

# Enabling Advanced Air Mobility through Digital and Physical Infrastructure

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SYSTEMS AND ENGINEERING TECHNOLOGY



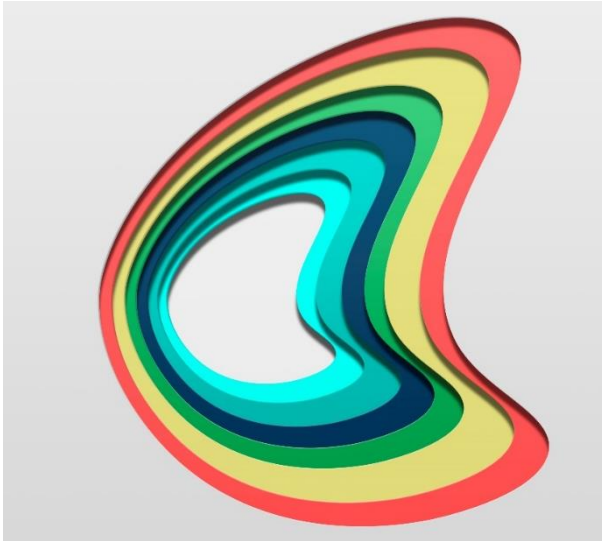
# AAM is moving from Renders to Reality



Microsoft 365 Stock image

## Existing Aviation Infrastructure

Microsoft 365 Stock image



- ▶ Built on multiple layers of control and protection developed over decades
- ▶ If one fails there's generally another backup
- ▶ Robust\*, well understood and relatively easy to unpick in the event of something going wrong
- ▶ Increasingly digital but built on physical backbone

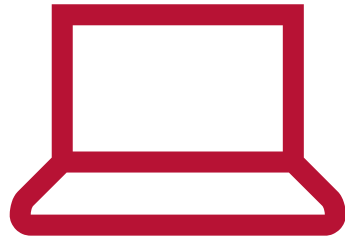


\*Not infallible: holes in the 'Swiss Cheese' can line up

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## What is Digital Infrastructure?

If you care about something physical, then it should be supported by a digital artefact:  
These artefacts together are digital infrastructure.

