CATLOC – Cost Calculation and Analysis.

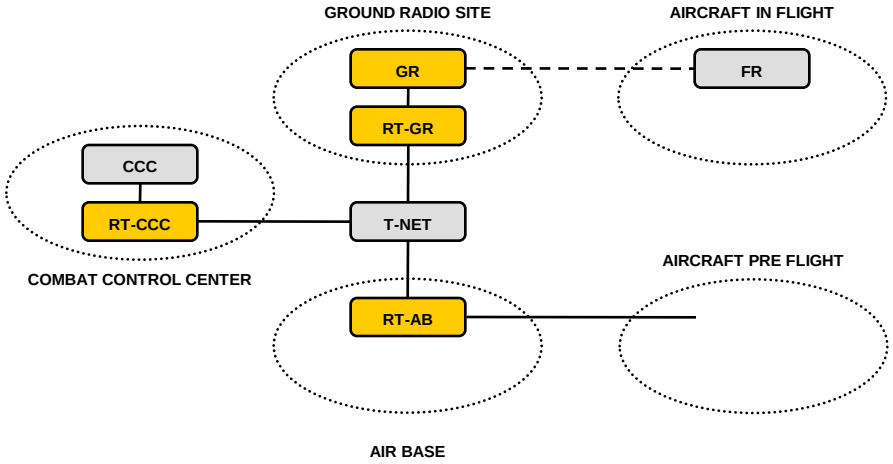
Combat control communication

C/E-analysis to facilitate cost-effective function sustainment

INTRODUCTION.

- what is LCC?
  - the total through-life cost of a system/product
  - a method/technique to support acquisition of systems and products
- couldn't it be
  - the total through-life cost of a function
  - a method/technique to support sustainment of functions?
  - certainly – we will show this today
- conclusions:
  - there is not one LCC model
  - the LCC model should be built around problem scope and setting
  - system/product acquisition LCC ≠ function sustainment LCC ≠ ...

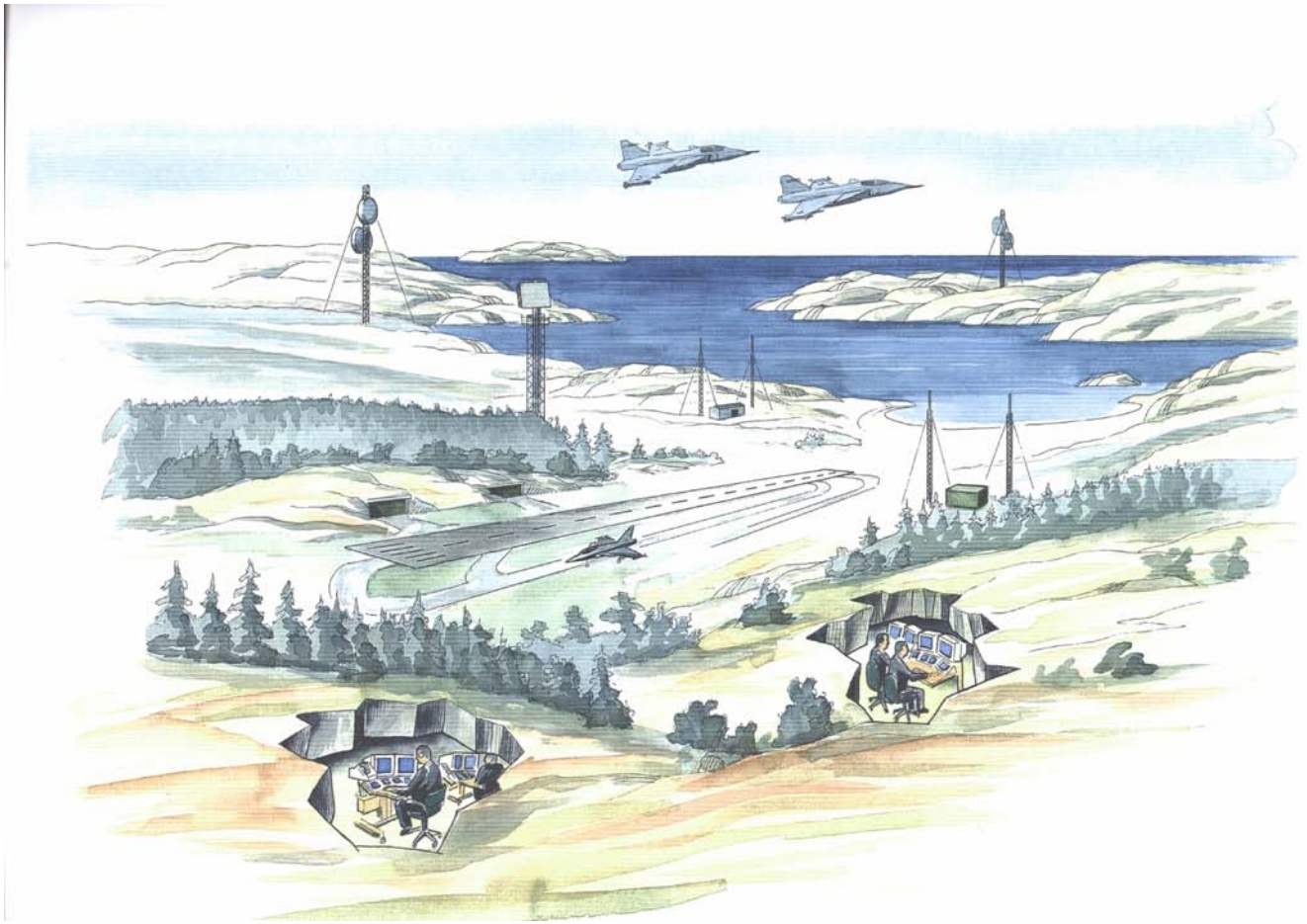
THE FUNCTION.



