



# GROWTH OF MBSE @ GULFSTREAM

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# QUICK EVOLUTION

Human Lifespan ~ 79yrs  
Aircraft Dev ~ 6-10yrs

~100 years ago:  
Wright Flyer (1903)



FEW SYSTEMS

~50 years ago:  
Gulfstream G1 (1958)



MANY SYSTEMS  
LOW INTEGRATION

Current (2018/2019):  
Gulfstream G500/G600



MANY SYSTEMS  
HIGH INTEGRATION

# FLIGHT DECK EVOLUTION



GI (1958)

1st purpose-built aircraft for business aviation



G500/G600 (2018/2019)

Symmetry™ Flight Deck



# WHY MODEL-BASED SYSTEMS ENGINEERING (MBSE)?

## Why Systems Engineering?

Right Thing?

Build It Right?

System  
Complexity

Requirements  
+ Architecture

Validation

Verification

## Why Model-Based Systems Engineering?

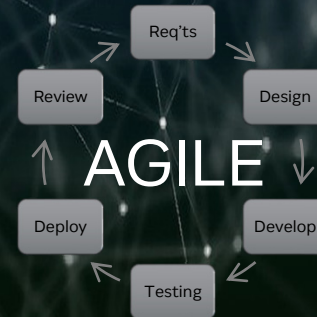
Req. + Arch.  
Complexity

MBSE Models  
(Req + Arch)

Validation

Verification

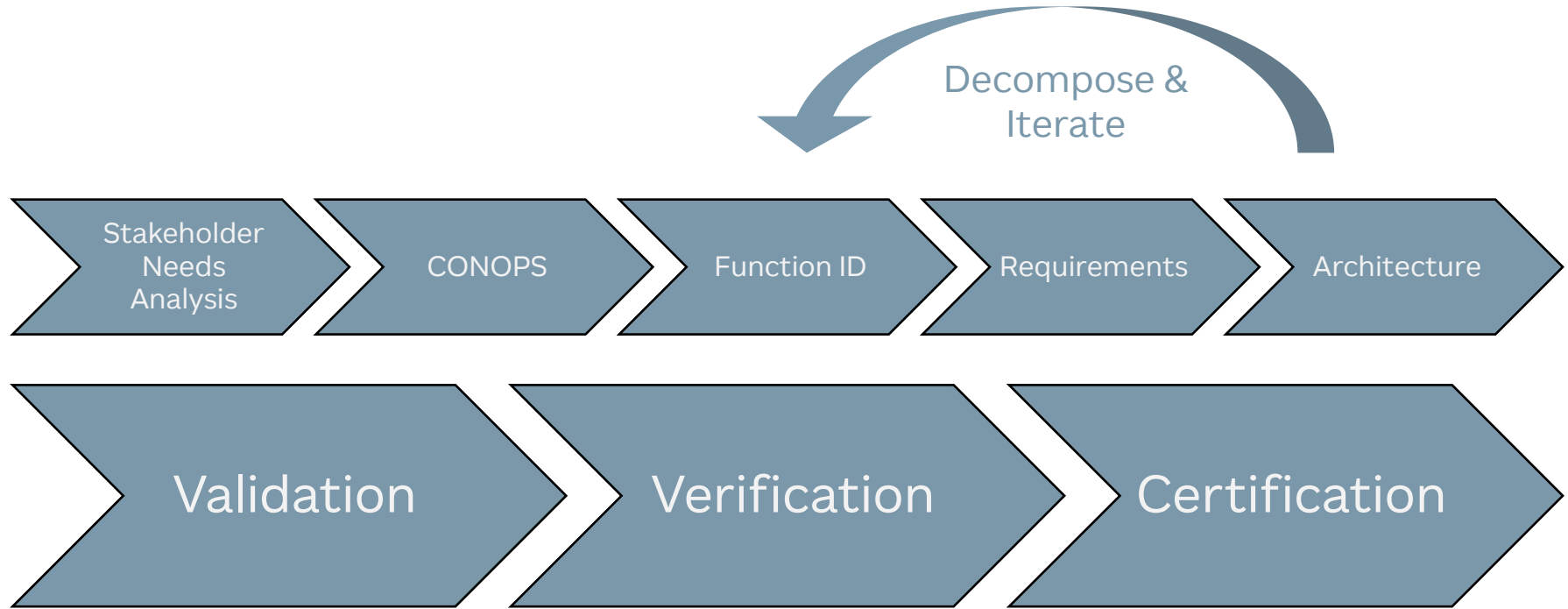
## What's the Business Case?



