

Qualitative Risk Management in Space Activities

A risk analysis method explored

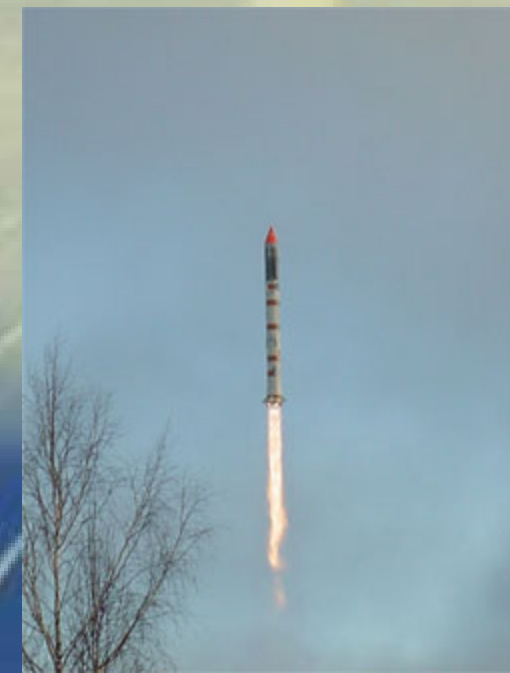
Henk H.F. Smid

Owner / Senior Space Consultant
ribs Space Consultancy & Insurance



The 7th Iranian Aerospace Society Conference
February 19-21, 2008, Sharif University of Technology, Tehran

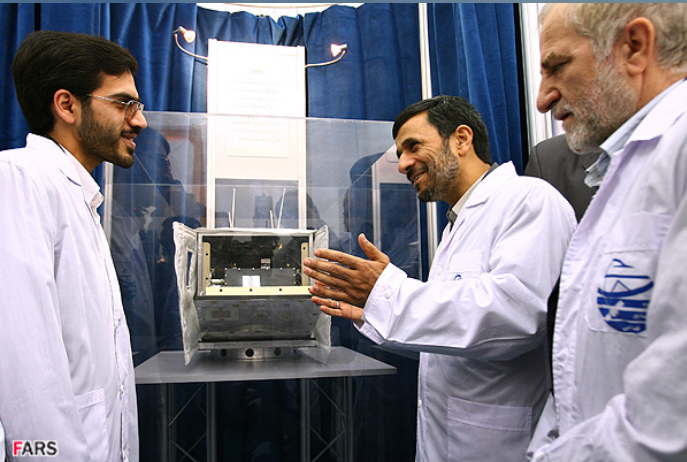
Iranian Sinah 1 satellite (170 kg)
telecommunication & research
launched 27 Oct. 2005
by Cosmos 3M launch vehicle
from Plesetsk (Russia) launch site



Iran inaugurates space complex with launch of Kavoshgar-1 rocket (Shahab-3B) on 4 February 2008 from launch site in Semnan Province