- function
  - communication between Combat Control Center and A/C pre flight and in flight

- technical systems och product types
  - flight radio (FR) – radio products installed on board A/C
  - ground radio (GR) – radio products installed at ground radio sites (GRS)
  - defence forces telecommunications network (T-NET)
  - radio terminal products (RT) – to connect CCC, GRS and Air Bases to T-NET

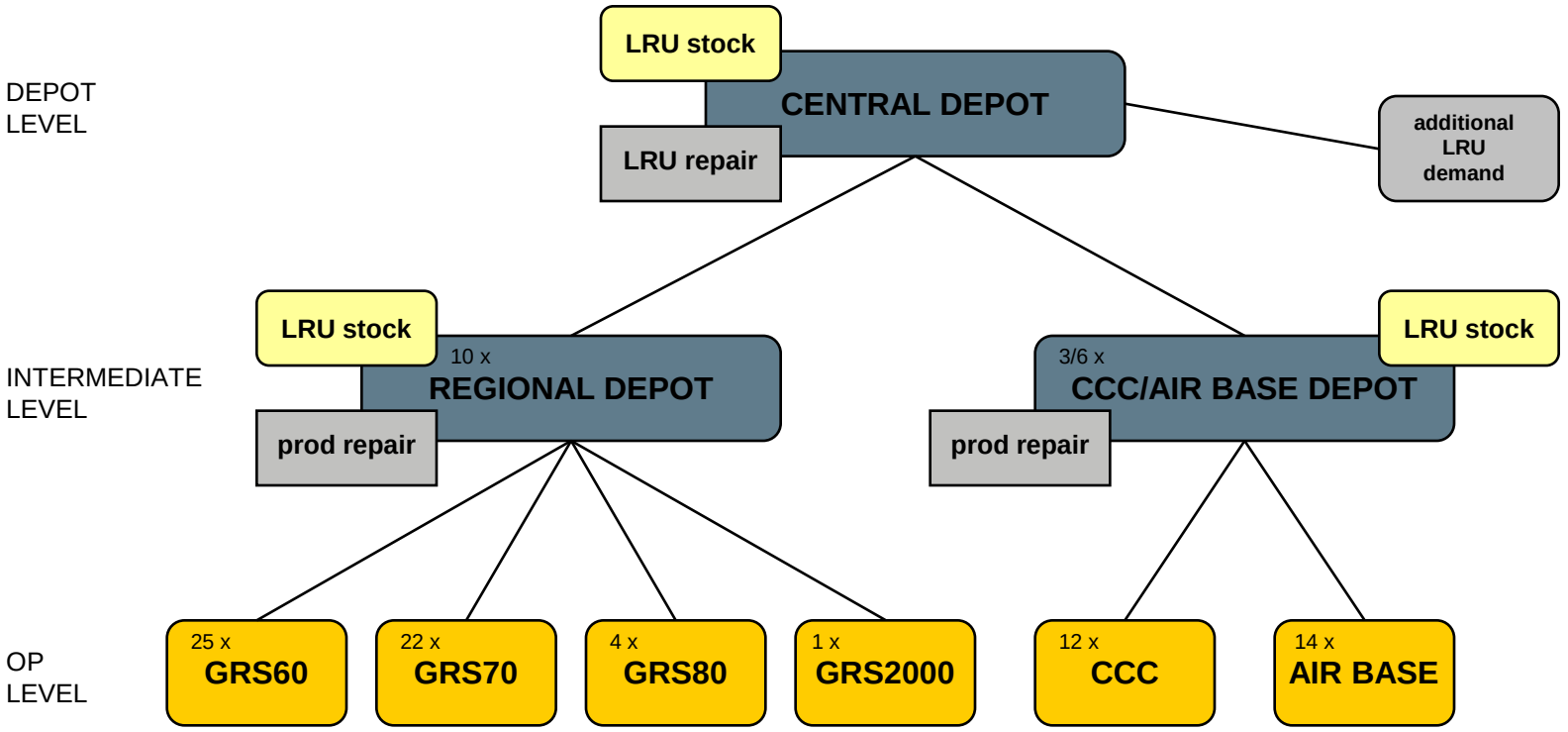
THE FUNCTION.



THE PRODUCTS.

- product portfolio ground radio
