Making cost effective decisions in early program phases despite lack of data – an analytical approach

Robert Hell, President Systecon AB

NDIA 17th Annual Systems Engineering Conference
27 – 30 October 2014

Systecon

Introduction

Robert Hell, President Systecon AB

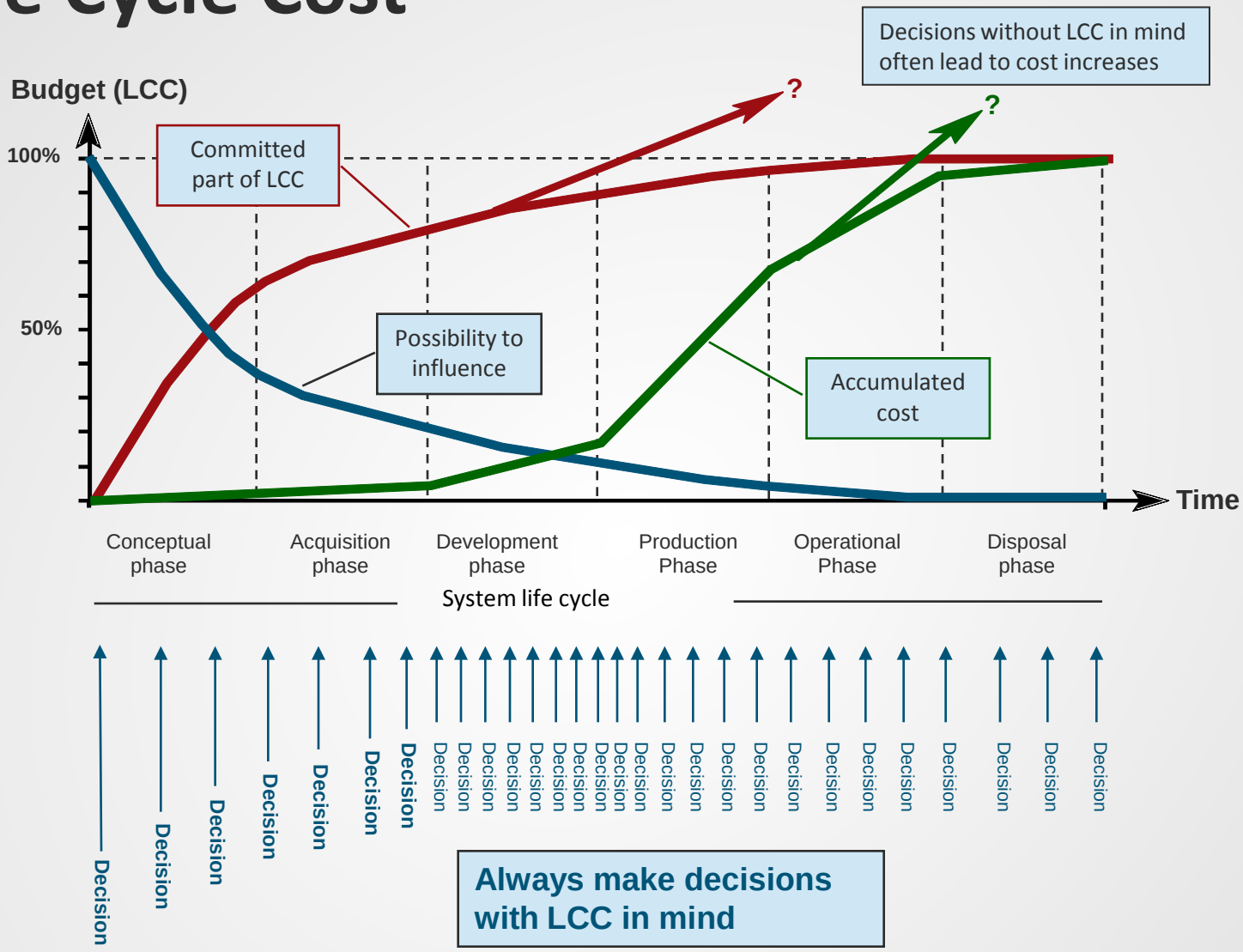
Background:

- Swedish Defence Materiel Administration (FMV)
  - Chief Engineer, Integrated Logistic Support
  - Head of Aircraft Logistics Division
  - Manager, Air Force Logistics Analyses Section
- Board member Swedish Defence and Security Industry Association

Agenda

1. Balancing Cost and Capability
2. Early phases
3. Applying an analytical approach
4. Two methods to address the “lack of data”-issue
5. Summary

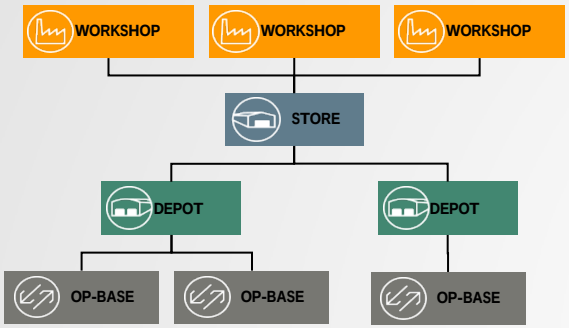
Life Cycle Cost

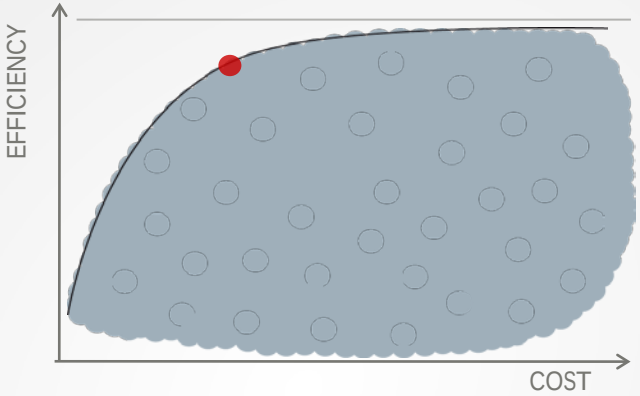


Systecon

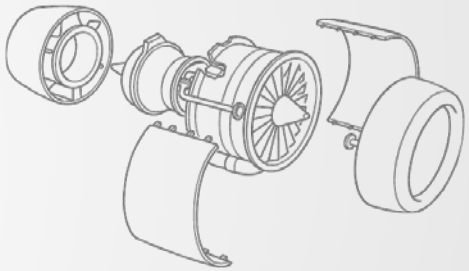
Optimal Balance between Operational Performance and Overall Cost

