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No. 1



# International Space Initiatives and the President's Vision

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- Return to the Moon -

# International Moon/Mars Mission

## Content

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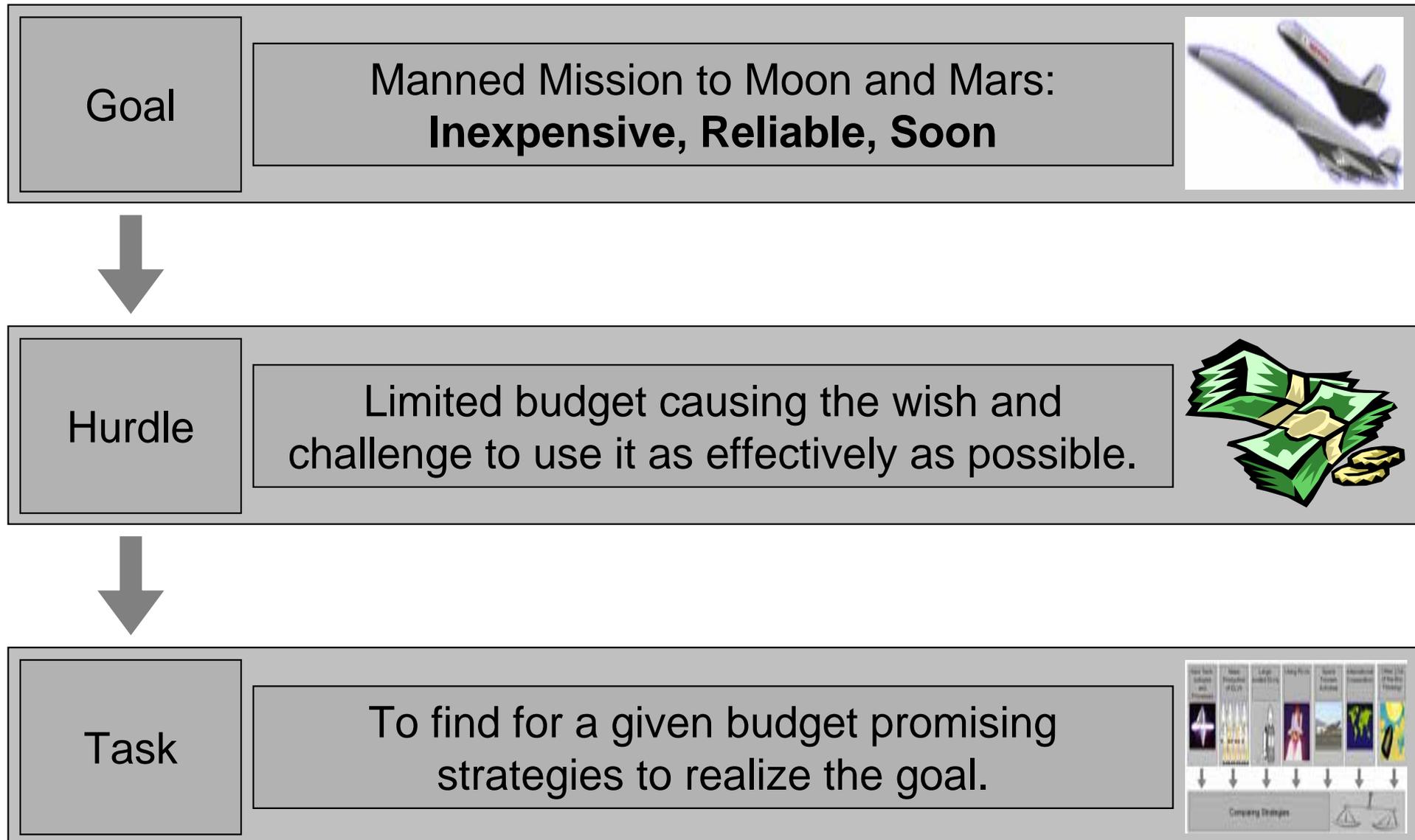


No. 2

- **Why International Cooperation?**
  - **Example: Arianespace**
  - **Advantages / Disadvantages**
  - **Conclusion**
-

