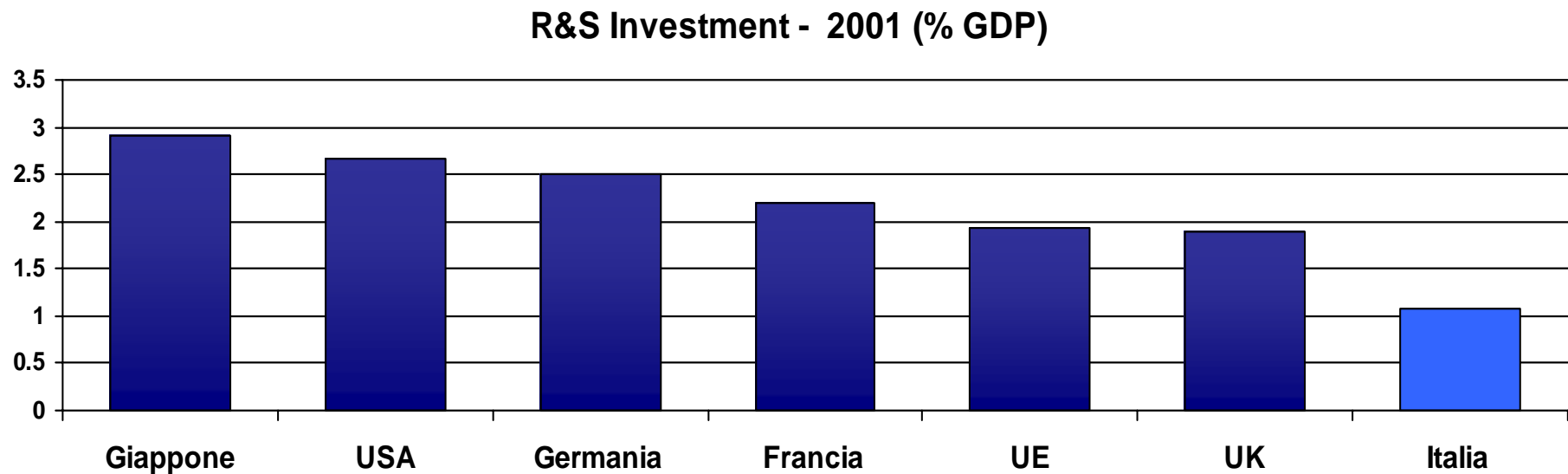


Technology Progress in the Commercial Aircraft Market



Competitiveness in Aeronautics: Key Factors

- ▶ High standards of Quality, Reliability, Safety
- ▶ Global competitiveness: cost, performance, customer support
- ▶ Increasing industrial process automation
- ▶ “Value for money”
- ▶ Innovation and high-tech clusters
- ▶ High investments in R&D
- ▶ Consistency of Government policy
- ▶ Positive integration among industry, academy and political world



(Source: OECD)

Alenia Aeronautica - Main Research Fields

Basic Research and Technology Development

► New materials and processes

Innovative metallic, composite and hybrid structures, integrated structure design for optimized manufacturing and assembly, new treatments, nanotechnologies

► Dual technology (civil and military applications)

Aeromechanical disciplines, multidisciplinary optimisation, information technology for more autonomous platform, flight control technology

Specific R&D to support Product Development

► Operational analysis

Scenario and threat modeling, survivability analysis and operational effectiveness

► Analysis and low observability technologies

Infra-red (IR) signature and radar cross section (RCS) estimation codes and design, RAM (radar absorbent) / IR materials, integrated structure design for optimized manufacturing and assembly, measuring, control and testing

► Design and system integration

System architectures, modular avionics, synthetic environment, interoperability, system for diagnostic and prognostic, smart structures, uninhabited aircraft technologies

► Manufacturing processes and non-destructive controls

Superplastic forming-diffusion bonding (spf-db), innovative joining methods for metals (bonding, friction stir welding, laser welding), carbon fiber technologies (cobonding and cocuring of large primary structure, resin transfer moulding, resin film infusion), non-destructive controls and structural health monitoring