SUPPORT SOLUTION

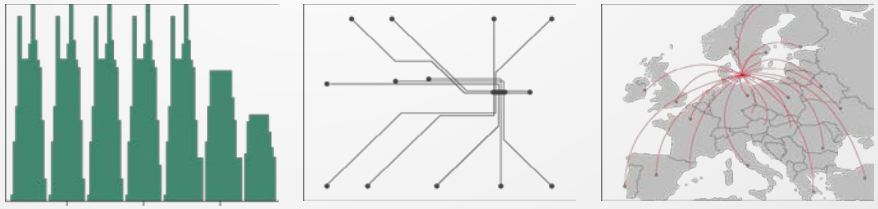




TECHNICAL SYSTEM



OPERATION



Systecon

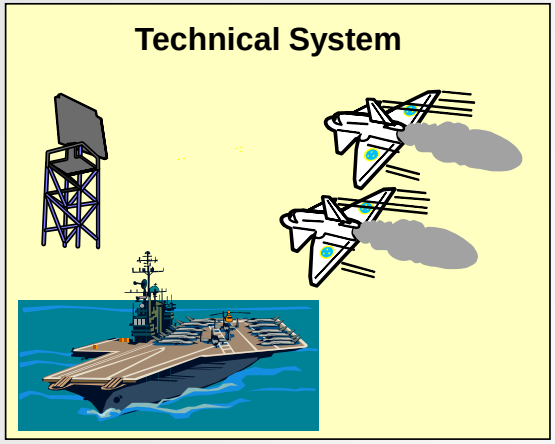
Statement

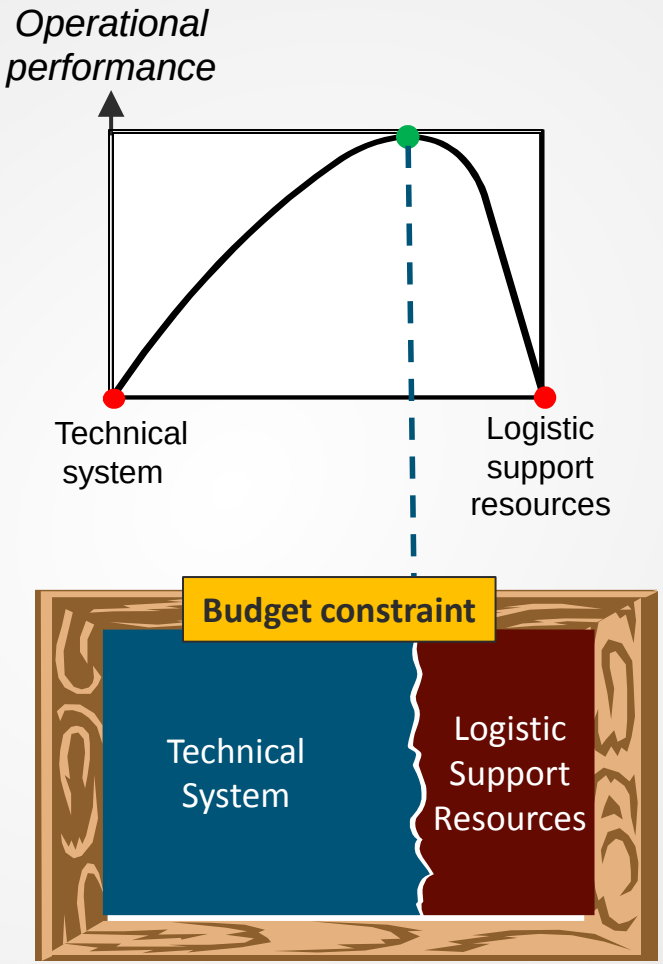
- If you want to influence your future cost and operational performance you must start early

- You will need to balance between your
  - operational concept
  - your technical system
  - your support solution.

