The Convergence of PLM and MBSE
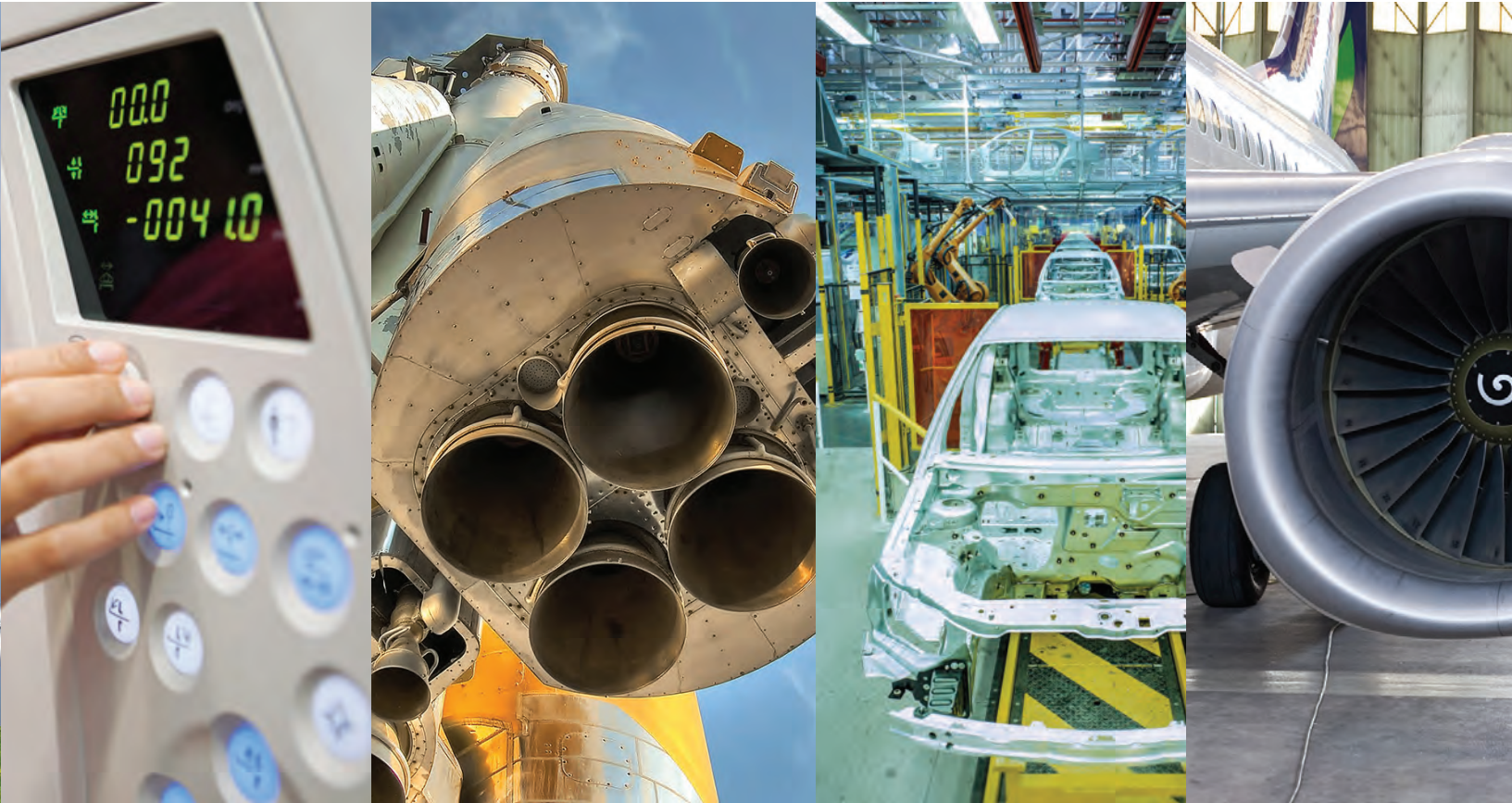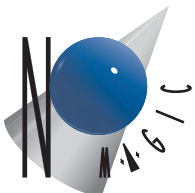*A collaborative toolset for engineering productivity*

A modeling and collaboration environment for Systems Engineering, Enterprise Architecture, Business Process Modeling, and Software Modeling from No Magic