AGILE

60%

# SYSTEMS ENGINEERING WORKFLOW

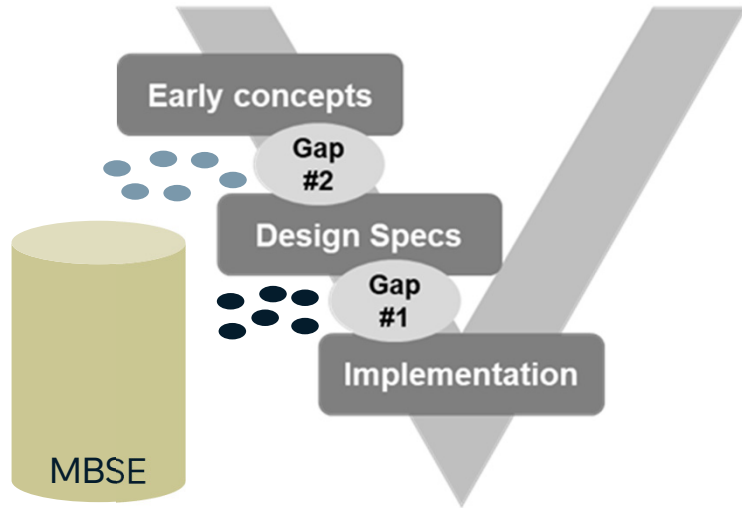




## BIRTH OF MBSE @ GULFSTREAM

- 3D CAD
- Aircraft Control Laws
- Flight Control Systems

# WHAT IF?



Easy and Intuitive MBSE Modeling

Evolve Early Concept to Detailed Model

Single Source of Truth

Model Artifact Roles and Ownership

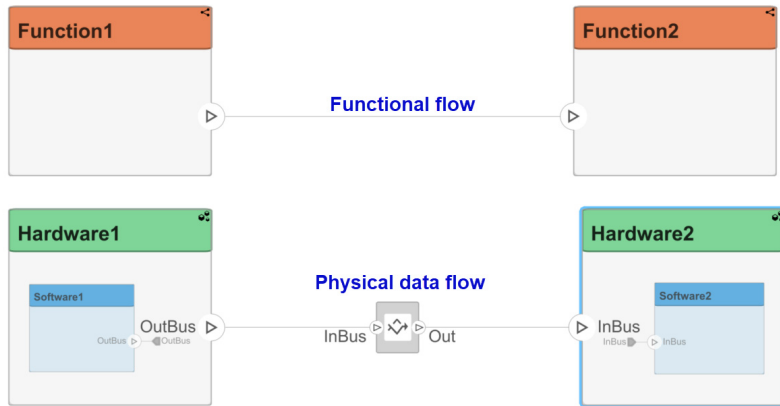
Validation via Simulation before Software Coding

Signal Flow & Failure Propagation Analysis

Model Integration with Lower-Level Tools

# ELECTRONIC SYSTEM ARCHITECTURE MODELING (ESAM) METHOD

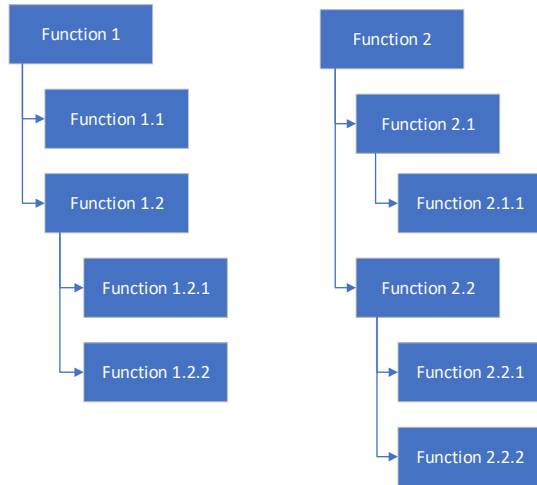
- System Composer: Generic modeling constructs
- eSAM: Standard modeling approach for electronic systems
- Suppliers + Gulfstream





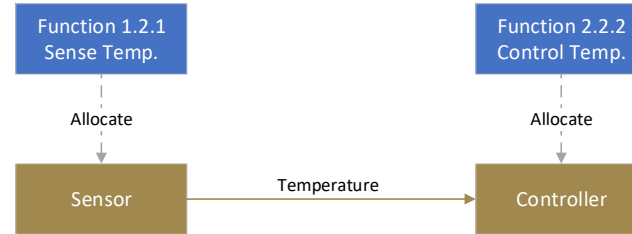
# POWER OF MBSE: FUNCTIONAL MODELING & ANALYSIS

## Functional Decomposition



What are the Functional Dependencies?