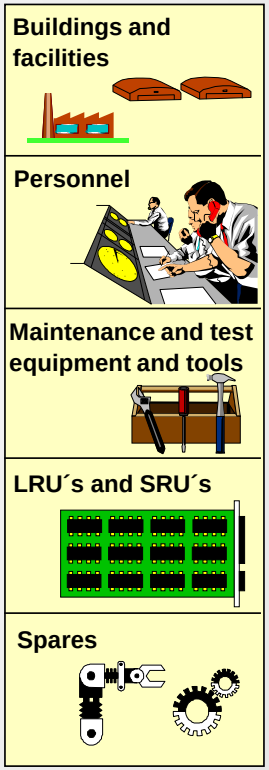
Examples of tasks in the early phases

Optimal allocation of budget to achieve maximum Operational Performance





Support Concept

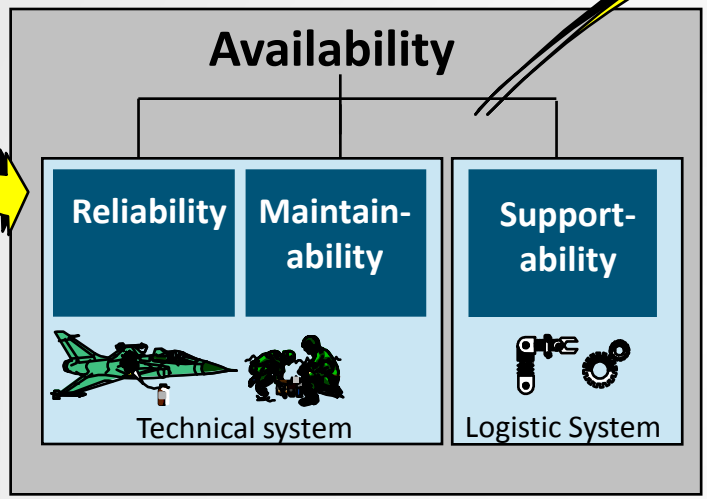


Systecon

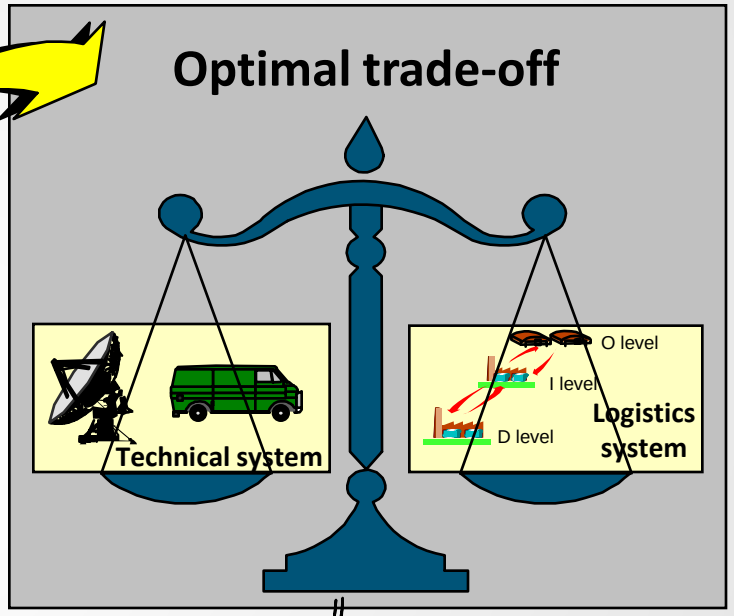
Analysing Availability Performance Requirements

Availability Performance Requirements

The requirements shall reflect the users needs!



What shall the requirements on the contractor be to fulfill the users requirements?



Are the requirements balanced between the technical system and the logistic system ?

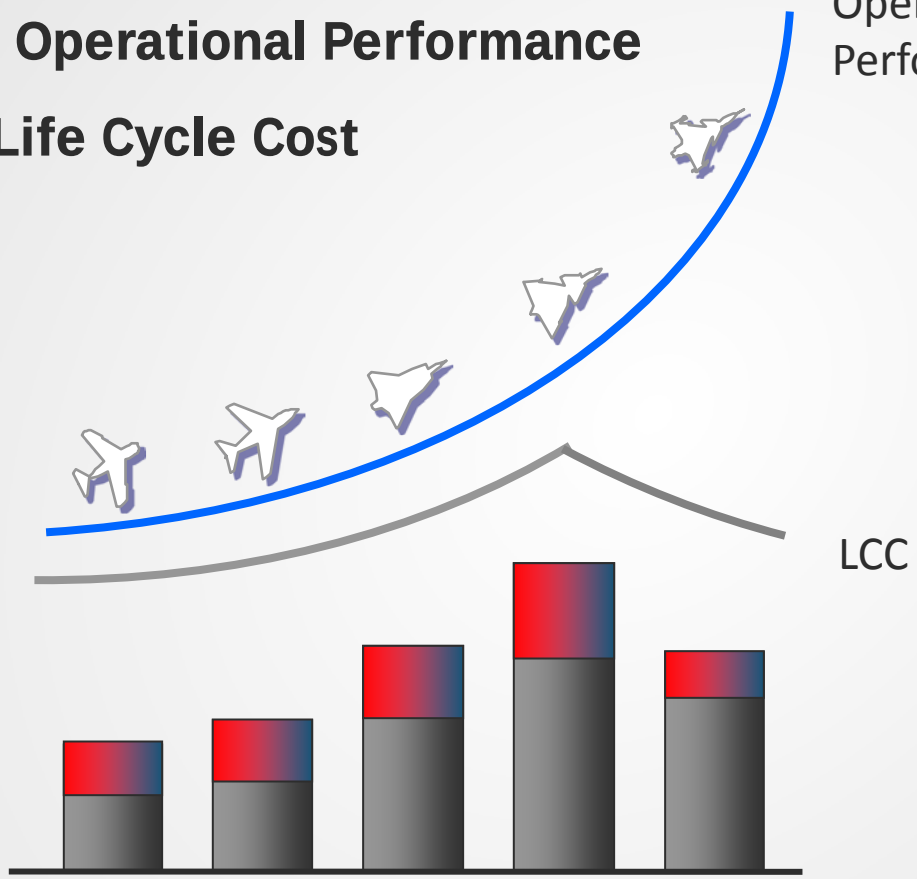
What are the economical consequences of the requirements and can we afford them?

Systecon

Design to cost (DTC)

Acquisition management technique to :

