# Transdisciplinary Approach to Enhance Customer Engagement in the Design of Complex Defence Systems

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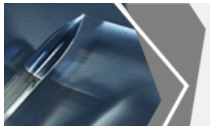

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# MBDA – The Company

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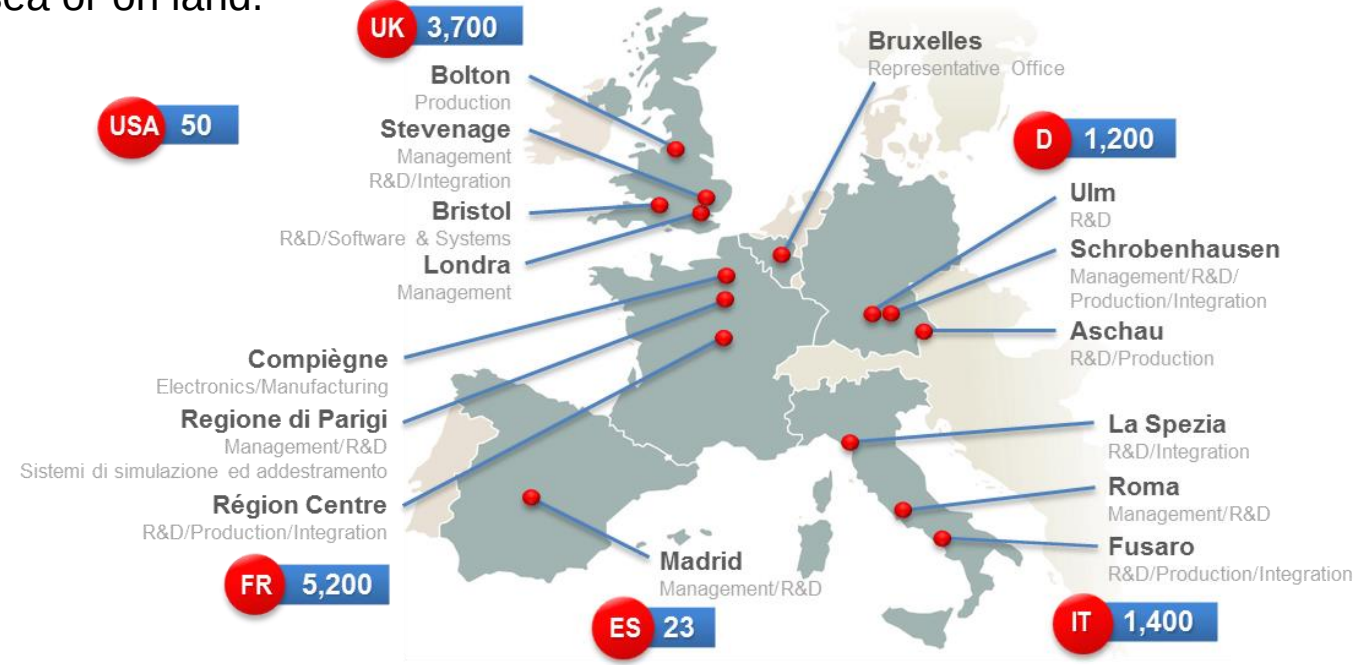
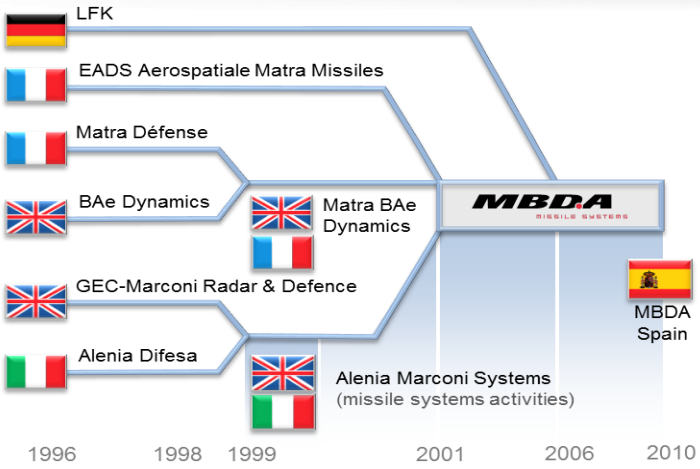
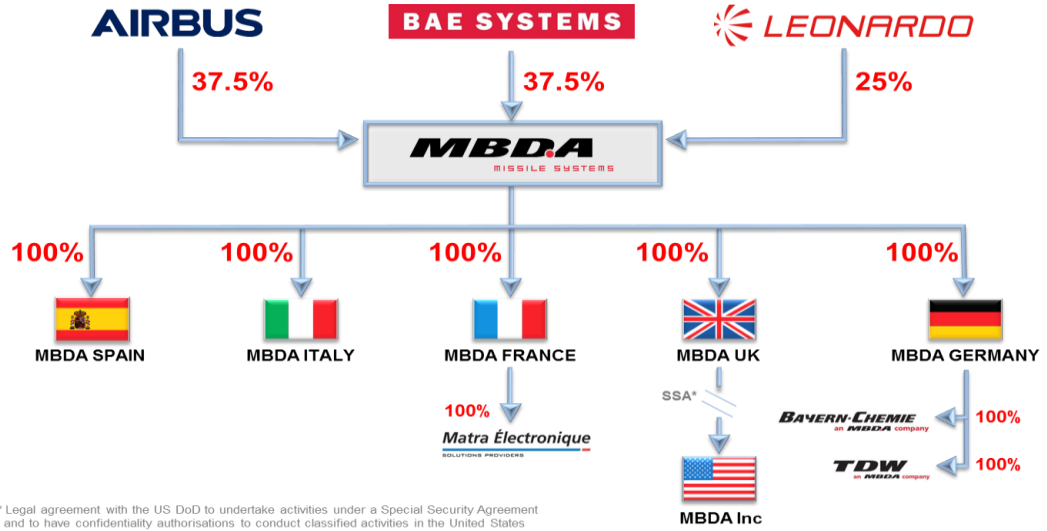
MBDA is the first truly integrated defence company in Europe and the only European one able to provide missiles and missile systems for each branch of the armed forces, whether in the air, at sea or on land.



