



Dr. Jean Botti

Airbus Group Chief Technical Officer

Keynote

10th International Workshop on Structural Health Monitoring 2015

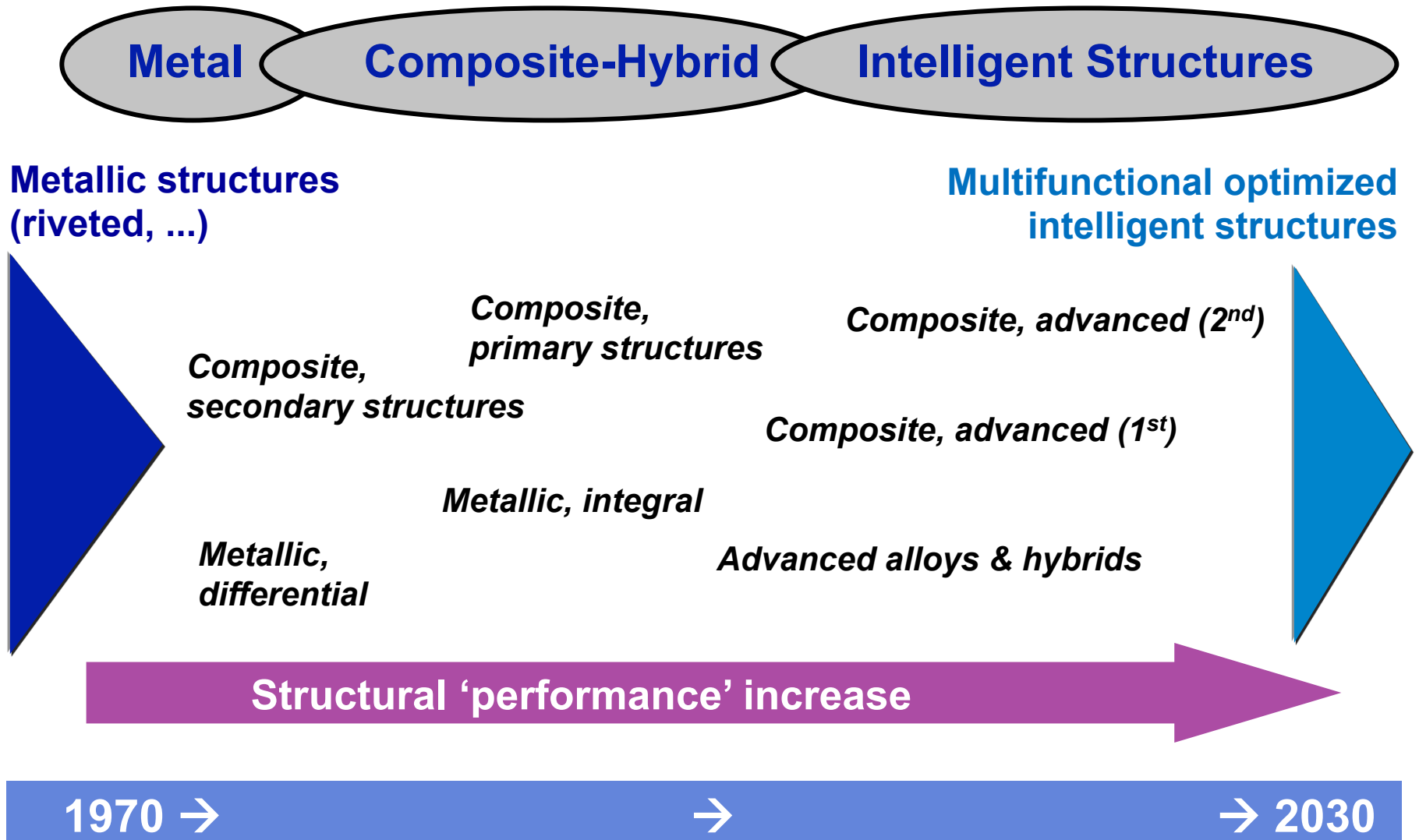
Stanford University
September 1, 2015

AIRBUS
GROUP

A close-up photograph of a dragonfly wing, showing the intricate network of veins. The image is overlaid with a semi-transparent blue filter, creating a monochromatic effect. The wing is positioned diagonally across the frame, with the base on the left and the tip extending towards the upper right.