# International Moon/Mars Mission

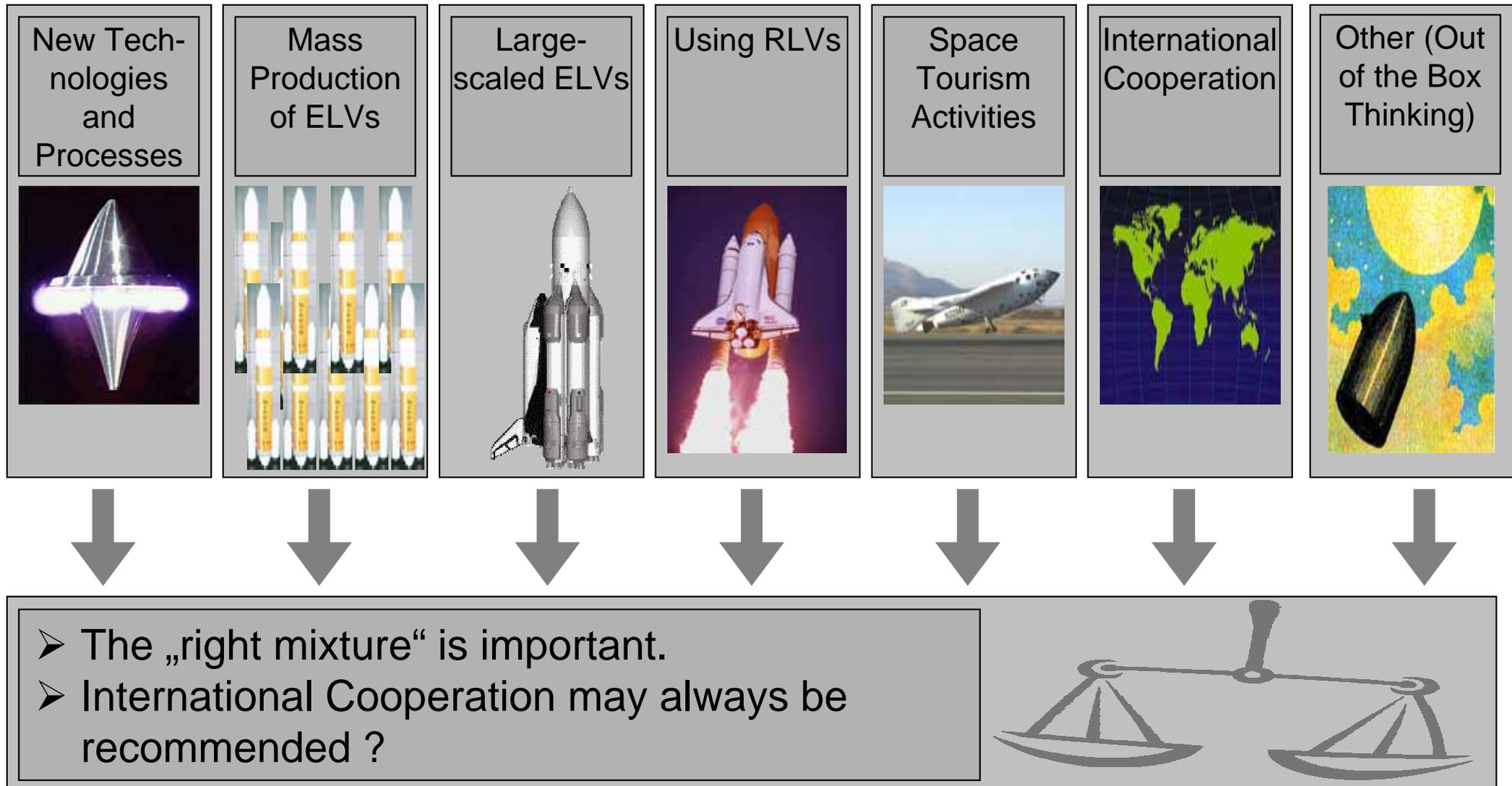
## Motivation of Research



# International Moon/Mars Mission

## Comparing Strategies

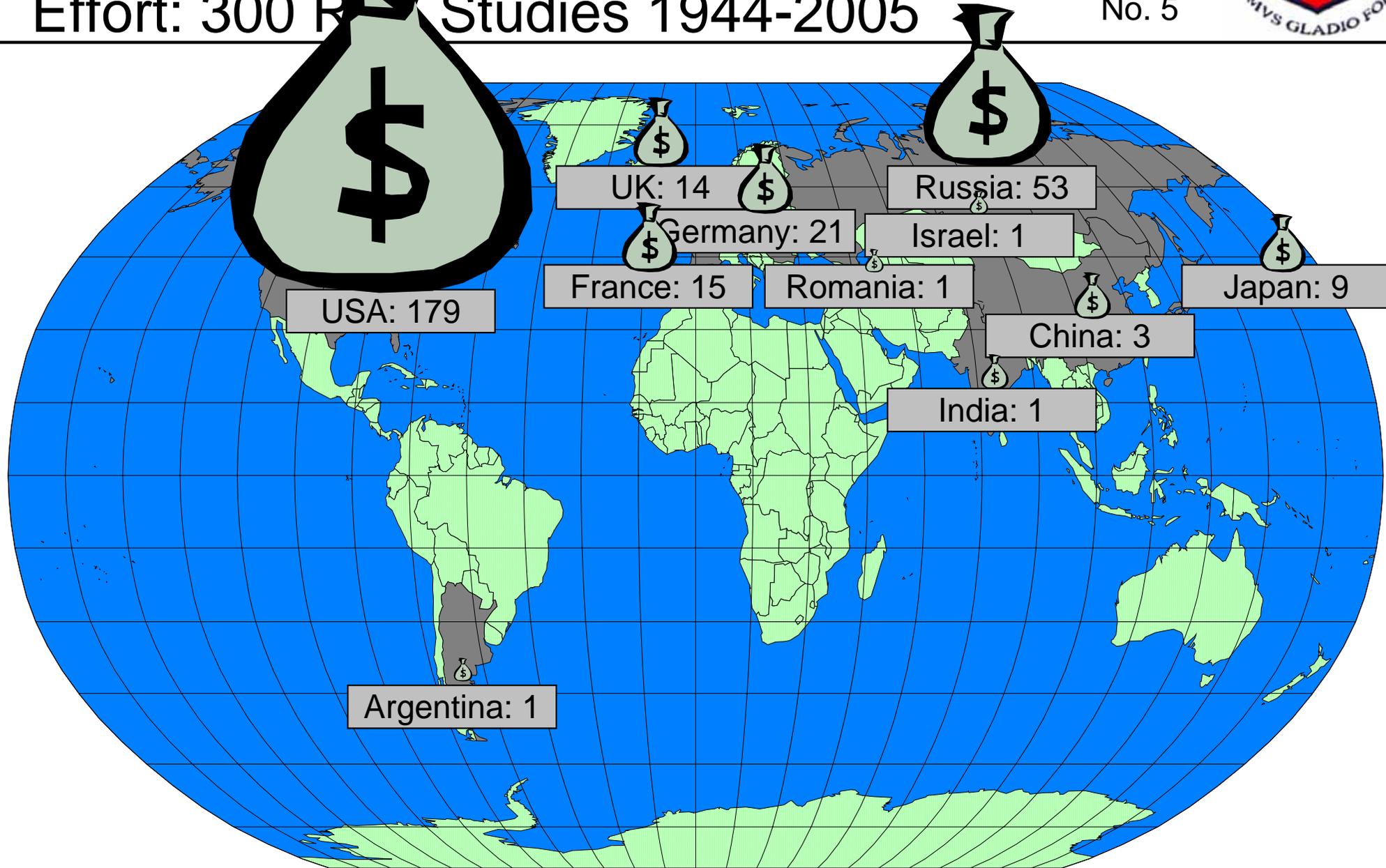