Case studies, white papers, and videos at **nomagic.com/mbse**

No Magic MBSE Solution

Requirements Engineering

Enable more rigorous requirements traceability with a model-based requirements engineering approach

System Design

Engage models to improve communications and enhance system design integrity

Analysis and Simulation

Gain system understanding without manipulating the real system

Verification and Validation

Perform early, and on-going, requirements validation and design verification

Product Lifecycle Management

Manage the evolution of the system through the SE lifecycle

OUR CUSTOMERS

Aerospace Corporation, BAE Systems, BMW AG, Deutsche Bahn, GE Aviation, GE Transportation, Hospira, JPL, Kongsberg Defence Systems, Lockheed Martin, ManTech, NASA, Northrop Grumman, Raytheon, Sandia National Laboratories, Siemens AG, SKA, U.S. Army, and others

Why our customers have chosen us

	Factor	Importance
1	Ease of use	31%
2	Latest standards conformance and enforcement	25%
3	Expert recommendations	9%
4	Competent and prompt support	8%
5	Dedicated collaboration environment	8%
6	Extendibility	8%
7	Quality of documentation	7%
8	Competitive price	4%
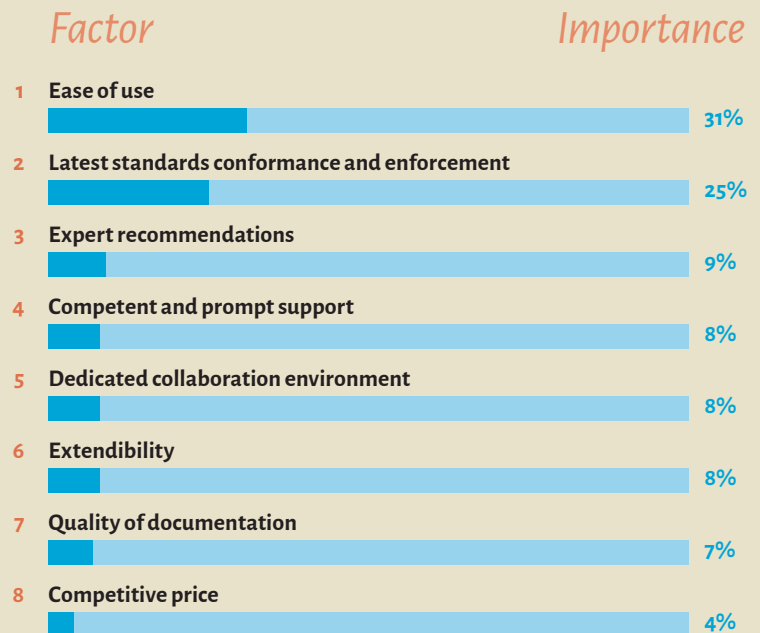
MBSE Solution Diagrams
powerful and easy to use

No Magic modeling and simulation solutions support the full MBSE life cycle, from concept exploration to validation and verification.

Use Case Diagram

Sequence Diagram

Activity Diagram

Matrix

Relation Map

Requirement Table

Block Definition Diagram

Internal Block Diagram

State Machine Diagram

Parametric Diagram

Timeline

Metrics

MBSE Ecosystem

Modeling Environment

Interoperability — Cameo Inter-Op — Cameo Workbench

Publishing & Reviewing — Cameo Collaborator

Collaboration — Cameo Enterprise Data Warehouse — Teamwork Server

Cameo Systems Modeler — **Modeling Environment** — magicdraw

Requirements Engineering — Cameo DataHub — IBM — ReqIF

Real-Time & Embedded — coFluent — intel

Design Optimization — PTC ModelCenter — ANSYS — STK

Analysis & Simulation — Cameo Simulation Toolkit — MATLAB Simulink — Maple — Wolfram Mathematica

