THE LONDON INSTITUTE OF SPACE POLICY AND LAW

SEMINAR SERIES: RISKS ASSOCIATED WITH SPACE ACTIVITY

REPORT ON THE PROCEEDINGS OF SEMINAR IV – II:
POLICY AND REGULATORY RISK
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TABLE OF CONTENTS

ANNEXES: POWERPOINTS FOR PRESENTATIONS

INTRODUCTION

Professor Sa'id Mosteshar welcomed delegates to the seminar and discussed how the seminar fit into the Risk series. He introduced Professor Richard Crowther,[1] who chaired the seminar.

1 RISK AND POLICY IN COOPERATIVE PROGRAMMES: EUROPEAN AND INTERNATIONAL LEVELS

Professor David Southwood[2]

1.1 Overview

There are numerous aspects of risk in cooperative space activities. The International Standards Organisation defines risk as 'the effect of uncertainty on objectives.' Management, which is aimed at achieving objectives, involves identifying, mitigating and juggling risk. As there are a variety of ways in which individuals measure risk in relation to objectives, a simple financial assessment is not necessarily sufficient.

At the European and international level, risk has been controlled through agreements such as conventions, framework cooperation agreements, or memoranda of understanding. Such arrangements are rarely contractual. As a consequence political considerations can be introduced into the process.

1.2 Motivations for International Cooperation

Cooperation between states inherently increases the risk involved for all parties. However, several factors that encourage cooperation may outweigh the increased level of risk.

First, cooperation provides savings on the overall use of resources. Separate projects would require a duplication of efforts, especially when there is a common objective, as in the exploration of Mars.

The second motivation relates to the prestige and influence that states gain through cooperation. Whilst the junior partner is most likely to gain prestige, the more technologically advanced state can gain influence. NASA has spent a large amount of money teaching other states how to conduct space activities. An example of this kind of collaborative project is the Ariel programme, with participation by the UK and the US. For the more technologically advanced state, the benefit of cooperation is not only in terms of 'soft power,' it may also serve as a means to stop a partner state from obtaining skills, by 'turning off' the supply.

The third factor driving cooperation is the opportunity to learn from the experience of the partner. In the ESA and Chinese 'Double Star' project, and the ESA Italian San Marco cooperation, each party gained technical knowledge from the other.

1.3 Tools to Mitigate Risk from International Cooperation

The background to international cooperation in space includes numerous projects. The following are some notable cases.

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[1] Chief Scientist, UK Space Agency; ISPL Advisory Board.

[2] Senior Research Investigator, Imperial College, London; Member of UK Space Agency Steering Board; ISPL Advisory Board; Former Director of Science and Robotic Exploration ESA.

The European Space Agency (ESA) Convention of 1975 is the mode for most civil space programmes in Europe, although not all members of the EU are members of ESA. It does not arise from the Treaty of Rome, but is based on the CERN[3] model and evolved through various organisations such as ELDO[4] and ESRO.[5] International cooperation is central to ESA.

In the United States, the 1958 mandate creating NASA required it to cooperate internationally. Perhaps the reason why the US government made this stipulation, when there was little or no financial benefit, was that it would strengthen ties to other countries. The cooperation with the US as a leader in the field of prestigious space activities would benefit the cooperating states, in that they could be seen to be wishing to have a space programme. Throughout the space age, all Western European states have been involved in cooperative efforts with NASA. The UK became the first European state to fly a spacecraft, and benefited politically through doing so, despite getting into space as a consequence of American technology.

The Soviet Union, and now Russia, has a long history of bilateral cooperation with Comecon countries and others. From 1962, during the Cold War, France and the USSR cooperated on space activities, and in doing so both states gained politically. Similarly, the Soyuz and Apollo rendezvous in space was seen as a symbolic connection between the USA and USSR during the détente of the 1970s. Since Perestroika all space-faring countries have cooperated with the USSR, and now Russia. ESA and others cooperated on several projects.[6]

1.4 Cooperative Structure Within ESA

ESA functions through a system of government council, with a unique structure of discretionary and mandatory programmes. Programme Boards (PBs) look after optional programmes. The internal governance of ESA is entrusted to four committees with devolved power:

- the Industrial Policy Committee (IPC), covers technological and industrial development, industrial 'fair return,' procurement and contract policy;
- the Administration and Finance Committee (AFC), a fairly standard requirement which might seem to be a focal point for programme risk assessment, although content is handled elsewhere;
- the International Relations Committee (IRC), which covers international cooperation outside Member States. All decisions on such cooperation must be unanimous, thus granting a veto to every member, although its veto is rarely used; and
- the Science Programme Committee (SPC), which approves the content of mandatory programmes, against a budget approved by the Council.

From the perspective of Member States, this combination of the Council, Committees and PBs provides a means to interact with management, and is therefore potentially a risk tool.

In addition to building and operating spacecraft and launchers, ESA in involved with technology development, space qualification and space standards. For example, it is involved with the European Cooperation for Space Standardization (ECSS), an initiative established to develop a coherent, single set of user-friendly standards for use in all European space activities.

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[3] European Organisation for Nuclear Research (Centre européenne pour la recherche nucléaire).

[4] European Launcher Development Organisation.

[5] European Space Research Organisation.

[6] ESA and partners cooperated with Russia on ISS; ESA with Russia on IACG and Integral.

1.5 Case Study: Risk Management of Beagle 2 Project

Following a test failure and review of the project, it became necessary to redesign certain elements of Beagle 2. In order to have Beagle 2 ready for its launch window it was necessary to 'cut some corners'. A decision had to be made between further financial investment and allowing some latitude on technical matters. The net result was that the project was completed in time to be launched. However, this was done at the expense of breaching certain ESA standards.

A Multi-Lateral Agreement (MLA) formed the basis for NASA Mars Odyssey craft to rendezvous with Beagle. MLAs were introduced in 2002 because of scepticism within NASA as to the Europeans' ability to deliver instrumentation.

1.6 Case Study: ITAR

The International Traffic in Arms Regulations (ITAR) creates a further risk in cooperating with NASA. Under these rules, sensitive technology can potentially be used, but the transfer of information about how it functions can be limited. The provisions are sufficiently strong that they make individuals responsible under US law for ensuring non-transfer of technology, even contravening ESA diplomatic status.

Such an operating environment creates major technical risks, as complex equipment cannot simply be exchanged as 'black boxes.' It is necessary to understand the manner in which the technology works.

1.7 Case Study – NASA's Relationship with the US Congress

Policy changes may occur due to NASA's need to secure its budget from Congress every year. Projects can suddenly have their funding removed. The financial strength of the USA can make other actors especially vulnerable to its actions. Ulysses, the dual solar polar spacecraft, is an example. The incoming Reagan administration unilaterally cancelled the US part of the programme. The USA has also taken unilateral decisions concerning the International Space Station. However the proposition to decommission it in 2016 was reversed following pressure from other partners. Mitigation of this kind of risk may come from concerted diplomatic action.