  - mixed and has developed over time
  - GR60 – 25 in operation (GRS60)
  - GR70 – 22 in operation (GRS70)
  - GR80 – 4 in operation (GRS80)
  - GR2000 – 1 in operation (GR2000) – 10 in store
- product portfolio radio terminal
  - more standardized with common components
  - RT-GR in a few variants
  - RT-CCC
  - RT-AB
- remaining products are considered transparent

THE SUPPORT ORGANIZATION.



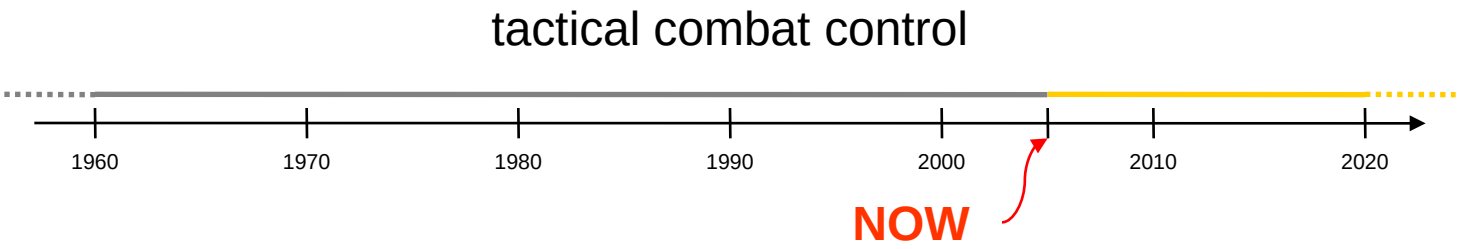
OPERATIONAL EFFECTIVENESS REQUIREMENTS.