PLM & CAD Integration — Syndeia — NX — Teamcenter — creo — Windchill

Modeling Environment

Cameo Systems Modeler™ is an industry-leading cross-platform collaborative Model-Based Systems Engineering (MBSE) environment, which provides smart, robust, and intuitive tools to define, track, and visualize all aspects of systems in the most standards-compliant SysML models and diagrams. The environment enables systems engineers to:
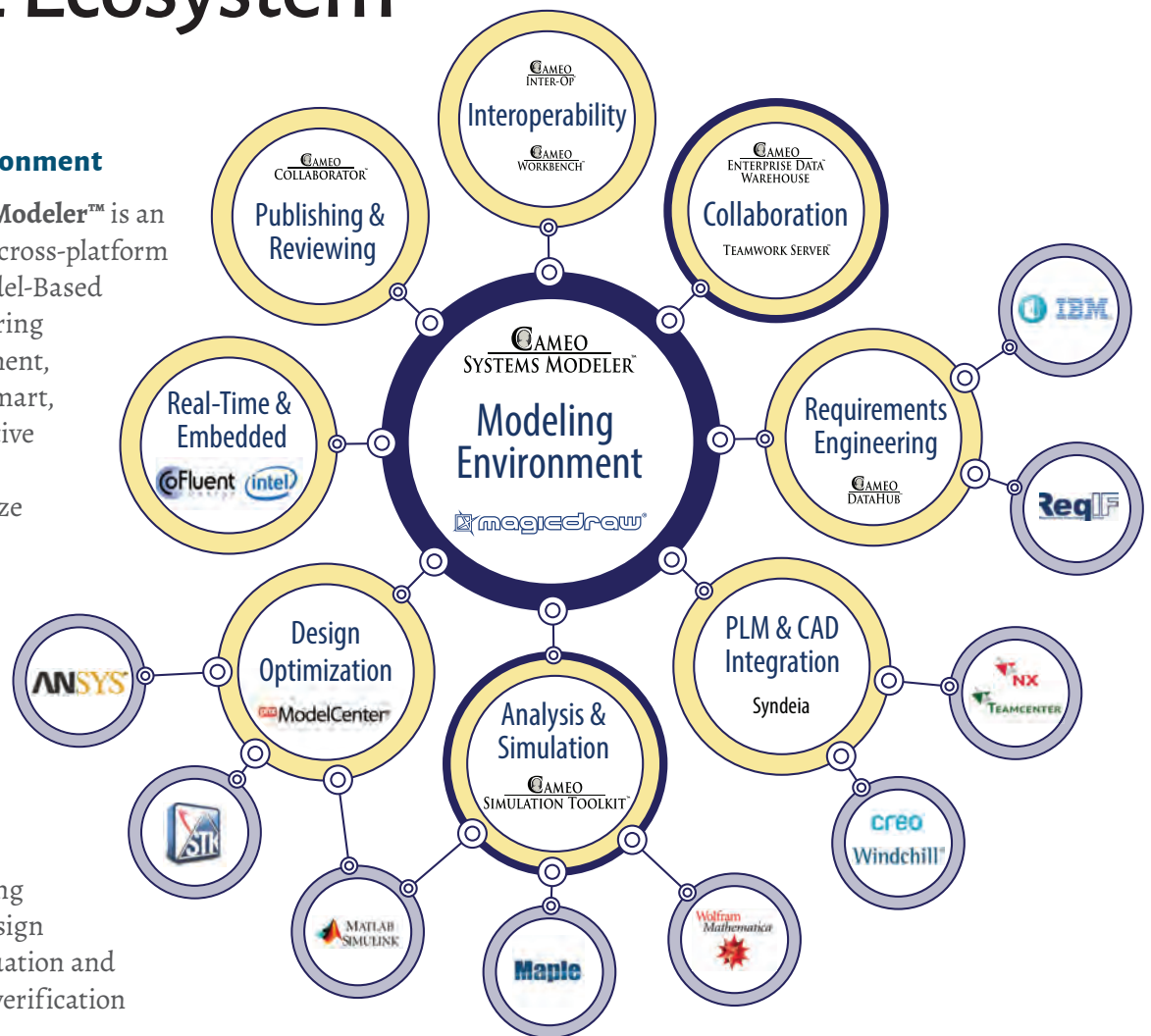
- Run engineering analysis for design decisions evaluation and requirements verification

- Continuously check model consistency

- Track design progress with metrics

System models can be managed in remote repositories, stored as standard XMI files, or published to documents, images, and web views to address different stakeholder concerns.

Collaboration

MagicDraw Teamwork Server is a central model repository that allows engineers to work collaboratively on a single system model at the same time, integrate changes, create baselines, and maintain model history. The server provides extensive branch, merge and compare capabilities, security, and access control features.