1.8 Case Study – Risk Within ESA

The 2010 Edwards Report Cost and Calendar of ESA Projects[7] analysed financial risks within ESA. The Director General was encouraged to put in place methods, processes and tools, to reinforce the Agency's capabilities to control the cost and planning of ESA projects.' The study concentrated on the point in a project at which an approved envelope and an industrial committing price are in place.[8] At this point, cost, scope and schedule are known, providing for better post hoc assessment of what would otherwise be 'risk.' It also argued that the most significant improvement to cost stability would be for the ESA Executive to refuse the imposition of 'unrealistic constructs and requirements'.

[7] ESA/C(2010)20.

[8] Usually at the start of Phase B2.

The PowerPoint presentation in Annex I[9] sets out various elements of risk associated with ESA programmes, including avoidable causes, Acts of God, conflicts of interest, along with their overall cost and schedule implications and ranking of particular causes for increase in schedule and cost. Programme Imposition was found to be the most serious cause of cost overrun, for reasons set out in the PowerPoint. There is also a financial programme management table illustrating cost overruns on particular projects.

These issues were analysed in detail in 2007.[10] It was concluded that there should be no more 'package deals,' deals effectively made in advisory committees and the Science Programme Committee to secure a mission's place on the list. A firm 'go' or 'no go' should be required from SPC against realistic budget. The team also analysed Operations, concluding that the substantial increase in operating costs was due to the large number of missions launched from 1999 on. A long-term plan to rebalance the programme was initiated, to report yearly to the Council.

1.9 Discussion

The US government cooperation and collaboration in the Atoms for Peace programme and the International Geophysical Year were seen as analogous to cooperation on space programmes. It is truly rare for a government to do anything for altruistic reasons.

2 CRITICAL POLICIES AND REGULATORY PROVISIONS AFFECTING SPACE PROJECTS

Professor Kai-Uwe Schrogl[11]

2.1 Context

All participants in space activities, whether private or public, operate in an environment that is shaped by space policy. Five regulatory issues are important:

- national space legislation;
- liability issues;
- frequency allocation;
- data policies; and
- insurance requirements.

2.2 Space Policy

Within Europe, space policy is multi-layered, comprised of the policies of multinational organisations such as ESA, Eumetsat, European Commission and European Defence Agency, as well as national space policies. ESA itself does not have a specific policy, as it is a research and development organisation. However, decisions on the allocation of funds are fundamentally policy decisions.

Because space policy is composed of factors from differing areas, it is inherently exposed to risk from changes enacted by European actors. The revision of a policy can lead to risk for

[9] See slides 23 – 31.

[10] Science Programme Review Team, 2007, appointed by the Council to investigate management of Mandatory Science Programme, Chair Reinder Van Duinen.

[11] Head of Policies, ESA. Presentation co-authored by Dr Ulrike Bohlmann, ESA. See Annexed Powerpoint Presentation.

those who wish to carry out space activities, as it results in an unstable environment. Risk in this context relates not only to large-scale matters, but also to seemingly minor issues that can cripple a whole project. Stability and reliability are crucial to programme perspectives, in policy areas such as focal areas, industrial policies and regulatory frameworks, as well as national and international partnerships including Public Private Partnerships (PPPs).

2.3 Industrial Policy

The purpose of industrial policy is to secure independent industrial capacity in strategic sectors. It aims to provide reliability for further development of the space sector, along with a stable market for commercial interactions and public procurement.

A risk associated with industrial policy is that government priorities can change. For instance, policies that promote SME or sectoral support programmes might be changed, reversed or halted.

Industrial policy can also be subject to 'over-regulation.' There are many detailed issues to be considered with reference to industrial policy, such as project architecture, subcontractor management, Technology Readiness Level, TRL, assessment and workforce development. When planning space activities, these can make it a complex area to navigate.

2.4 Regulation: National Space Legislation

National space legislation is driven by the need to benefit the national space sector, and by implementation of international obligations. National legislation is drafted to implement, for example, Article VII OST,[12] the Liability Convention, and the Registration Convention, through authorisation and licensing procedures.

The national regimes vary, as the States are signatories to different combinations of Treaties. There is no European harmonisation of regulation. Under Article 189 II of the *Treaty on the Functioning of the European Union* (TFEU) there shall be no harmonisation of national space legislation. The situation is therefore complex as some states have very detailed and sector-specific legislation, whilst others have virtually none. Furthermore, some elements of national space law are not easily workable with each other. The International Relations Committee of ESA has worked towards harmonisation of European wide legislation on space policy, but has not succeeded.

This lack of harmony, and an absence of clarity concerning future developments including new requirements, leads to legal uncertainty, and an element of risk arises concerning the stability of the legal environment. This might lead to operations being conducted under 'flags of convenience' from states with relatively weak legislative requirements. France has placed television satellites in orbit using Ariane, which is heavily regulated, while in contrast Luxembourg uses a cheaper, and less regulated, Chinese system.

2.5 Regulation: Liability Issues

Under public international law, there is general liability, raising the need for due diligence. Under specific space law, including the Liability Convention, there is absolute liability for the Launching State for damage caused on Earth or to aircraft in flight. Fault-based liability applies to damage caused elsewhere. Space debris presents physical risks to space projects. The UN and the Inter-Agency Space Debris Coordination Committee (IADC) are devising guidelines for debris mitigation. Where there is a need to prove fault, two risks arise: along

[12] Outer Space Treaty 1967.

with an inherent difficulty in proving that a fault has occurred, it may be difficult to establish exact liability when ownership of objects change.

In relation to liability risks, it is necessary to monitor technical advancements and the current state of the art. Indemnification may be an issue in the case of private activities.

Under domestic law, there is general liability, although they are generally waived among participants and partners. Further, financial liability is often capped. There may be risks associated with these laws. Although cross-waivers are compatible with US and French space law, they cannot be considered to be valid under all domestic jurisdictions. The French government recently asked for the European Commission to examine its liability cap and corresponding State warranty to establish whether they were permissible under state aid regulations. The Commission found that they constituted state aid and distorted competition, but that they were compatible with the common market.

2.6 Regulation: Frequency Allocation

Frequencies slots available for satellites are a limited natural resource and are regulated by the International Telecommunications Union (ITU).[13] There is also informal international coordination through the Space Frequency Coordination Group (SFCG).[14] Applications are made to national authorities, which are responsible for allocation.

Risk may arise through this system of international competition for frequency allocation. Operators are exposed to the inherent risk that they will not be able to establish the capacity that they require. Those wishing to use them are dependent upon the ITU's current position, and consequently must monitor all relevant study groups for any changes that may occur.

Risk can also arise as a result of systems of national and regional allocation, such as the EU telecommunications package. The EU is radically liberalising the telecoms market and its regulation. It has introduced technology and service neutrality. Satellite services may be put at a competitive disadvantage, as they depend on security of frequency allocation throughout the life of the satellite.

