

A SYSTEM ENGINEERING APPROACH TO VALUE ENGINEERING CHANGE PROPOSALS (VECP)

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Background

- Interest in Value Engineering (VE) waned in late 1990s
 - Impacted by performance-based acquisition
 - Loss of knowledgeable staff
- RMS began efforts to reenergize VE

Background (cont'd)

- RMS Formed teams
 - Customer team – meets annually
 - Contracts team and technical team – meet quarterly
- Established fund for use with Value Engineering Change Proposals (VECP)
- Status of projects discussed at meetings
- Led to Systems Engineering VE approach

VECPS - Proposal to Change Contract and Share in the Savings

- Simple Type
 - Establish second source
 - Change containers, packaging, etc.
- More Complex
 - Change can affect other subsystems
 - Change can require extensive testing
- Therefore need a systems engineering approach

Systems Engineering Approach

- Unique issues with weapon systems
 - VECs for one item saved money
 - Often resulted in other increased costs in related components or subsystems
 - "Suboptimization"
- Look at system as a whole
- Conduct functional analysis
- Decomposition of the system

Weapon System Components

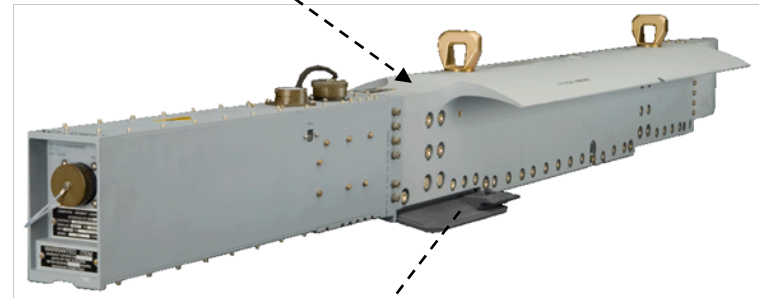
- Operator
- Fire control system
- Launch platform
- Missile
 - Mounted various ways - fixed location or mounted for travel
 - Land vehicle, ship, aircraft, shoulder of warfighter

US Air Force Weapon System

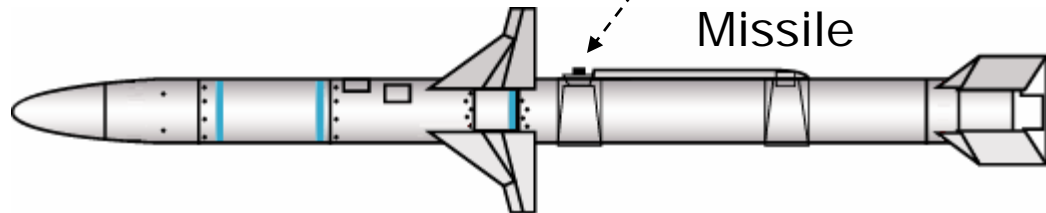
F-16 Aircraft



Launcher

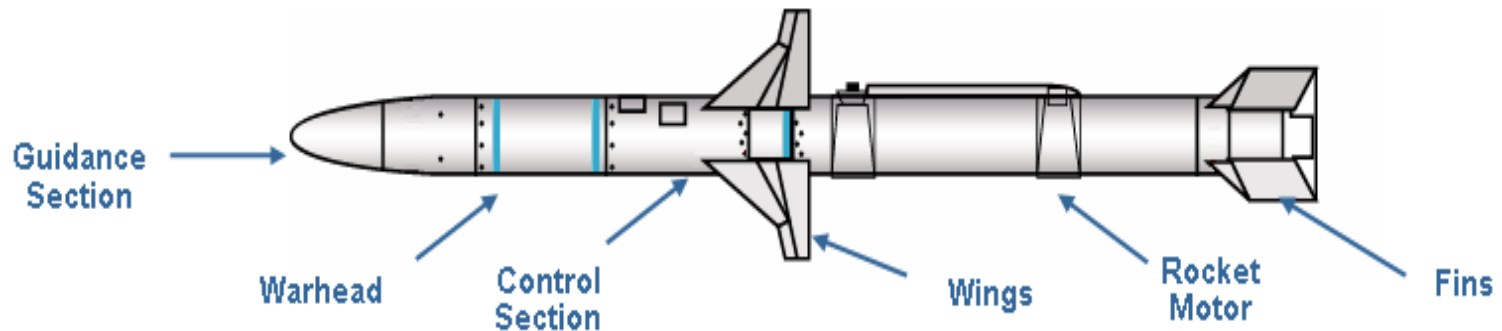


Missile



Components of a Missile

- Warhead
- Propulsion (rocket motor)
- Airframe
- Guidance and control (guidance section, control section, wings, and fins).