- **Increase Operational Performance**
- **Control Life Cycle Cost**



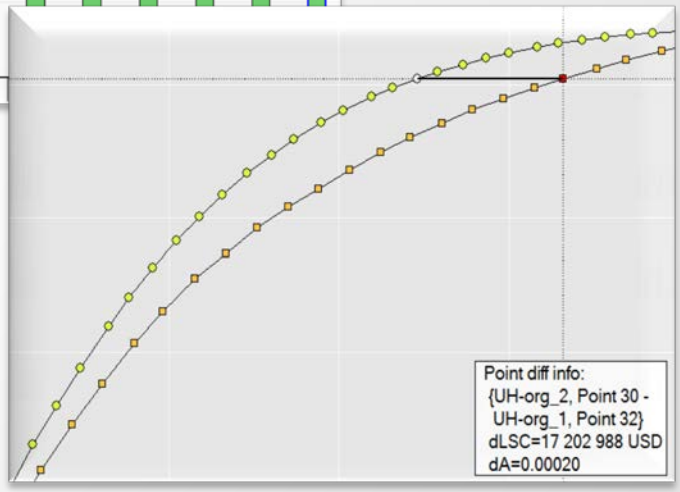
Systecon

More things you want to know early

CONCEPT DEFINITION

ACQUISITIO

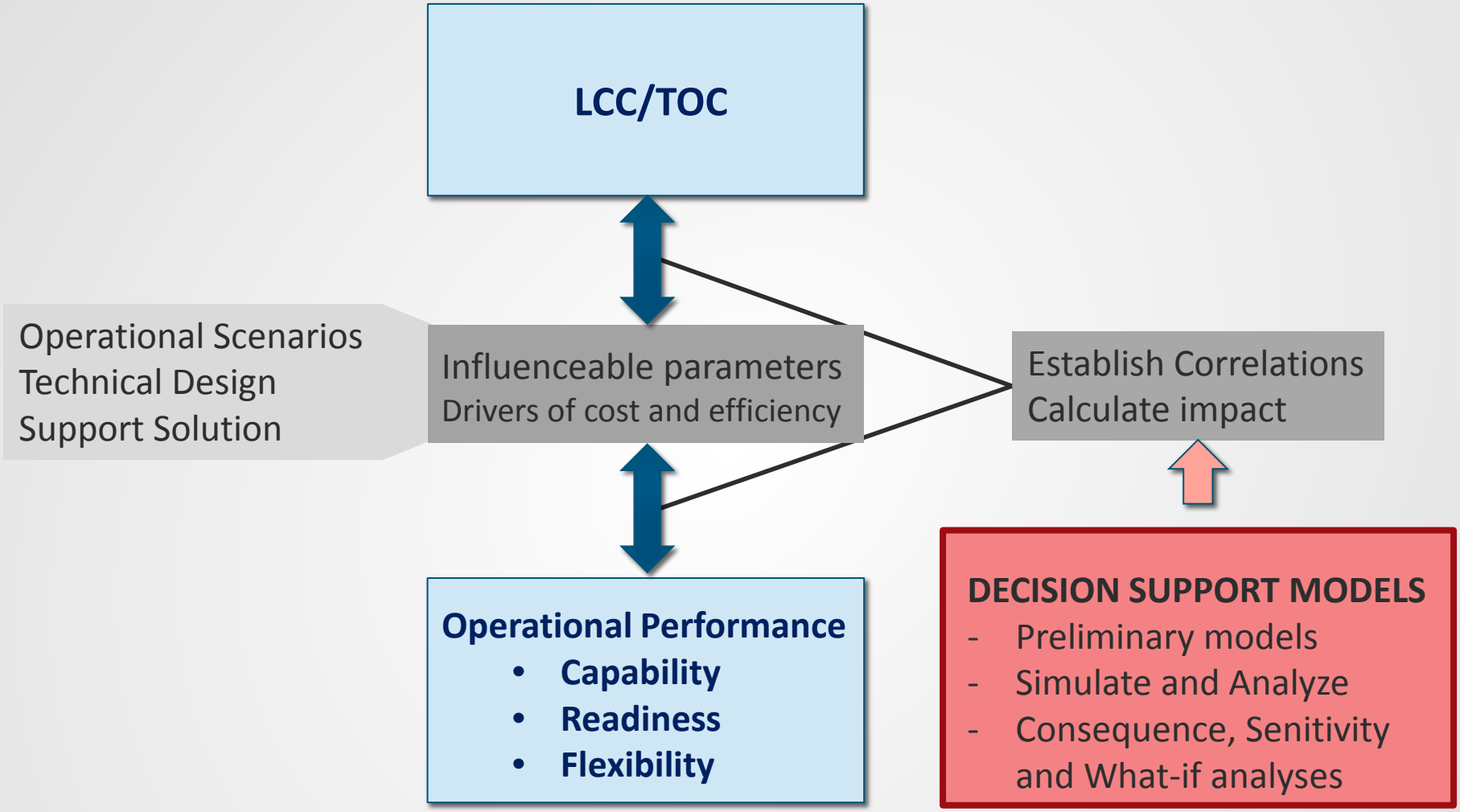
OPERATIONS



- MOST COST/EFFECTIVE SYSTEM DESIGN?
- MOST COST/EFFECTIVE SUPPORT SOLUTION?
- FLEET SIZE vs. USAGE PROFILE?
- LIFE CYCLE COST BUDGET?
- AVAILABILITY PERFORMANCE REQUIREMENTS?

Systecon

Applying an analytical approach to LCM



Systecon

Can we get good enough data?

Building blocks for modelling

Support solution

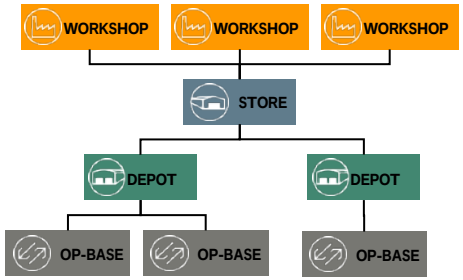
- Supportability
- Organization
- Turn-around-times
- Transportation times
- Resources
- etc.

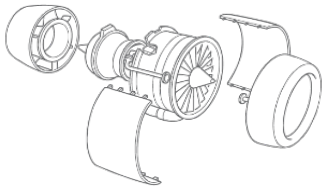
Technical system

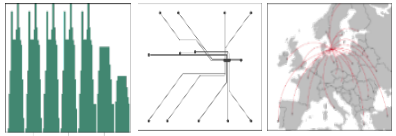
- Reliability and Maintainability.
- Item prices.
- Maintenance tasks

