



Upside Down: *Competitiveness when Failure is Not an Option*

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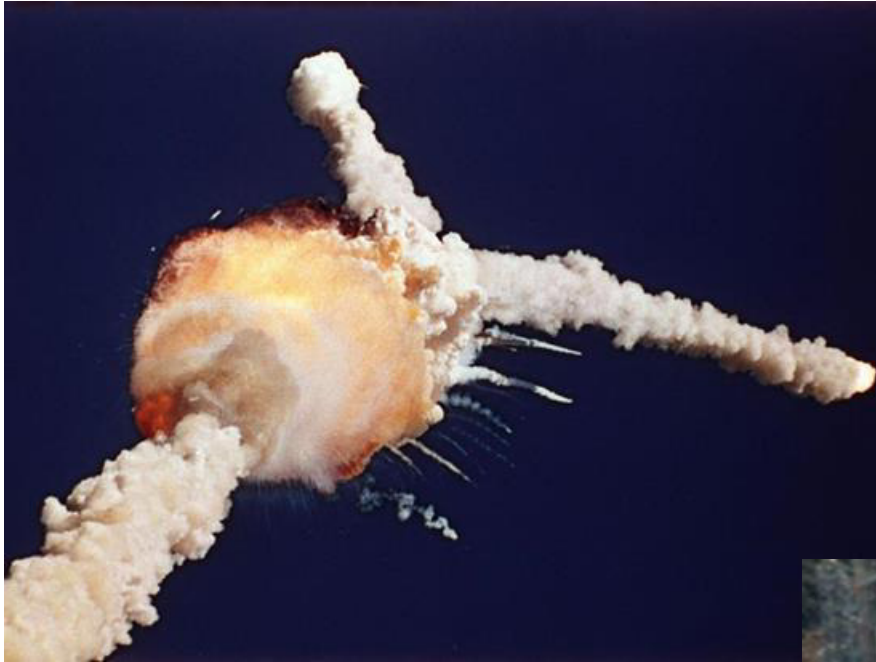
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- Reserves: Our use of the term “reserves” in this presentation means SEC proved oil and gas reserves.
- Resources: Our use of the term “resources” in this presentation includes quantities of oil and gas not yet classified as SEC proved oil and gas reserves. Resources are consistent with the Society of Petroleum Engineers 2P and 2C definitions.
- Organic: Our use of the term Organic includes SEC proved oil and gas reserves excluding changes resulting from acquisitions, divestments and year-average pricing impact.
- Shales: Our use of the term ‘shales’ refers to tight, shale and coal bed methane oil and gas acreage.
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Two Industries – Complexity & Safety



Why Failure is Not an Option



- Space Shuttle Challenger
- 1986

- Shell Moerdijk
- 2014



THE WIDER PICTURE



Safety



Sustainability



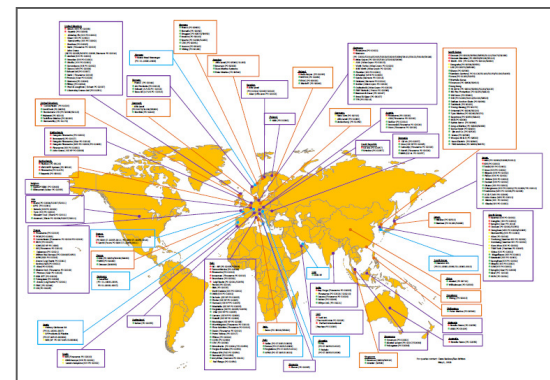
Cost



Silos



Demographics



Complexity

Another Perspective

- High complexity
- Mach 0.8 @ 11,000 meters
- Impossible 100 years ago → now routine
- 8 million lives per day; > 3 billion per year
- Safest mode of transport AND cost competitive