Photo : Hassan Ghaedi FARS NEWS AGENCY



FARS Photo : Hassan Ghaedi FARS NEWS AGENCY



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IRINN COMMISSIONER: WE HAD TO GO THROUGH THIS TO GET TO THIS POINT



ISNA / PHOTO: MEHDI GHASEMI



FARS Photo : Hassan Ghaedi FARS NEWS AGENCY

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Introduction

A space project to be analysed
The RISMAN-method

Four steps method

Determine goals
Map the risks
Determine important risks
Map the control measures

Concluding remarks

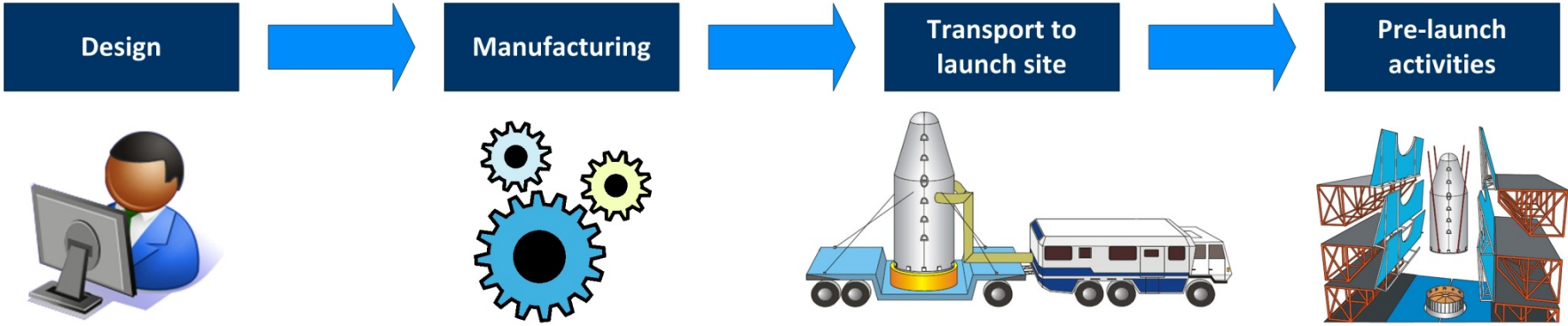
Questions & Answers



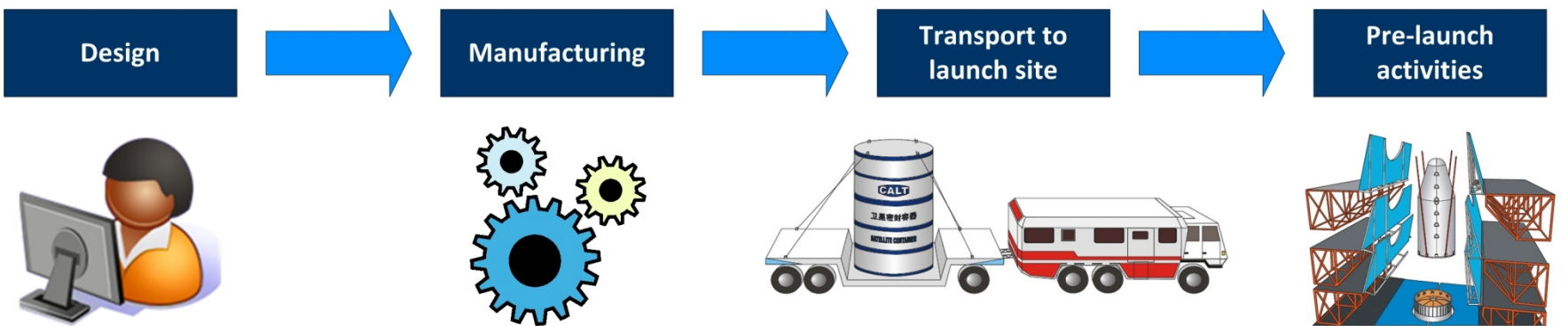
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A space project to be analysed