Developmental Issues

- Long lead-time required
- Full-scale production may take up to ten years
- Parts become obsolete and/or excessively priced
- Extensive testing requirements limits the ability to change things

VE Changes at Component Level

- One-piece mirror being phased out by the manufacturer
- Replaced with three-piece mirror
 - Reduced the unit price
 - Provided the same performance
 - Was readily available
- Adversely impacted guidance system

Unexpected Problem

- One-piece mirror had compensation factors for mass properties injected into firmware
- Three-piece mirrors had different mass properties
 - Guidance section was compensating for the wrong measurements
 - Caused shut down of production line to fix problem
 - Resulted in increased costs

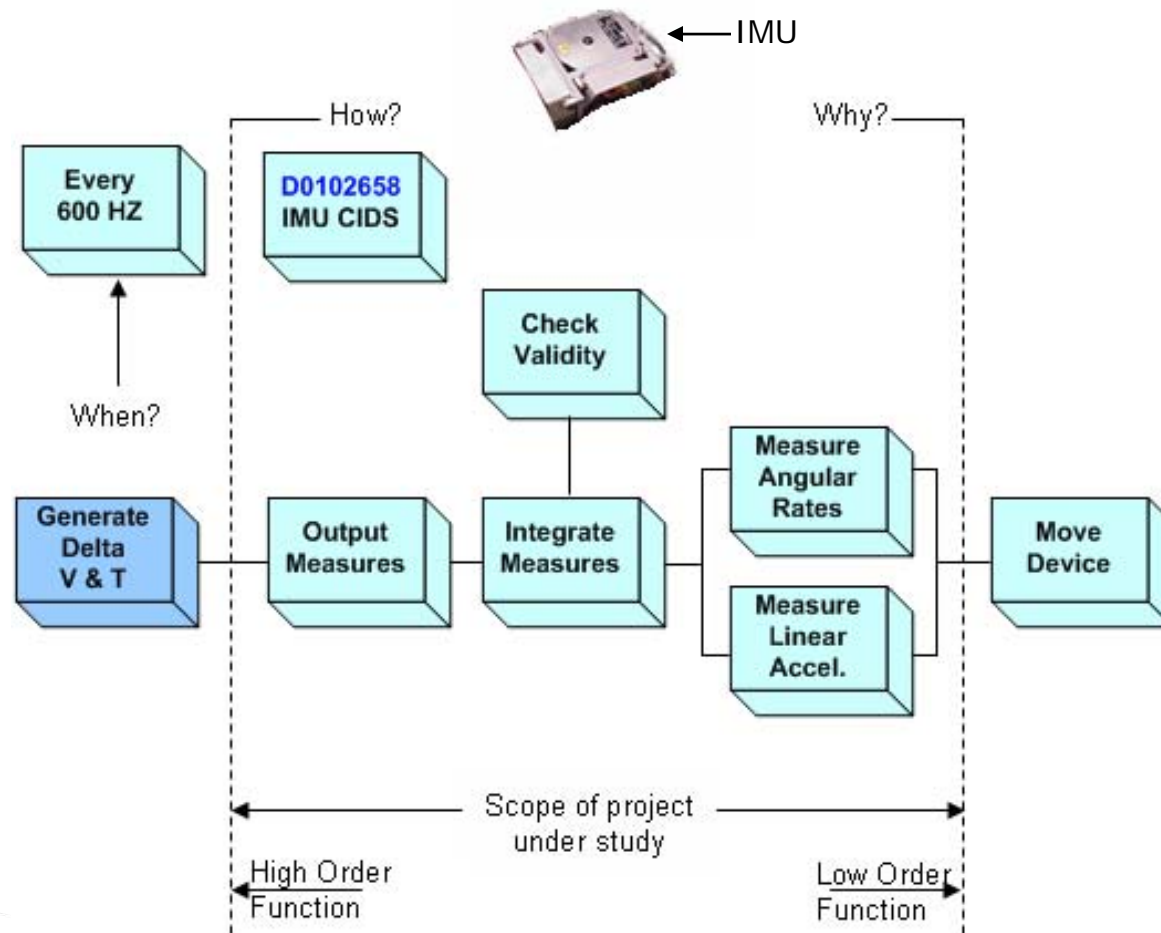
Taking a Different Approach to Implementing VECs