- Ground Radio Site:
  - mean time between failure (MTBF) > 4 000 hours
  - mean down time per failure (MDT) < 96 hours

- Radio Terminal at Combat Control Center (RT-CCC):
  - mean time between failure (MTBF) > 12 000 hours
  - mean down time per failure (MDT) < 8 hours

- Radio Terminal at Air Base (RT-AB):
  - mean time between failure (MTBF) > 12 000 hours
  - mean down time per failure (MDT) < 48 hours

THE PRESENT SITUATION.



- CCC's report:
  - ground radio sites are frequently down
  - long down times
- central depot reports:
  - problem to repair some LRUs
- central depot maintenance data collected (2000-):
  - repair flow, times and costs
- maintenance plan describing support organization and strategy
  - transportation times, etc.
- LRU allocation plan describing LRU assets per location

THE MAIN QUESTIONS.

- does the function, in its current realization, fulfill the operational effectiveness requirements?
  - can we expect it to do so for another 15 years?
- is the current function realization cost-effective?
- what can we do to fulfill/guarantee the operational effectiveness requirements and lower the costs?
- what shall we do?
  - C/E-analyses to answer this question

WHAT CAN WE DO.

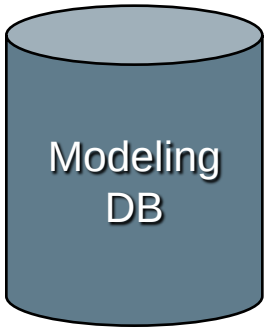
- substitute products
- reallocate LRU assets
- replenish more LRUs
- acquire equipment or training to improve turn-arounds
- revise maintenance plan
- etc.

THE COST (LCC) MODEL IN BRIEF.

- cost model to reflect function sustainment

- LPC – life project cost
  - project management, configuration management, operations and maintenance survey, accreditation, system safety, etc.
- LAC – life acquisition cost
  - product acquisition, integration and installation, etc.
- LTC – life termination cost
  - product removal, disposal, etc.
- LOC – life operation cost
  - electricity, etc.
- LSC – life support cost
  - maintenance, spares, etc.

MODELING DATABASE.

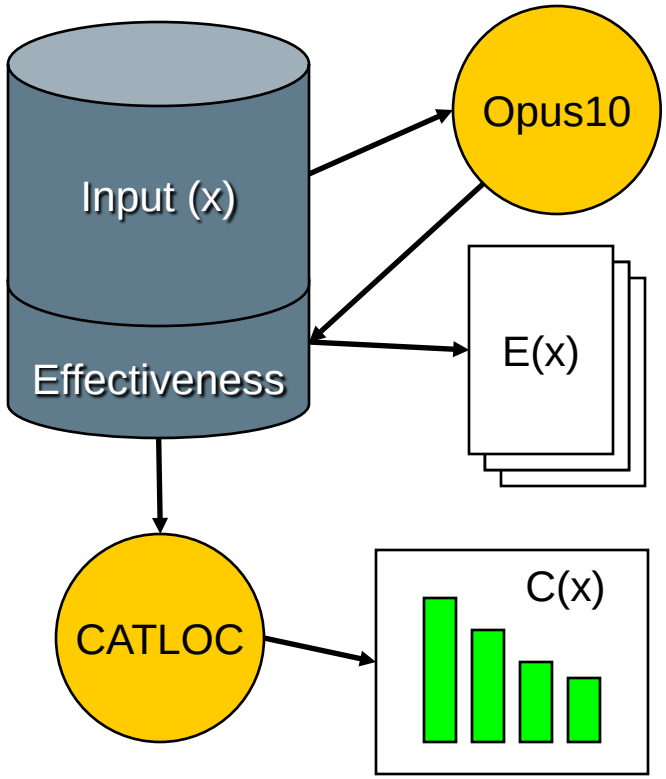


- contains all pieces of information at hand
  - product information
  - data collected from central depot maintenance (repair flow, etc)
  - maintenance plan (stations, transportation times, etc)
  - LRU allocation plan
  - cost model
  - cost estimates