Satellite

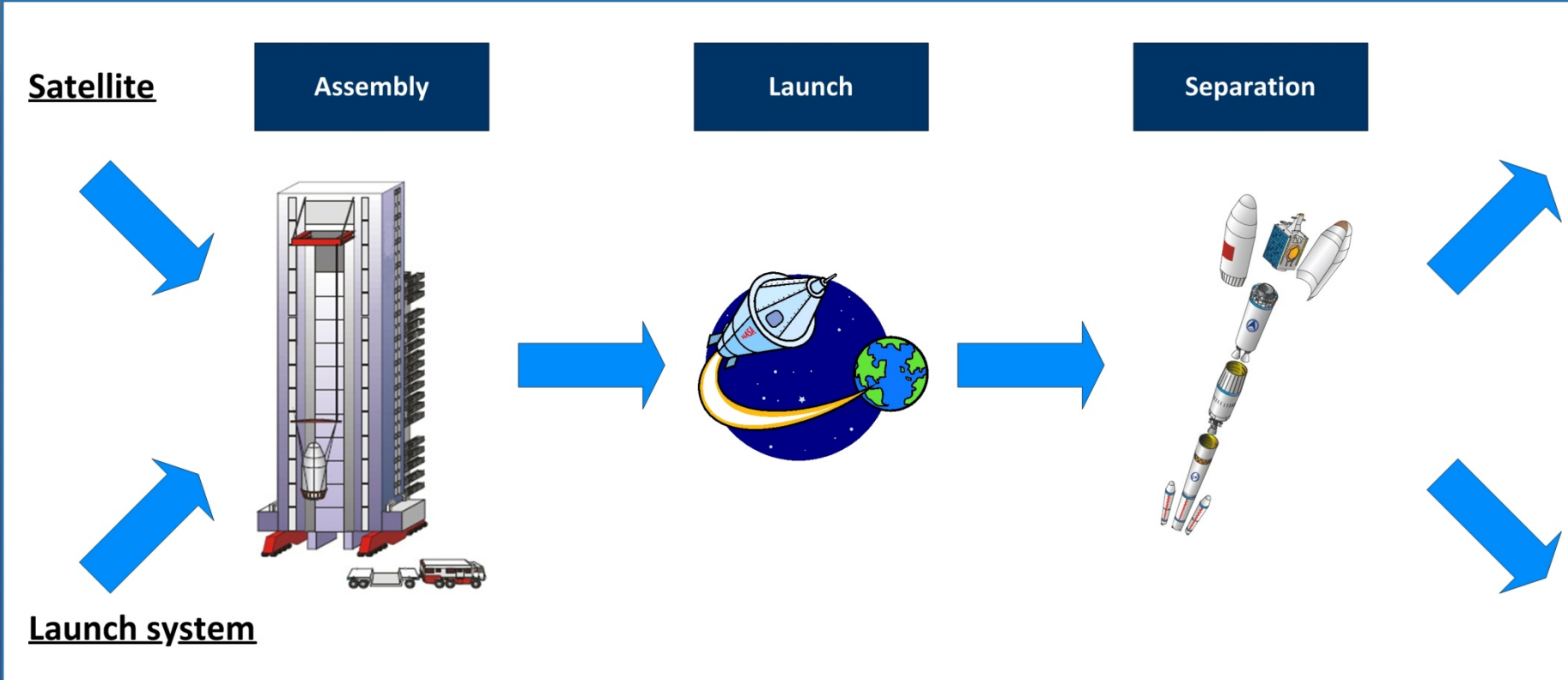


Launch system



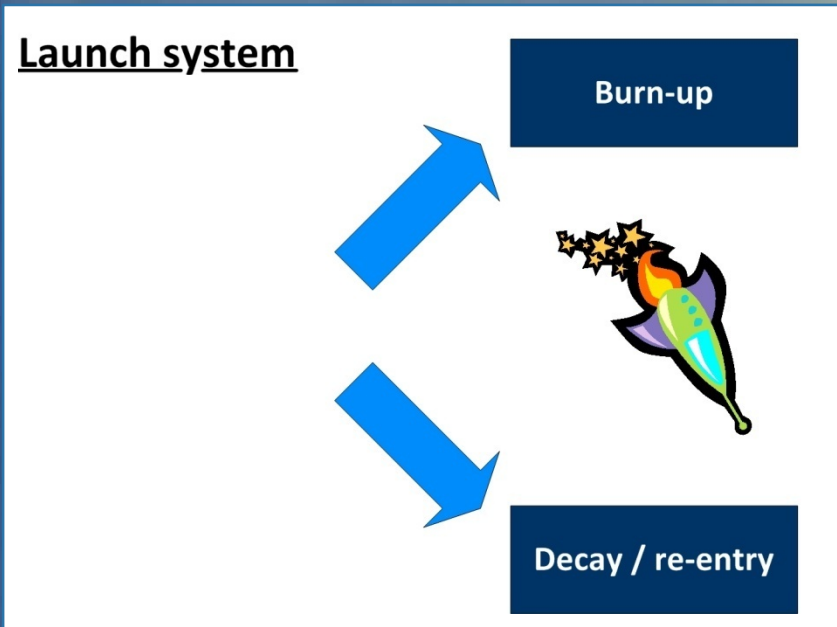
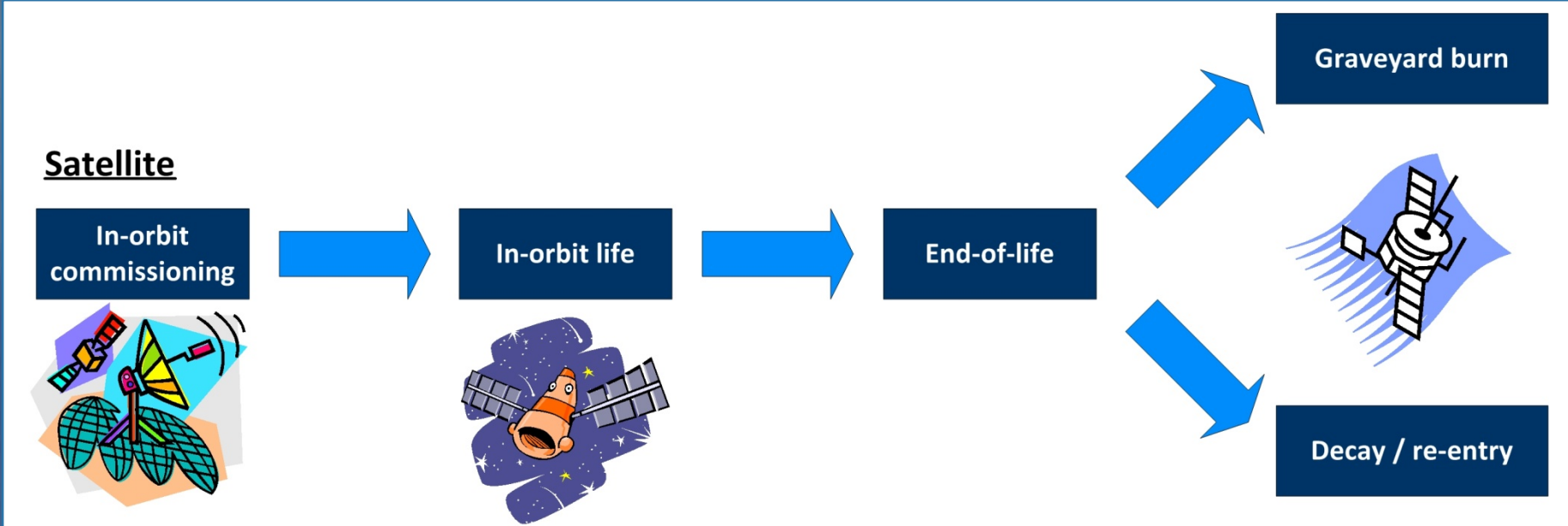
Qualitative Risk Management in Space Activities

A space project to be analysed



Qualitative Risk Management in Space Activities

A space project to be analysed



The RISMAN-method is a technique to conduct risk analysis and is very well suited to be used in long duration projects, because it could be utilized throughout the whole project.

The RISMAN-method has been developed as a risk analysis tool to assess the risks in planning large infrastructural projects.

With the RISMAN-method risks are made clear in a systematic way and from a variety of perspectives, and the measures to control these risks are identified.

Flooding control in the Oosterschelde (The Netherlands)



Storm surge barrier in the New Waterway (Rotterdam/The Netherlands)



In every phase of a (space) project, risk analysis is the core element of risk management.