Applications



UAV/UCAV: Sky-X, Neuron



EFA, JSF



Aermacchi M-346



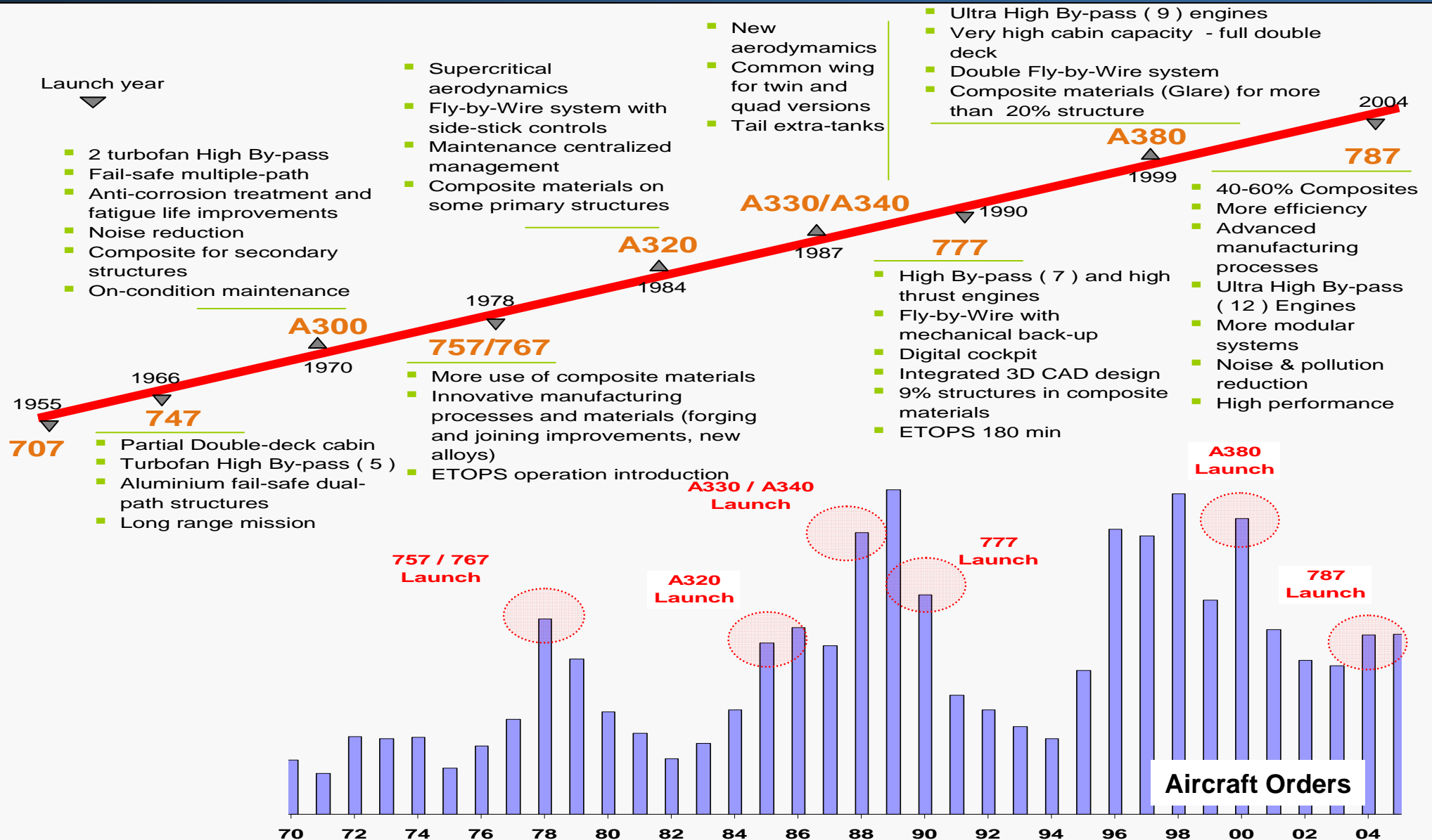
Airbus A380



Boeing 787



Commercial Aviation Trend – Innovation and Competitiveness



787 Key Technologies

Variable Camber Trailing Edge

- block fuel savings

Wing Load Alleviation

- block fuel savings
- weight savings

Composites

- weight savings
- block fuel savings
- Increased span
- Wing load alleviation
- Lower cabin altitude
- Improved durability

Wing Trailing Edge Architecture

- Reduced drag
- Lower maintenance costs

Flight Deck

- Operational commonality including mixed fleet flying

Electric Brakes

- maintenance cost savings
- weight savings
- fewer parts – lower spares costs

Advanced Flight Controls

- block fuel per seat
- weight savings
- high psi hydraulics
- wing load alleviation

