



**WORKING
EXPERIENCE
ON RUSSIAN
RISKS**

**RUSSIAN ASSOCIATION OF AEROSPACE INSURERS
2 MARCH 2017**

WORKING EXPERIENCE ON RUSSIAN RISKS



- Challenges in the early days:
 - Information flow
 - Openness
 - Trust
 - Security clearance
 - Technical language
 - Policy language and structure
 - Internal pressures from management and independent reviewers

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Why did we bother?

- Undeniably vast heritage:
 - Begun space exploration in 1940's
 - Pioneers in rocket development
 - Nine of the first ten space stations were Soviet-built
 - More than a quarter of a million people employed in the Russian Space industry
- Russian rockets launched around a third of the commercially insured satellites

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- However:
 - From 2011 to 2015, the international insurance market paid claims in excess of \$1.6bn on Russian risks
 - Represents in the region of 40% of the market income over the same period

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The Quality Puzzle:

- Requires both financial and intellectual investment in the sector
- Embracing advancements in production techniques and equipment
- Demonstrated and consistent improved reliability

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Reliability Estimation Techniques

- Failure Discounting Methodology
 - Once a failure has been analysed and corrective actions for that specific failure mode have been implemented, the probability of the failure's recurrence is diminished
- Incipient Failure Probability Methodology
 - This calculation assumes that the next launch is a failure

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Reliability Growth

- *“Initial designs and prototypes are never perfect”*
- *“Reliability can be improved via an extensive testing programmes to identify flaws and make corrections”*
- *“Reliability also grows from operating a system and learning from the performance, the anomalous behaviour, and failures”*

Estimating the Reliability of a Soyuz Spacecraft Mission

Michael G. Lutomski, Steven J. Farnham II and Warren C. Grant

NASA-JSC, Huston, TX – ARES Corporation, Huston, TX

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- We are we today?
- Perception is a difficult thing to change

THE TIMES

1st February, 2017

Metal thieves halt Russian space rocket programme

Russia

Tom Parfitt Moscow

Russia has been forced to delay the launches of Proton space rockets after it was discovered that workers building their engines were using cheap materials that could cause an accident.

The Proton is a “heavy-launch lift vehicle” used to deliver military and commercial satellites to low orbit.

Dmitry Rogozin, the deputy prime minister in charge of the space industry, said workers at the Voronezh mechanical plant in central Russia had deliber-

ately replaced alloys made from precious metals with less heat-resistant ones. “They knew perfectly what their actions could have resulted in — accidents and maybe even death,” he said, demanding “the toughest possible” investigation.

Mr Rogozin said all Proton-M rockets were being grounded for three-and-a-half months because of the defects, which were discovered during tests.

About 300 grams of an alloy for soldering that contains precious metals had gone missing, according to Russian media reports. It was unclear whether it

had been sold or used for another purpose. Officers from the Federal Security Service, the Investigative Committee and prosecutors have been dispatched to the factory to find out how the faulty engines were approved.

“All those guilty for switching the technology and the documentation will be harshly punished,” Mr Rogozin promised. “Three Proton-Ms will be disassembled. Second and third stage engines will be replaced.”

It is the latest scandal to hit Russia’s space industry after years of construction setbacks and allegations of corrup-

tion at the new Vostochny cosmodrome in the far east of the country, which President Putin opened last year.

Dozens of engines made in Voronezh, some of them already delivered to the Baikonur cosmodrome which Russian currently uses in Kazakhstan, will be returned to the factory.

A Soyuz rocket with an engine from the Voronezh factory crashed in December after blasting off to deliver a Progress cargo craft to the International Space Station. Mr Rogozin said that accident was not connected to the switching of alloys.

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THANK YOU