- Replace an Inertial Measurement Unit (IMU)
 - Original IMU priced at \$32K, was approximately 7 years old, reliable, and very accurate.
 - New IMU with equal performance using a different technology was priced at approximately \$10K
 - Could result in a \$22K savings per unit

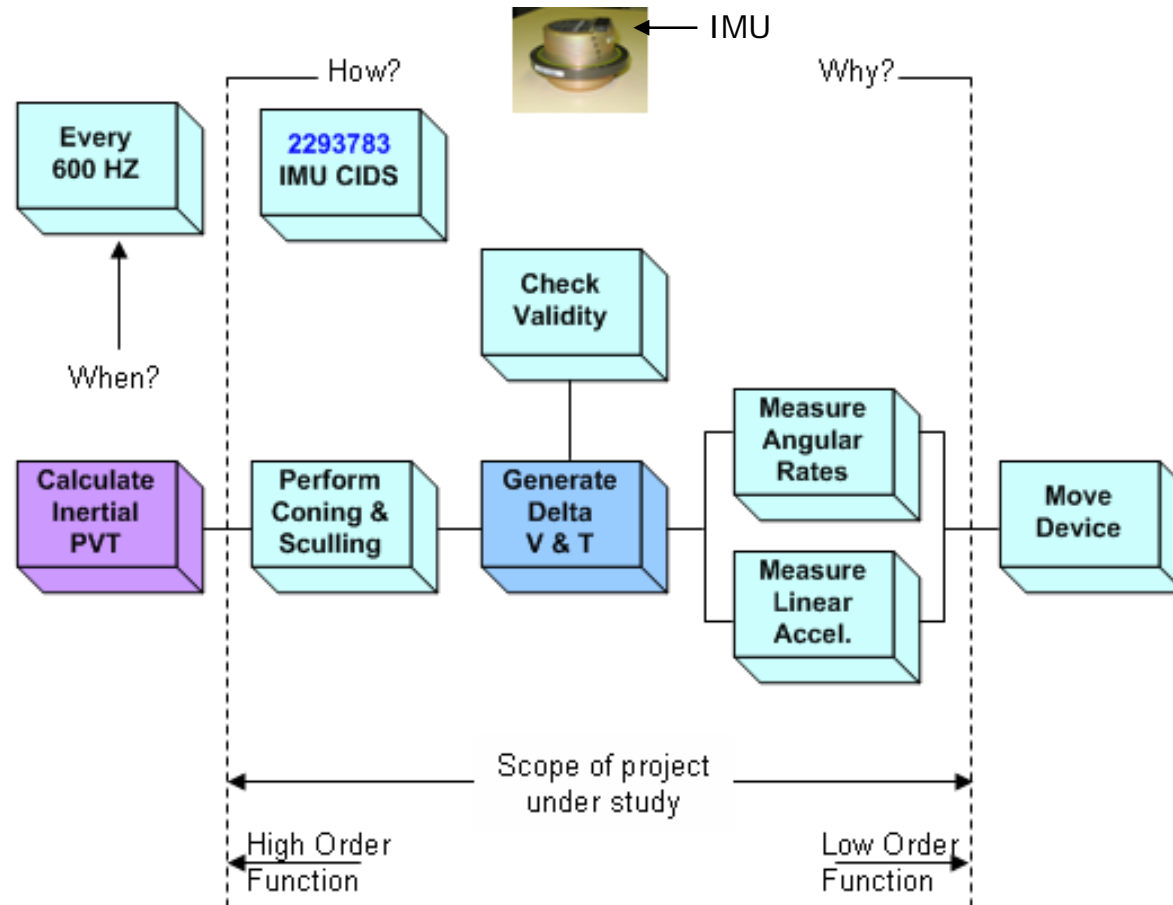
The Fast Approach

- Three questions
 - What is it?
 - What does it do?
 - What must it do?
- Functions documented and categorized into basic, dependent and independent functions
- A classical FAST diagram was created