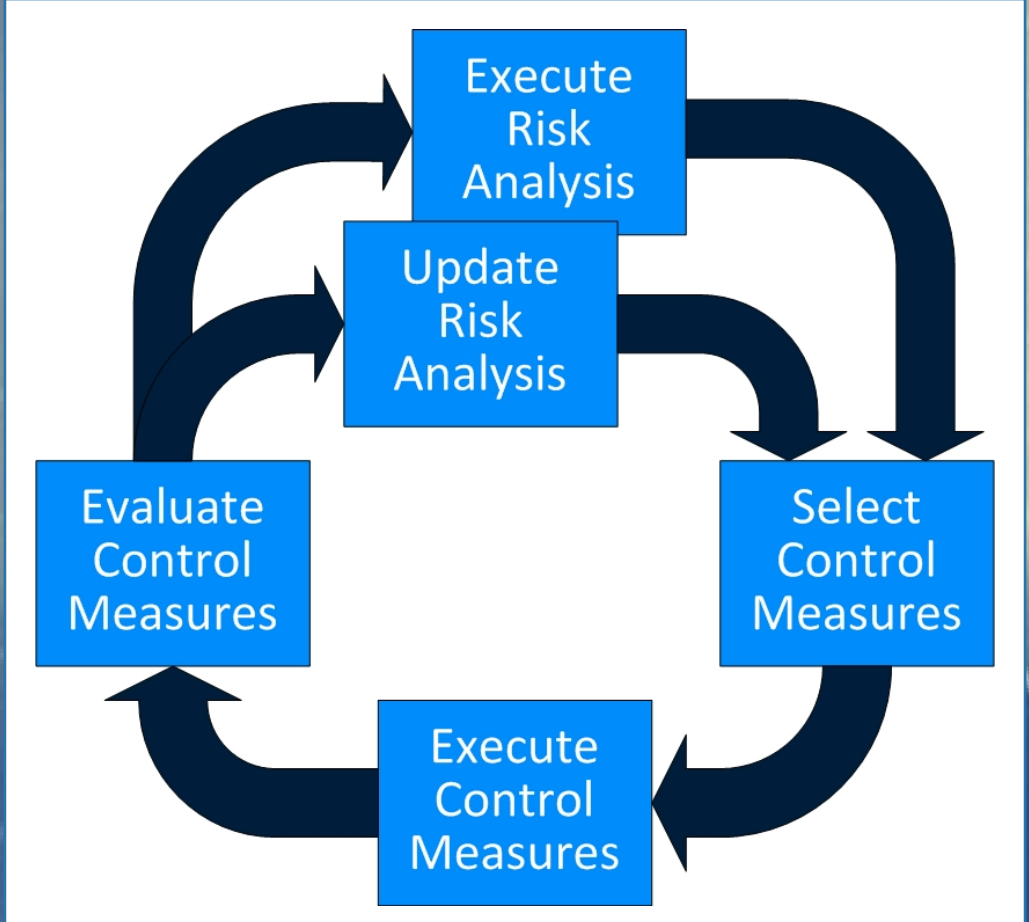
Risk management begins with a risk analysis to systematically identify the risks within the project.

Risk management must be a cyclical process that has to be carried out continuously.

Risk Analysis



Risk Management



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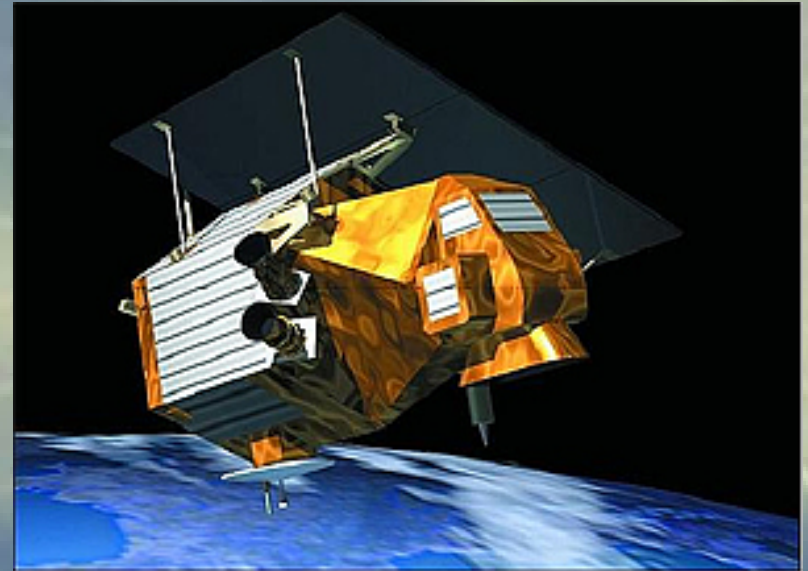
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[1] To determine ones goals, ask questions like:

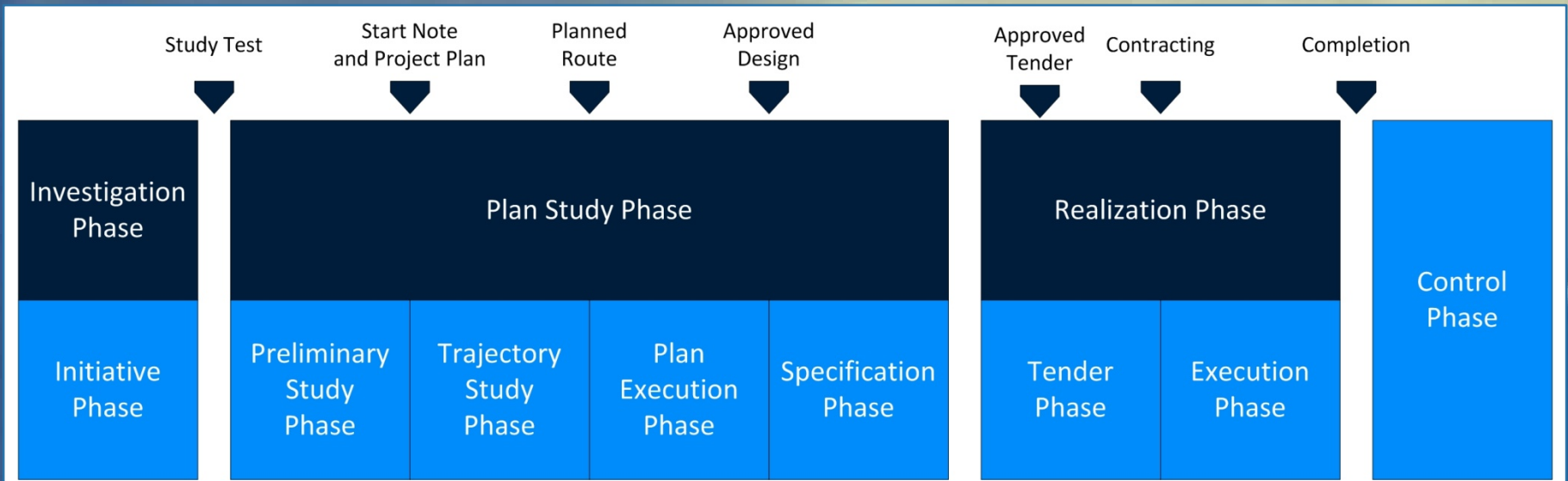
- What do you want to achieve?

Better project control, prioritize, decision support, ...

- On what control aspects do you focus the analysis?

Time, money, quality, information, organisation, ...

- At what part and phase of the project will the analysis be focussed?



[2] To determine ones goals, ask questions like:

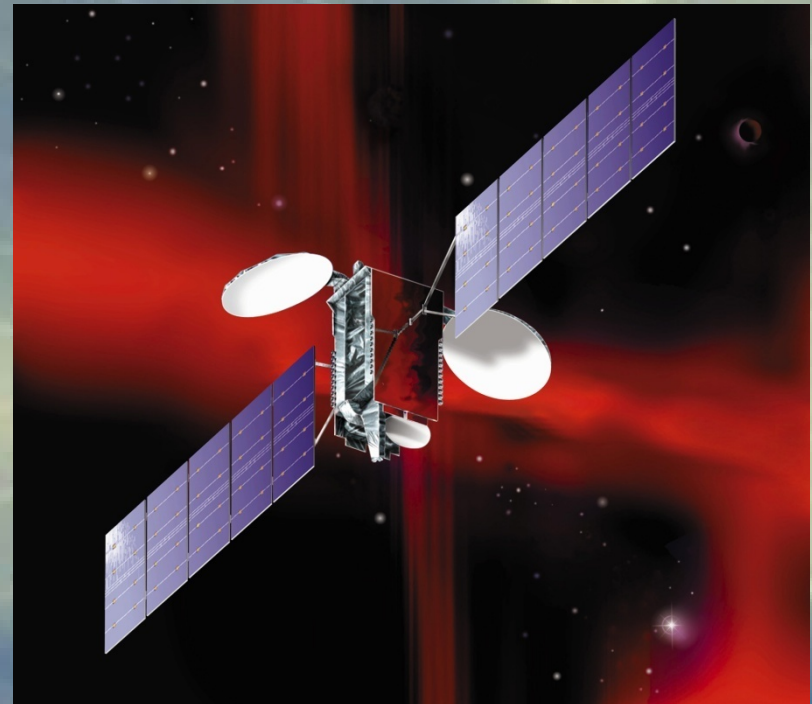
- Will it be a qualitative or quantitative analysis?

Qualitative Risk Analysis	Quantitative Risk Analysis
<u>When to use</u>	<u>When to use</u>
- For risk management	- Demonstrate/substantiate feasibility of the estimation/planning
- For insight in the most important risks	- Substantiate contingency item(s)
<u>Advantage</u>	<u>Advantage</u>
- Provides a quick and clear overview of the risks, understandable for most people	- Time, money and quality effects of measures to be applied, can be better mapped
<u>Disadvantage</u>	<u>Disadvantage</u>
- Priority issues give less information	- Analysis costs much time and effort - Numbers and results could get a life of their own; starting points could disappear

[3] To determine ones goals, ask questions like:

- Which information is available and can it be used?

- Project plan
- Sub-plans
- Cost estimate
- Quality plan
- Information plan
- Organisation plan or outline
- Program of demands for the whole project and/or parts thereof
- ...



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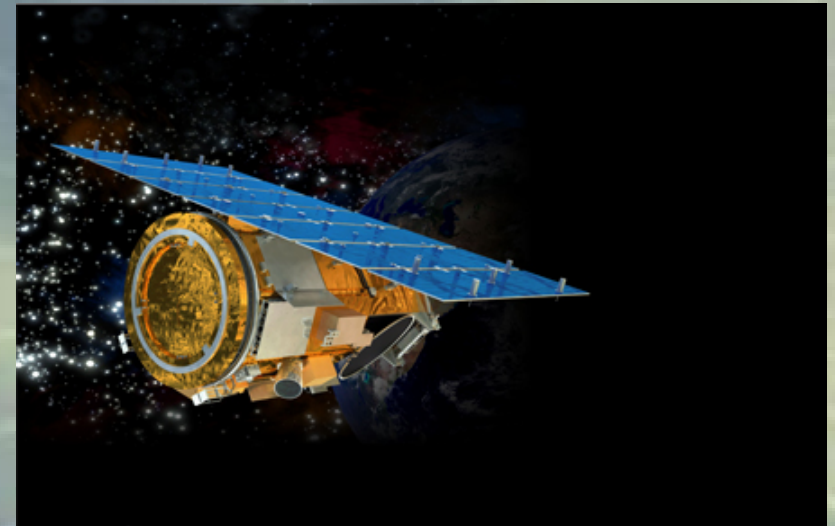
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Four Step Method – 2. Map the risks