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# International Moon/Mars Mission

Effort: 300 Research Studies 1944-2005

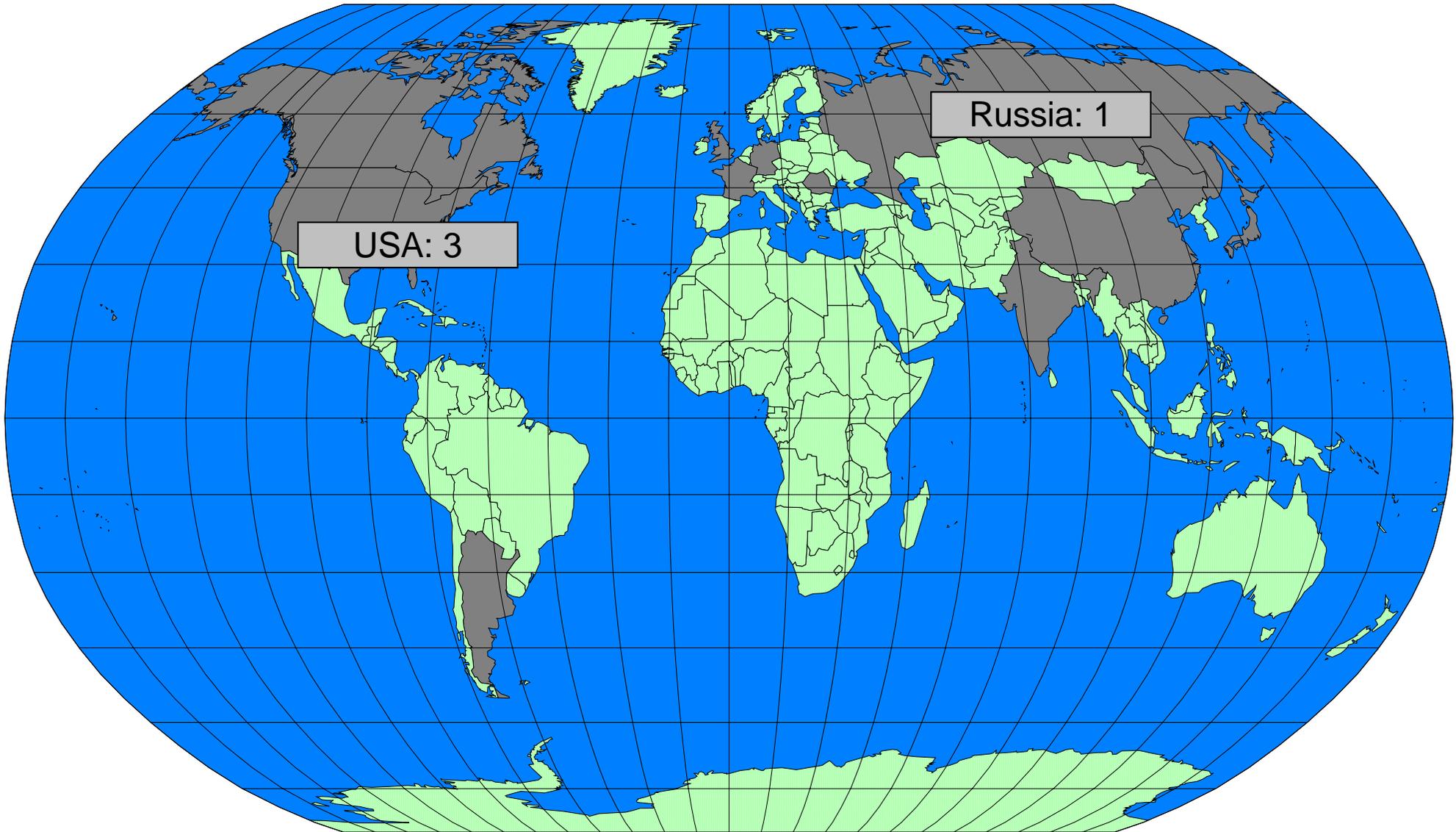
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# International Moon/Mars Mission

