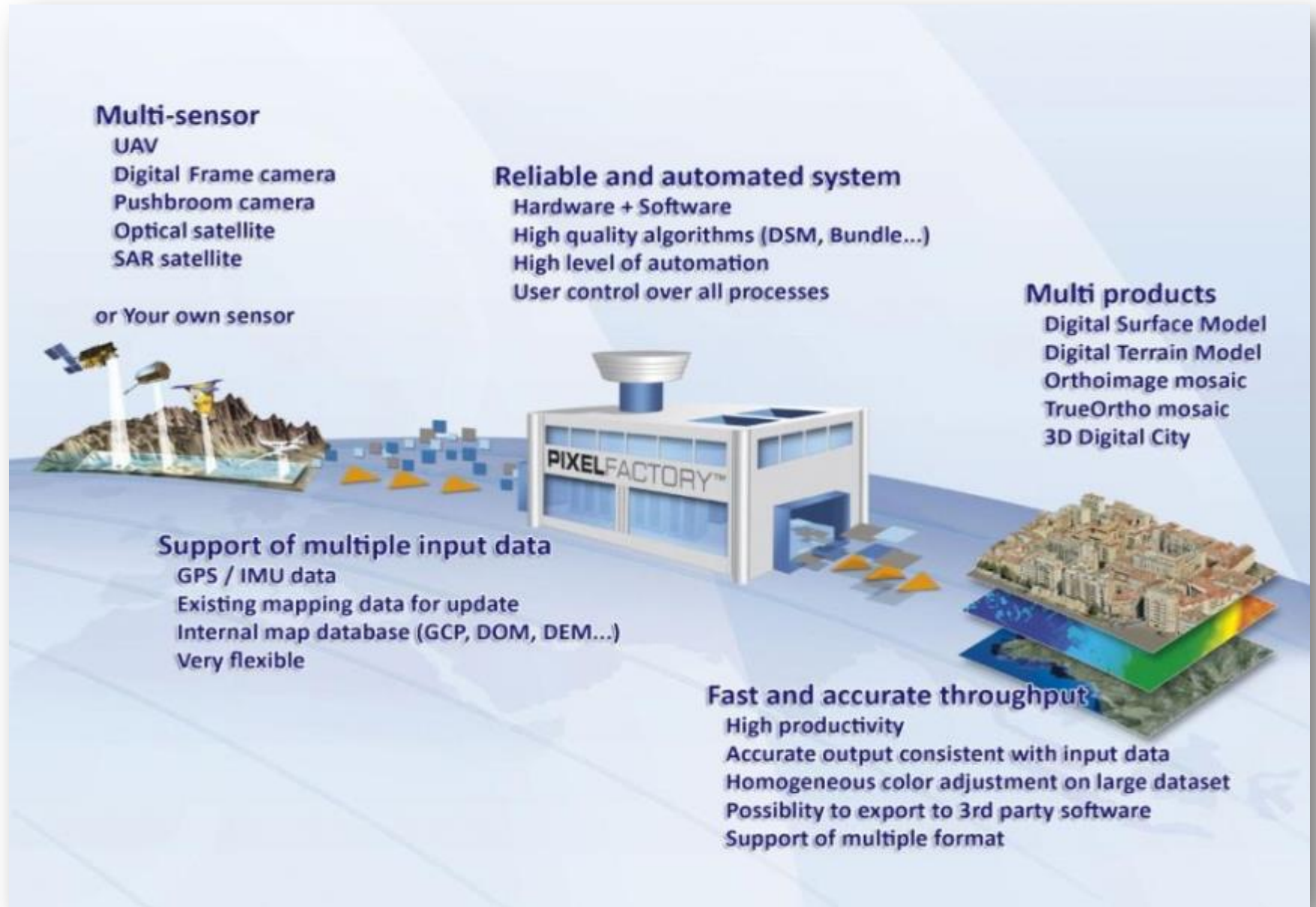
UAV System



Pushbroom Airborne Camera



Frame Camera



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Some applications « unique » for UAV

Compared to satellites and airborne solutions, civil RPAS will sustain disruptive advantages because of their specific capabilities to:

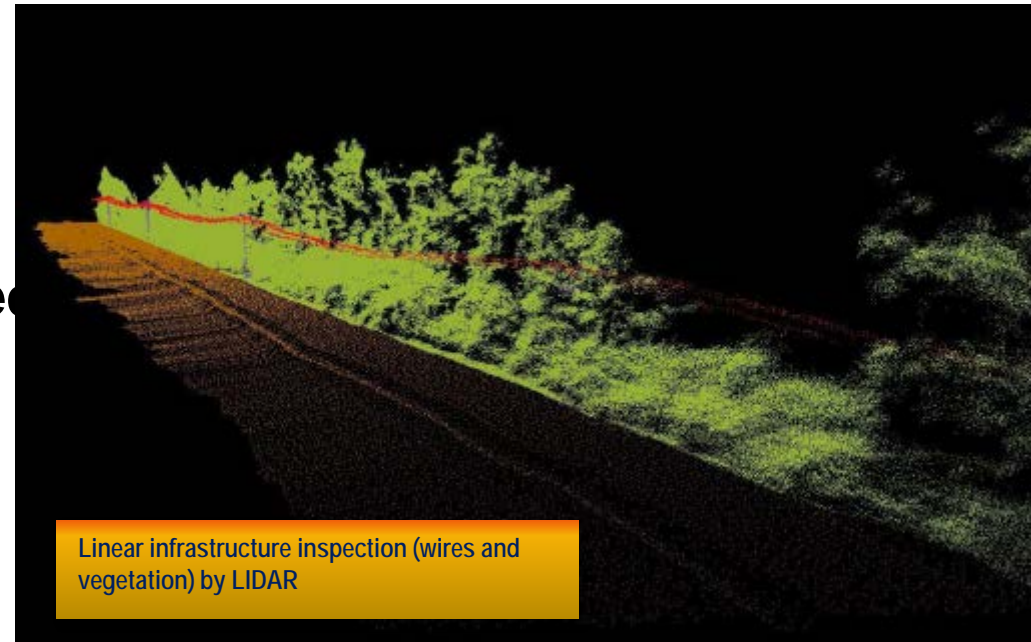
- **operate close to the terrain and with additional sensing (i.e. gas, radiation, 3D HF, lidar....) to the Imagery payloads, possibly in severe environment**
- **deliver different angle of observation, typically below 45° from vertical,**
- **benefit from the general payload miniaturization trend,**
- **be operational with :**
 - **low cloud ceiling,**
 - **nearly in all weather conditions**
(low atmospheric influence because of short range)
 - **with persistence capability if needed**



Critical infrastructure multisensor monitoring)



Offshore windfarm inspection (visual +3D HF)



Linear infrastructure inspection (wires and vegetation) by LIDAR

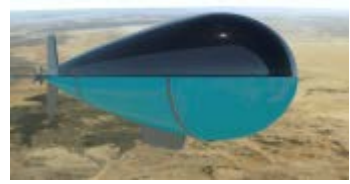
CONCLUSIONS

Besides the issues of airspace integration and operations over dense populated areas, RPAS opportunity is to exploit unique application niches and deliver packaged information to users, not a flying payload, by considering the end-to-end mission chain.

This product packaging and integration into common information layers/standards may benefit from best practices and investments of satellites and airborne solutions.

Complementarity of RPAS with other systems underlies that RPAS may manifest themselves as contradictory solutions at different times, depending on the mission conditions but that together with the others will exhaust the individual possibilities ... and develop business.

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QUESTIONS ?