Risks must be identified and structured

Risk matrix

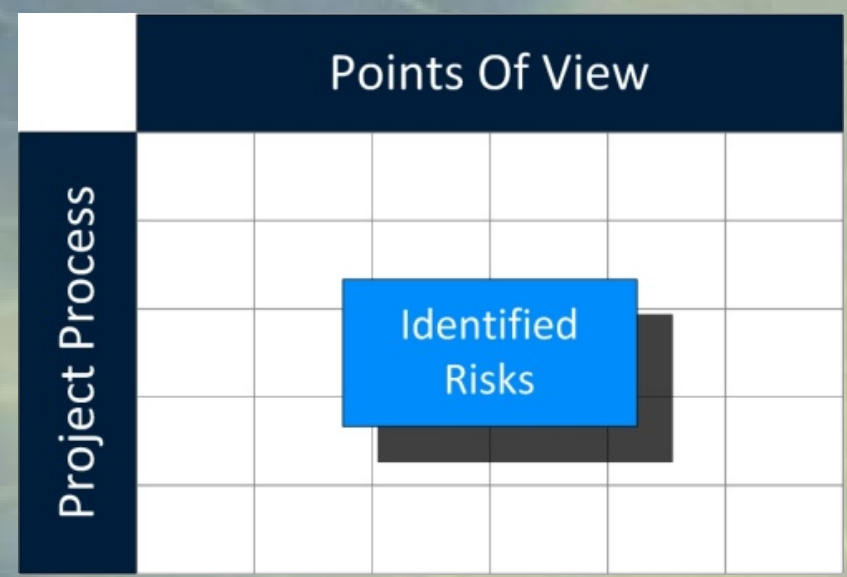
	Points Of View					
Project Process						

Identified Risks



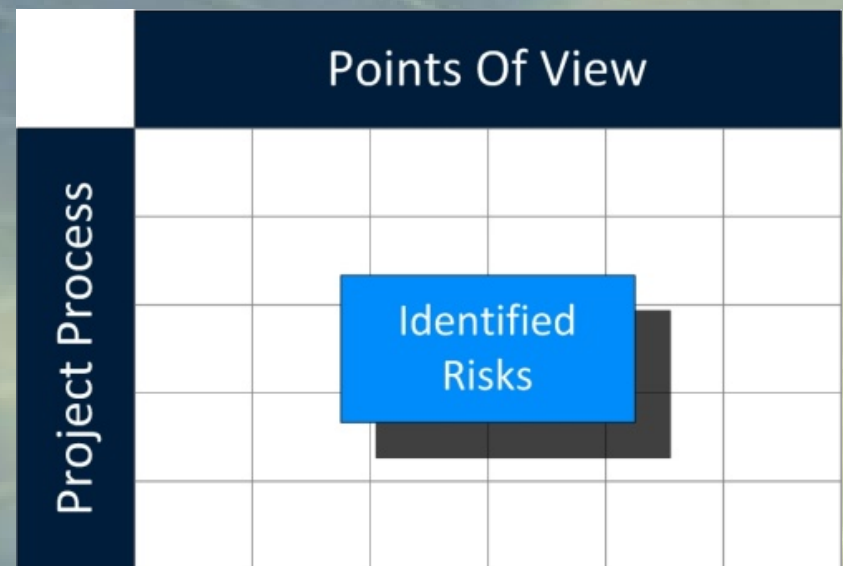
Risk matrix | Vertical axis
Focus on risk analysis

- Phases
- Sub-projects
- Milestones
- Sub-results
- ...



Risk matrix | Horizontal axis
Focus on (line of) approach

- Technological
- Organisational
- Spatial / Planning
- Legal
- Financial / Economical
- ...



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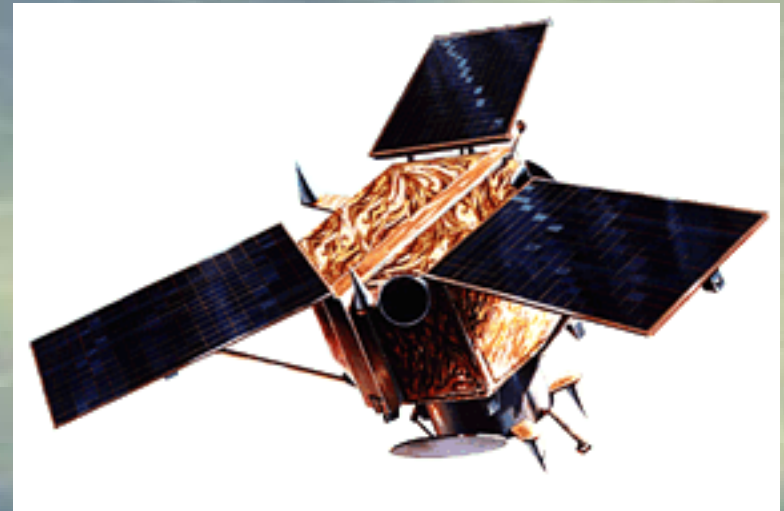
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When the risks identified in step 2 have been assessed, in step 3 the most significant risks must be determined.