SHM in the Airbus Group

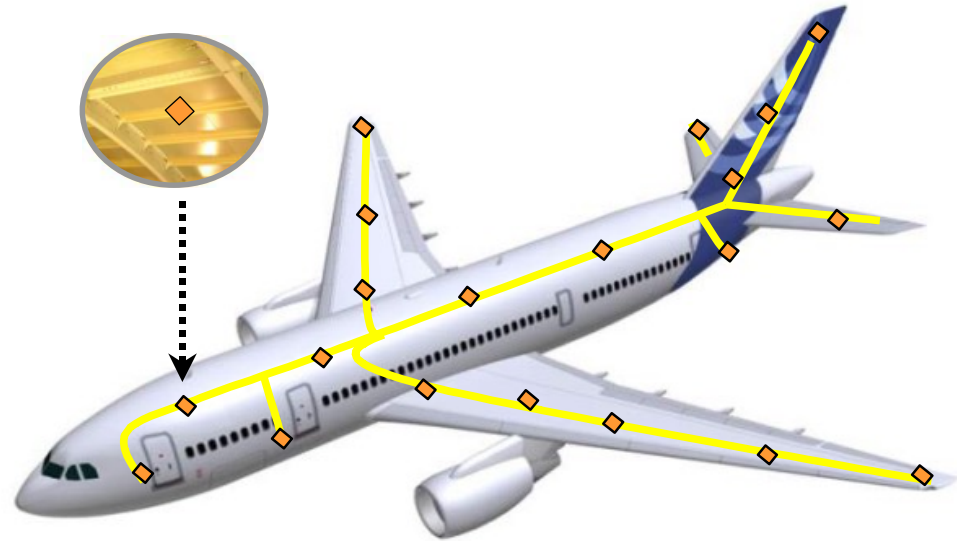
SHM within the Evolution of Airframe Structural Design



The intelligently “sentient” aircraft

Goals of Structural Health Monitoring

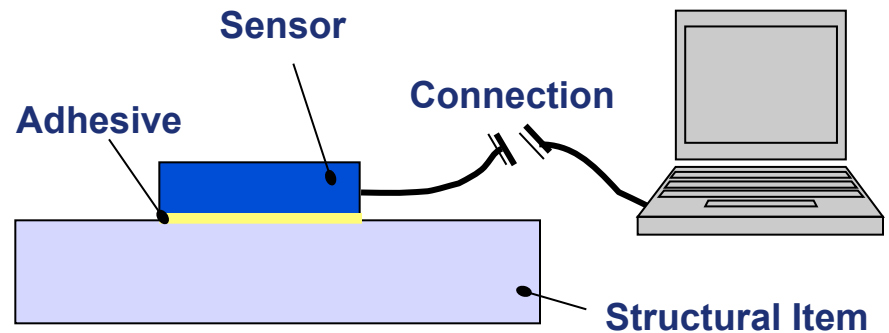
- Reduce Maintenance Costs
- Increase Aircraft Availability
- Reduce Weight



Non-Destructive Testing (NDT)



Structural Health Monitoring (SHM)



SHM = Onboard NDT of Defects, Damages, Stress, Conditions

Examples for Running SHM Projects in Airbus Group



**Tail strike indication system
now deployed on the A380
A380 full-scale fatigue test
The A350 used SHM during structure
certification and flight testing**

**The Life-Time Monitoring System
(LTMS) is an optional installation
on the A400M**



**Integration of Onboard SHM system
as part of the Integrated Vehicle Health
Management System**

**Health and Usage Monitoring Systems
(HUMS) in helicopters**



Airbus Group Divisions' Contribution to Support the E2E Value Chain



Project: @MOST

**Airbus Total Maintenance
Operations Services and
Technologies**



Project: NG HUMS

**Airbus Helicopter Next -
Generation HUMS**



Project: HMM @ Airbus DS

**Integrated System Health
Management**

T E C H N O L O G Y F O C U S

- Reliable aircraft health status (current and predicted) / including SHM
- Optimized maintenance scenarios from Aircraft and Fleet condition
- Remote Maintenance capability proprietary document.
- Contextualized and dynamic documentation
- Full Aircraft Configuration available "on demand"
- Integrated and Cost-effective end-to-end maintenance operations

- Reliable aircraft health status (current and predicted) / including SHM
- Automated Customer Data Collection
- Customer Data Management
- Usage & health-based Maintenance Management
- Condition based Maintenance (Maintenance Credit)

- Reliable Aircraft Health status (current and predicted) / including SHM
- Data-driven and model-based Diagnostic
- Data-driven and model-based Prognostic
- Condition based Maintenance (Maintenance Credit)
- Open System Architecture for Condition based Maintenance
- Simulation based CBM V&V Framework