Cameo Enterprise Data Warehouse (CEDW) is the next-generation model repository for globally distributed teams, built with scalability and high availability in mind. It supports RBAC permission system, element-level history, and partial model load. In the future, it will provide web-based model access for traceability, reviews, analysis, and simulation.

Analysis & Simulation

Cameo Simulation Toolkit enables model execution and user interface prototyping for early system behavior simulation, better understanding, and validation, all with the help of debug and animation, model-based testing, timeline plots, and duration constraint analysis.

The toolkit also comes with the built-in parametric solver, scripting engines, and integrations with MATLAB®/Simulink®, Maple, and Mathematica to perform engineering analyses, such as parametric and topological trade studies, automated requirements verification, mass/cost/power roll-ups, and what-if analyses.

Design Optimization

The MBSEPak add-on for Cameo Systems Modeler™ allows users to link SysML parametric models with multi-disciplinary analysis models for extensive requirements verification, trade-studies, design-space explorations, automatic design optimizations, and various visualizations developed in **ModelCenter®** — a graphical environment for automation, integration, and design optimization by Phoenix® Integration.

Requirements Engineering

Cameo DataHub is an add-on for Cameo Systems Modeler that allows importing, exporting, synchronizing, and referencing text-based requirements in IBM® Rational® DOORS®, IBM® Rational® RequisitePro®, and CSV format files.

ReqIF Importer is a built-in functionality of Cameo Systems Modeler™ that supports standards-based requirements exchange among different tools, e.g., IBM® Rational® DOORS®, PTC® Integrity, Polarion®, Siemens Teamcenter, and others.

PLM & CAD Integration

Syndeia add-on from Intercax is an environment where system engineers can connect, communicate, and sync with detailed requirements, parts, bills of materials, CAD (NX®, Creo®), and complex data structures that are version-managed and configuration-controlled in enterprise-strength PLM systems, such as Teamcenter and Windchill®.

Real-time and Embedded Systems

The **CoFluent™ Studio** add-on offers tools and methodology for joint SysML and MARTE use for design and simulation of multicore/multiprocessor hardware/software embedded system and chip models, enabling designers to observe the system behavior and analyze performance properties in the Intel® CoFluent™ Studio environment.

Interoperability

Cameo Inter-Op and **Workbench** provides a two-way bridge between Cameo Systems Modeler™, IBM® Rational® Rhapsody®, System Architect, MATLAB®/Simulink®, Vitech CORE®, Rational® Statemate, Petri-nets, SystemC, VHDL, and more.

Excel and CSV Import add-ons allow mapping and importing any information from Excel or CSV format files into a system model.

Publishing & Reviewing

Cameo Collaborator is a web-based product designed to present models in a simplified form for stakeholders, sponsors, customers, and engineering teams. The solution makes it easy for users to review models and diagrams in a transparent, collaborative environment — keeping the entire project team up to date on any changes made to the model, and involving even non-technical team members in the model review process.

Report Wizard is a built-in functionality of Cameo Systems Modeler™ that enables document generation out of the SysML model. It supports text-based report templates such as plain text, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, RTF, HTML, Office Open XML, OpenDocument format, and XML.

"The No Magic toolset conforms to the standard, and I use it as a reference tool for my modeling concepts."

Tim Weilkiens

Author of numerous SysML and MBSE books and co-author of the SysML specification

Components of the No Magic MBSE Solution

MBSE Evangelism
No Magic applies best practices while solving difficult problems in various engineering domains. We cooperate with widely recognized book authors: Sandy Friedenthal, Pascal Roques, Tim Weilkiens, and others.

Proof of Concept
Our teams think big, start small, and evolve. We clearly identify your expectations with our team of experts, define goals and project scope, build reference architecture, create guidelines, and evaluate tools.

Toolset
Use our fully integrated toolset, which gives you the ability to capture, integrate, and maintain standards-based enterprise architecture (EA) models and precisely model your complex systems.

Consulting
Gain a competitive advantage with on-line and on-site consultancies during all stages of your project.