2.7 Regulation: Data Policies

There are conflicting policy priorities concerning the availability and distribution of data. The UN Principles on Remote Sensing,[15] Aarhus Convention[16] and INSPIRE Directive[17] are based

[13] World radiocommunication conferences (WRC) held every three to four years review, and, if necessary, revise the Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. Revisions are made on the basis of an agenda determined by the ITU Council, which takes into account recommendations made by previous world radiocommunication conferences.

[14] The informal group of frequency managers of civil space agencies formed in 1979. Their purpose is to provide working level coordination of international RF spectrum usage among science services, to informally implement policy and procedural changes in advance of formal ITU regulatory changes, and to adopt agreements that provide means for space agencies to make best use of allocated bands and to avoid interference among member space systems. See https://www.sfcgonline.org/home.aspx, accessed 11 March 2012.

[15] The Principles relating to remote sensing of the Earth from space, 1986, http://www.un.org/documents/ga/res/41/a41r065.htm

[16] The Arhus Convention is the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters adopted 25th June 1998. It is an important environmental agreement. See http://www.unece.org/env/pp/welcome.html

on the principle that access to data should be unrestricted. By contrast, the intellectual property rights (IPR) regime protects data collection. The EU's Database Directive creates intellectual property rights in databases, which control access to the gathered information.

The principal risk in this area is governmental policy change that may occur during a long-term project. These may arise from security considerations, such as the new license requirement under SatDatSiG,[18] under which the German government presently limits data gathered by satellites that can be sold. There may also be indirect influence on commercial projects from policy concerning government projects, such as the Global Monitoring for Environment and Security programme (GMES).[19]

2.8 Regulation: Insurance Requirements

The UK government, as of 4th July 2011, requires insurance cover of €60m for third party liability. The US government determines the amount based upon maximum probable loss, generally not exceeding $500m. Australia has a comparable approach.

As with all insurance in volatile, high-risk sectors, there are imponderables. Launcher reliability and the presence of orbital debris pose risks including the potential loss of satellites, and consequently increased insurance costs. Because there is a narrow market, changes in insured risks will have a proportionately large impact on premiums.

2.9 Discussion

It was observed that the International Standards Organisation (ISO) is developing standards, which might be agreed by Member States. This is one of a number of responses that have been put in place to address the risk associated with the debris problem.

3 MANAGING POLICY AND REGULATORY RISKS: CHANGE OF GOVERNMENT FOCUS AND EMPHASIS AND POLITICAL PRIORITIES

Stephen Gibson[20]

3.1 Context

Regulation is defined as a rule or directive made and maintained by an authority. There are a variety of perspectives concerning its desirability. It is dynamic, subject to change, political, restrictive by nature. Its impact on the space industry is in several areas.

3.2 Regulation in Space Industry

The space sector is subject to regulation in the following areas:

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[17] The INSPIRE Directive 2007 establishes an infrastructure for spatial information in Europe to support Community environmental policies, and policies or activities that may have an impact on the environment. http://inspire.jrc.ec.europa.eu/

[18] The objective of the Satellite Data Security Act (SatDSiG) is to maintain the security and foreign policy interests of the Federal Republic of Germany in connection with the distribution of Earth remote sensing data. (Translation of statement at http://www.bafa.de/bafa/de/weitere_aufgaben/satdsig/index.html)

[19] GMES is the European Programme for the establishment of a European capacity for Earth Observation.

[20] Commercial and Procurement Director, Surrey Satellite Technology Ltd. (SSTL).

1. Health and safety;
2. Space licensing;
3. Taxation;
4. Insurance;
5. Export (ITAR); and
6. Chemical - environmental (Hydrazine as regulated by REACH).

The presentation focussed on ITAR and Hydrazine as regulated by REACH.

3.3 Overview of ITAR

The International Traffic in Arms Regulations (ITAR) is an export regime imposed by the United States government on defence-related equipment and services.[21] They date from the Cold War, were intended to prevent technology reaching the USSR, and have a stated goal of safeguarding US national security and furthering US foreign policy objectives.

ITAR regulates movement of hardware between countries and people, specifically the export and import of defence-related articles and services on the US Munitions List (USML). It also regulates movement of information between US and non-US citizens. Information must be provided concerning exactly who has seen and touched a piece of technology. The regulations are actively enforced[22] by legal action against companies and individuals, which may result in heavy fines and imprisonment. Actions under ITAR have increased over the last two decades.

ITAR regulations directly affect the European space industry, as essential items are included on the USML. Its significance to the industry was highlighted by the loss of INTELSAT 708, built by Space Systems Loral, on board a Chinese Long March rocket in 1996. ITAR controlled cryptographic technology was lost over the People's Republic of China (PRC).

3.4 Consequences of ITAR

ITAR is an expensive and bureaucratic process for companies, not least because any component subject to ITAR regulation has to be tracked throughout its entire life. It is necessary to demonstrate control of the relevant products and information. Furthermore, the process is lengthy. US approval for export takes a minimum of 6 weeks. An added risk for European companies with US subsidiaries is the accidental transfer of information, perhaps by e-mail. Interactions with US employees must be heavily controlled.

ITAR restrictions on the sale of technology to certain countries, including the PRC, North Korea, India and Iran, limits the size of the market for potential sales. This, along with the cost and inconvenience of the ITAR regime, has driven companies to develop innovative programmes to avoid its complications. DMC-3, The Disaster Monitoring Constellation-3 satellite constellation is one example.[23] It also motivates companies to develop ITAR-free technology, such as Thales Alenia Space telecom satellites, which it states are ITAR-free.[24]

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[21] The regulations implement provisions of the Arms Export Control Act (AECA).

[22] The Department of State Directorate of Defense Trade Controls (DDTC) interprets and enforces ITAR.

[23] Built by SSTL and owned by its subsidiary, DMCii, its commercial model is to lease capacity, providing daily access anywhere in the world. The first customer is the Twenty First Century Aerospace Technology Co. Ltd. (21AT) of Beijing, taking 100% of the capacity of the three high-resolution satellites under a 7-year contract. See http://events.eoportal.org/get_announce.php?an_id=10003531

[24] A number of Thales satellites labelled 'ITAR-free' have either been launched by China or are expected to be, and in 2011 the government of Turkmenistan ordered the latest ITAR-free satellite as part of a contract that includes a launch aboard the Chinese rocket. China has slated the launch of two more Thales ITAR-free

ITAR plays a major role in US foreign relations, not only with states which are perceived as threats, but also allies of the USA. The uncertainties this creates are significant. The UK government is still waiting for approval for technology required for the Joint Strike Fighter (JSF) Lightning II programme, held up in government committee. Canada, exempt from ITAR between 1963 and 1999, was subjected to its restrictions following use of third country nationals and non-agreement over US-proscribed markets. It was exempted again in 2001. US contractors have seen orders go to foreign manufacturers, such as the EADS helicopters bought by Australia in preference to Sikorsky, in 2006. The US share of the satellite manufacturing market fell significantly in 2008, from 80% to 50% of the market.

