

Part 6

No. 1



C.O.S.T ENGINEERING™

„Design and Marketing of Rockets“

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



- Part 6: Basics about Space
Transportation Systems -

Content

No. 2



- **General**
- **Space Transportation Systems**
 - Expendable versus Reusable Rockets
 - Single-stage versus Multi-stage Rockets
 - Propulsion Technology
 - Typical Ascent Trajectory
 - Spaceports
- **Definition**
 - Cost Engineering (Practice VI)
- **Requests from Audience for Lectures**

General Contact

No. 3



Dr.-Ing. Robert Alexander GOEHLICH
Mobile: +81-(0)90 1767 1667
Fax: +81-(0)45-566-1778
Email: mail@robert-goehlich.de
Internet: www.robert-goehlich.de



Ms. Akiko FUJIMOTO (Teaching Assistant)
Mobile: +81-(0)80-5039-6222
Email: af07302002@yahoo.co.jp



Mr. Kenji HASEGAWA (Webmaster)
Mobile: n.a.
Email: malayzaru@hotmail.com



Keio University
Department of System Design
Engineering
Ohkami Laboratory
(Space System Engineering)
Office 14-609/14-620
3-14-1 Hiyoshi
Kohoku-ku
Yokohama 223-8522
JAPAN

General Goal of Today's Lecture

No. 4

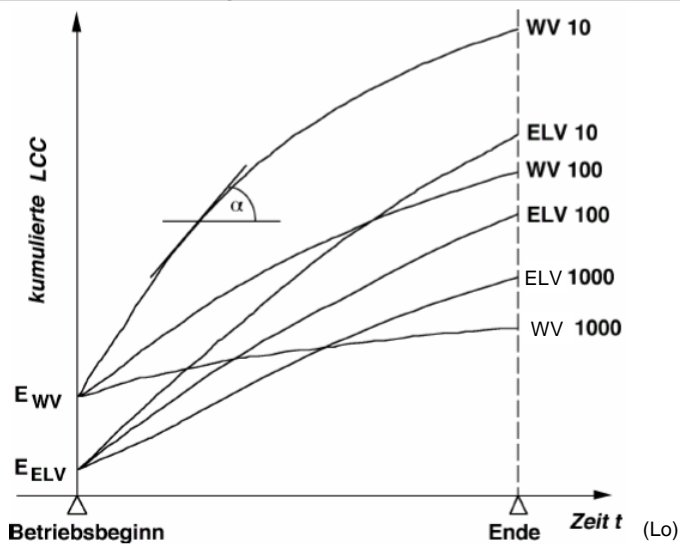


„You will learn about basics of space transportation systems and do some exercises with selected examples.“

Expendable versus Reusable Rockets

Cost (Life-cycle) Diagram

No. 5



Single-stage versus Multi-stage Rockets

No. 6



Single-stage Rocket

- example: Venture Star concept
- not feasible with today's technology
- + potential for aircraft-like operation
- => mass space tourism flights



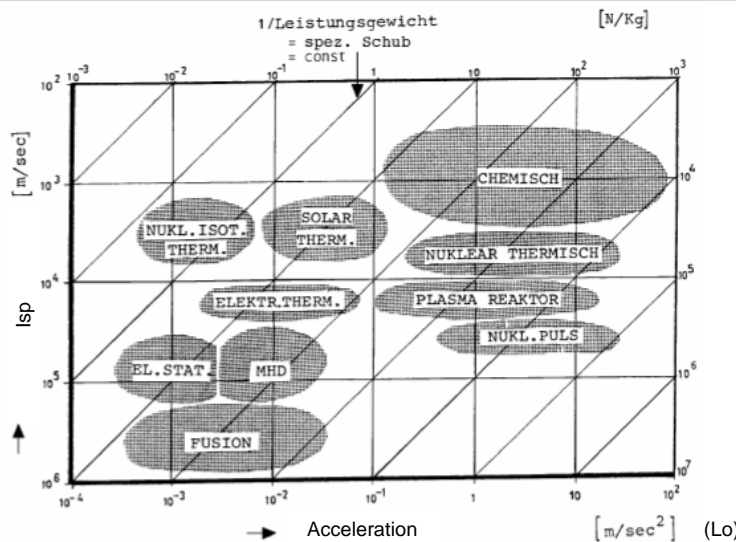
Multi-stage Rocket

- example: Space Shuttle System
- + technical realization is easier
- little potential to cut operation costs
- => no mass space tourism flights