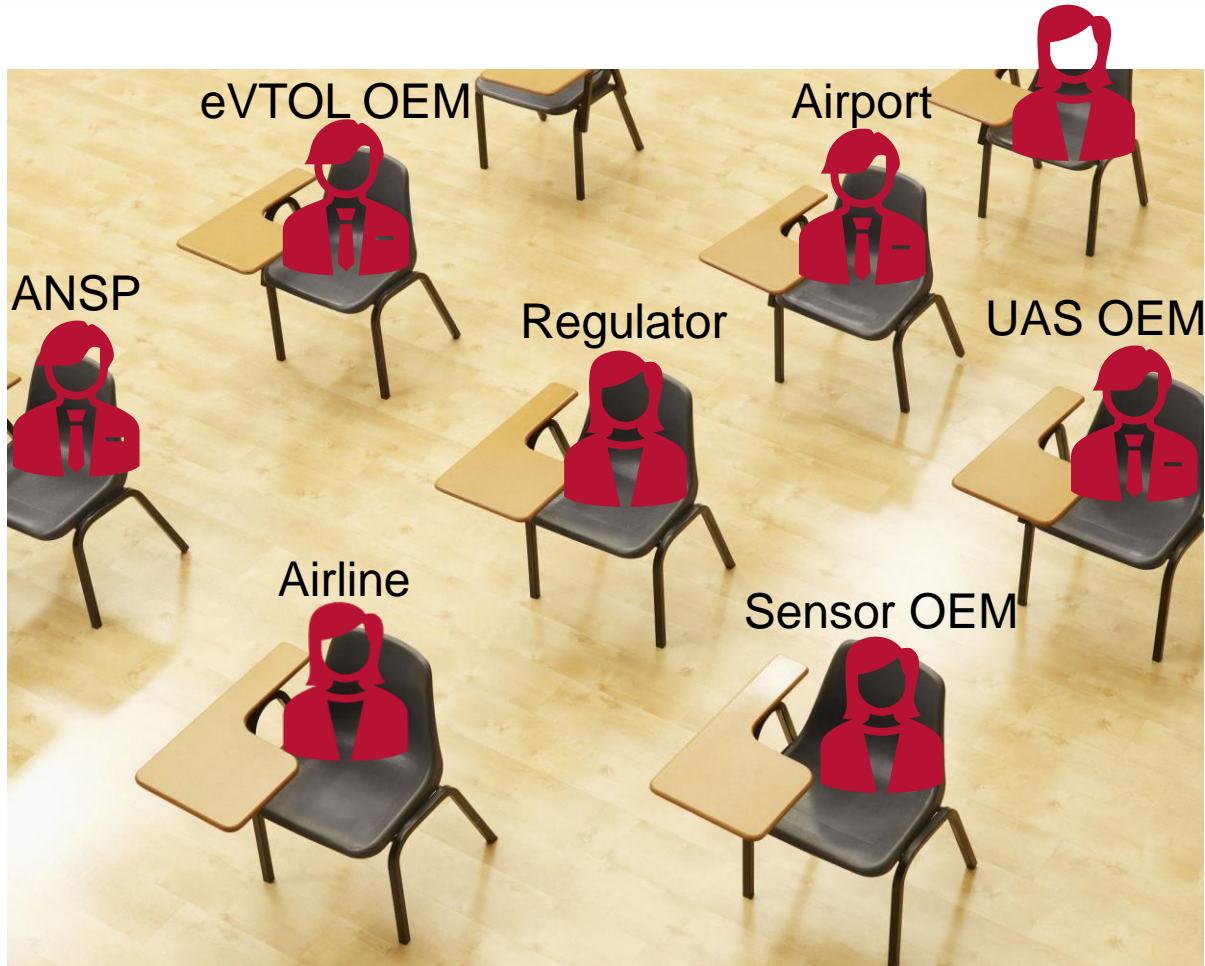


There should be no piece of digital infrastructure that doesn't have a clear thread through to a real-world system



There should be barely any real-world system that isn't supported by and interfaced with a useful digital artefact

## Example: Test Flight



Composite from Microsoft 365 Stock image

- ▶ Instrumented test flight is nothing new
- ▶ The challenge presented to regulators and AAM companies to enable safe and widespread flight is enormous
- ▶ Feeding test flight data back into an aircraft design programme can't be enough
- ▶ We need to take the opportunity of the test flight of new systems where possible to move forward the supporting infrastructure

## Example: Regional Airport Tower Refurb



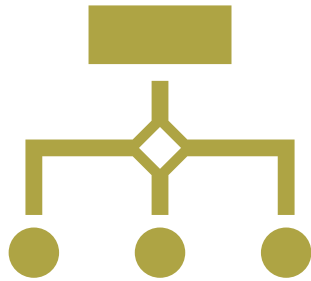
Microsoft 365 Stock image

- ▶ Upgrade or refurb of an ATC tower or airport radar system is a relatively rare event
- ▶ We need to embed digital infrastructure in as much of existing aviation infrastructure as possible
- ▶ Every new ATM system should be forwards compatible with a future UTM...
- ▶ And / or be a potential test bed for future systems

# How do we deliver Digital Infrastructure?



# What is MBSE?



‘The formalised application of modelling to support system requirements, design, analysis, verification, and validation activities from concept to decommissioning’.

*International Council on Systems Engineering (INCOSE) Systems Engineering Vision 2020 (INCOSE-TP-2004-004-02, Sep 2007)*

