SAAB CPS CHALLENGES

With a focus on Education & Training

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SAAB - THE DOMAIN







WHAT IS THIS?

THEN, WHAT IS THIS?

EXAMPLE SYSTEM PROPERTIES

RCS

Fuel consumption

Center of Gravity

Safety

Availability

Operational cost

Payload

Service life

Flight envelope

Fuel capacity

Weight

Environmental impact

Range

Supportability

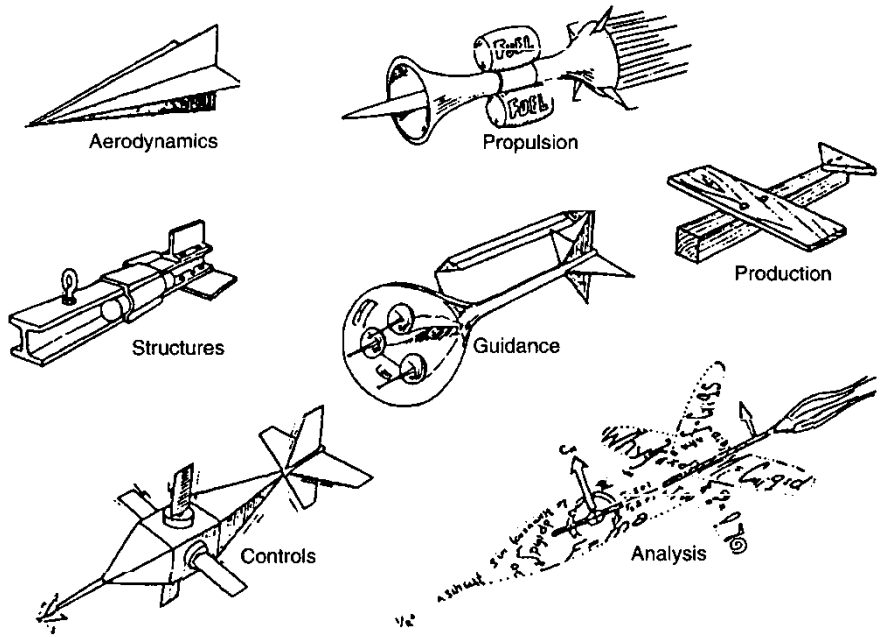
Development Cost

Maintenance interval

Security

INDUSTRIAL DEVELOPMENT CHALLENGES

- Formal models, simulations results, proofs matter little if we aren’t in agreement on what we are building
- Safety analyses, no matter how elaborate, of a system we do not intend to build has little value
- Parts built, but not compatible in the intended configuration has little utility even though they may be fully verified
- The merit of the design solution is low if it can be maintained



- Mastering development is not about improving domain engineering methods but methodology for understanding and communicating system design

THE SIGNIFICANCE OF CPS

- Swedish industry is strong in many traditional industry domains
  - Mature markets, competition is tough
- CPS, IoT & Co allow for the creation of completely new, disruptive systems by combining and integrating solutions from (previously) disconnected domains
  - New paradigms may strangle established organisations in short time
  - And provides great opportunities for new entrants
- CPS development organisations will grow in terms of engineering competencies covered
- CPS will increase the reliance on documentation and engineering communication for capturing and understanding the properties of the evolving system
  - A barried for embrasing the potential of CPS in traditional industries

CONCLUSION

- The main CPS challenge is not about sharpening the domain analysis tools and methods, but about
- Enabling communication across the engineering disciplines in an organisation developing CPS

SAMPLE SYSTEM PROPERTIES

- Accessibility
- Accountability
- Adaptability
- Administrability
- Affordability
- Agility
- Availability
- Capability
- Composability
- Configurability
- Compatibility
- Demonstrability
- Deployability
- Durability
- Executability
- Extensibility
- Evolvability
- Fidelity
- Flexibility
- Functionality
- Integratability
- Interoperability
- Interpretability
- Maintainability
- Manageability
- Mobility
- Modifiability
- Operability
- Performability
- Portability
- Practibilty
- Practicality
- Predictability
- Producibility
- Recoverability
- Reliability
- Repeatability
- Responsibility
- Reusability
- Scalability
- Serviceability
- Stability
- Supportability
- Suitability
- Survivability
- Tailorability
- Testability
- Traceability
- Trainability
- Transportability
- Trustability
- Understandability
- Upgradability
- Usability
- Verifiability
- Vulnerability