Usage

- Usage profiles
- Usage enviroment

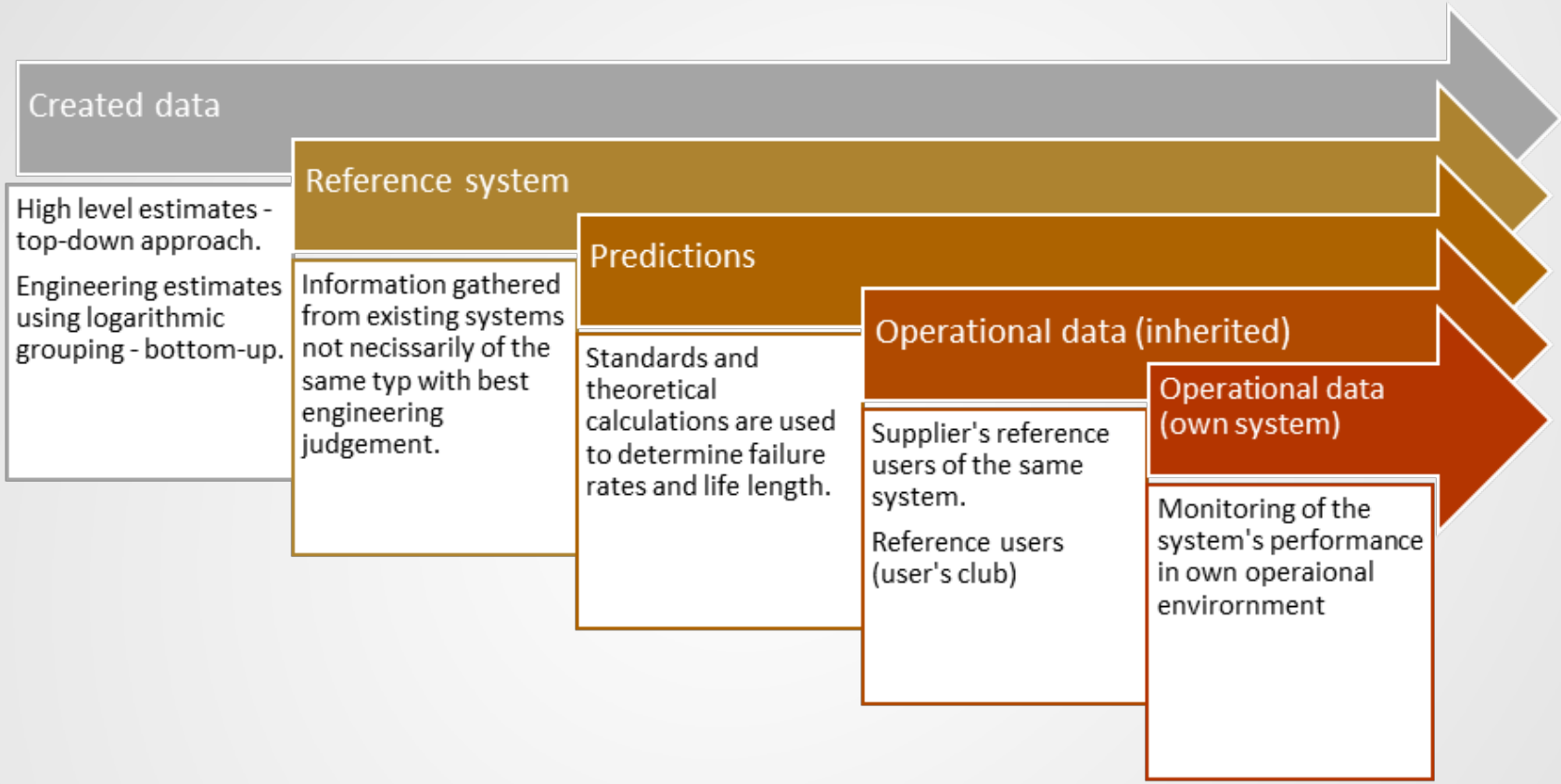






Systecon

The data issue



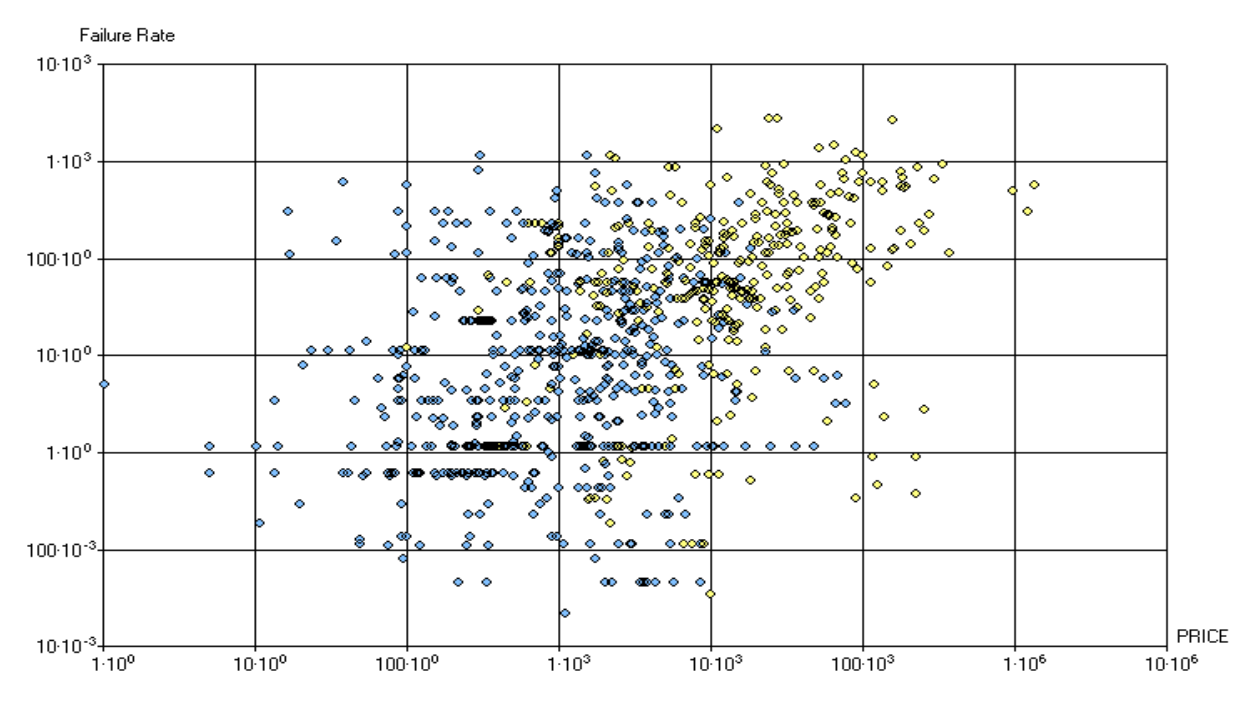
Systecon

Method 1: Top-down - generated data

- Generate a random system based on high level estimates (or goals) on:
  - Total failure rate of the system
  - Total price of the system
  - No of primary items in the system