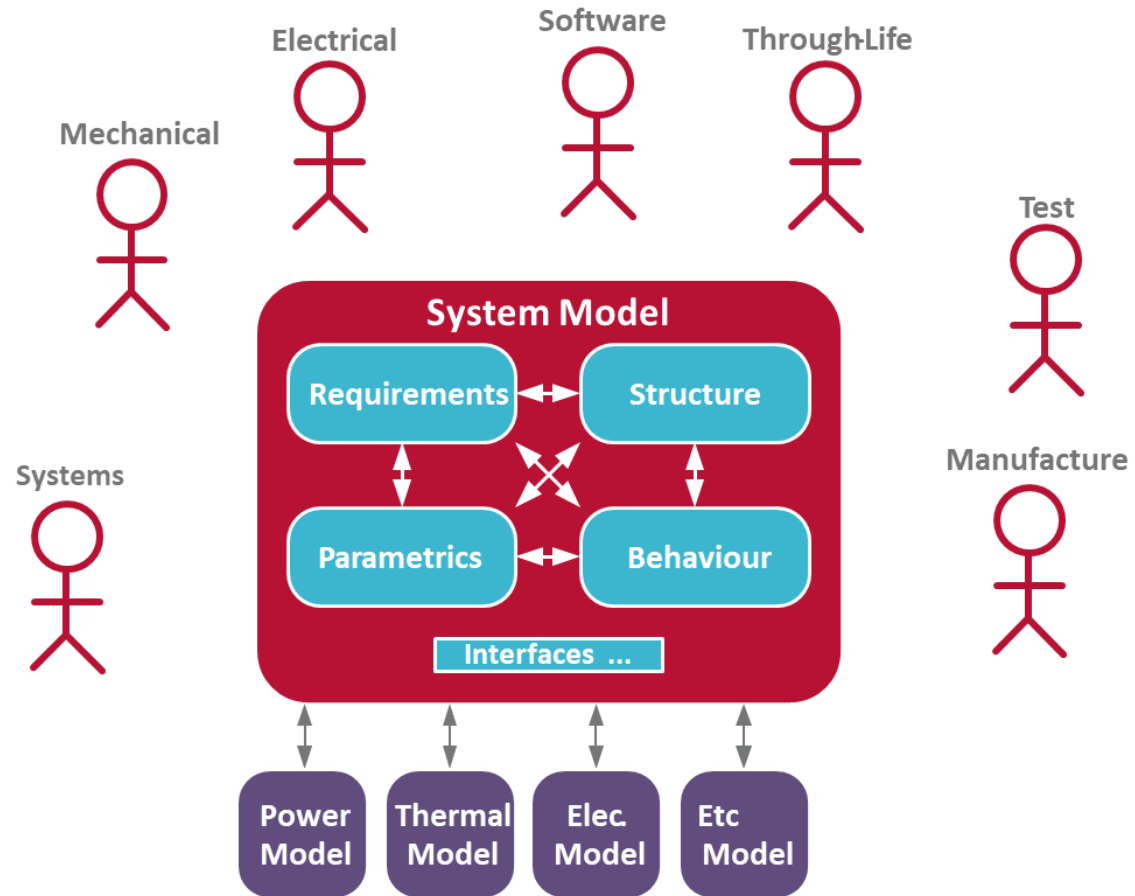


Models may be structural, behavioral, physical, electrical, parametric...