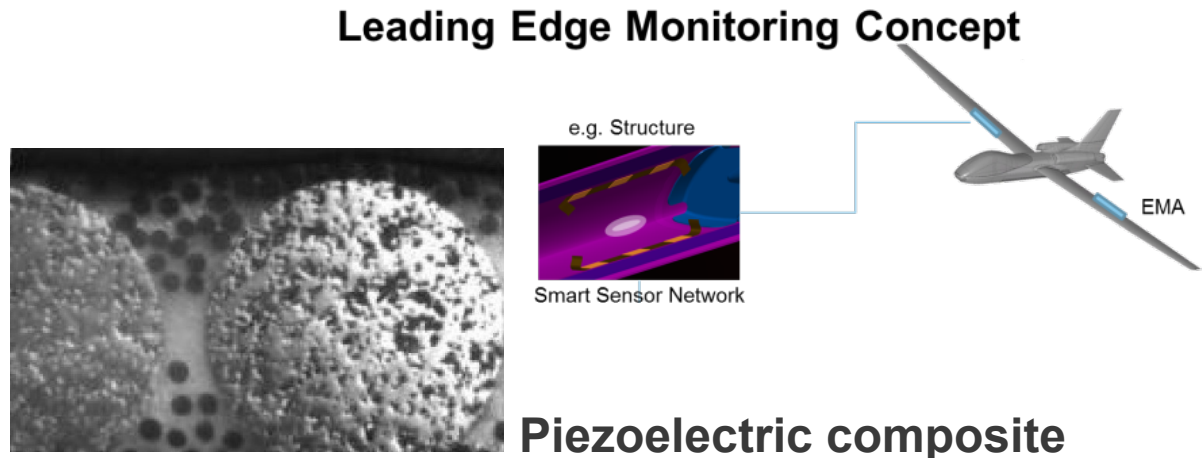
Roadmaps for SHM in the Airbus Group Divisions



Critical SHM-related Technologies Currently Elaborated by Airbus Group

Sensor Application

- Surface Application
- Embedded Sensors
- Sensor Network
- Network Management
- Functional Structure



SHM - / HMM Architecture

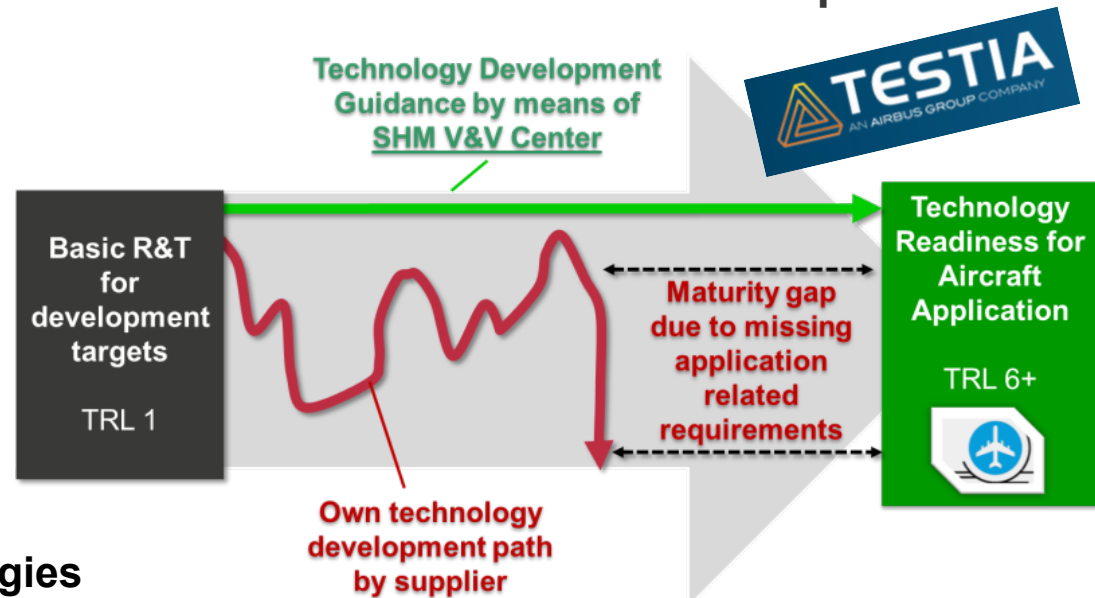
- On-board Maintenance System
- Off-board Maintenance System
- Mission Management System

Certification

- Probability of Detection
- Reliability of Information

Big Data

- Data organisation and storage
- Data processing: select technologies and frameworks for data processing, visualisation
- Data analytics: correlation, fusion, specific algorithms, ...