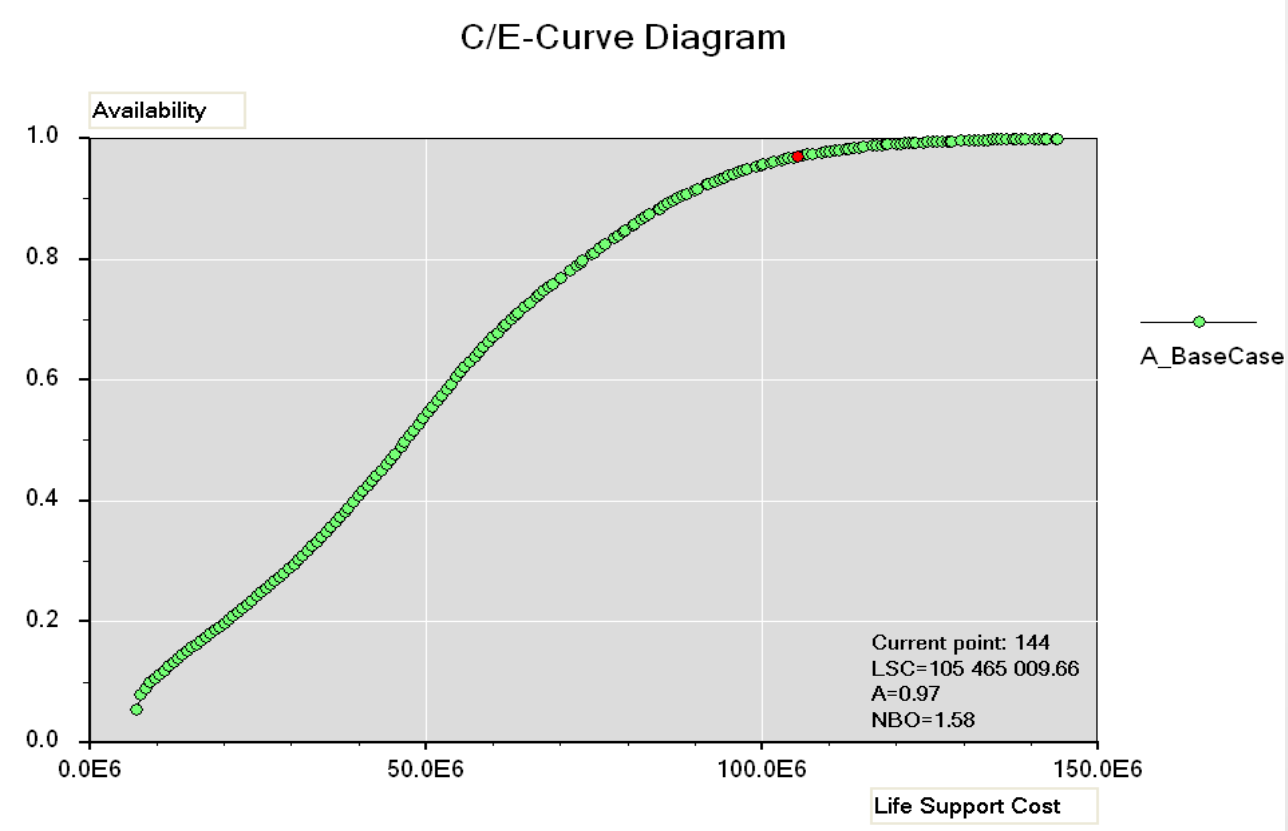
A real system

- 989 Items,
  (355 repairables)
- Price = 17,9 M
- MTBF = 11,6 h



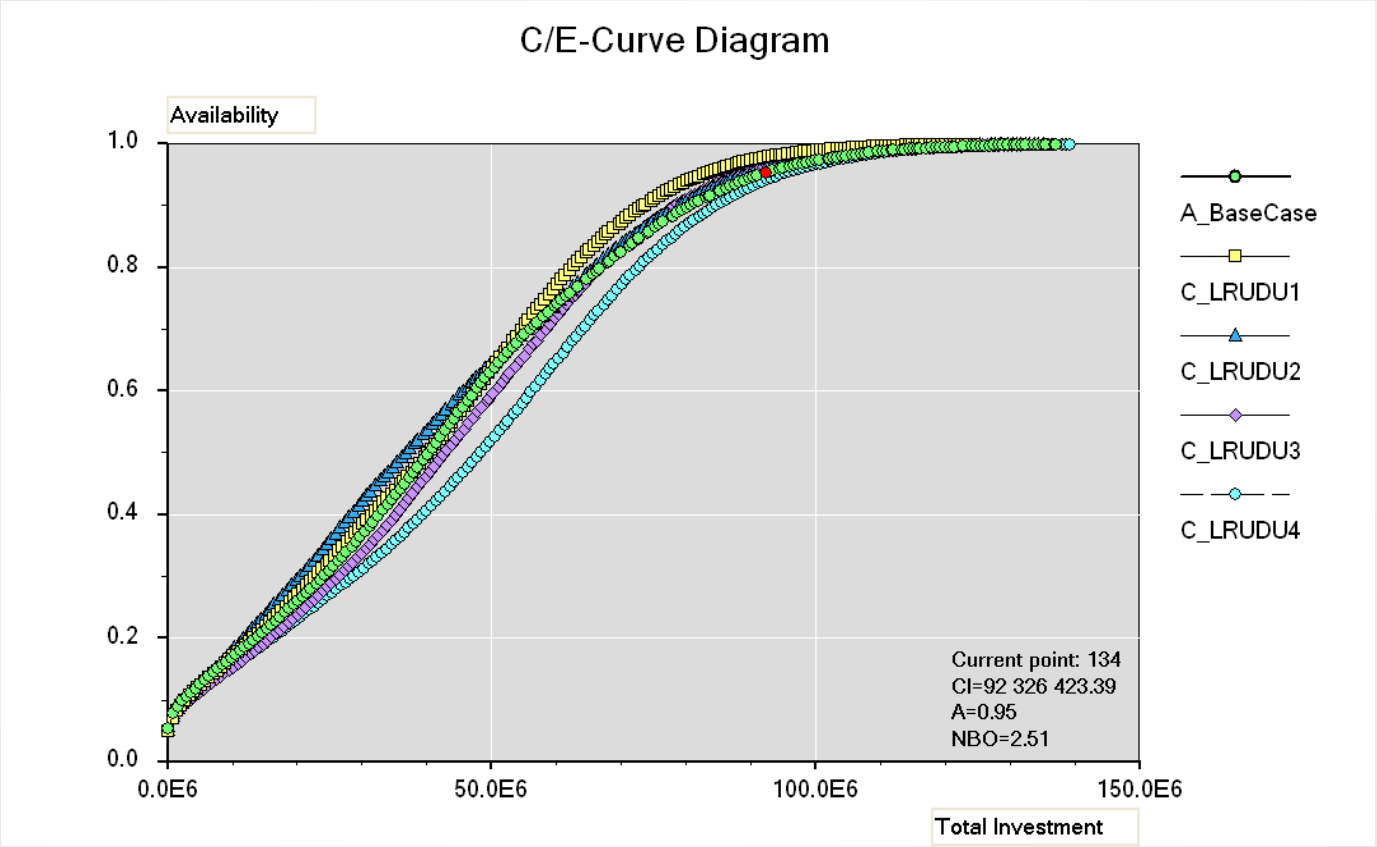
Systecon

Cost/efficiency curve for that system



Systecon

Comparison with four randomly generated systems