Customized Training
Improve your employees' knowledge with dedicated training based on your project environment, new technologies, standards, and best practices.
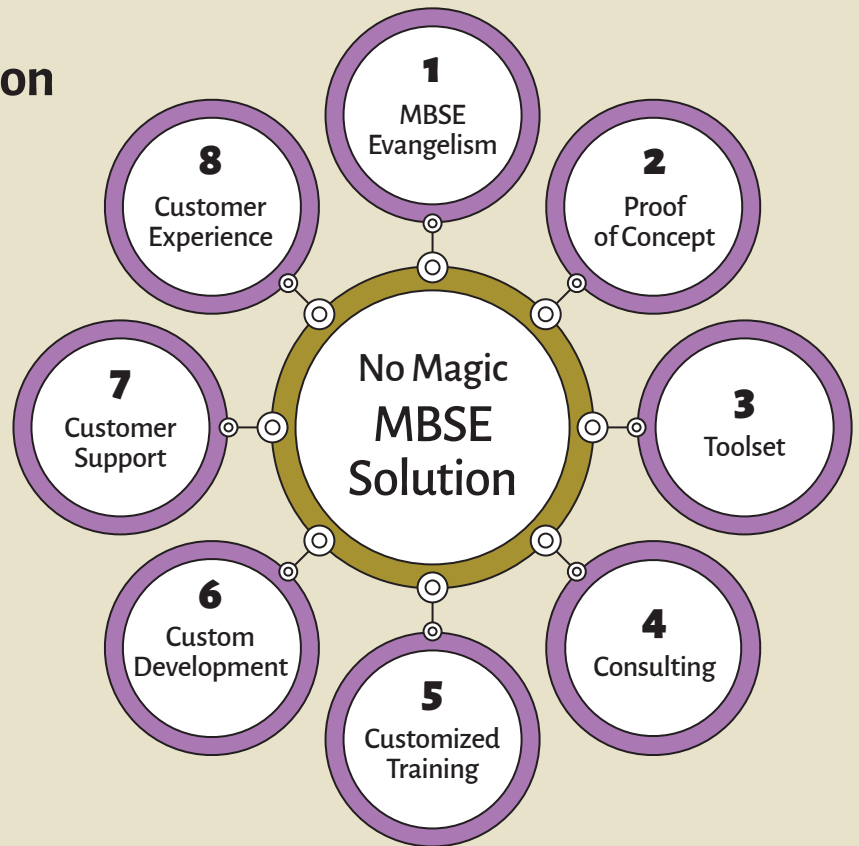
Custom Development
We exploit the extendibility of the No Magic toolset. We implement your business requirements using proven technologies, professionalism, and experience.
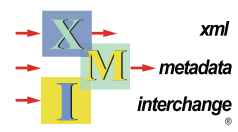
Customer Support
Tell us what you want to do and we will tell you how to do it, 24/5.