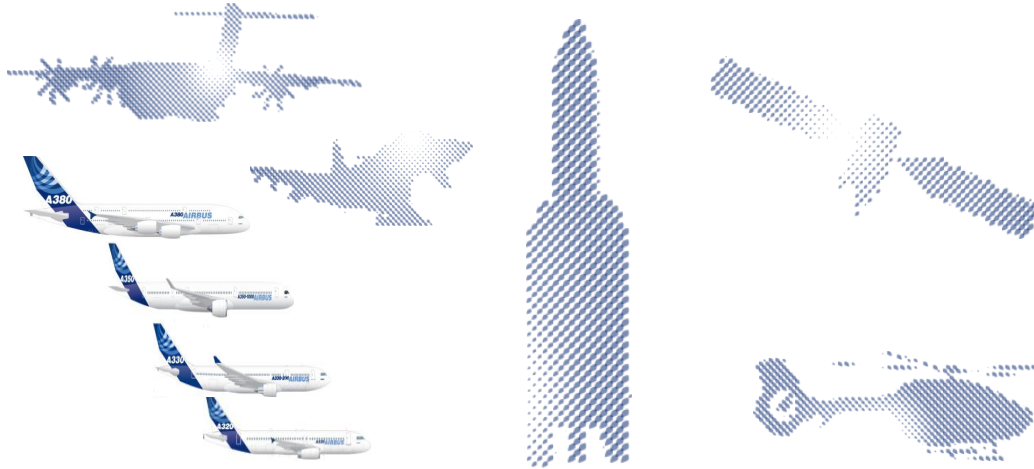


BIG DATA at Airbus Group



BIG DATA - beyond SHM

Flight Test Analysis Flight Operations Support



Maintenance, Diagnosis, Prognosis

Fleet / Constellations Management

... and probably many others to come.

R&T have to provide innovative solutions to create the expected value out of the data



Cyber Security*







Intelligence, Imagery data

Ground Operations

We are sitting on a huge amount of data we do not fully leverage

Example: Aircraft Operation Data

		Flight Test	A/C In-Service Data		Take-Off / Year	Total Fleet / year	
			Std ACMS	Potentially Recordable		Std ACMS	Potentially Recordable
 A350	#Parameters	670 000	4000	400 000	N/A	N/A	N/A
	Data Recorded/flight	500 GB <small>450 TB produced for the certification process in 2014</small>	450 MB	300 GB			
 A380	#Parameters	320 000	4 000	400 000	5.800	2,6 TB	1,1 PB
	Data Recorded/flight	250 GB	450 MB	200 GB			
 Long Range	#Parameters	14 000	1 500	40 000	84.000	17 TB	2,5 PB
	Data Recorded/flight	10 GB	200 MB	30 GB			
 Single Aisle	#Parameters	12 000	1 500	13 000	744.000	37 TB	9 PB
	Data Recorded/flight	10 GB	50 MB	12 GB			

x 50 in ~30 years (Flight tests)