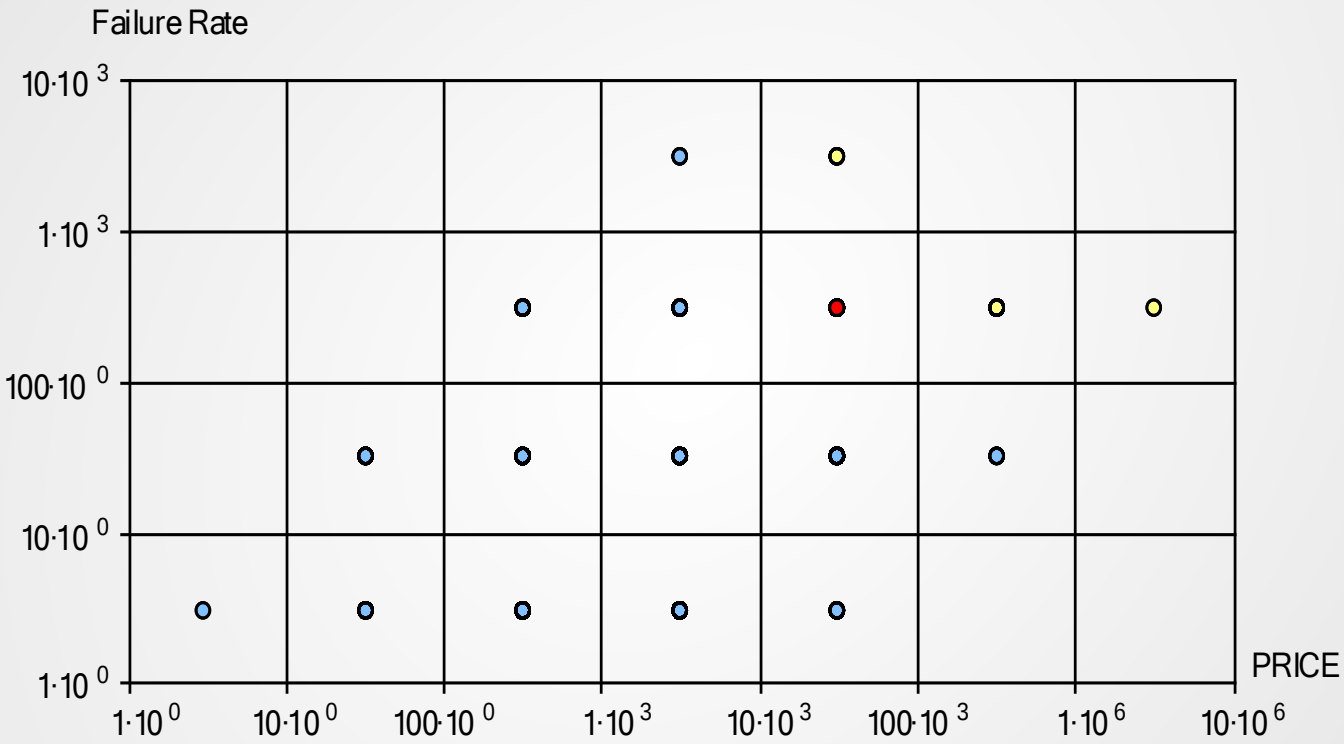
Systecon

Method 2: Bottom-up – best engineering judgement

- Estimate the total no of items
- Let the engineers place each items in a price/failure rate intervall using a log/log-scale
- Create a system consisting av items using the geometrical mean values of each intervall