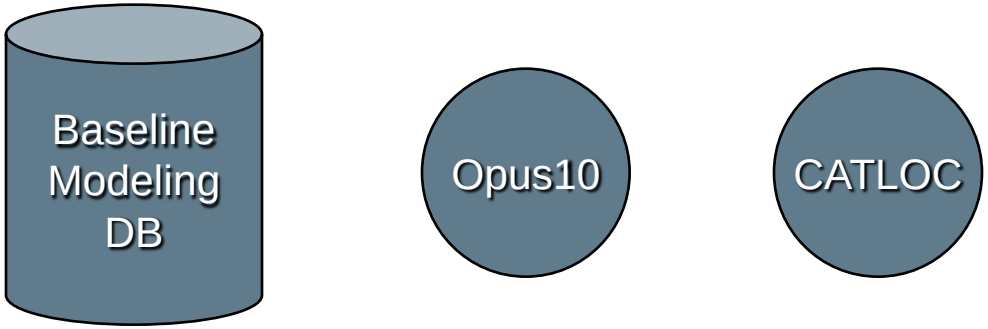
ANALYSIS SETUP.

- use Opus10 to estimate operational effectiveness performance
  - input x imported to Opus10
  - Opus10 calculates E(x)
  - effectiveness results exported back
  - results presented in reports/lists

- use CATLOC to calculate and analyze costs
  - input x imported to CATLOC
  - CATLOC calculates C(x)
  - costs are broken down, analyzed and depicted using CATLOC



BASELINE – AS IS TODAY FOR 15 MORE YEARS.



	MTBF		MDT	
Site	req	actual	req	actual
GRS60	**4000**	3305	**96**	119.7
GRS70	**4000**	**10120**	**96**	**82.7**
GRS80	**4000**	**30622**	**96**	**83.9**
GRS2000	**4000**	**34029**	**96**	**89.7**
AIR BASE	**12000**	**105241**	**48**	48.4
CCC	**12000**	**16488**	**8**	17.6

BASELINE CONCLUSIONS.

- effectiveness performance
  - problems with GR60 and the down time requirement for RT-CCC
- cost
  - maintenance costs are dominant (labor, material and travel)
  - Gr60 is a cost driver
  - preventive maintenance tasks are costly
- need to replace GR60
  - with what?
  - perhaps also GR70 and GR80 to standardize product portfolio?
- need to improve RT-CCC down time
  - how?

REPLACEMENT STRATEGY.

- B: GRS60 replaced by GRS2000
- C: GRS60 replaced by GRSNEW
- D: GRS60, GRS70 and GRS80 replaced by GRS2000
- E: GRS60, GRS70 and GRS80 replaced by GRSNEW