Output: 4 Realized RLVs

No. 6



# International Moon/Mars Mission

## National versus International Programs

No. 7

National Programs



- Each nation develops its own basic technologies
- ...but they are similar
- ...and budget is (normally) consumed before program is successfully finished



ALFLEX  
(at JAXA's museum in Japan since 1997)

HOPE project stopped



PHOENIX  
(flight in Sweden in 2004)

# International Moon/Mars Mission

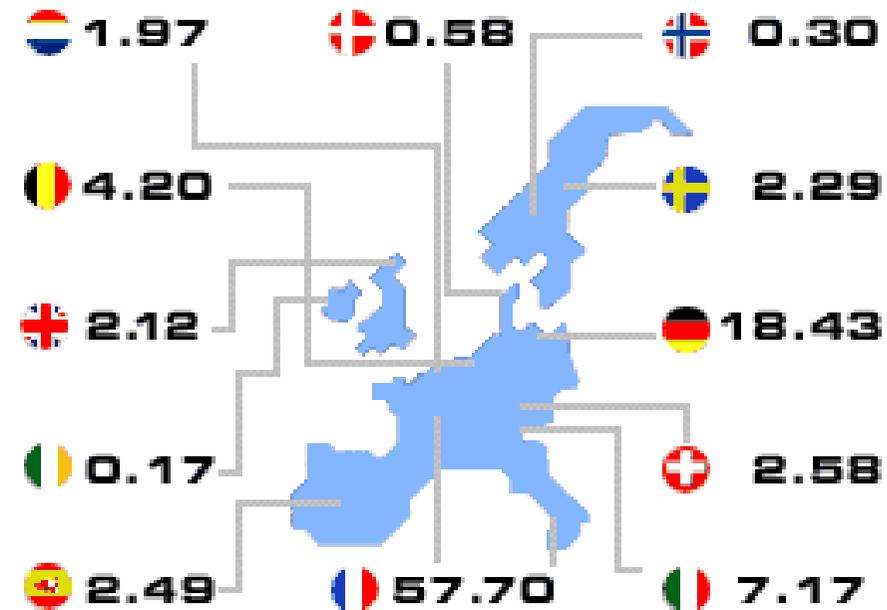
## National versus International Programs

No. 8

International Program



- Nations share resources to develop basic technologies together or specialize in different fields
- ...but this is feasible?