# MBDA's heritage mirrors the history of tactical missiles in Europe



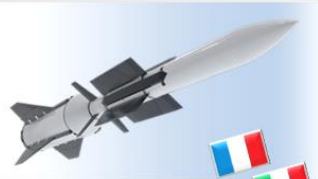




* Legal agreement with the US DoD to undertake activities under a Special Security Agreement and to have confidentiality authorisations to conduct classified activities in the United States

# Promoting and delivering cooperative programmes is deeply rooted in MBDA's DNA


STORM SHADOW / SCALP


METEOR


ASTER Family


CAMM, CAMM-ER


TAURUS KEPD 350


SEA VENOM / ANL

FC/ASW

# Managing complexity in systems design

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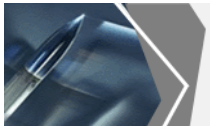
# Missile….1 single word for many technical aspects

*When you read "Missile", what do you think of?*

The enhancement in missile design processes has to encompass current and future missile developments in all fields that are part of MBDA portfolio, including access to platforms and customer engagement:

***How many missile-platform-customer combinations can you imagine?***

## *Facing the change*

- The Defense world is facing a big change → Processes to facilitate the transition
- Cooperative multinational programs → Protect information, enable sharing
- MBDA wide portfolio and number of customers → Many variants to be managed
- Need to manage increasing complexity in missile design → Systems engineering is more and more relevant. Risk reduction is a must
- Missile interoperability is leading to a wider-ranging requirement set, Concepts of Operations (ConOps) and Concepts of Use (ConUse) → Move from a document-based approach to a model-based approach (broad meaning)
- Limited budget constraints → Provide modular, interoperable and cost-efficient solutions





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# Customer engagement: the added value

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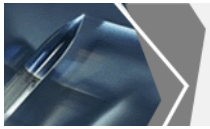



Engaging the Custumer since the early stages of design and keeping the engagement for the entire life-cycle *[ref. 1]* is the winning factor in order to have:

- Effective needs elicitation and requirements refinement
- Reduce rework
- "building the right thing" and "building it right" *[ref. 2]*