Customer Experience
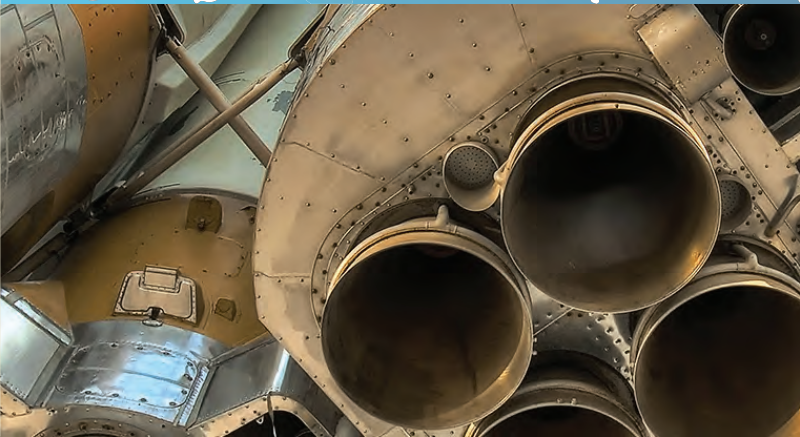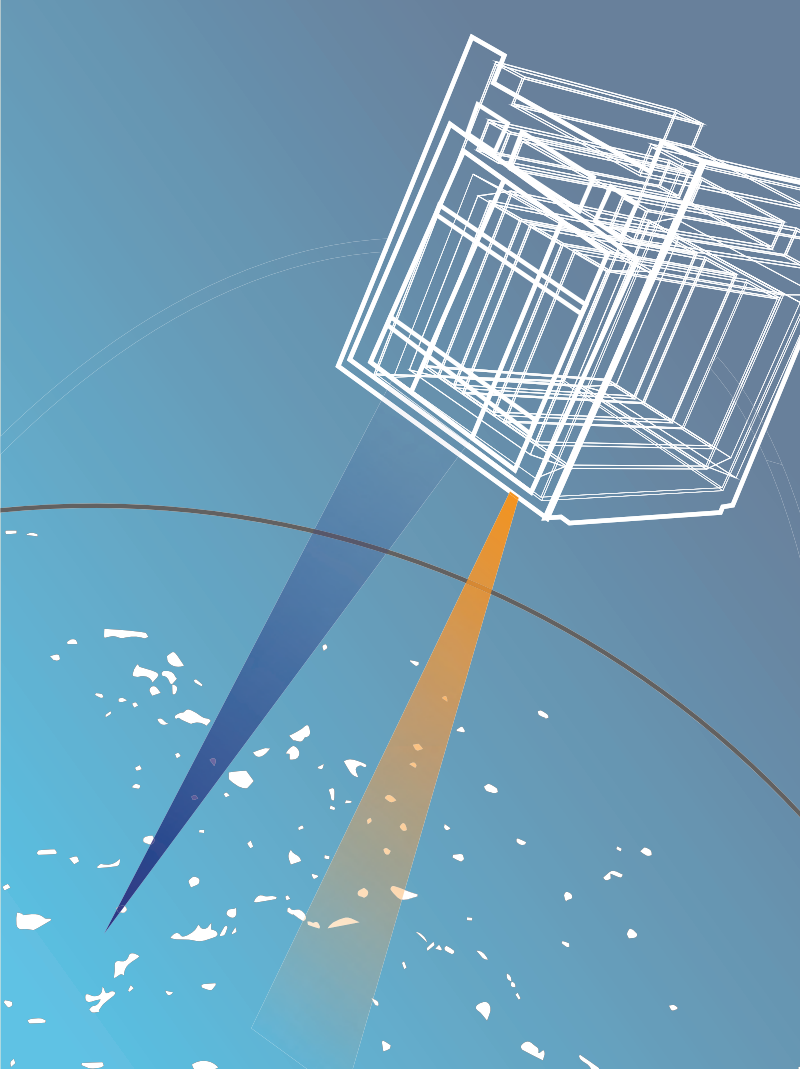Find an answer or share your story in our user community. Leverage social media platforms, our user forum, and our blog.

No Magic MBSE Solution

1 MBSE Evangelism
2 Proof of Concept
3 Toolset
4 Consulting
5 Customized Training
6 Custom Development
7 Customer Support
8 Customer Experience

NO MAGIC AFFILIATIONS

INCOSE
International Council on Systems Engineering

OMG
OBJECT MANAGEMENT GROUP®

No Magic is an active participant in

- OMG Standards: SysML, UPDM, UML, fUML, XMI, Model Interchange Working Group (MIWG)

- INCOSE MBSE Challenge Teams

xml
metadata
interchange

MBSE Solution for
NASA and INCOSE

Modeling & Simulation of CubeSat Mission

CubeSats are a class of research spacecraft called nano satellites. The cube-shaped satellites

- are approximately 10 cm long

- Have a volume of about 946 cm^3

- Weigh about 1.4 kg

Challenges

- How do satellite states evolve throughout a mission?

- Does the vehicle design/operation meet all mission requirements?

- How do changes in spacecraft mission parameters impact performance and requirements satisfaction?

Solutions

- MBSE

- MBSE Tools
  - **Modeling:** MagicDraw + SysML
  - **Simulation:** Cameo Simulation Toolkit
  - **Integration:** Phoenix Model Center
  - **Analytical Models:** STK and MATLAB

Integrated models and tools are critical to design and plan for these missions.