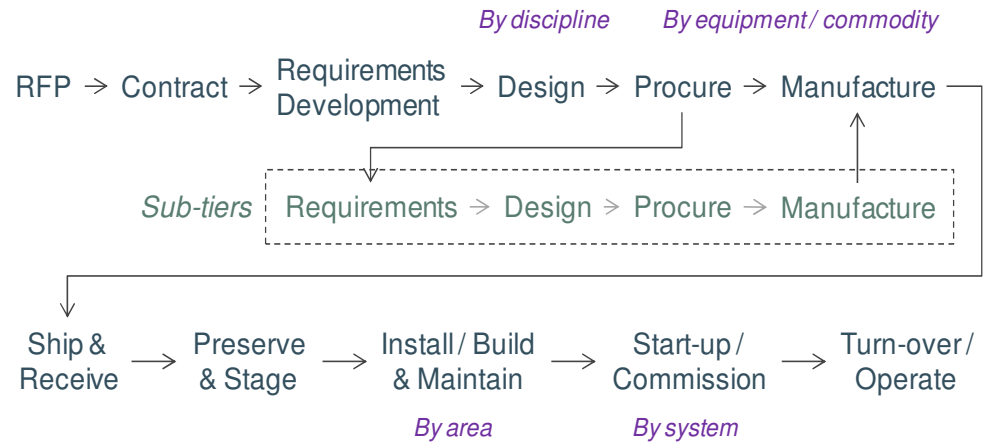


Upside Down?

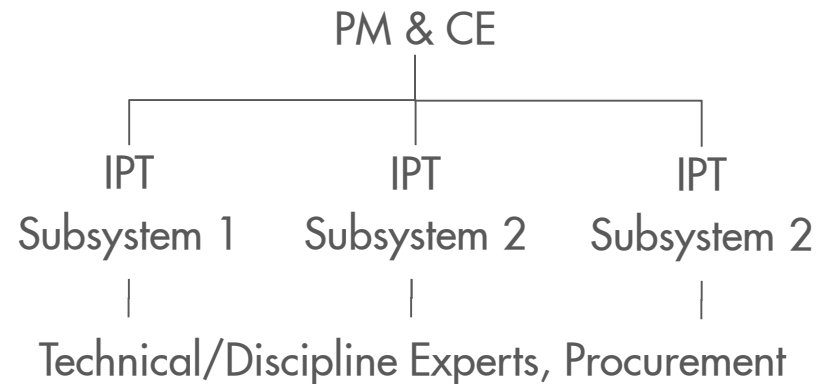
Does additional oversight increase quality?



1. Integration



O&G - Sliced & Diced Approach

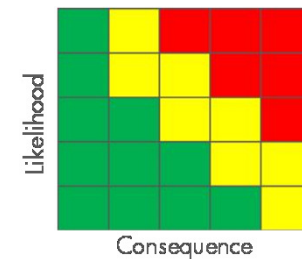
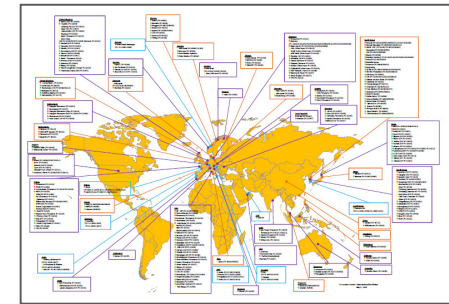
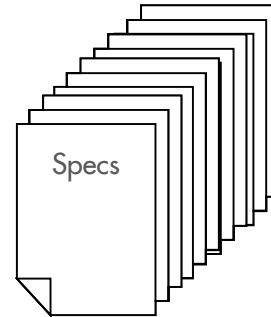


Aerospace - Integrated Approach

- Adding bodies isn't the answer
- Right people, place & time
- Integrators & Interfaces

2. Risk-Based

- Requirements clarity
- Specificity
- Margin & Risk
- Knowledge of Why
- "Grilling ritual"



3. Innovation

- Embracing change
- Where & When to Fail
- Integrated & Risk-Based
- Solution oriented



As Engineers, The Future is in Our Hands