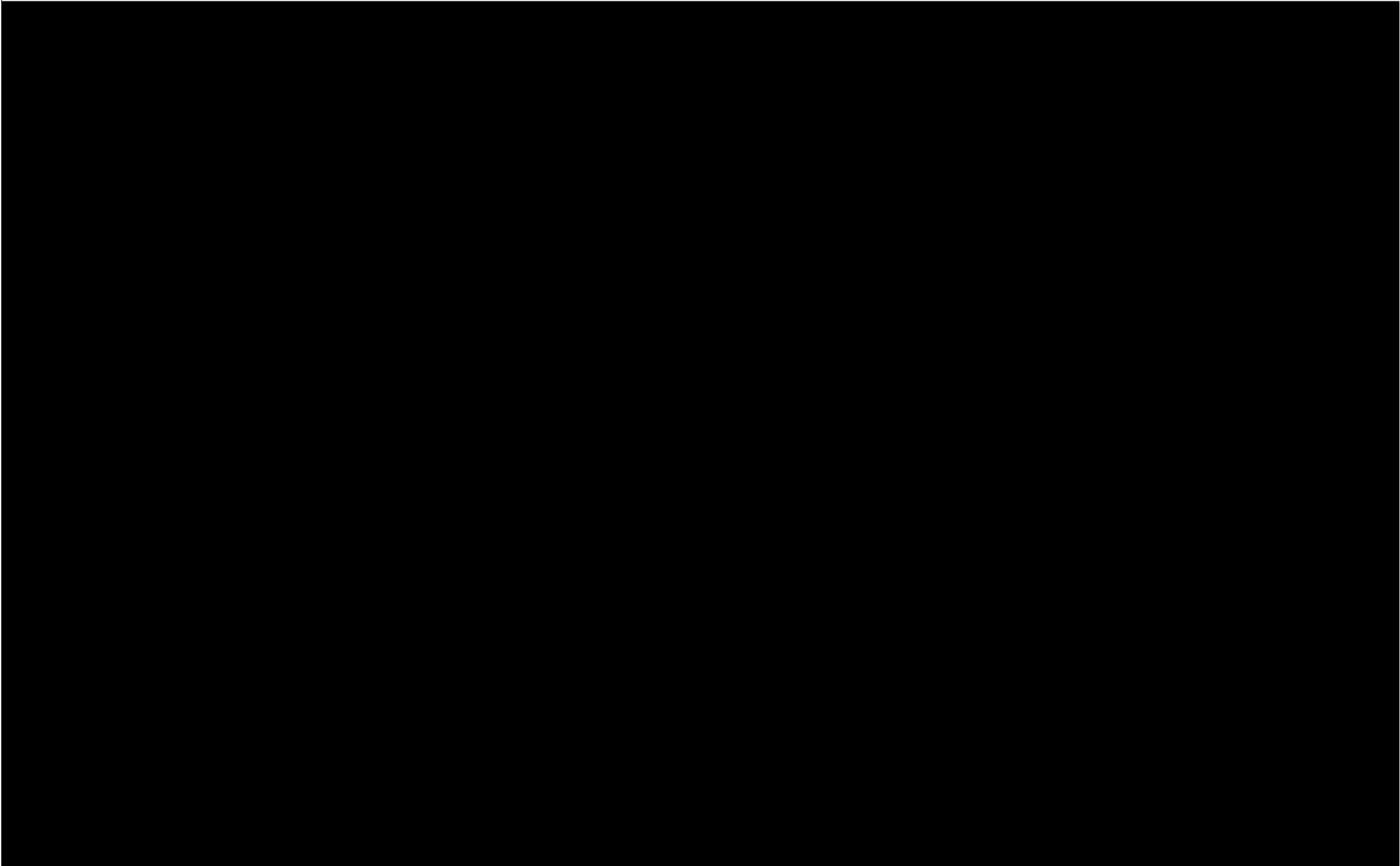
### ARIANE

The shareholder base of Arianespace is composed of:

- 41 Aerospace manufacturers and engineering companies from 12 European countries
- 11 Banks
- 1 Space agency

# **International Moon/Mars Mission**

Example for International Cooperation: Arianespace



# International Moon/Mars Mission

## Advantages (selection)

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- **Synergy Effect** to achieve much more in a space program than a country can afford to attempt on its own for a given budget. It includes man power (experts from different countries), know-how (high technology) and use of existing infrastructures (spaceport, production facilities, etc.).



- **Social Benefit** in terms that it does broaden the mind and give people a planetary conscience (humankind is sitting in the same boat if e.g. a killer asteroid hits Earth)



- **Realization** because this might be the only way in near-term to put the vision into action.

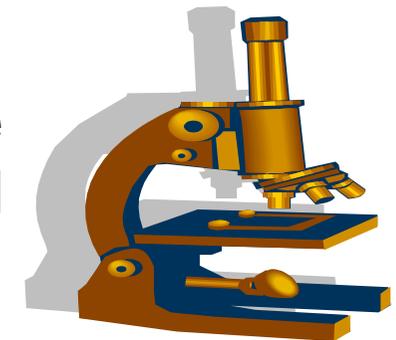


# International Moon/Mars Mission

## Disadvantages (selection)

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- **Share Pride** with other nations, e.g. US statement: “The space program is a visible symbol of U.S. world leadership; its challenges and accomplishments motivate scientific and technical excellence among U.S. students; and it provides for a diverse American population a sense of common national accomplishment and shared pride in American achievement.” (Longsdon, 1989)
- **Share Technology Leadership** is problematic because most launch technology has direct military applications and much of the technology has been classified or is sensitive.
- **Tendency of Parallel Contractors** means a cost increase by 15 % if there are two parallel contractors instead of one, by 25 % for three parallel contractors, by 32 % for four parallel contractors, by 38 % for five parallel contractors and so on (Koelle, D.E., 2003).