Step 3 could be performed qualitatively (prioritizing in degrees of risk likelihood and level of impact)

or quantitatively (detailed calculations required for each individual risk).



Qualitative risk analysis is much more utilized

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Four Step Method – 3. Determine important risks

Risks →	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Points
↓ Participants											
A											
B											
C											
D											
E											

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Four Step Method – 3. Determine important risks

Risks →	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Points
↓ Participants											
A	20	5	0	10	0	0	0	15	30	20	100
B											
C											
D											
E											
	20	5	0	10	0	0	0	15	30	20	100

Qualitative Risk Management in Space Activities

Four Step Method – 3. Determine important risks

Risks →	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Points
↓ Participants											
A	20	5	0	10	0	0	0	15	30	20	100
B	5	10	30	0	0	20	10	0	25	0	100
C	10	25	15	20	0	0	5	0	5	20	100
D	5	20	17	15	33	10	0	0	0	0	100
E	5	18	20	7	20	30	0	0	0	0	100
	45	78	82	52	53	60	15	15	60	40	500

Qualitative Risk Management in Space Activities

Four Step Method – 3. Determine important risks

Risks →	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	Points
↓ Participants											
A	20	5	0	10	0	0	0	15	30	20	100
B	5	10	30	0	0	20	10	0	25	0	100
C	10	25	15	20	0	0	5	0	5	20	100
D	5	20	17	15	33	10	0	0	0	0	100
E	5	18	20	7	20	30	0	0	0	0	100
	45	78	82	52	53	60	15	15	60	40	500

Risk 3 scores highest
Risks 7 and 8 score lowest

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Four Step Method – 3. Determine important risks

Description of risks	Probability (Scale 1-5)	Effect (Scale 1-5)	Risk	Score
More design changes than planned	4	1	4	4
More materials needed	3	4	12	1
Extra safety measures	4	2	8	3
Extra testing of hardware	2	5	10	2

Overall Risk = Probability x Effect

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Four Step Method – 3. Determine important risks

Description of risks	Probability (Scale 1-5)	Effect (Scale 1-5)	Risk	Score
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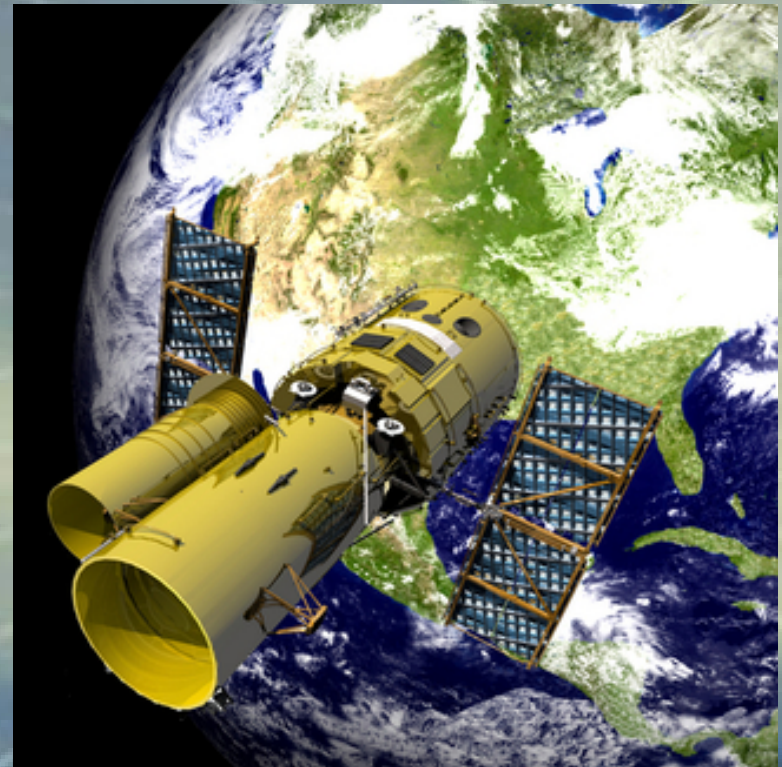
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Control measures are:

Measures to deal with risks, as a result of which a project becomes better manageable.