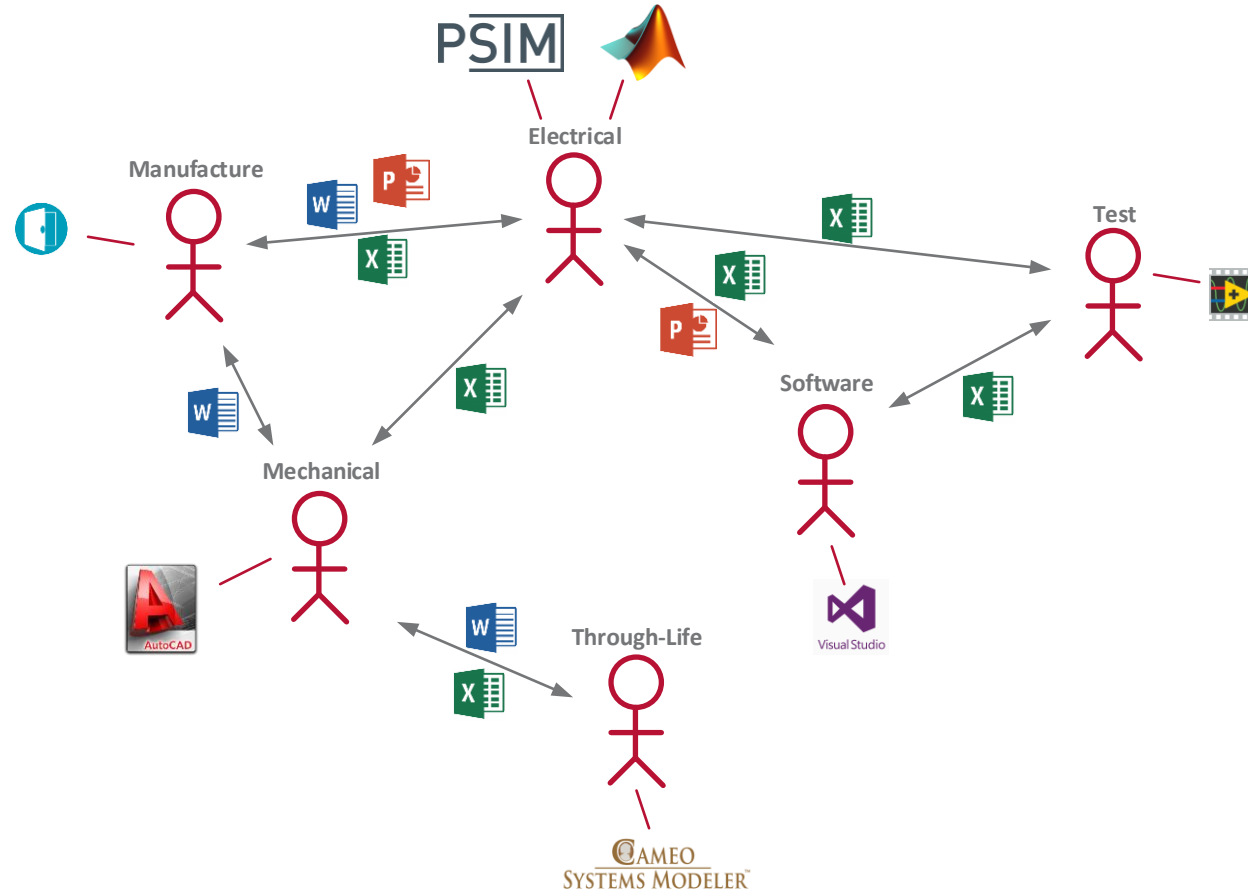
...tied together by a system model, shared by all disciplines, with multiple ‘views’ as required



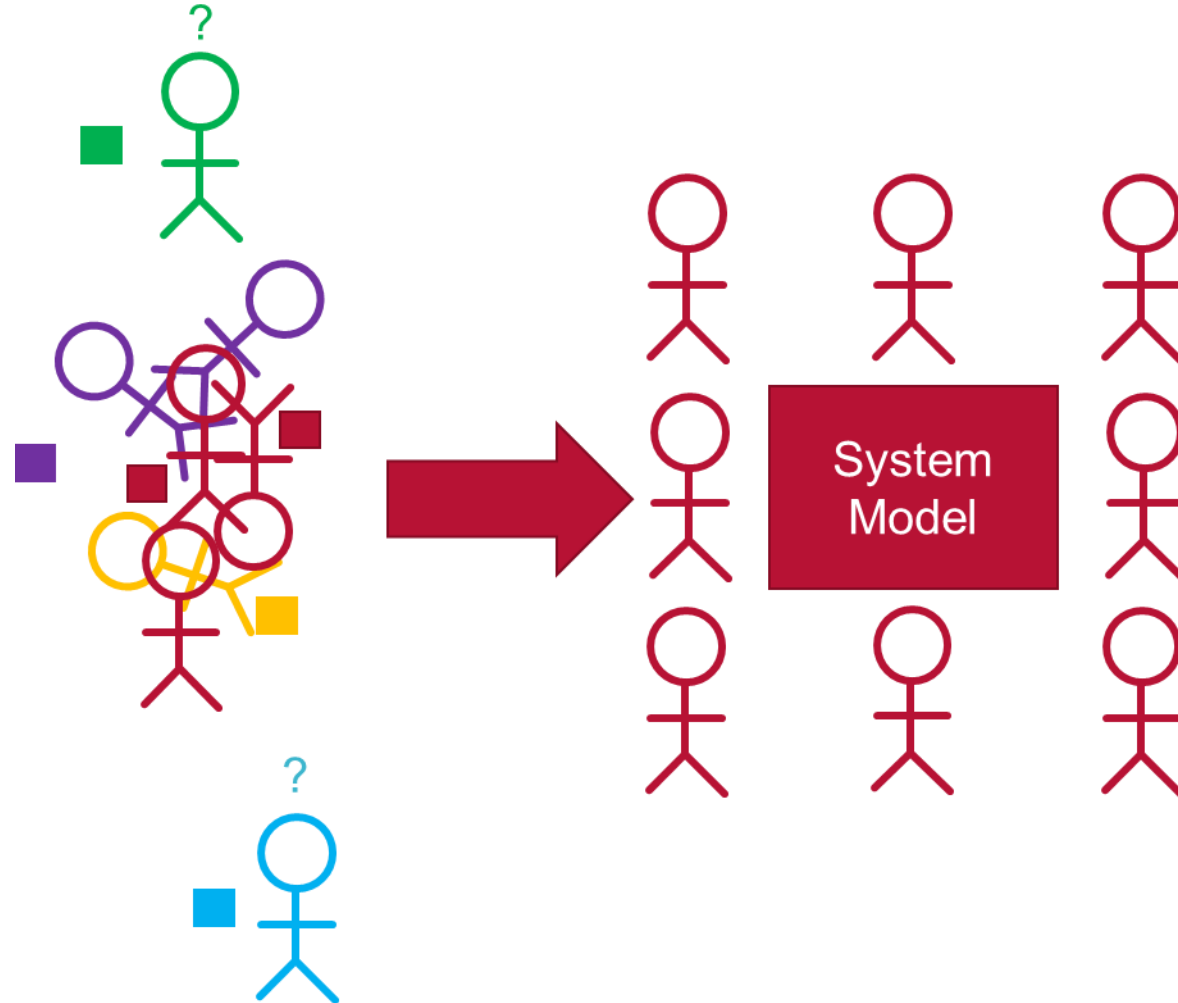
# What is MBSE?