An added element of risk arises from the fact that the list of items prohibited by ITAR is constantly changing. Companies must be vigilant, as a piece of technology might become subject to ITAR during a programme. Furthermore, if an ITAR piece of technology is part of a non-ITAR device, the whole system becomes subject to ITAR. It is essential to ensure that ITAR-free technology does not 'become infected with the ITAR virus.'

Finally, contractual negotiations are complicated by ITAR considerations. Pre-approval of export may be part of the tender process. Nor is it considered *force majeure*. European satellite customers expect the manufacturer to take ITAR risk of delays or failure to receive approval.

3.5 Overview of REACH Regulations

Registration, Evaluation, Authorisation and Restriction of Chemicals[25] (REACH) is EU legislation on substances damaging to the environment or human health. The PowerPoint in Annex 3 explains some of the terminology.[26] Its three pieces of legislation are:

1. CLP, which enhanced requirements of safety data sheet (SDS) management, COSHH-type assessments and labelling of containers;

2. Supplier Communication, concerned with SDSs and Article 33 Declarations; and

3. Elimination of Substances, containing the Candidate List, Annex XIV and Authorisation. This part of the legislation is relevant to the use of hydrazine by the space industry, and was the element of REACH covered in this presentation.

All substances manufactured or imported by companies in quantities of more than 1 tonne per year have to be registered with the European Chemicals Agency (ECHA). All registered substances must also have all uses identified on a SDS with a 5-part code. ECHA must also be notified if more than 1 tonne per year is used of a substance on the Candidate List.

REACH has a scope that is larger than previous legislation.[27] Instead of focusing solely on short terms effects of substances, for instance whether they are poisonous or explosive, REACH considers long-term effects to establish whether substances are hazardous. It adds

satellites for 2012. See Peter B De Selding, *US, Thales at Odds Over Request for ITAR-free Satellite Design Information*, Space News, 6 January 2012, http://www.spacenews.com/policy/120106-thales-request-itar-free-sat-info.html. The US State Department has since 2008 made efforts to investigate whether the W3C contravened ITAR, but the company asserts that it may not flout French Government rules forbidding companies to supply documents or information to be used in foreign governmental investigations.

[25] Regulation No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

[26] See slides 12 and 13.

[27] The legislation is more than 2,250 pages long.

substances with long-term effects on human health and the environment, such as those that are:

- carcinogenic, mutagenic, or toxic for reproduction;
- persistent bio-accumulative and toxic;
- very bio-accumulative and very persistent; and
- possessing endocrine disrupting properties.

When a substance is proposed for evaluation by REACH by a Member State or by ECHA, there is a period of public consultation, after which it will be decided whether it meets these criteria. If so, it is labelled a substance of very high concern (SVHC).[28] Once that determination is made, it may be added to the Candidate List. [29]

The EU Member State Committee (MSC) then decides whether the substance should be a of prohibited substance. The decision is made on the basis of the hazardous nature of the substance. Submission concerning the impact of its prohibition are allowed, but do not form part of the decision-making process.

3.6 Prohibited Substances and Hydrazine Regulation under REACH

The list of substances that are prohibited is given in Annex XIV of REACH. Individual users can apply for Authorisation from the European Chemical Agency (ECHA) to continue using the substance, but this is expensive as it is specific to one company, whereas Exemption applies across a whole industry. In theory an Exemption can be granted for a specific industry to continue using the substance, but there have been very few exemptions.

When a substance is added to Annex XIV a sunset date will be given after which it cannot be used, usually a period of three to four years.

The space sector has a particular interest in one substance now on the Candidate List. Hydrazine is a relatively cheap and effective rocket fuel. It is also carcinogenic, mutagenic and toxic to reproduction. It was added to the Candidate List at the request of Sweden, it could be moved to Annex XIV as soon as June 2012. Furthermore, hydrazine has not been registered for use as a satellite fuel. The manufacturer must register all uses of the substance, and in June 2012 its use for this purpose will become illegal. No exemption or authorisation will be possible.

There are no current plans to eliminate the use of hydrazine in the US, Russia, China or India. Nor is there currently a substitute for hydrazine,[30] and developing a replacement satellite design could take 10 to 15 years. It is not only used by the European space industry. 250,000 tonnes of it are manufactured every year of which only 50 tonnes for the use of European satellites. If the substance were not used elsewhere, it would not be economically viable to manufacture it solely for the space industry.

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[28] There are about 3,500 SVHCs to be processed by ECHA.

[29] At this stage REACH does not impose reporting requirements or specific restrictions, provided there is compliance with SDS and use definitions.

[30] Ammonium dinitramide (AND), said to be a smokeless and green propellant, has been proposed as a possible substitute. Its solubility in water allows its application as liquid monopropellant. See Márcio y Nagamachi, José Irineu S Oliveira, Aparecida M Kawamoto, Rita de Cásia L Dutra, *ADN - The New Oxidizer Around the Corner for an Environmentally Friendly Smokeless Propellant,* Journal of Aerospace Technology and Management, Vol. 1, n. 2, Jul. - Dec. 2009, pp. 153 et. seq., http://www.jatm.com.br/papers/vol1_n2/JATMv1n2_p153-160_ADN-The_new_oxidizer_around_the_corner_for_an_environmentally_friendly_smokeless_propellant.pdf

3.7 Hydrazine Regulation under REACH – Potential Solutions

Replacement would be an ideal solution, but there is no viable alternative to Hydrazine within the available timescale.

Application for *authorisation* is the second option. While the legislation defined some exemption scenarios, the process is not defined. There are certain circumstances in which Authorisation may be exempted or may not apply.[31] Very few have been granted so far, and the cost is high, and there is no guarantee of success.[32] In addition, the application must be received prior to the start of the public consultation period, which for hydrazine could commence in the middle of 2012.

Use may be exempted from Authorisation on the basis of existing specific Community legislation imposing minimum requirements relating to the protection of human health or the environment of the use of the substance, and the risk is properly controlled.

Do safety measures we implement in hydrazine use have a foundation in EU regulation? Does ESA exercise control over our processes?

It is difficult to believe that an application for Authorisation would be refused, as doing so would destroy much of the European space industry. However, there is no way in which to get a 'default' Authorisation. It would be necessary to follow the entire process and all users would have to cooperate, including all national enforcement agencies and space agencies. All levels of the supply chain would need to obtain Authorisation, and it would be unlikely to be granted to new users. Furthermore, if an Authorisation were obtained, it would not guarantee that supply of hydrazine would be available, as the amount used for space applications is so small as to be uneconomic for manufacturers.

Exemption is the preferred option. The disposition is made much earlier in the REACH process, leaving time to apply for Authorisation if necessary. The cost is significantly less,[33] and the entire supply chain need not be involved in the formal response. While the Authorisation process is onerous, exemption is designed to allow justified uses. If there is to be an application for exemption, it must commence soon.