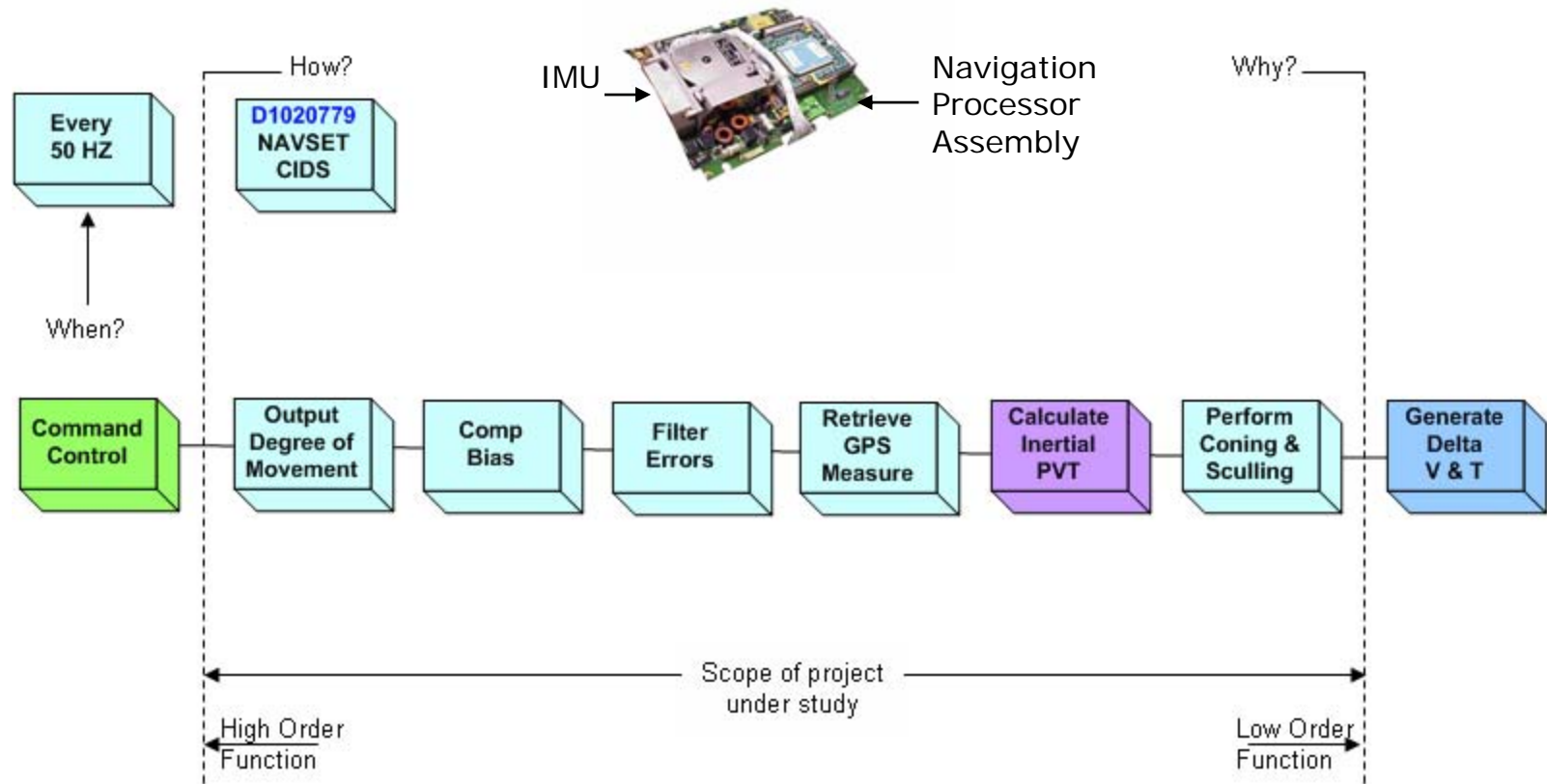
Example of Original IMU FAST Diagram



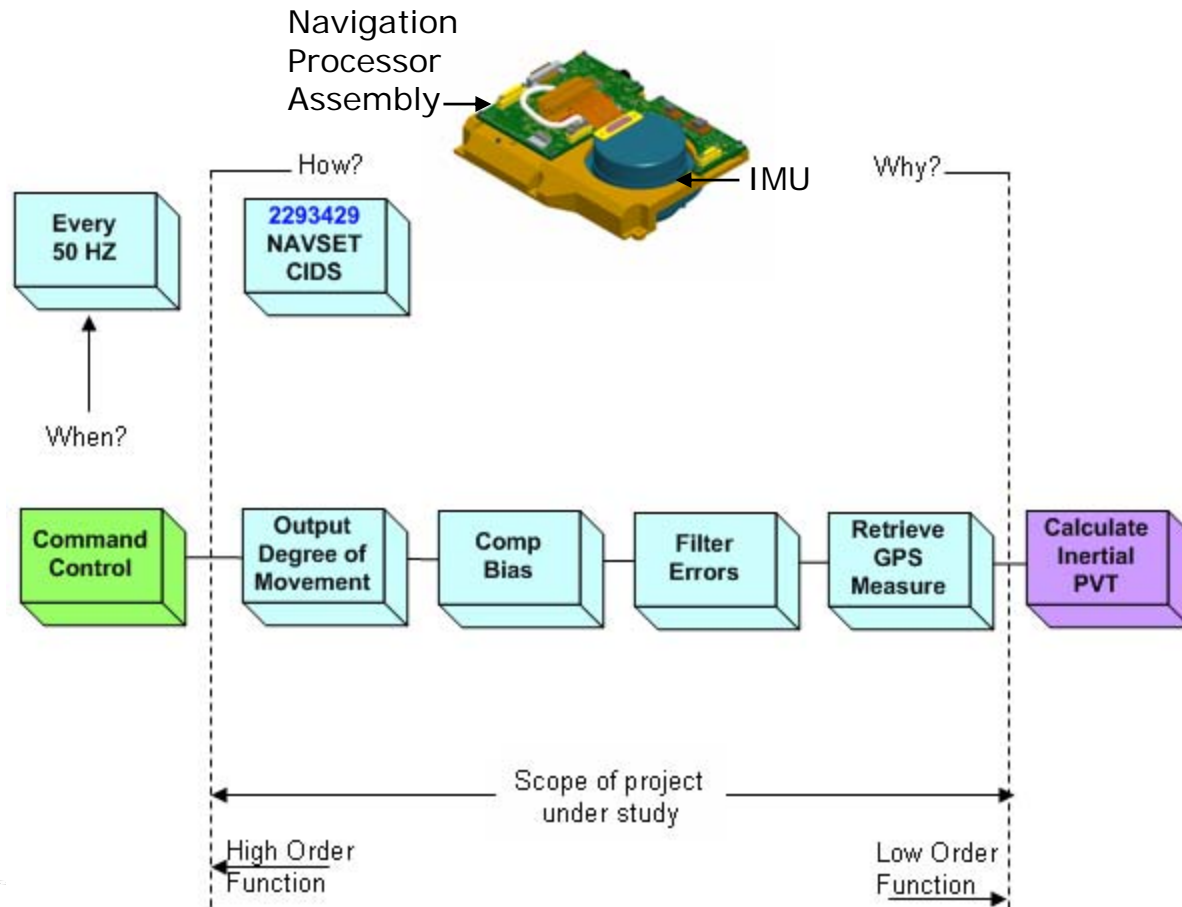
Example of New IMU FAST Diagram



Example of Original Navigation Processor FAST Diagram



Example of New Navigation Processor FAST Diagram



Benefit to the Modified Approach

- Inter-relationships of the lower level to upper level components became obvious
- Various types of trade studies were performed on each level of the system that depicted a difference in the FAST diagrams
- Studies documented all system components that would change in implementing the new IMU

Conclusion

- Modified FAST approach proved a viable solution to system sub-optimizations
 - Negative effects of the VECP can be neutralized
 - May result in increased savings and performance for the entire system.