## Functional Allocation

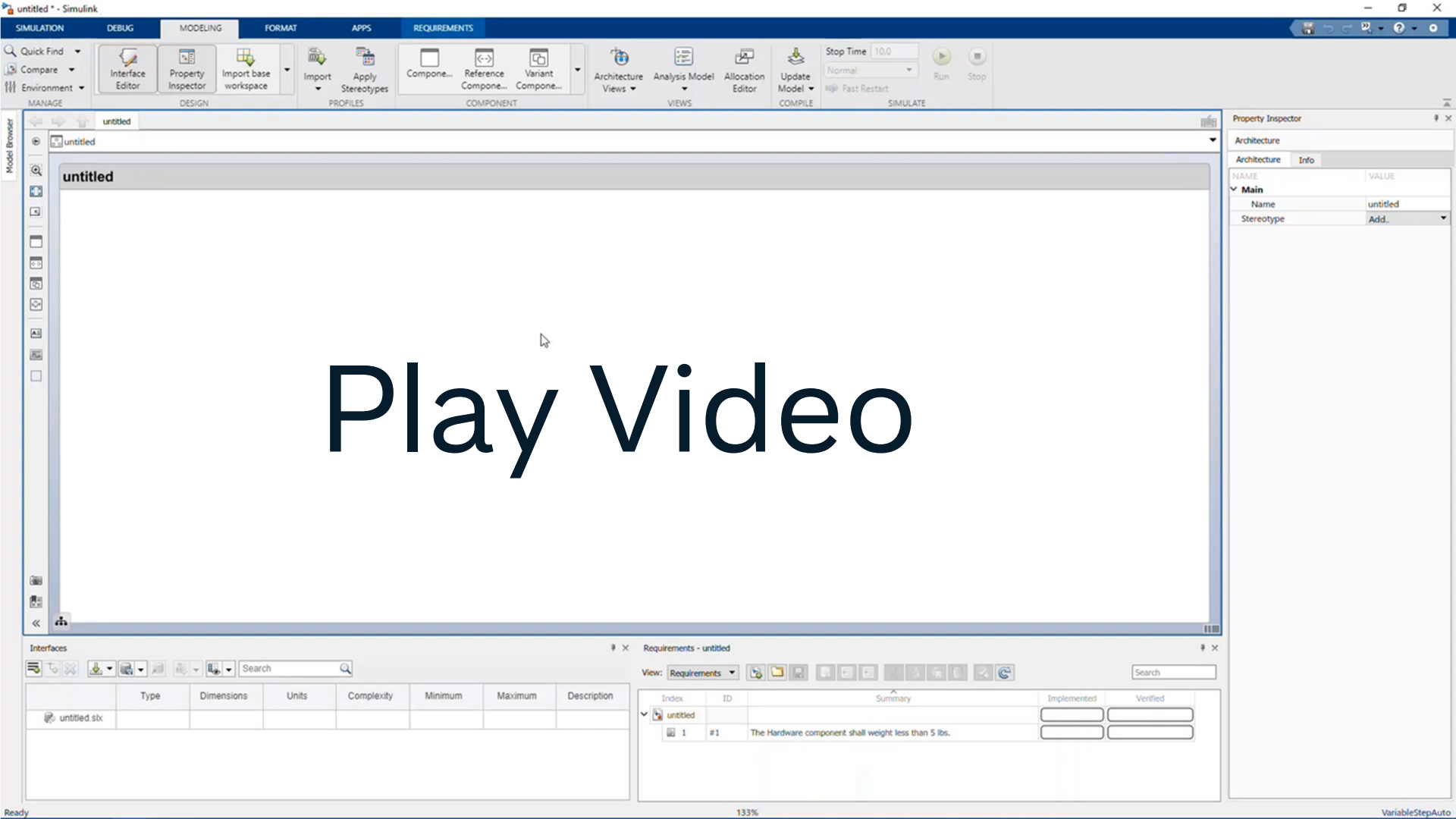


## ANALYSIS:

### *Derived* Functional Flow Diagram



Auto Drawn with  
eSAM and System Composer



# FUTURE WORK



Finalize eSAM Method



Ensure Tool Functional Support



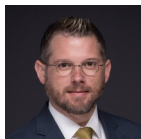
Safety Analysis Support/Integration



Release eSAM Modeling Standard

# ESAM DEVELOPERS

Publication:  
System Architecture Modeling for Electronic Systems  
Using MathWorks System Composer and Simulink  
<https://ieeexplore.ieee.org/document/9256753>



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# THANK YOU