Product	price	MTBF
GR2000	**300 000**	**80 000**
GRNEW	**300 000**	**125 000**

- which alternative is best?
  - cost-effective

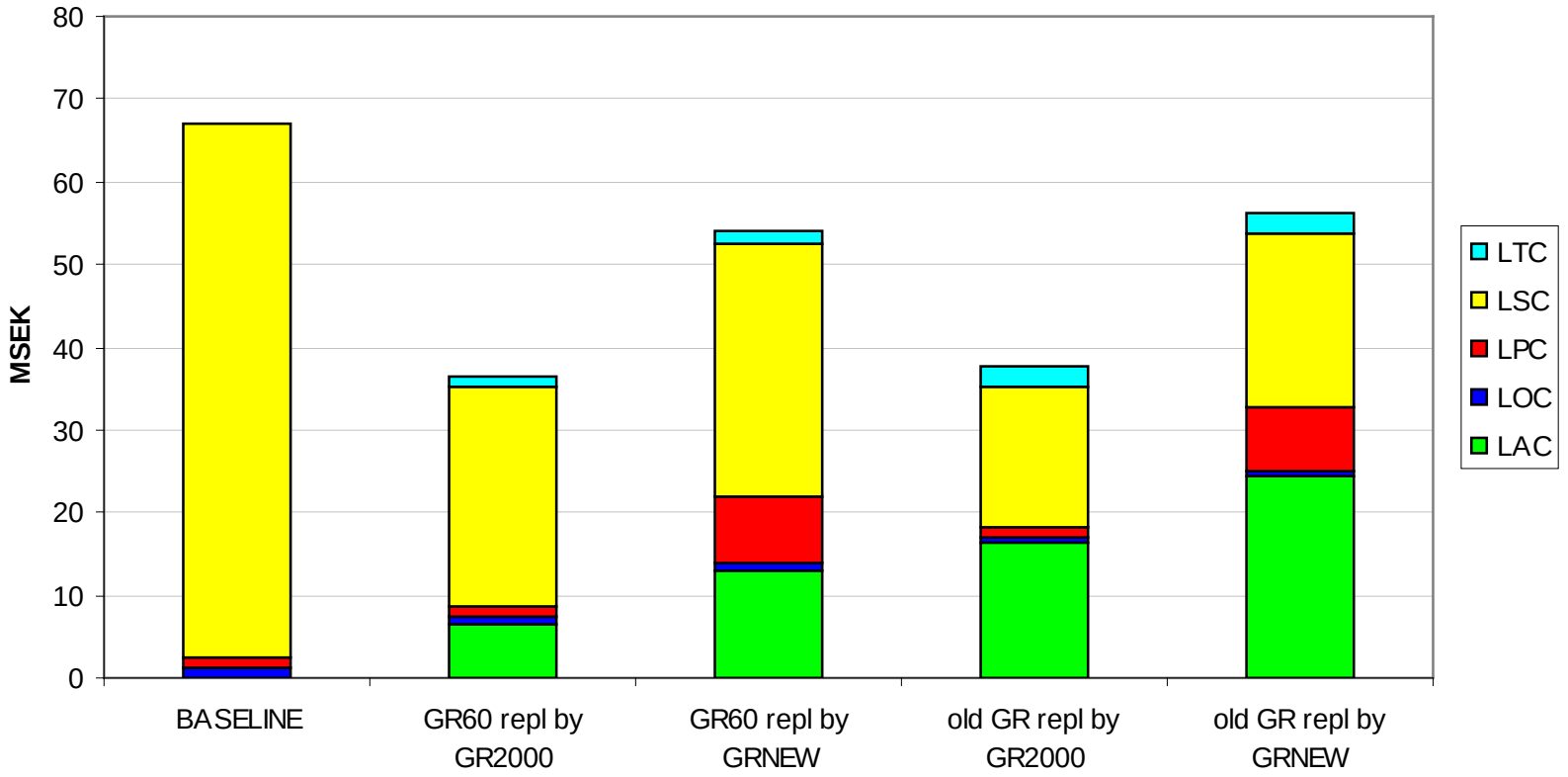
EFFECTIVENESS ANALYSIS (Opus10).

- estimated MDT-performance
  - note: spares replenished

	MDT					
Site	req	A	B	C	D	E
GRS60	**96**	119.7	-	-	-	-
GRS70	**96**	**82.7**	**66.6**	**66.6**	-	-
GRS80	**96**	**83.9**	**59.8**	**59.8**	-	-
GRS2000	**96**	**89.7**	**94.1**	**62.9**	**94.1**	**43.4**
GRSNEW	**96**	-	-	**93.9**	-	**83.0**
AIR BASE	**48**	48.4	**48.0**	**48.0**	**48.0**	**48.0**
CCC	**8**	17.6	17.6	17.6	17.6	17.6

- estimated MTBF for GRSNEW = 40 183 hrs (req. fulfilled)

COST ANALYSIS (CATLOC).



CONCLUSIONS - REPLACEMENT.

- effectiveness performance
  - all suggested solutions fulfills the requirements except for the down time requirement for RT-CCC
  - note: additional spares replenished
- cost
  - alternative B and D result in much lower costs
- preferred choice: D
  - only one type of radio in the product portfolio
  - relatively new radio – sustainable decision
  - investment to reduce variable costs

FURTHER IMPROVEMENTS.