# International Moon/Mars Mission

## Disadvantages (selection)

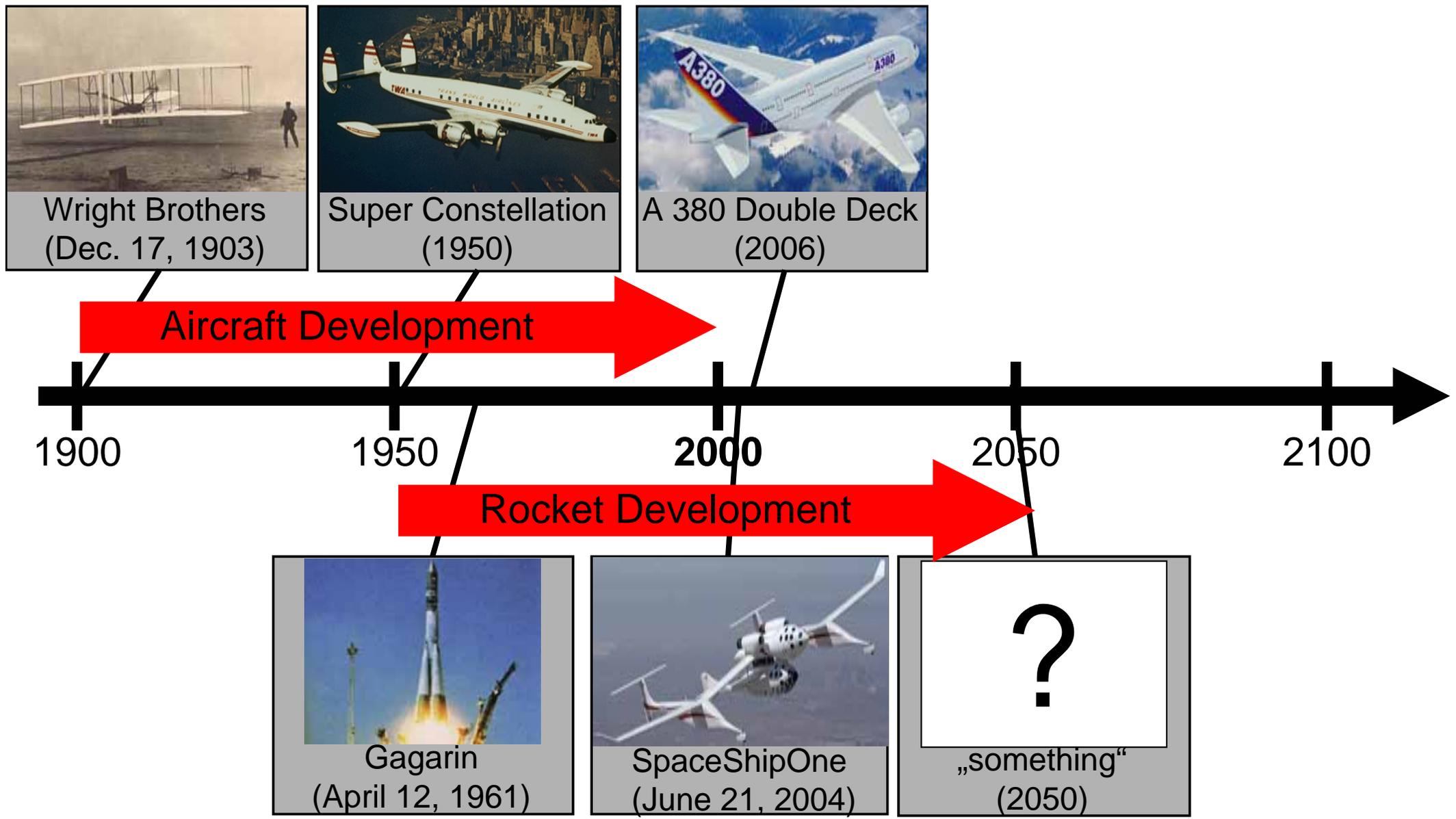
- **Cultural Business Challenge** is existing beside the technical one. Management practices and effectiveness depend on cultural variables such as attitudes, beliefs, value systems, need hierarchies, etc, which are the result of different environmental factors in different countries.
- **Running Board Effect** is existing in particular for international cooperation. It is difficult to monitor effort of another country and “force” a country to keep to a contract.
- **Power Struggle Effect** between nations to get international matters through by put other countries under pressure.
- **Risk** because the success of project is dependent on the continuation of all participants.