Results

- Developed fundamental systems model of CubeSat mission

- Coupled analytic models with simulation capabilities

- Balanced mission and design trade-offs

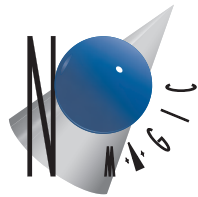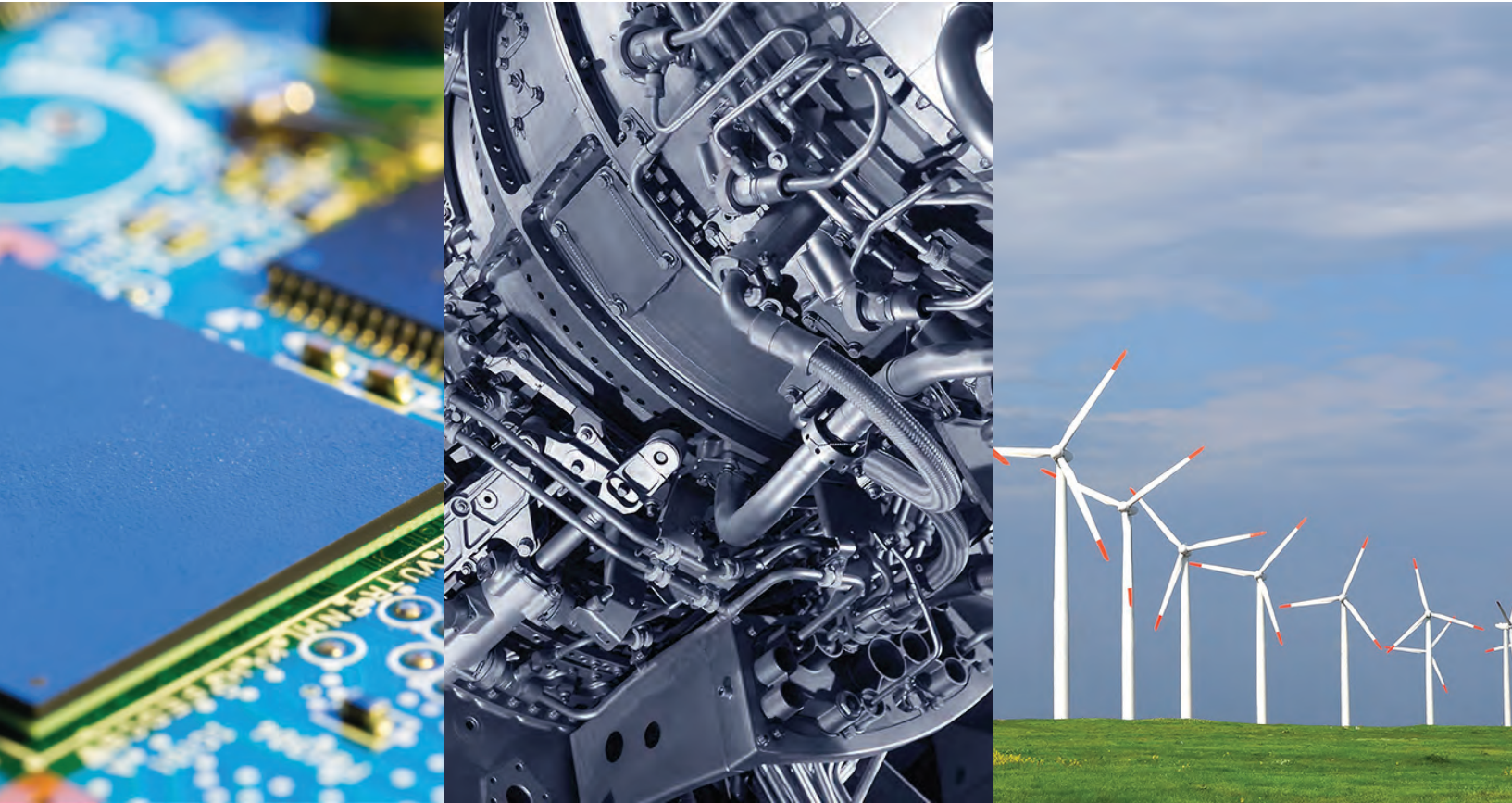- Achieved requirements verification for full end-to-end missions

"The Europa team was able to study three distinct mission concepts for the resources usually sufficient to study only one or two, and the high quality of all three studies was lauded by the Hubbard Review Board and by NASA HQ."

Dave Nichols and Chi Lin

JPL MBSE practitioners at INCOSE International MBSE Workshop 2014

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in 90
countries

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companies

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Texas

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Lithuania

Bangkok,
Thailand

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