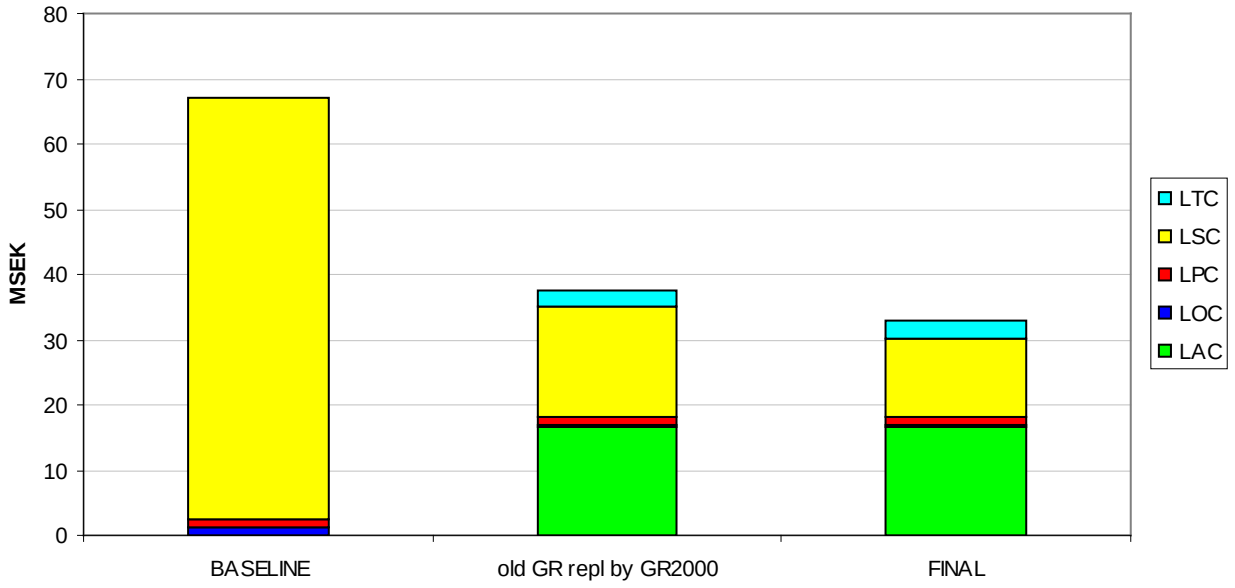
- need to improve RT-CCC down time
  - acquire test equipment to shorten MTTR from 4 to 0.5 hours
  - invest in training at central depot to guarantee TAT < 3 months
- improve MDT in general
  - revise LRU allocation plan (Opus10 reallocation)
- revise maintenance plan concerning PM for RT-CCC
  - no PM tasks performed

EFFECTIVENESS ANALYSIS II (Opus10).

- estimated MDT-performance
  - note: no further spares replenishment required

	MDT			
Site	req	A	D	Final
GRS60	**96**	**119.7**	**-**	**-**
GRS70	**96**	**82.7**	**-**	**-**
GRS80	**96**	**83.9**	**-**	**-**
GRS2000	**96**	**89.7**	**94.1**	**80.1**
GRSNEW	**96**	**-**	**-**	**-**
AIR BASE	**48**	**48.4**	**48.0**	**8.5**
CCC	**8**	**17.6**	**17.6**	**6.3**

COST ANALYSIS II (CATLOC).



SUMMARY.

- C/E-analyses for a function: combat control communication
  - ensure that the function fulfills operational effectiveness requirements
  - sustain the function at low cost

- the current realization fails to meet the requirements
- the current solution is costly

- using C/E-analyses we have pinpointed a much better solution:
  - all operational requirements fulfilled
  - the function can be sustained over the next 15 years for a cost of less than 50% of the BASELINE

- modern and standardized product portfolio

SUMMARY.

- the analyses are mainly based on real-world data collected over the last 4 years
  - reliable results
  - traceable results
  - explainable results
  - etc.

- we have had access to a tool (CATLOC) which is
  - adaptable
  - powerful in indicating cost drivers

- we can now address and solve the problem of
  - cost-effective function sustainment