

## Part 9

No. 1



# C.O.S.T ENGINEERING™

*„Design and Marketing of Rockets“*

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



- Part 9: Case Study for a Typical Orbital Rocket for Space Tourists -

## Content

No. 2



- **General**
- **Case Study for Orbital Rocket**
  - Design
  - Mass Characteristics
  - Flight Profile
  - Economic Performance
- **Definition**
  - Cost Engineering (Practice IX)
- **Requests from Audience for Lectures**

## General Contact

No. 3



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## General Goal of Today's Lecture

No. 4

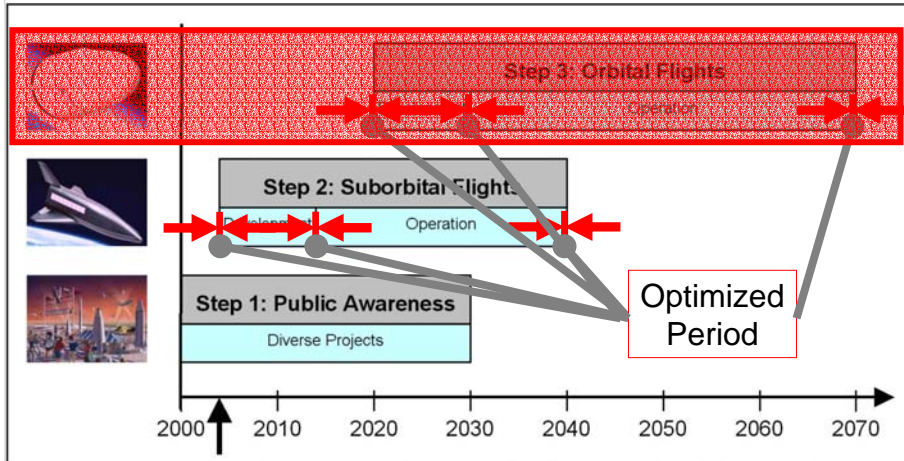


*„You will learn about details, pros and cons of a typical orbital rocket for space tourists.“*

# Introduction

Scenario with representative RLVs

No. 5



# Kankoh Maru Plus Concept

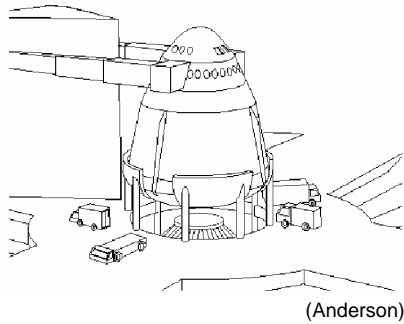
The Reason of this Name...

No. 6

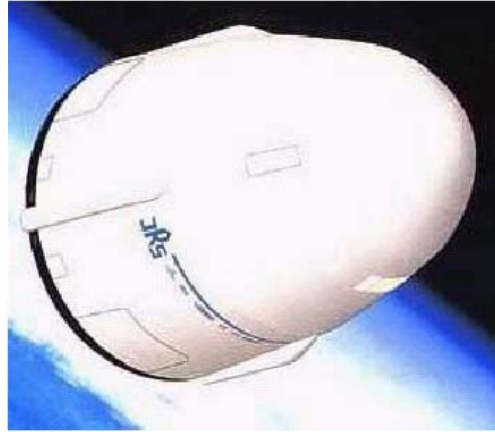


# Kankoh Maru Plus Concept Vehicle

No. 7



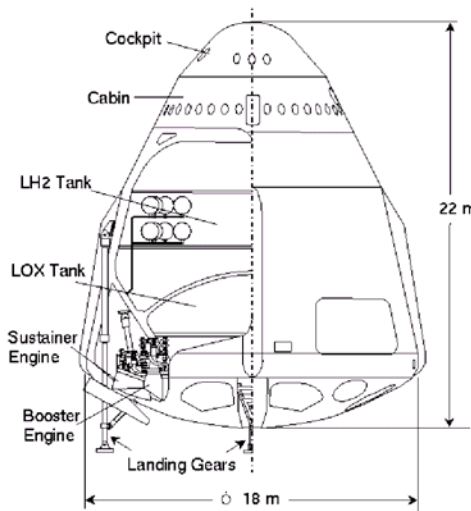
(Anderson)