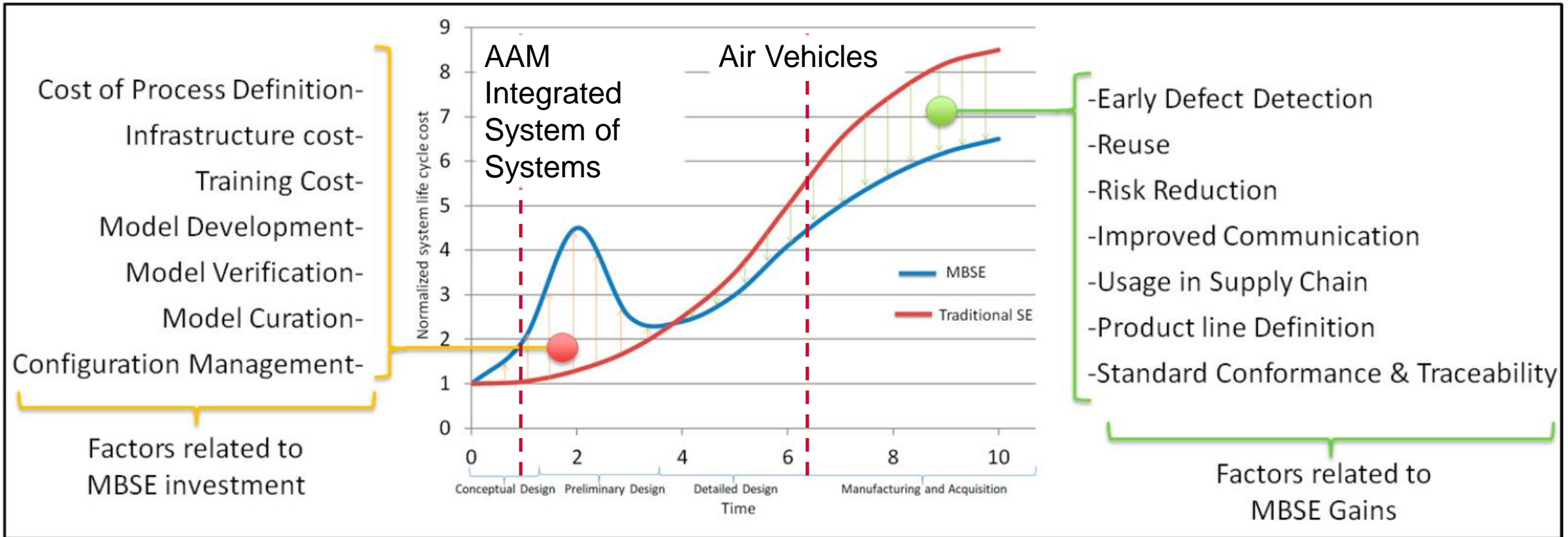
# What isn't MBSE? Modelling in Traditional Systems Engineering