**CANCELLED**

# Open Question

## The meaning of 100 years...

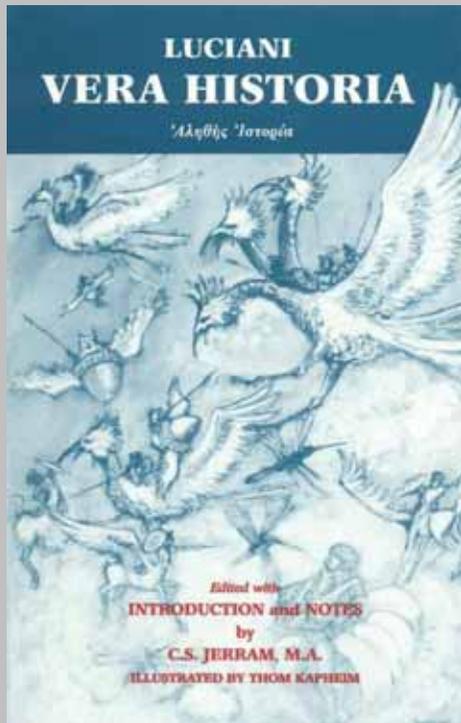


# Open Question

## When is technology „ready“ for Moon/Mars Rockets?

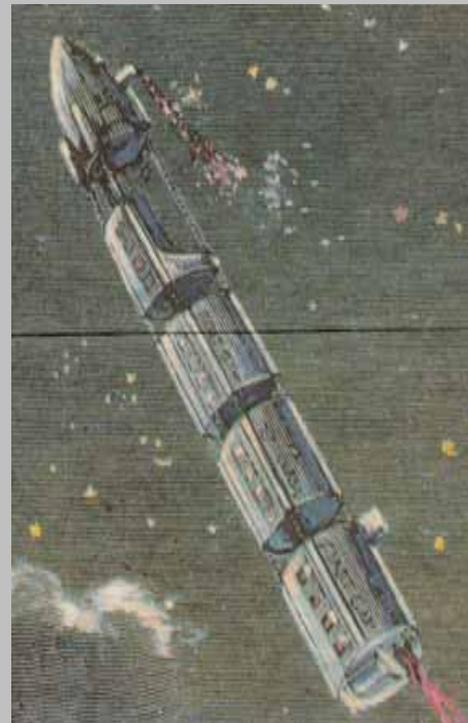
**2nd century**

Lucien of Samosata  
(using birds)  
not feasible, even if  
effort is infinite



**19th century**

Jules Verne  
(using railway)  
not feasible, even if  
effort is infinite



**20th century**

Soyuz  
(using expendable  
components)  