(Kawasaki)

# Kankoh Maru Plus Concept Design and Mass

No. 8

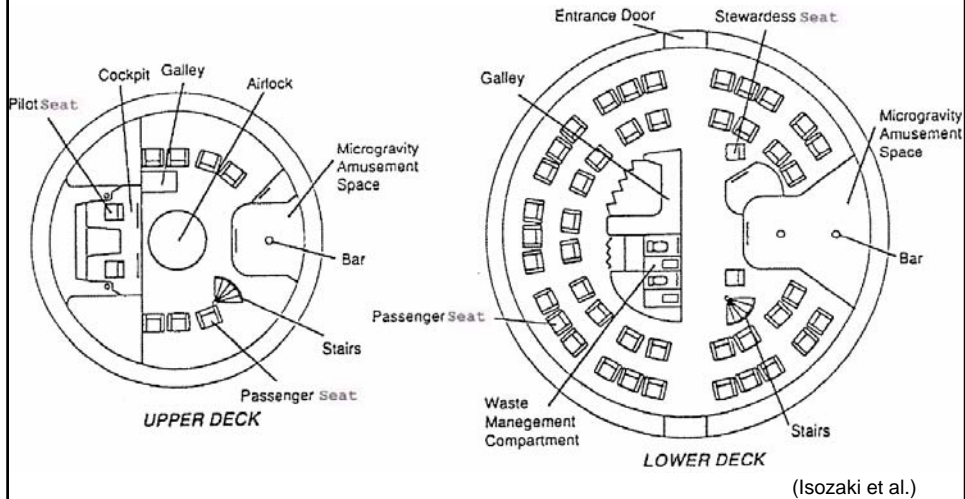


(Isozaki et al.)

Subsystem	Total	Unit
Cold Structure	10,4	Mg
Hot Structure	3,9	Mg
LH2 Tanks	8,9	Mg
LO2 Tanks	4,1	Mg
Equipment	8,0	Mg
Engines	13,5	Mg
Recovery	1,4	Mg
<b>DRY MASS</b>	<b>50,2</b>	<b>Mg</b>
Payload	5,0	Mg
Propellants	494,9	Mg
<b>TAKE-OFF MASS</b>	<b>550,1</b>	<b>Mg</b>

# Kankoh Maru Plus Concept Passenger Compartment Design

No. 9

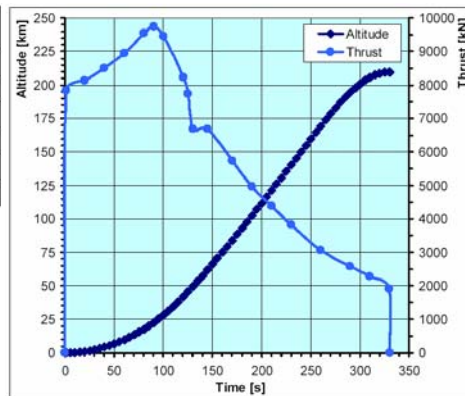


# Kankoh Maru Plus Concept Ascent Phase

No. 10



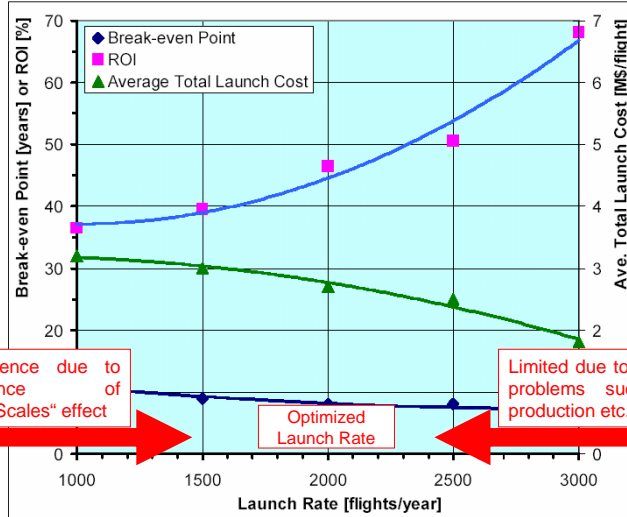
Phase	Description	Begin [s]	End [s]	Pitch Rate [°/s]
0	Liftoff (Begin)	0	0	-
1	Vertical ascent	0	17	-
2	Pitch rate	17	38	0.9
3	Gravity turn	38	242	-
4	Pitch rate	242	330	0.6
5	Low Earth Orbit (End)	330	86 400	-