Integrated Vehicle Health Monitoring

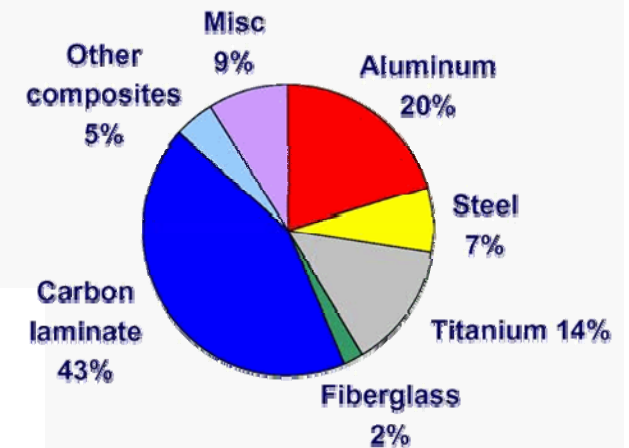
- Improved reliability

Next Generation Engines

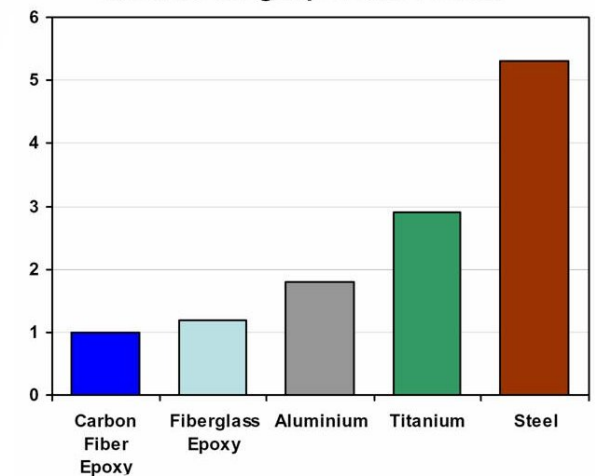
- more efficient
- no-engine-bleed systems architecture

Advanced ECS

- Lower cabin altitude



Relative Weight per Unit Volume

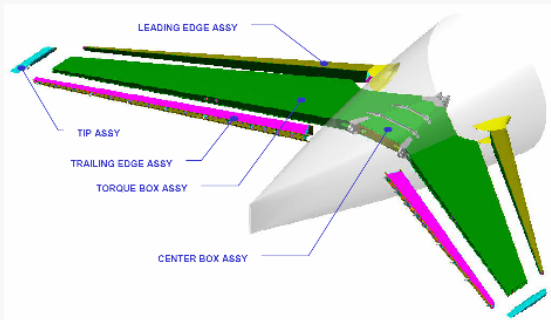


Joint Boeing & Alenia MOA Activity Proprietary Information

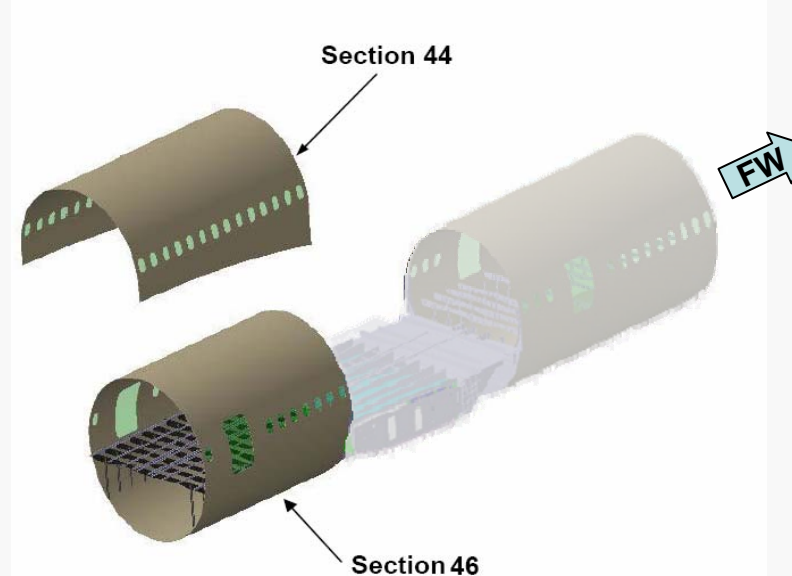


Alenia Aeronautica 787 Workpackages

Alenia is responsible for the Design, Analysis, Test and Manufacturing of the following aircraft sections:

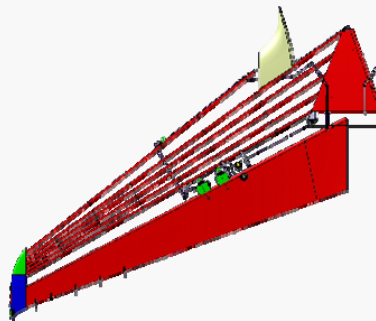


Horizontal Stabilizer

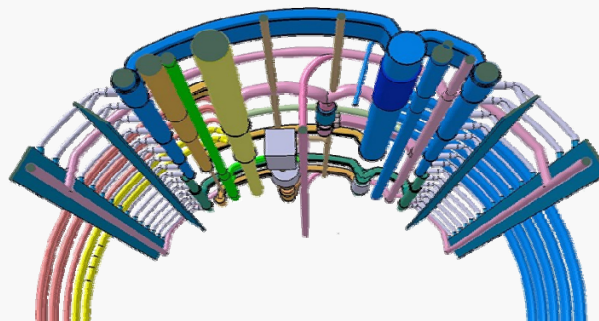


One piece barrel technology

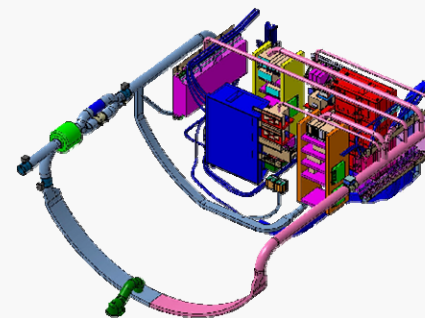
... and for system installation provisions in the Workpackages