Application for an exemption may well involve industry-wide action, and would probably include new users. Significant expert assistance would be required, and if Authorisation is required, costs would escalate. Very few exemptions have been granted. Further, they are usually time limited, so a replacement would still be required. An argument could be made for exemption on the basis that Hydrazine is not present in the exhaust of rockets, and that it may not be relevant if Hydrazine is exhausted outside of the Earth's biosphere. More research is required into the potential of this course of action.

Information is being gathered about the hydrazine supply chain, and about previous exemption applications. Consultants are evaluating whether any or all of the exemptions we explored are viable. There is on-going evaluation about cooperation with other satellite manufacturers for a coordinated European strategy for Europe, and whether a single application for exemption may be made on behalf of the European satellite industry.

[31] See slide 22 in the PowerPoint at Annex 3.

[32] €2 million. See ppt. p. 21.

[33] € 300 – 400 thousand.

In future, steps could be taken which include negotiation with ECHA, meetings with satellite integrators to identify common ground, confirmation of exact codes for SDSs to establish a baseline for exemptions, and develop an action plan.

3.8 Conclusions

ITAR is a US government tool, driven by US perceptions. It is an expensive overheard for industry to carry, as there is always the risk of fines for small errors. Institutional customers are not sympathetic and expect the industry to carry the risk.

The issue of REACH regulation of hydrazine is an environmental and health and safety issue for Europe. It is a threat to the European space industry, where safety is more important than business impact, and one that the USA, Russia and China do not face. The processes are heavily bureaucratic, with no guaranteed final solution. Solving the problem will be difficult and expensive, requiring cooperation throughout the European space industry.

3.9 Discussion

Clarification was requested as to whether hydrazine was to be restricted to being used in quantities under a tonne per year, or completely banned. It was to be completely banned.

4 APPROACH TO POLICY AND REGULATION IN THE ISLE OF MAN

Dr. Don Jayasuriya[34]

4.1 Legal Location of the Isle of Man

The Isle of Man (IoM) is not part of the UK. It is a Crown Dependency in Custom Union with the UK, and consequently has free movement of good and services within the EU. The UK is responsible for its Foreign Affairs and Defence.

4.2 Regulation of Satellites Registered in the Isle of Man

There are two government bodies that regulate space activities: the Isle of Man Communications Commission and the Department of Economic Development, Office of Space Commerce. There is also Honorary Representative for Space in the Office of the Chief Minister. The government's objective is to expand the space sector by creating the right legal and commercial climate for the sector.

The Outer Space Act (OSA) was extended to cover the IoM under the Statutory Instrument 1990 No 596. The IoM government enforces OSA regulations and applications for an OSA licence are made ultimately to the UK Space Agency.

Satellite filings from the IoM are subject to regulation by OFCOM, which carries out ITU functions within the UK. ManSat assists the government in this process, carrying out satellite filing on behalf of the IoM government as part of a Public Private Partnership with the Communications Commission. The same conditions and regulations that OFCOM applies throughout the UK apply in the IoM.

In the UK, and therefore in the IoM, licensing regulations are applied stringently. An application for space activity based in the IoM is submitted first for advice to the Manx government, followed by the formal application to the UKSA, where it is treated as any

[34] Director, ManSat.

domestic application. The IoM government insures itself for liability with insurance cover above the protection level required by the UKSA for a launch licence.

Several major satellite companies carry out filings through the IoM. ManSat is able to offer a seamless process to guide satellite operators through the regulatory process, and is thus able to reduce risk to the industry.

Companies based in the IoM have obtained 11 OSA licences to launch or operate space objects. ViaSat-1 was recently launched under licence from the Isle of Man, to operate under one of the IoM orbital slots. It covers North America and Hawaii and has a greater capacity than the sum total of all other satellites covering the territory.[35]

4.4 Conclusions

The Isle of Man aims to minimise the burden of the regulatory environment for those wishing to conduct space commerce. ManSat and the IoM Government assist in the process of OSA licensing.

4.5 Discussion

A delegate asked about the location of the Board of ManSat. ManSat is a very small company, with administrative offices and the majority of the Board meetings on the island. The company also has offices in London and Houston.

5 QUESTION & ANSWER SESSION

Chaired by Professor Richard Crowther

5.1 The Human Element in Identification of Risk

What about the human element in establishing risk?

There is always an element of psychology in bringing information that is a long way from 'day to day' issues to the attention of senior managers. Project Managers tend not to be forthcoming with problems, and seek to resolve them without bringing them to a senior manager's attention.

5.2 Use of the Terms 'Plans' and 'Objectives'

Was not the term 'plans' preferable to 'objectives', as political elements can cloud the issue when discussing objectives?

A distinction can be drawn between objectives and plans, which can be changed in order to achieve objectives. 'A studied ambiguity' can be necessary when bringing together two parties' separate objectives. Similarly, a tightly written contract can be fulfilled, but still fail to meet the overall objective because it was crisply written.

5.3 The Appreciation of Risk in Documents

[35] Viasat-1, launched in 2011, is the first to operate from one of the IoM's orbital slots. It is a 140 Gbps throughput, high-capacity Ka-band spot beam satellite covering North America and Hawaii. It provides consumer broadband in the US, and in Canada. The technology is also scheduled to begin delivering service to passengers aboard two airlines. See http://www.space.com/13432-isle-man-launched-satellite-viasat.html, http://www.ssloral.com/html/satexp/viasat.html, and http://www.viasat.com/viasat-1-launch.

Have there had been changes in the appreciation of risk when drafting documents?

Force majeure provisions have expanded in different directions. More risks are now included in force majeure, such as industrial action, whereas it used to refer almost exclusively to 'Acts of God.' There is a debate about whether 'epidemic' or 'pandemic' should be included in force majeure provisions. ESA does not classify ITAR as force majeure.

It was also observed that twenty years ago US companies backed the confirmation of ITAR.

5.4 Certification and Licensing

Would it not be preferable if the UKSA had a process of certification instead of licensing?

As horizontal take-off will pass into different jurisdictions, the only solution is certification, along the lines of the airline industry.

There would be a resource issue, as it would result in the UKSA doubling in size. The matter is currently under review. In addition, in 2012 many competencies relating to vehicles requiring aerodynamic lift will be transferred to the European Aviation Safety Agency (EASA). The US Federal Aviation Authority (FAA) has a licensing system for space flight, as there was a requirement for system of regulation that was not too restrictive. Again, there is a question of resources. Further expansion into a certification system could lead to issues of double regulation.

5.5 Substances regulated by REACH

Are there substances other than hydrazine that might become subject to REACH regulation in relation to the space sector?

Hydrazine is the focus of attention at present because of the timing of its status in the regulatory process and its importance to the industry. The industry was not expecting the development, and perhaps should have been paying more attention. The REACH regulations are concerned with sustainable development, and ESA has conducted some research into this matter, which is usual for such an intergovernmental organisation.