# Simulation

## Optimized Launch Rate

No. 11



Negativ influence due to non-performance of „Economy of Scales“ effect

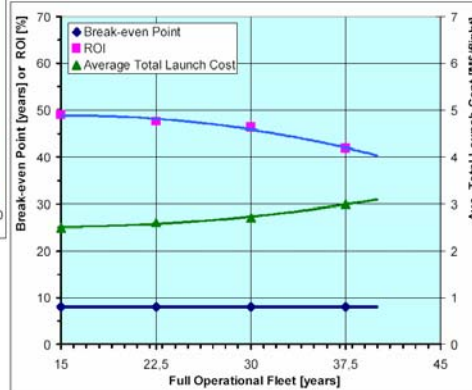
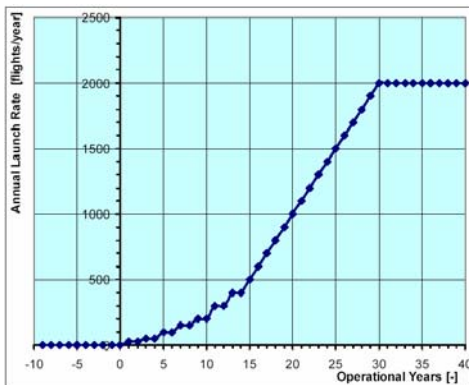
Limited due to infrastructure problems such as fuel production etc.