# MBSE Benefits



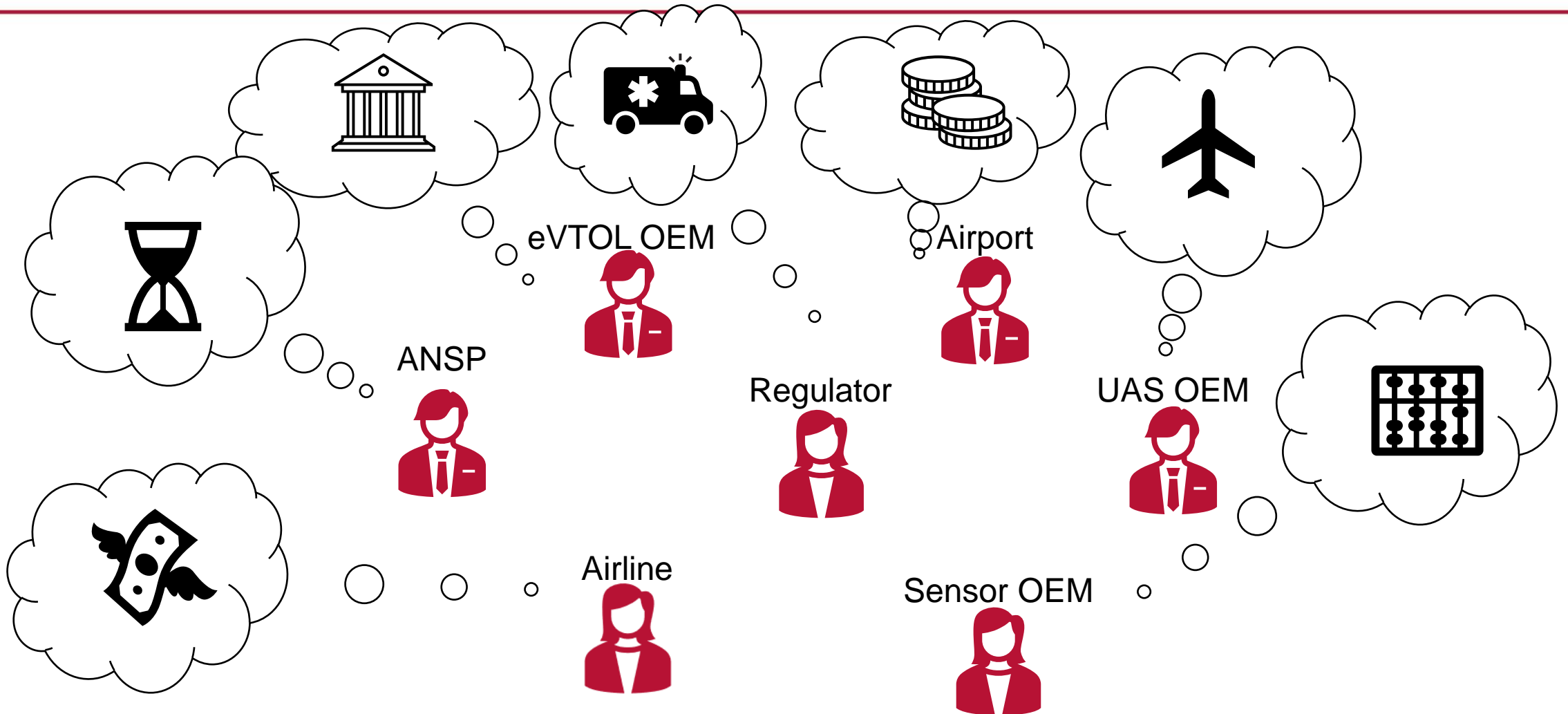
# MBSE Benefits



*MBSE should enable long term whole system development cost reduction – an effect which scales with system complexity and longevity*

Source: Madni, Purohit, “Economic Analysis of Model-Based Systems Engineering” Available from: <https://www.mdpi.com/2079-8954/7/1/12>

# Conclusion



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