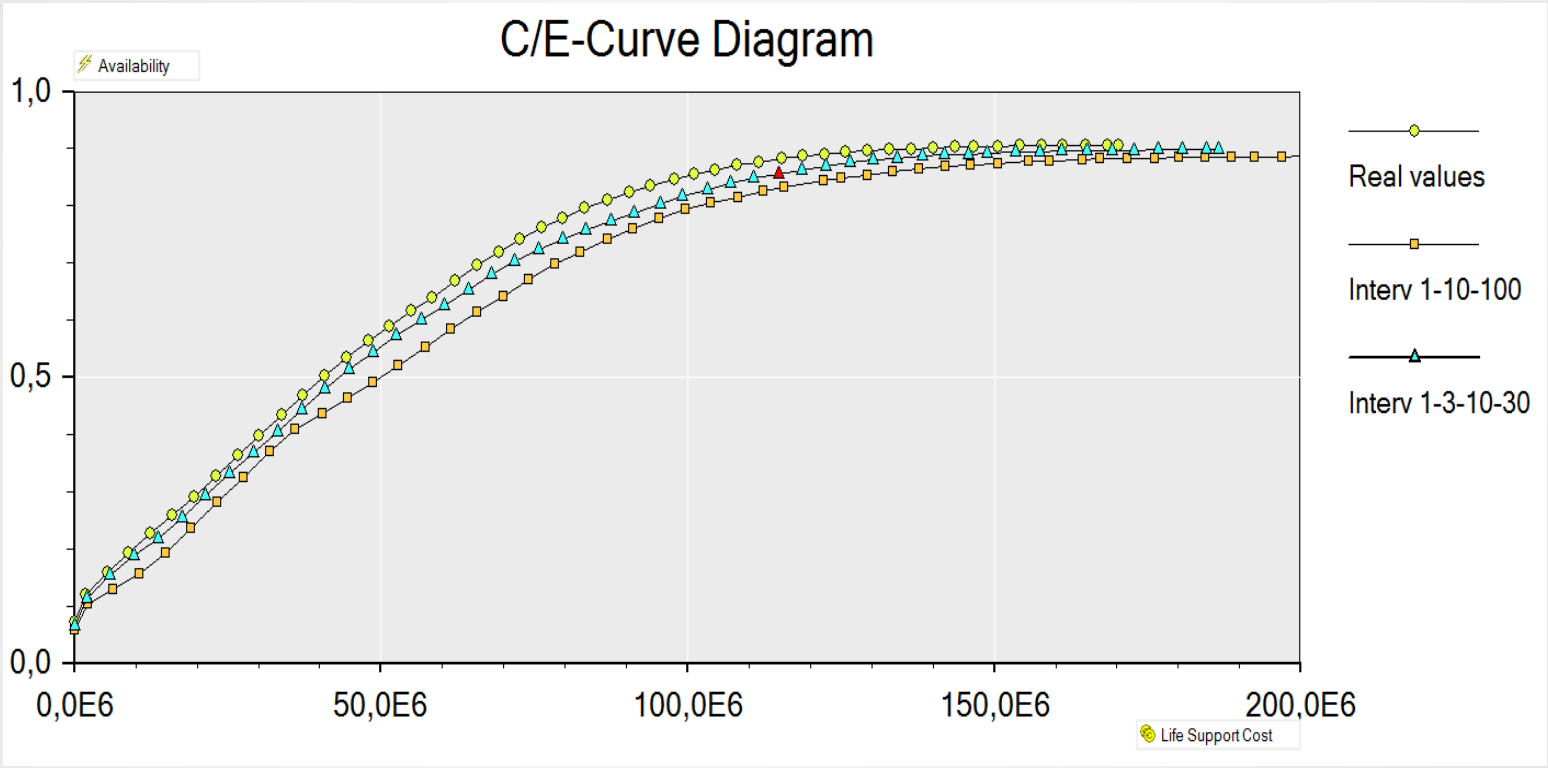
Note. The tighter log/log-intervall the better accuracy

Example log/log-matrix



Systecon

Comparison of the real system with two fictive systems using different log/log scales



Systecon

Summarizing the two methods

- These two methods will provide you with a starting point for your analyses
- The first method is extremely fast.
- The second method provides better accuracy but requires more effort to perform.
- With a baseline model in place, it is easy to perform “what if”-analyses to evaluate different operational scenarios, changes in the logistic prerequisites, etc. and improve data quality where needed most
- The two methods can be combined and also be complemented with actual data on sub-systems already known or other reference system data.

The methods have proven good enough to support decisions such as:

- Which system alternative is most cost-effective?
- Which logistic support concept will be most cost effective?
- Which requirements on availability performance and life cycle cost for the technical system are feasible?
- What key performance parameters should be used in a performance based support agreement?
- What should my budget be from a Total Ownership Cost perspective?

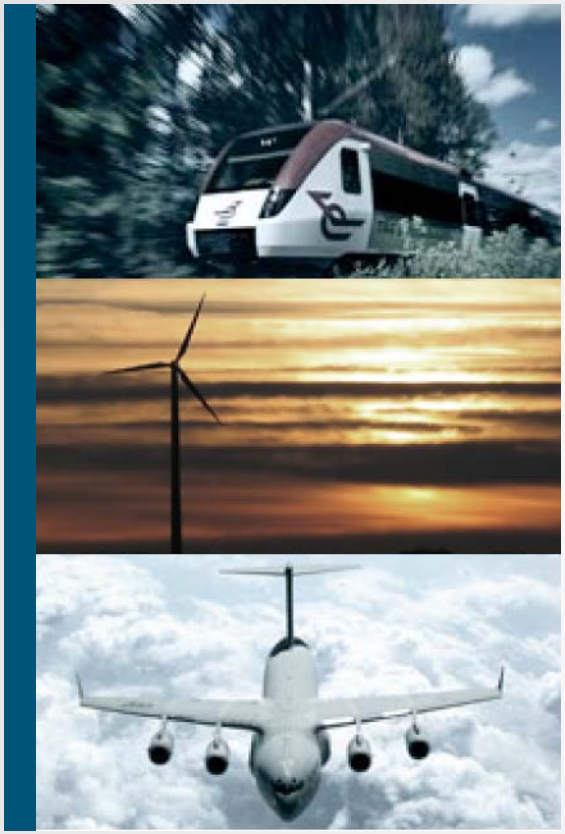
Summary

- Successful Life Cycle Management requires a capability to understand and influence the parameters that has impact on operational performance and Life Cycle Cost.
- This can be accomplished through an analytical approach based on Modeling and Simulation
- It is in the early phases that you have the most to gain, but at that time you lack real world data about your system
- We have shown two different methods that will provide you with good enough data to start your analytical process.

”Lack of data” is a poor excuse for not doing analyses

Without analyses it is hard to make the right decisions

Systecon



IN SEARCH FOR THE OPTIMUM

We find the optimal balance between system performance and cost efficiency.

Thank you for listening!

Robert Hell

Robert.hell@systecon.se

+46 70 259 5600

Systecon