BIG DATA Understanding and Maturity within Airbus Group



Positioning BIG DATA within the Entire Digitalization Scope



1 Mix the appropriate technological solutions ...

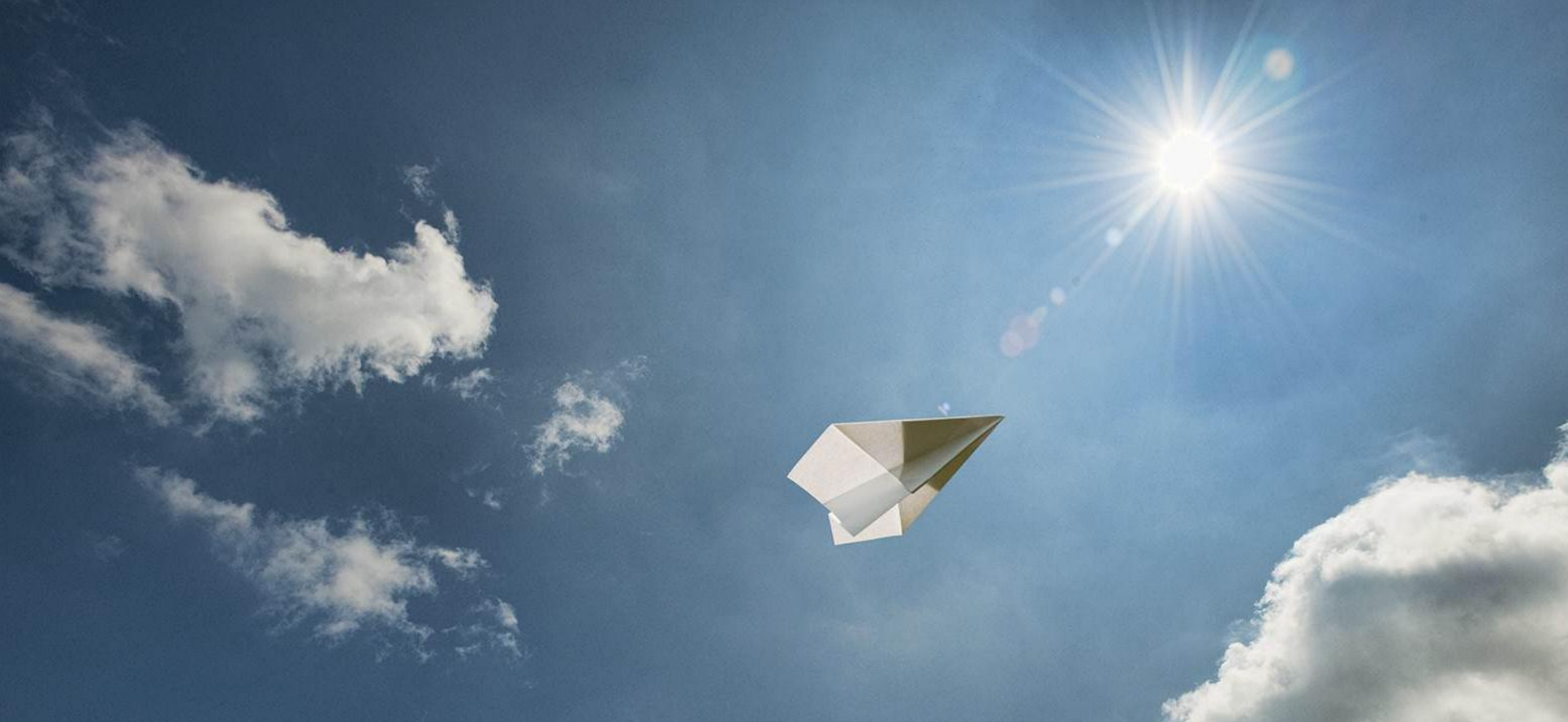


2 ... with clear business opportunities or problems...



3 ... and with the right mindset to create tangible business value

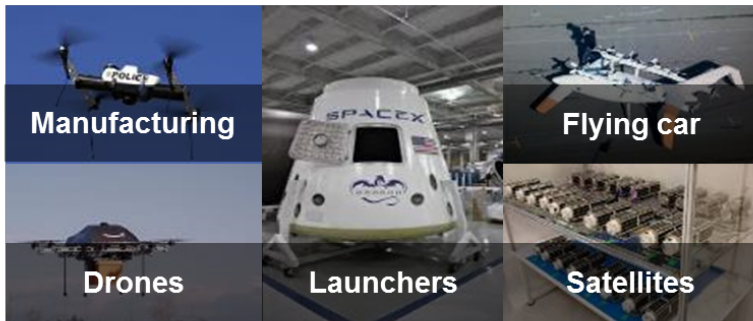
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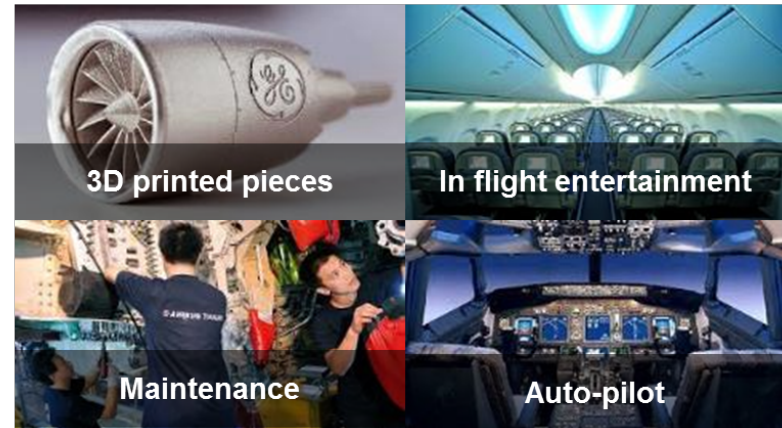
The Airbus Group Innovation to Business Center in the Silicon Valley