Optimized Launch Rate

# Simulation

## Optimized Full Operational Fleet

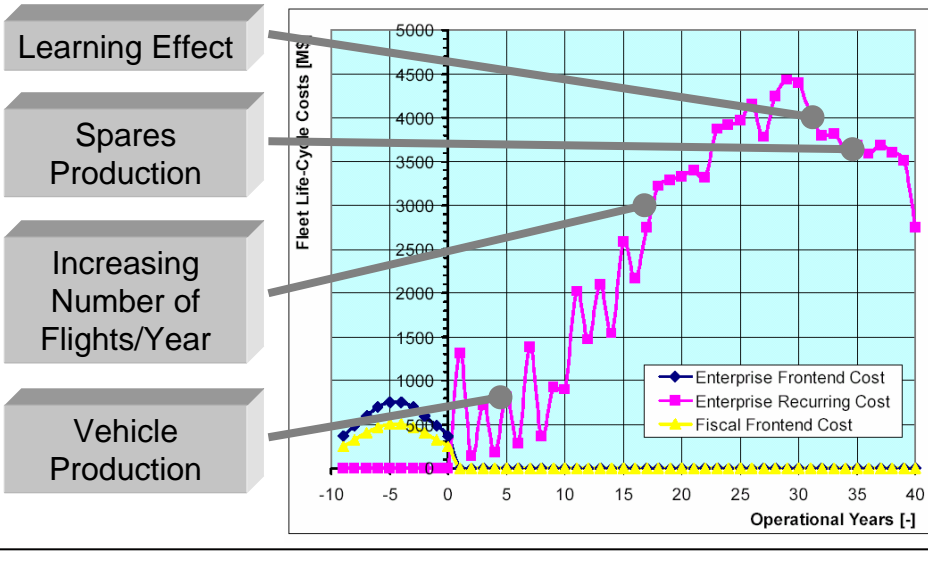
No. 12



# Simulation

## Fleet Life-cycle Costs

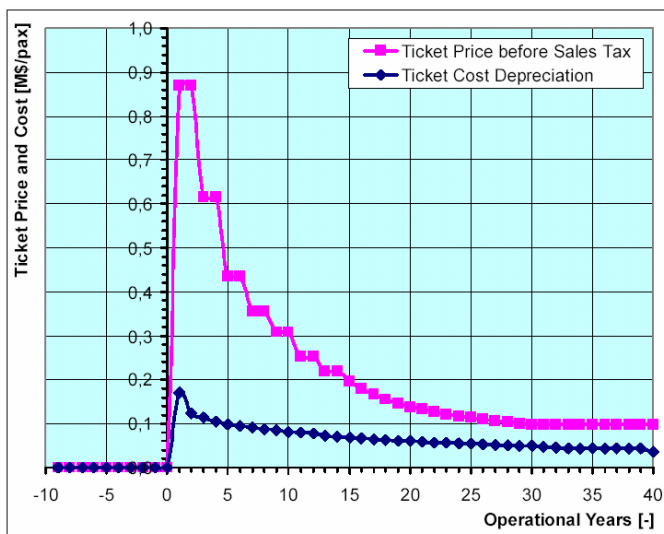
No. 13



# Simulation

## Ticket Price

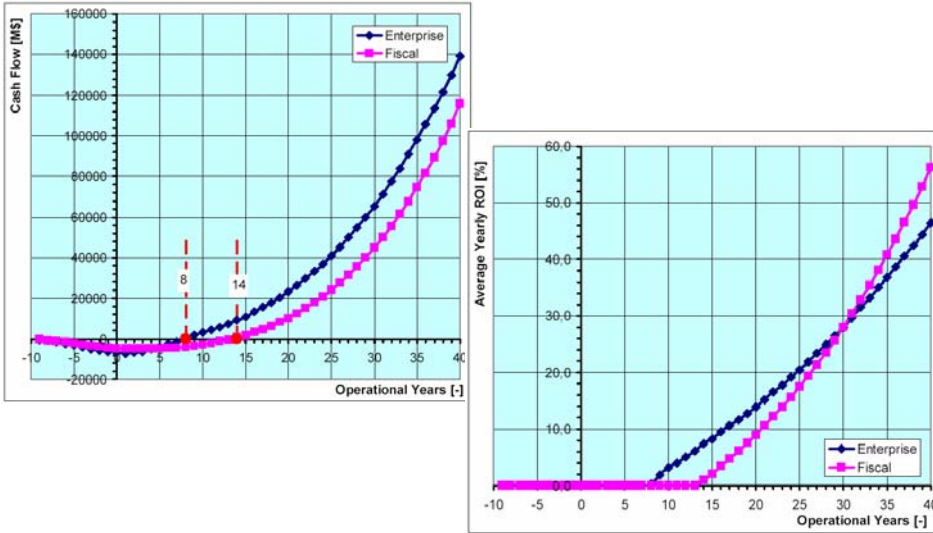
No. 14



# Simulation

## Cash Flow and average ROI/year

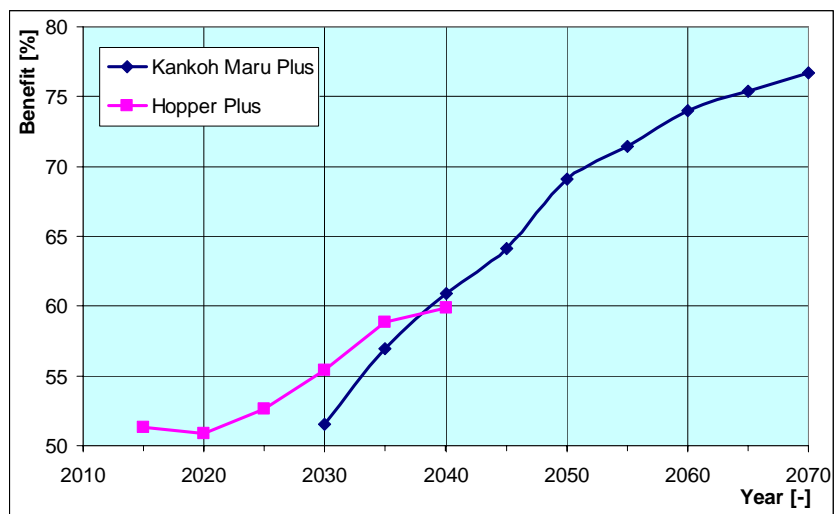
No. 15



# Benefit Performance

## Benefit of all Sub Objectives

No. 16





## Definition

### Definition of Cost Engineering (Practice)

No. 17



#### Case C

- *Step 9: Prepare a layout for seat arrangement of an orbital tourist rocket.*