5.6 Regulation in the Isle of Man

What is it about regulation in Isle of Man that makes it less burdensome, when the licence applications still go through UKSA?

This is achieved through the expertise of ManSat, so that the applicant is guided through the application process.

6 CONCLUSION OF THE SEMINAR

THE Chairman and the Director of ISPL thanked the delegates and the speakers for their contributions.

ANNEX I

RISK & POLICY IN COOPERATIVE PROGRAMMES, EUROPEAN & INTERNATIONAL LEVEL

Professor David Southwood

Warning: Author is neither lawyer, international relations, nor policy expert.

However much experience of large space project development in last decade
- all with many elements of international cooperation.

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Risk and Policy in Cooperative Programmes
at European and International Level

3

Example of programme level risk reporting :

5. Tableau De Bord

Status 09/11/2009

Programme/Project	Schedule	Technical	CAC or PA Plans	PA Forecast 2009	Contractual Status (CA plans)	Workforce	Risk
D/SRE OVERALL	NA	NA	NA	↓	→	→	↓
HERSCHEL-PLANCK	→	↑	↓	NA	→	NA	→
LISA PATHFINDER	→	↑	→	NA	→	NA	→
GAIA	→	→	↓	NA	→	NA	→
JWST	→	→	→	NA	→	NA	→
BEPICOLOMBO	→	↓	→	NA	→	NA	↓
ExoMars	→	→	→	→	→	→	→

Legend: Trend since previous review — ↓ Less critical, → Unchanged, ↑ More critical

Issue level: No issue to discuss | Issue at D/SRE level | Issue at DG Level

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Risk and Policy in Cooperative Programmes
at European and International Level

4

At *European and international level* control of risk has, almost always to be through international agreements (Convention, Inter-Governmental Agreement, Framework cooperation agreement, MOU, LOA, MLA, etc.)

– normally commitments are "no exchange of funds" and "best efforts", rarely contractual…..

Politics enters inevitably.

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What are the tools to mitigate risk from international cooperation?

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International Cooperation : Some background items

ESA Convention (1975) – for most Western European countries this is the primary mode for most civil space programmes
- grew out of ashes of ELDO and ESRO
- which in turn grew out of CERN (not Treaty of Rome)
- international cooperation at the core.

NASA – mandate to cooperate internationally from founding in 1958
- UK Ariel programme based on NASA
- All Westerm European nations have had cooperations with NASA

Russia (USSR) cooperated bilaterally
- notably with France from 1962 + others in perestroika period (**incl UK**)
- Comecon countries (as USSR)
- USA (Soyuz/Apollo (as USSR) , ISS (as Russia) with ESA + partners
- with ESA in IACG and Integral

Numerous other small cooperations between space-faring nations

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Risk is "the effect of uncertainty on objectives"

- What are the objectives of international cooperation?
  - to save overall resource (and is undertaken with common objective)
  - for reasons of prestige and influence (on part of dominant partner)
  - to learn from experience of partner

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Risk and Policy in Cooperative Programmes at European and International Level 8

Risk is "the effect of uncertainty on objectives"

- What are the objectives of international cooperation?
  - to save overall resource (and is undertaken with common objective) - e.g. exploration of Mars with US, or cooperation on JWST
  - for reasons of prestige and influence (on part of dominant partner) – ISS (from US perspective), Ariel (from US perspective but also UK), San Marco (from US perspective)
  - to learn from experience of partner - San Marco (Italy), China (Double Star),
  - (?) Sometimes even to preclude/delay partner obtaining skills……

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ESA Convention (1975) – ESA grew out of ashes of ELDO and ESRO – which in turn grew out of CERN (not Treaty of Rome)

Note that ELDO has been used in Management Schools as an example of how not to manage large cooperative projects

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Risk and Policy in Cooperative Programmes at European and International Level 10

Sets up a system of government through Council
- unique system of optional + mandatory progammes

Four committees with devolved power
IPC, AFC, IRC, SPC (covering mandatory science programme)
Programme Boards (PB's) look after optional Programmes

From Member State perspective, Council + Committees, PB's provide means to interact with management
– therefore potentially a risk tool

NOTE on Committees

"Administrative and Finance Committee" fairly standard requirement for such organisations.

*"International Relations Committee" covers international cooperation outside Member States - all decisions on international cooperation have to be taken finally by **unanimity** at Council.*

"Industrial Programme Committee" covers generic technology development, development of industry, industrial "fair return", procurement policy, contract policy

Science Programme Committee – approves content of mandatory programme – against a budget approved by Council

AFC might seem the focal point for programme risk assessment from MS viewpoint
– however content (including internat'l affairs) handled elsewhere.

What else does ESA cover beyond building and operating spacecraft and launchers?

Technology development, space qualification

Space Standards

Technical standards

ECSS Organisation

Risk reduction by use of international standards

Industry (through Eurospace) play a major role

"self-regulation"

Imposition through contract

Link CEN - ISO

ECSS Steering Board as of 8 February 2011	
SOUTHWOOD David (Chairman)	European Space Agency (ESA)
BALESTRA, Luciano (ECSS Executive Secretary)	European Space Agency (ESA)
Voting representatives	
PROCACCI, Benedetto	Agenzia Spaziale Italiana (ASI)
LAM-TRONG, Thien	Centre National d'Etudes Spatiales (CNES)
DE MESMAY, Jérôme (Proxy Voting rep.)	
HEINEMANN, Jürgen	Deutsches Zentrum für Luft- und Raumfahrt (DLR)
PEROL, Phillipe	European Space Agency (ESA)
MEIJVOGEL, Bert	Netherlands Space Office (NSO)
CROWTHER, Richard	UK Space Agency
LE MOINE, Michel	Astrium Satellites (for Eurospace)
PAYSSÉ, Jean-Marc	Thales Alenia Space (for Eurospace)
FIAT, Michel	Thales Alenia Space (for Eurospace)
WATILLON, Philippe	Astrium Space Transportation (for Eurospace)
Not voting ECSS members	
HARTMAN, Leo	Canadian Space Agency (CSA)
ANDERSEN, Bo	Norwegian Space Centre (NSC)
TA Chairman	
MOURY, Gilles	CNES
SB Observers	
MOURA Denis	EDA
BERNÈDE, Georges	EUMETSAT
DELLA FAILLE DE LEVERGHEM, Alexandre	CEN

14

Report from D/SCI ESA to DG ESA mid-2002

"Following the Beagle-2 review during March, the progress has been slower than hoped for, due to the necessity for redesign in certain areas following test failures. A resident engineer is being placed in Stevenage to oversee the current test programme, which is not being run to ESA standards, rendering it difficult to evaluate failures."