feasible, but only  
single event



**20th century**

Space Shuttle  
(using reusable  
components)  
feasible, but not  
economical

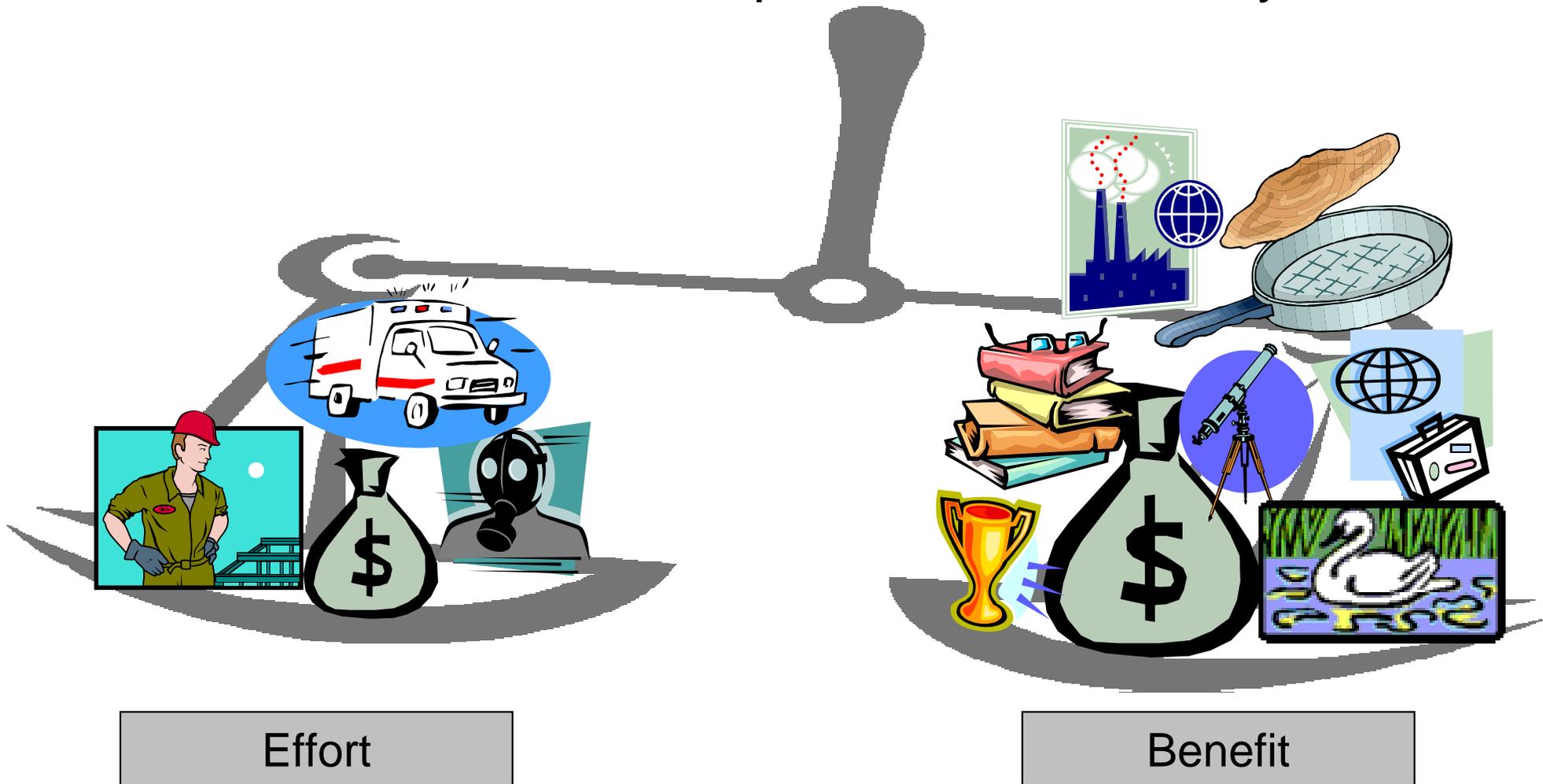


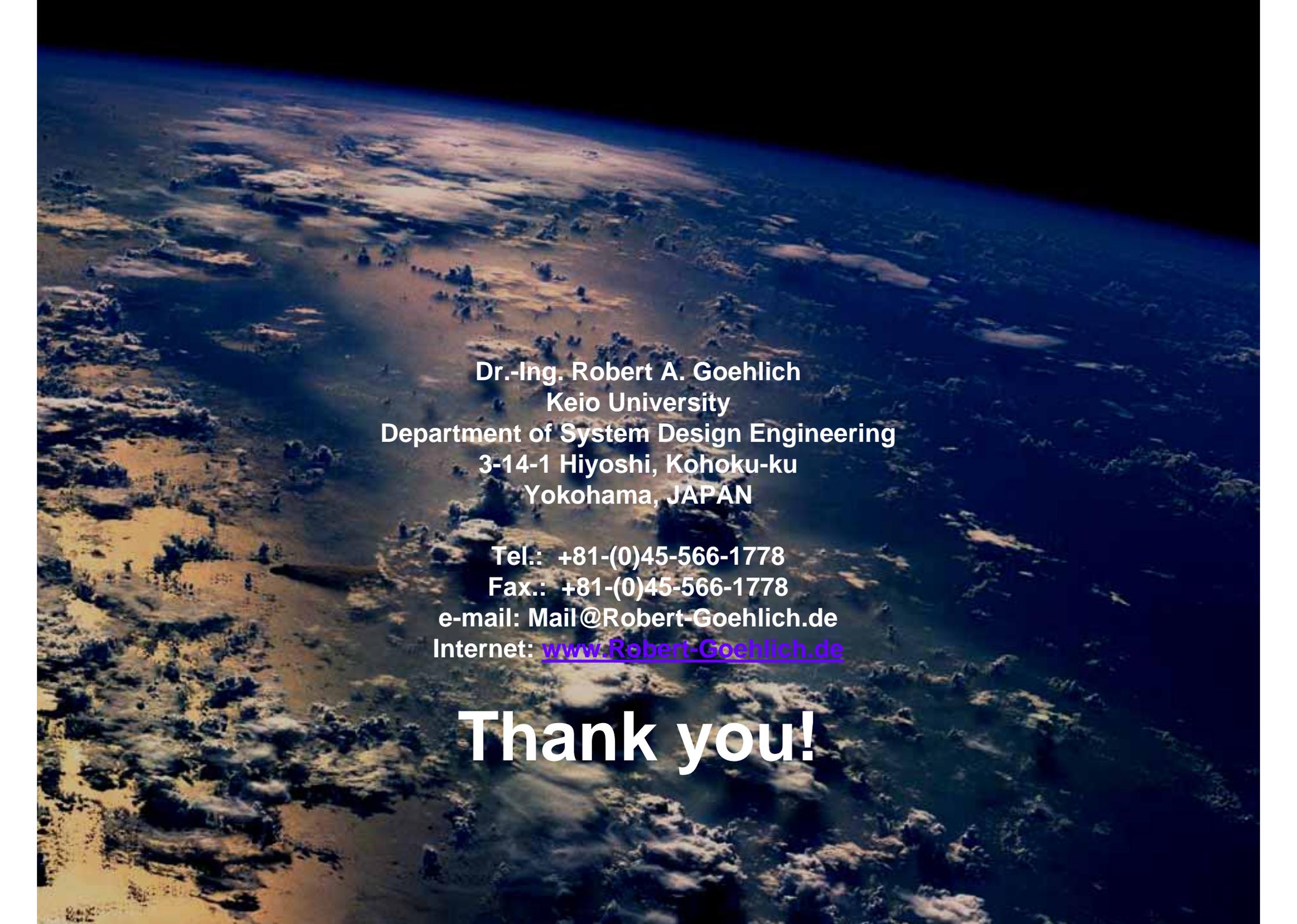
# Open Question

## Benefit versus Effort

No. 15

Is the effort for developing a Moon/Mars rocket worth compared to the benefit in terms of improvement of Quality of Life?





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**Thank you!**