# Transdisciplinary approach

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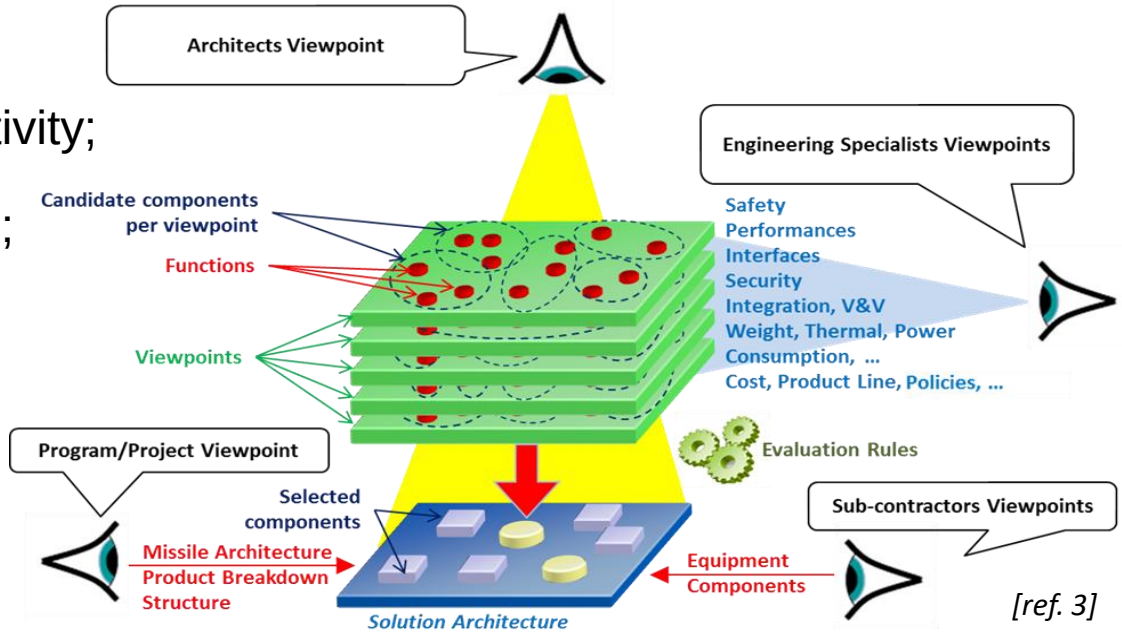
MBDA fosters wide adoption of Model-Based Systems Engineering:

- MBSE in MBDA empowers the advantages provided by cross-sharing and model consistency;
- MBDAAF, a legacy MBDA DAF (i.e. Defense Architectural Framework);
- International working groups;
- National Capability Teams to foster MBSE within each National Company (NatCo);
- Legacy guidelines and procedures.
- Limited sharing across NatCos due to restricted or classified information, therefore MBSE is tailored for each project-specific solution

# The system architecture design has to face many challenges:

- Multi-viewpoint engineering activity;
- Functions are cross-viewpoints;
- 1 source of truth;
- Early and robust validation of the solution architecture.




*[ref. 3]*

Missile design and customer engagement are linked together with the definition of Functional Chains *[ref. 4, ref. 5]* :

- Group missile Functions with a goal-driven approach;
- Easier elicitation of the needs at the right level, generating clear expectations and delivering a fit-for-purpose solution;
- High-level requirements are captured in a compact model that is easy to read, especially if compared to traditional document-based approach;
- Providing the Customer with a benchmark within the project and across projects;
- Requirements are therefore analyzed with all the cross-dependencies.

# Conclusions

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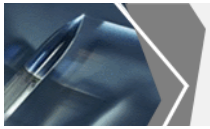



We’re challenging the approach with the Customer in order to increase the effectiveness of Customer engagement.

The traditional approch is evolving:

1. Document-based sharing (verbose)
2. Model-based Systems Engineering (models are requirements in context)
3. Engagement through out the entire life-cycle (fully transdisciplinary approach)

    \+ Funcional Chains (requirements and all cross-dependencies)





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# Benefits for the Customer:

- Easier elicitation of the needs at the right level, generating clear expectations and a fit-for-purpose solution;
- High-level requirements are captured in a compact model that is easy to read, especially if compared to traditional document-based approach;
- Functional Chains allow to see the cross-dependencies between requirements, with clear rationale for design choices.

# References

[1] Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities, version 4.0, INCOSE 2015

[2] IEEE Guide--Adoption of the Project Management Institute (PMI) Standard A Guide to the Project Management Body of Knowledge (PMBOK Guide) Fourth Edition, 2012

[3] J.-L. Voirin,“Methods & Tools for constrained system architecting”, INCOSE International Symposium 2014

[4] G. Telleschi, A. Caroni, E. Willingham, P.-H. Pradel, “Reference Missile Functional Architecture, addressing design in a multinational Defense Company”, INCOSE Italy Conference on Systems Engineering 2018

[5] A. Caroni, G. Telleschi, I. Mactaggart, E. Willingham, P.-H. Pradel, “Reference Missile Functional Architecture, an architecting toolset to drive design and modelling”, Requirements Engineering Conference 2019

# Questions and requests of further information may be addressed to:

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