Report from D/SCI ESA to DG ESA mid-2002

"Following the Beagle-2 review during March, the progress has been slower than hoped for, due to the necessity for redesign in certain areas following test failures. A resident engineer is being placed in Stevenage to oversee the current test programme, which is not being run to ESA standards, rendering it difficult to evaluate failures."

On the other hand – what was the background?

Beagle-2 was under severe financial and schedule stress. Already a large amount of ESA support had been given and certain Member States felt a line should be drawn…… Shouldn't a line be drawn financially but latitude given technically?

Later the approach was to be a major element of the Select Committee criticism of ESA in its handling of Beagle-2 expressed as "Treatment of Beagle-2 as an instrument"

Nevertheless, with the cutting corners approach, the lander was built, tested, delivered, successfully checked-out in space, and launched towards Mars. Nature had ensured there was no back-up for 2003 launch date. (Next Mars opportunity in 2005 was not propitious and s/c could not carry a lander and get to Mars.)

Beagle-2 was far from only example of Member State furnished instrument being under-resourced

=> introduction of the MLA – Multi-Lateral Agreement

- signed between all Member States who are providers of items directly from national resources for an instrument or other item of payload

- introduced finally in 2002 because of NASA scepticism of a European Member State consortium's capacity to manage and deliver the large MIRI instrument for JWST

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	Risk	Causes	Consequences	Mitigation action(s)	I.S.	Risk Owner(s)
12	Failure of national entities within MS to deliver in-kind contributions in the frame of existing agreements	Insufficient funds available to national funding Agencies Delays in delivery Re-assessment of the international partner's priorities	ESA could be solicited for additional funding; increase of mission cost; delays or even cancellation of the cooperative programme	1) Put in place together with MS a MLA-type agreement governing all types of in-kind contributions. 2) Agree with MS a liability scheme governing financial consequences of delays of in-kind contributions. 3) Applicable to the Scientific Programme only: • In the case of major international cooperation: negotiate self standing in-kind contributions (self standing packages, with clear interfaces), create a good working scheme for exchange of info and preventing delays, ensure early signature of MOUs to set responsibilities as soon as possible • In the case of multilateral agreement for P/L delivery: ensure the P/L provider has sufficient funding for the delivery of the P/L, upon signature of the multilateral agreement.	a a b c	D/LEX and D/SRE

Multilateral agreement – MLA – introduced 2001/2 in order to meet NASA scepticism of large scale European member state capacity to deliver on time for JWST.

Now a standard procedure for Science and being introduced elsewhere

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Risk and Policy in Cooperative Programmes at European and International Level 18

Further major risk issue with NASA

ITAR

ITAR = International Traffic in Arms

Use of sensitive technology is possible in cooperation but transferring information on how it works is limited.

Agreements required that make individuals responsible under US law for ensuring non-transfer of technology (even contravening ESA diplomatic status)

Introduces major technical risks – a research level technological cooperation cannot simply exchange "black boxes"

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Third major risk issue with NASA

Changes in policy associated with changing policy due to NASA's need each year to obtain budget from US Congress

Most infamous example : Ulysses – dual solar polar spacecraft ESAincoming Reagan administration unilaterally cancelled US side of programme

There have also been unilateral decisions on ISS. However original presidential proposal to end in 2016 was reversed following action by partners

Mitigation – concerted diplomatic action

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Risk and Policy in Cooperative Programmes at European and International Level 20

ESA level risk

Edwards Report Cost and Calendar of ESA Projects ESA/C(2010)20

Presented to ESA COUNCIL - February 2010

2008 ESA Council at Ministerial level (CM-08) the ESA Director General was encouraged "to put in place methods, processes and tools, to reinforce the Agency's capabilities to control the cost and planning of ESA projects"

Edwards Report on "Cost and Calendar of ESA Projects" ESA/C(2010)20

Study concentrates on the point in a project where an approved envelope and an industrial committing price are in place, usually at the start of Phase B2.

At this point scope, cost and schedule are known and therefore provided clear yardsticks for post hoc assessment of what would otherwise be "risk"

	CAUSE DEFINITIONS
A)	**Avoidable**
#1	Production problems (with mature technology)
#2	Insufficient Design Maturity (e.g. development schedule to CDR)
#3	Insufficient ESA Internal Manpower
#4	Missing Requirement/Requirements growth (Class A CCNs)
#5	Optimistic Initial Cost estimate / Optimistic cost allocation for subs
#6	Optimistic original Schedule estimates
#7	Poor Industrial performance
#8	Poor procurement approach
#9	Technology Insufficiently demonstrated (failure of qualification etc)
B)	**Acts of God**
#10	Force Majeur, accident
C)	**Conflict of interest**
#11	Programmatic Imposition *
#12	Programmatic delay due to launchers
#13	Programmatic Imposition 3rd party delivery problem
#14	Geographical constraint

Table 2: Generic Causes defined for the Analysis

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23

The initial analysis of the 30 programmes i

	Specific Causes	Cost increase in absolute terms		Cost increase in % compared to baseline CAC	No of causes with specific schedule impact	
		In %	in M€	In %	in %	in causes
Avoidable						
1	Production problems (with mature technology)	1%	25	0.2%	3%	3
2	Insufficient Design Maturity (eg development schedule to CDR)	8%	183	1.5%	10%	11
3	Insufficient ESA Internal Manpower	1%	17	0.1%	1%	1
4	Missing Requirement/Requirements growth (Class A CCNs)	6%	147	1.2%	5%	5
5	Optimistic Initial Cost estimate / cost allocation for subs	9%	217	1.8%	5%	5
6	Optimistic original Schedule estimates	5%	122	1.0%	13%	14
7	Poor Industrial performance	8%	192	1.5%	13%	14
8	Poor procurement approach	7%	169	1.4%	4%	4
9	Technology Insufficiently demonstrated (failure of qualification etc)	6%	145	1.2%	10%	11
Acts of God						
10	Force Majeur, accident	6%	134	1.1%	6%	6
Conflict of Interest						
11	Programmatic Imposition	28%	650	5.2%	7%	7
12	Programmatic delay due to launchers	9%	205	1.7%	10%	10
13	Programmatic Imposition 3rd part delivery problem	4%	104	0.8%	8%	8
14	Geographical constraint	0%	0	0.0%	6%	6
	TOTAL	100%	2,311	18.7%		105

Table 3: Overall results of cost and schedule implications per defined cause.

