Spring Semester 2005
13.4.2005

C·O·S·T ENGINEERING II™

Economics of Satellites, Rockets and Space Organizations

Lecture Series given by Dr.-Ing. Robert Alexander Goehlich

- Part 1: Introduction -

General

The Reason why I am here...

Space System Engineering

R. Goehlichさんとの出会いなど

- フランスで開催された宇宙大学で出会う(02/05)
  宇宙開発の将来について語り合う
- Ph.D学生時代に「宇宙旅行」を出版(02/05)
- 日本学術振興会（JSPS）の
  外国人特別研究員としてSD
  学科に滞在(03/09-05/08)
- 宇宙開発の市場性、コスト等
  についてオープンな講義を
- 活発な質問と討論を期待

2003/11/05

SD学科教授　狼　嘉彰

General

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Content

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- **Introduction**
  - Goal Definition of this Lecture
  - Summary of each Lecture
- **Definition (Repetition)**
  - Cost Engineering (Theory)
  - Cost Engineering (Practice)
- **Student Project**
- **Requests from Audience for Lectures**

Introduction

Goal Definition of this Lecture

The aim of this class is to increase the awareness of aerospace and non-aerospace students for economical optimization of satellites, rockets and space organizations. Economical optimization of commercial, national security and scientific space systems will be an essential key point for a future growing space market. Cost Engineering means to take costs as a main decision criterion for the whole program duration into account. If applied all strategies, the cost of projects could be reduced drastically of the traditional Business as Usual costs.

Introduction

Summary of each Lecture (Part 1)

Week	Date	Topic	Short Description
1	13.4.	Introduction	short summary of each lecture, definition of cost engineering, requests from audience for lectures
2	20.4.	Basics about Orbital Mechanics and Design of Satellites	Newton's laws, Kepler's laws, Hohmann transfer, the n-body problem, rocket equation, atmospheric entry, aerobraking, mission design, propulsion, configuration, structural design, power systems, thermal management, systems integration
3	27.4.	Basics about Rocket Science and Space Transportation Systems	rocket equation, delta velocity, Earth's atmosphere, solar system, Newton's laws, Kepler's laws, expendable versus reusable rockets, single-stage versus multi-stage rockets, propulsion technology, typical ascent/descent trajectory, spaceports
4	11.5.	Basics about Space Organisations	Introduction to agencies such as NASA, ESA, JAXA, etc., companies such as Arianespace, EADS, Boeing, Kawasaki Heavy Industries etc.
5	18.5.	Microeconomics in 3 hours (Part I)	Maximizing profits, efficiency, role of knowledge, market structure, organizational architecture, outsourcing, TQM, ethics
6	25.5.	Microeconomics in 3 hours (Part II)	Elasticity, demand, marginal revenue, monopolistic competition, Pareto optimality, price discrimination, returns to scale,

Introduction

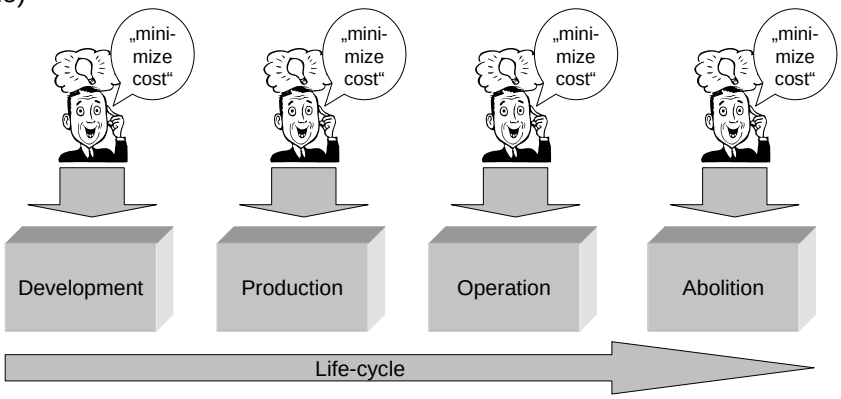
Summary of each Lecture (Part 2)

Week	Date	Topic	Short Description
7	1.6.	Macroeconomics in 3 hours (Part I)	Financial markets, fiscal policy, economic catastrophes, banks, labor market, recession, central planning
8	8.6.	Macroeconomics in 3 hours (Part II)	Gross Domestic Products, portfolio choice, prisoner's dilemma, self-interest, balance of payments, budget constraint
9	15.6.	Strategies to Reduce Cost	Cost of governmentally contracted projects (Business as Usual) may be reduced drastically under favorable conditions (Smart Business), which are discussed here (e.g. timing, type of contract, annual funding profile, etc.)
10	22.6.	Case Study of a Typical Scientific, Commercial and National Security Satellite	life-cycle costs, discussion about which strategies should be applied to which type of satellite
11	29.6.	Case Study of a Typical Rocket	discussion of main cost items caused by launch service, rocket life-cycle costs versus satellite life-cycle costs
12	6.7.	Case Study of a Typical Space Organisation	national versus international organisations, small versus large organisations
13	13.7.	Conclusion	outlook, feedback

Definition

Definition of Cost Engineering (Theory)

„*The goal of Cost Engineering is to determine a vehicle design and its operation for minimum life-cycle costs. This means that costs have to be taken into account as a main decision criterion for the whole program duration.*" (D. Koelle)



Definition

Definition of Cost Engineering (Practice)

Case A

- *Step 1: Build a Rocket within 15 minutes in a team.*
- *Step 2: Cut costs of 50 % (by reducing material of 50 %) within 5 minutes.*

Case B

- *Step 1: Build a Rocket within 15 minutes in a team by using only 50 % of material as used in Case A's Step 1.*

Review:

Compare results of Case A with Case B.

Requests from Audience for Lectures

Please fill out the lecture survey form.

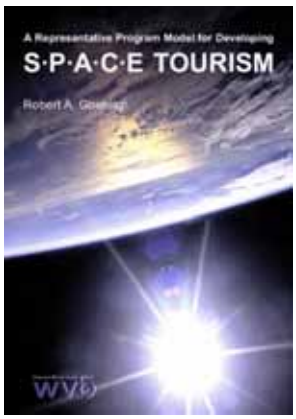
The reason is to figure out your knowledge about space engineering to prepare suitable lectures in future.

Do not be worry if you cannot answer all correct. Please just try.

Ganbatte!

Lecture`s Textbook

- Paperback Version
- Price: 2500 Yen
- More info:
  - www.amazon.de
  - www.robert-goehlich.de



- ISBN 3-936846-29-4

- ISBN 3-936231-36-2

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