Measures ↔ Effect



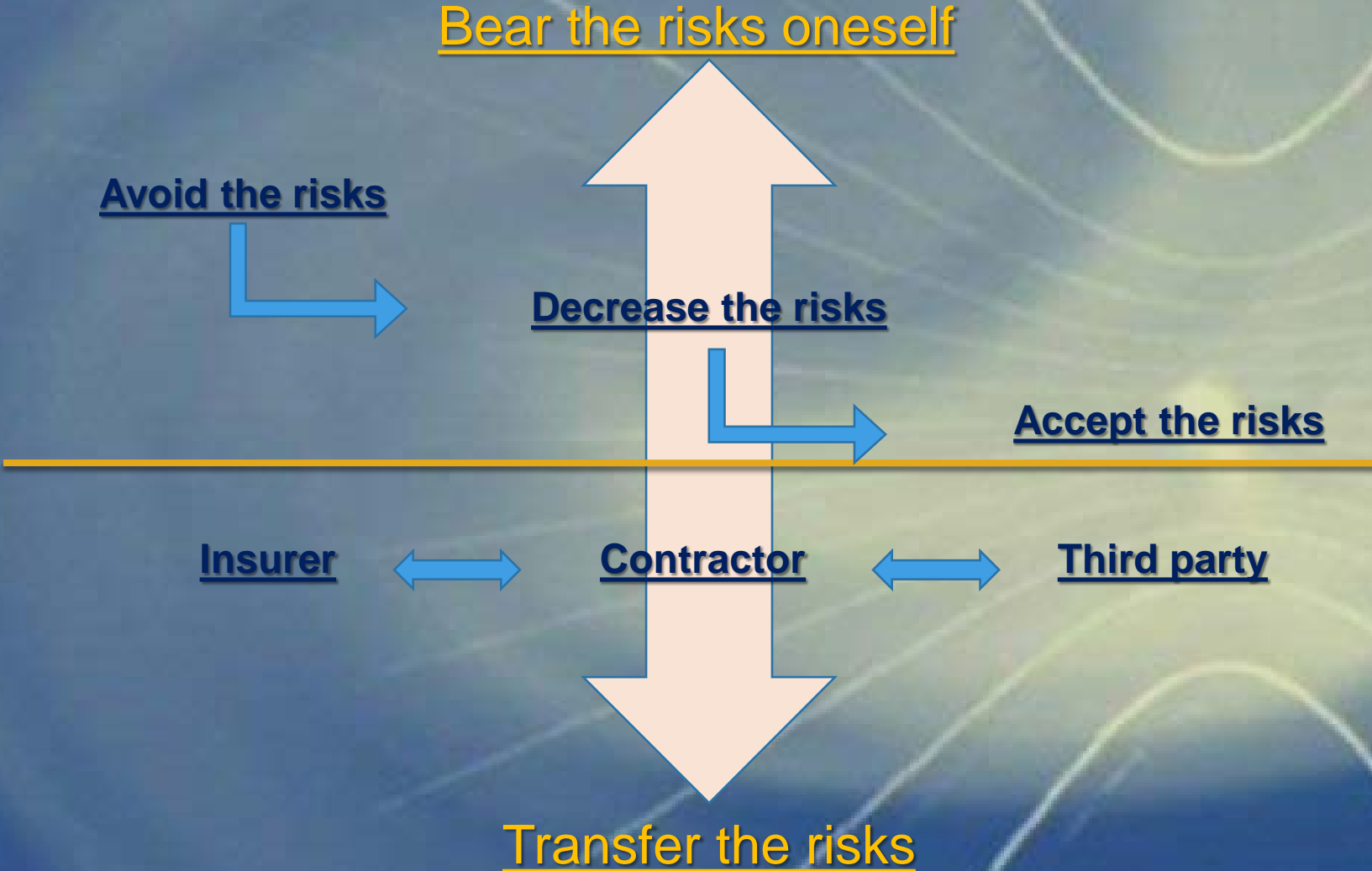
Enforcing control measures contributes to risk reduction and improved control of the project.

Many control measures,
only two types:

- Measures of which the risks are born by oneself;
- Measures of which the risks are transferred to a third party.

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Four Step Method – 4. Map the control measures



Effects of control measures

Risk	Measures	Effort	Cost	Effect
①	A, ...	High/Low	High/Low	Big/Small
②	B, ...	High/Low	High/Low	Big/Small
③	C, ...	High/Low	High/Low	Big/Small
④	D, ...	High/Low	High/Low	Big/Small

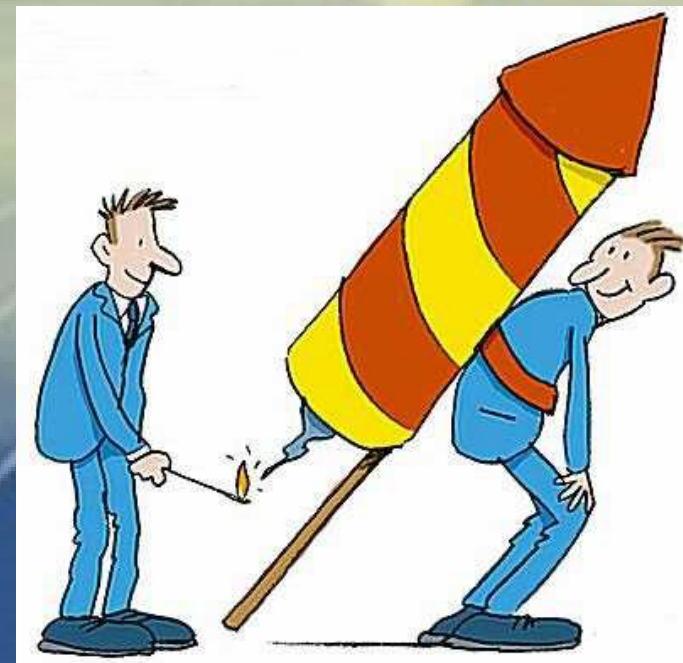
Risk analysis / risk management is NOT something new.

You probably do it already; maybe not always.

Make sure that risk analysis / risk management is always embedded in your projects.

Accept that it is no wonder cure.

But do it anyhow !



Effectively managing the risks in (planning) processes in space endeavours, using the proper tools, improves the balance of costs, time and quality, and safety of the project.

By adapting the RISMAN methodology for space projects, a universal and structural tool for risk management in this high risk sector of industry was developed and successfully utilized in different projects.



Q&
A