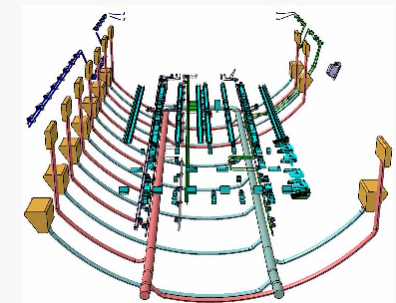
Horizontal Stabilizer



Upper Fuselage



E/E Bay

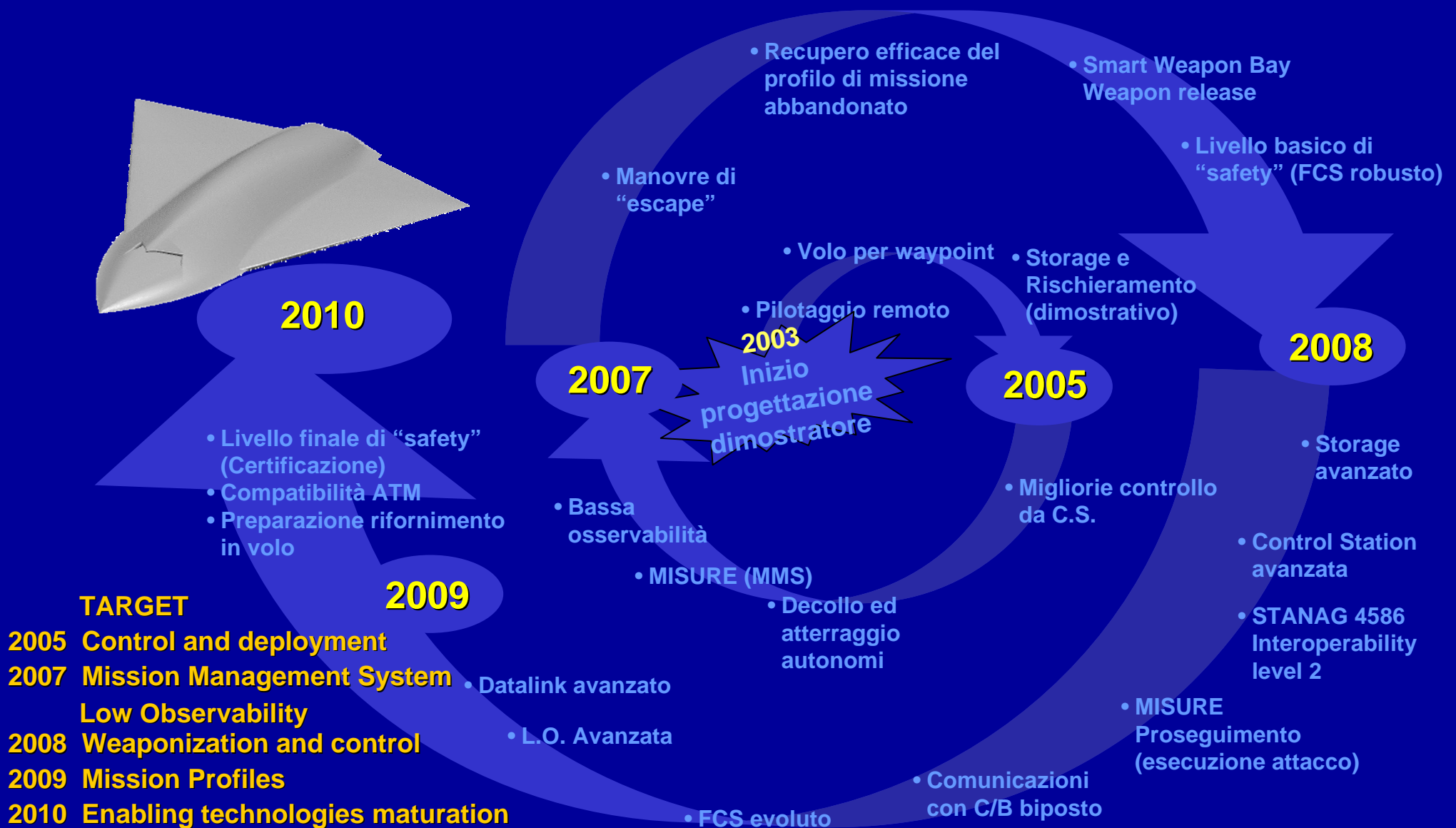


Lower Fuselage

Joint Boeing & Alenia MOA Activity Proprietary Information



UAV Challenges



The SRA-1: the five challenges

Quality and Affordability

- Reducing travel charges
- Increasing passenger choice
- Transforming air freight services
- Creating a competitive supply chain able to halve time-to-market

Environment

- 50% cut in fuel consumption and CO₂ emissions
- 80% cut in NO_x emissions
- Halving perceived external aircraft noise
- Reducing the environmental impact of manufacture of aircraft and related product

Safety

- Reducing accident rate by 80%
- Reducing human error and its consequences

Air Transport System Efficiency

- Enabling ATS to accommodate 3 times more aircraft movements by 2020 compared with 2000
- Reducing the time spent by passengers in airport
- Enabling 99% of flights punctuality (within 15 minutes)

Security

- Zero successful hijack



Key technologies

New aircraft configuration for community noise and pollution reduction:

Advanced aerodynamics and aeroelastics solutions, smart actuation systems, new soundproofing materials, advanced active noise and vibration control, digital flight control system.

“All electric” aircraft to allow higher efficiency and fuel reduction.

“Health management” relating the whole aircraft will considerably help “users” to avoid errors.

“Crashworthiness” is one of the key topic to improve safety and reduce casualties.

Advanced Avionics system:

High speed data transmission network, advanced communication system (e.g. satellite and radar), 4D Flight Management System, Enhanced and/or Synthetic Vision System (EVS and SVS) for unlimited operations on airports without ILS Automatic Dependent Surveillance, advanced Traffic Collision Avoidance System.

Communication, Navigation, Surveillance / Air Traffic Management (CNS/ATM) step 4 (2020 in free flight regime):

Increase of aircraft automation levels, 4D navigation, Approach and landing with bad weather conditions, Reduced aircraft separation (horizontal and vertical), Flight crew reduction.

Integrated structure design for optimized manufacturing and assembly:

Increased use of “design for composite” approach, Hybrid structures, “Green” materials, “green” and automated processes, “Self check” and “free-inspection” sensorised structures, Virtual testing for reduced certification cost and time.



The Future - Emerging Technologies

Innovative Concepts & Scenarios

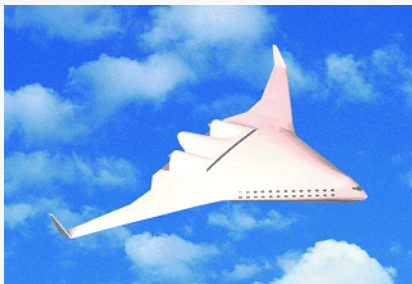
- Unconventional configurations and new aircraft concepts
- Novel propulsion solutions (e.g. pulse detonation engine, electrical propulsion, distributed thrust...)
- Blended Wing Body configuration (BWB)
- Adaptive (e.g. variable cycle) engine
- VSTOL vehicle technologies
- VTOL capable of independent procedure
- Revolutionary concept removable cabin

Breakthrough Technologies

- Morphing airframes
- Designer materials tailored for multifunctional applications
- Hydrogen-based engine concepts, a/c concepts with hydrogen-based propulsion
- Autonomous flight control systems for freighter aircraft



UAV



Blended wing A/C



Alternative energy source



Adv. Rotary-Wing aircraft



Unconventional configurations

Source: Airbus, Boeing, NASA, NLR, Agusta, Alenia Aeronautica