Propulsion Technology

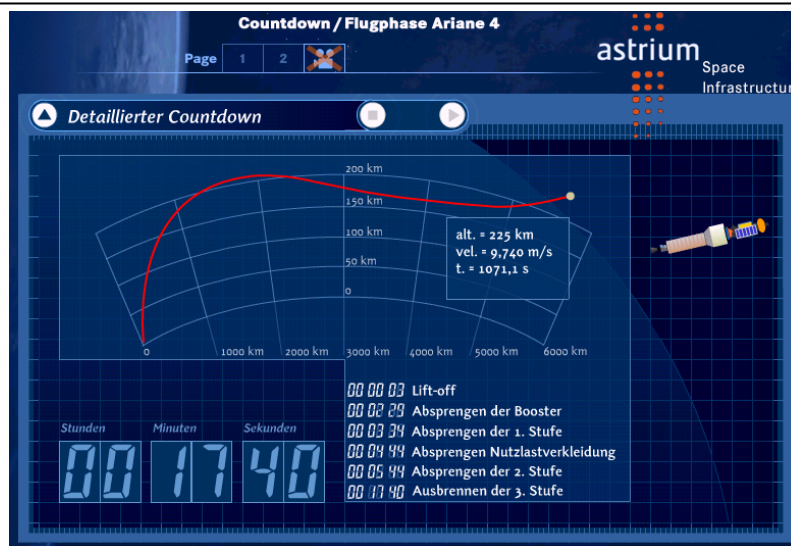
Isp versus Acceleration of Different Concepts



Typical Ascent Trajectory

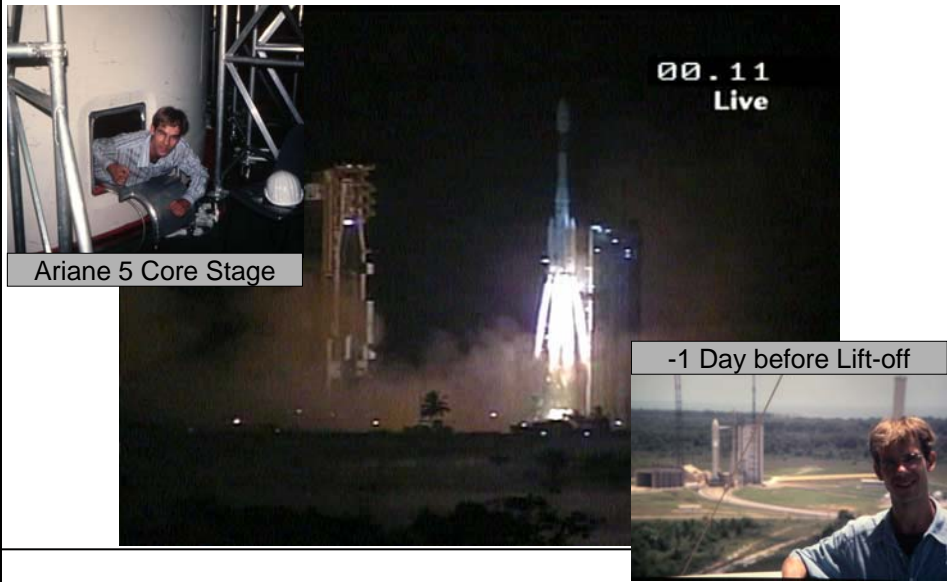
Realtime Simulation

No. 8



Spaceports

Personal Experiences at Kourou Spaceport No. 9



Definition

Definition of Cost Engineering (Practice VI) No. 10



Case C

- *Step 6: Make a drawing of the infrastructure of a typical spaceport by using your knowledge about cost engineering.*



Dr.-Ing. Robert Alexander GOEHLICH
Keio University
Department of System Design Engineering
Space System Engineering (Ohkami Laboratory)
3-14-1 Hiyoshi, Kohoku-ku
Yokohama 223-8522, JAPAN
email: mail@robert-goehlich.de
Mobile: +81-(0)90-1767-1667
Fax: +81-(0)45-566-1778
Internet: <http://www.robert-goehlich.de>