CPS EDUCATION

THE NEW RECRUITS

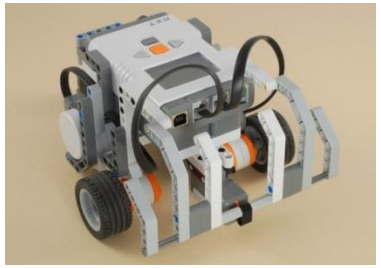
Lifecycle management
Verification & Validation of heterogeneous systems
System of systems
Requirements management
Systems thinking
System integration
Systems architecting and design
Reliability, Availability & Maintainability
Systems engineering
System safety
Operations analysis
System modelling & simulation
Systems security
Multi-disciplinary trade studies
Configuration management
Human system integration

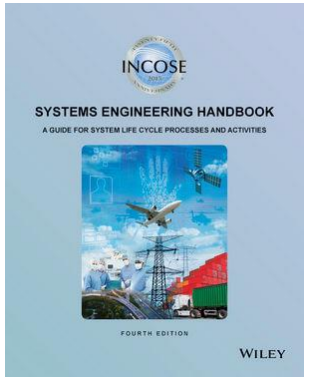
Computer Science
Machine design
Electronics engineering
Engineering management
Material sciences
…
…
…
Logistics
Aeronauticsl engineering

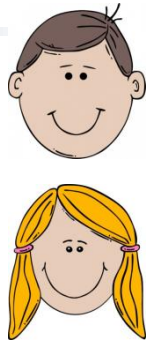
Ecomics, HR, Law, …

CONTINUOUS COMPETENCE DEVELOPMENT

- Internal training programs
- General Systems Engineering courses
  - 6-20h training
  - INCOSE CSEP preparation courses
    - 20 students/year
- Dedicated courses in
  - Safety
  - ILS
  - Architecture
  - …
- In this area we are missing a partner that can offer more in depth training in systems engineering subjects
  - And provide a meeting space for people and organisations with similar challenges

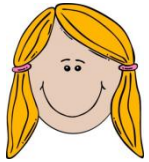


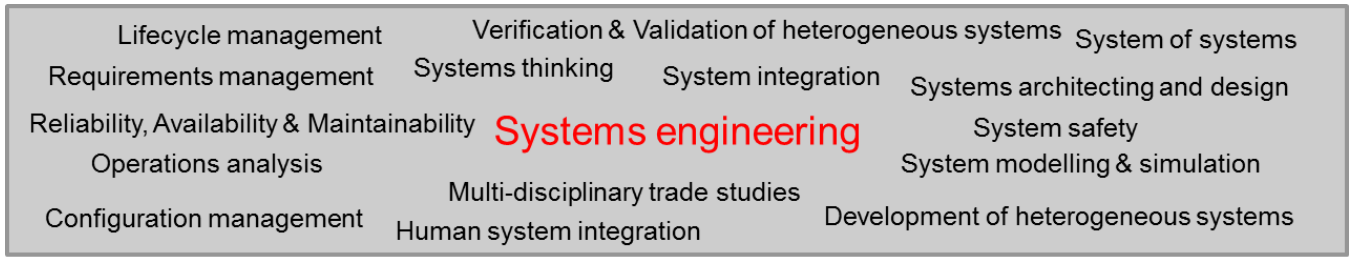


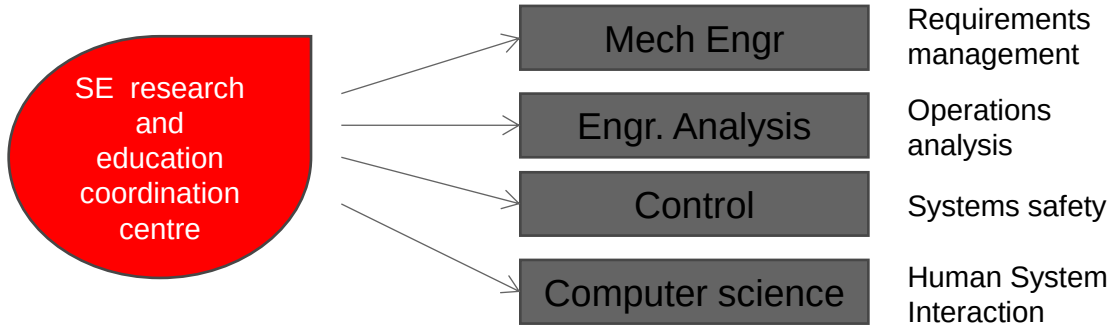


RESEARCH

- Many of our research projects are systems related
- When placed at non-systems institutions a lot of time and energy is required to adapt to the academic tradition of that institution
  - Difficult to take advantage and build on earlier research







QUESTIONS?