Silicon Valley is Making In-roads into our Core Market

Disruption of the current business



Improvement of the current business

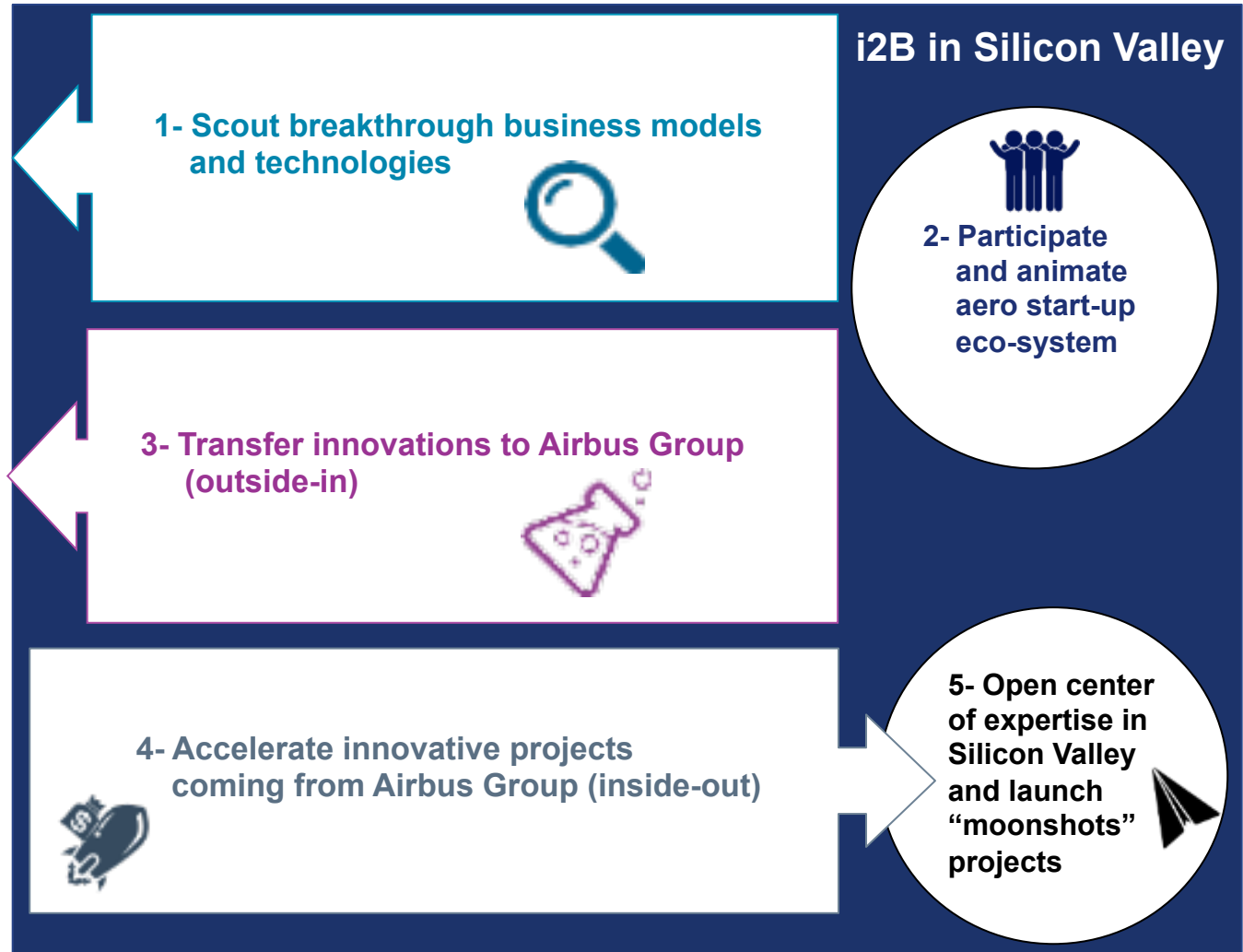


Massive investments in key technologies and innovation enablers



The i2B Fosters Innovation to Business for Mothership Airbus Group

Mothership company
in Europe



The Airbus Group Innovation to Business (i2B) Center in the Silicon Valley



The Fully-Electric E-Fan Crossed the Channel on July 10, 2015



Thank you for your attention