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24

ATV/IOV
32 % or over 400 M€ of the cost overrun attributed to "Programme Imposition". The justifications for this attribution include:

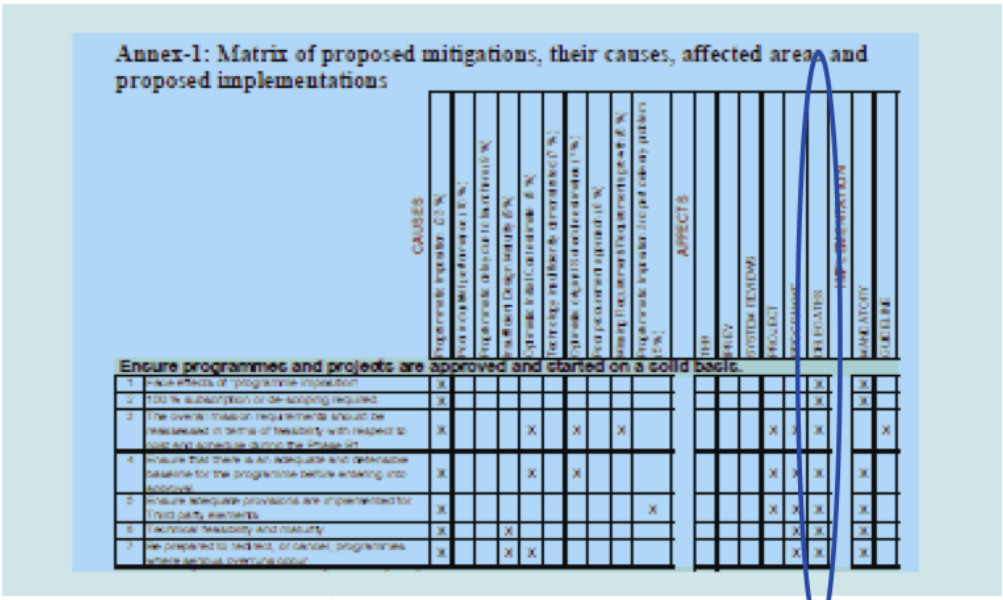
For IOV: "*Artificial Prime Contractor, weak technical and management leadership and conflicts of interest between stakeholder and supplier role*" to which impositions coming from the EC must be considered

For ATV: "*The prime Astrium Bremen in phase B1 had to be changed for political reasons to Aerospatiale Les Mureaux in phase B2 (and changed back to Bremen for the production)*". In addition "*The decision to build the ATV Control Centre at CNES, Toulouse, instead of making use of the ESOC facilities*".

These programmes, and, indeed, Exo-Mars as originaly constructed, wre found to have disparate political aspirations driving major redirections of the project, or imposition of unworkable concepts, after a cost baseline had been set, and without re-baselining the finances of the programme to match the changed approach.

No.	Specific Causes	Total weighted result	Weighted result excluidng ATV and IOV	Weighted result including only ATV and IOV
1	Production problems (with mature technology)	2%	2%	0%
2	Insufficient Design Maturity	9%	7%	10%
3	Insufficient ESA Internal Manpower	1%	1%	0%
4	Missing Requirement/Requirements growth	6%	2%	13%
5	Optimistic Initial Cost estimate / cost allocation for subs	8%	5%	13%
6	Optimistic original Schedule estimates	7%	9%	5%
7	Poor Industrial performance	10%	11%	7%
8	Poor procurement approach	6%	4%	10%
9	Technology Insufficiently demonstrated	7%	12%	0%
10	Force Majeur, accident	6%	10%	0%
11	Programmatic Imposition	23%	16%	32%
12	Programmatic delay due to launchers	9%	12%	6%
13	Programmatic Imposition 3rd part delivery problem	5%	6%	5%
14	Geographical constraint	1%	2%	0%
	TOTAL	100%	100%	100%

Table 4: Ranking of cause for increase in schedule and cost


Annex-1: Matrix of proposed mitigations, their causes, affected areas and proposed implementations
CAUSES
APPECTS
Ensure programmes and projects are approved and started on a solid basis.
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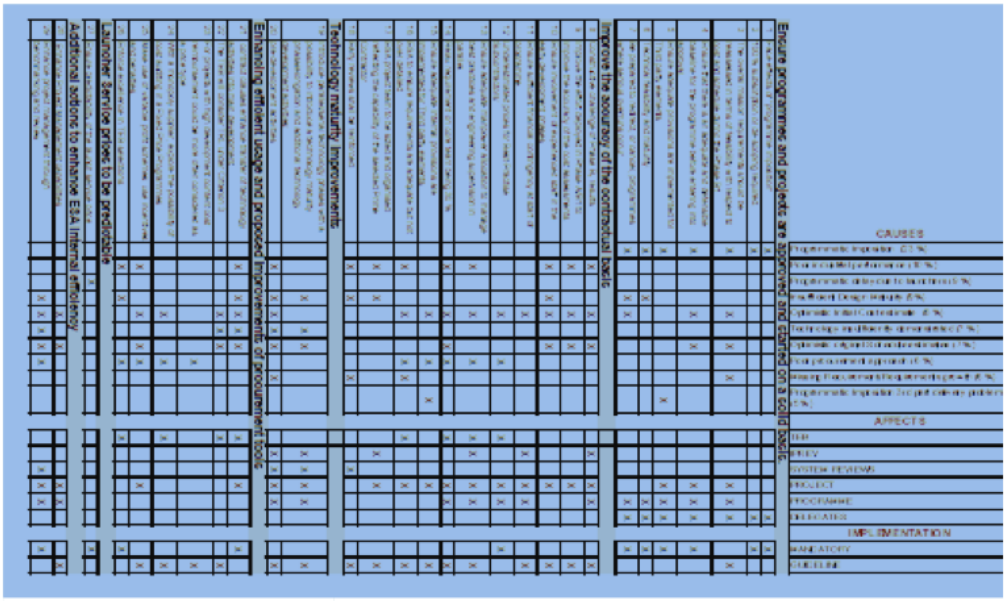
27


Additional actions to enhance ESA internal efficiency
Launcher Service project to be predictable
Enhancing efficient usage and proposed improvements of procurement tools
Technology maturity improvements
Improve the accuracy of the contractual basis
Ensure programmes and projects are approved and started on a solid basis.
CAUSES
APPECTS
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28

Edwards Report

The single most significant improvement in the cost stability of ESA programmes would be for the Executive to refuse (the imposition of) such unrealistic constructs and requirements, unless these margins are appropriately augmented.

What about project phases before phase B2?

Analysed in some detail by "Science Programme Review Team" 2007

- external team appointed by Council to investigate management of Mandatory Science Programme (chair: Reinder Van Duinen)

The Van Duinen Problem

Financial programme management
Differences compared with the a priori set envelopes

Mission	Best Financial Prediction 2005 e.c., all figures M€	2000 Allocation updated to 2005 e.c. (2000 e.c.), all figures M€
GAIA	557 (- 11%)	626 (542)
BepiColombo	650* (4%)	626 (542)
LISA-PF	*185* (123%)*	*83 (72)*
LISA	*360* (72%)*	*209 (181)*
LISA Total ESA	545* (87%)	292 (253)
JWST	305* (46%)	209 (181)
Solar Orbiter	410* (96%)	209 (181)
TOTAL	**2467**	**1962**

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Van Duinen : Science Programme Review Team

There must be no more "package deals" (deals effectively made in advisory committees and SPC to secure mission's place in list).

Firm go/no-go required from SPC against realistic budget

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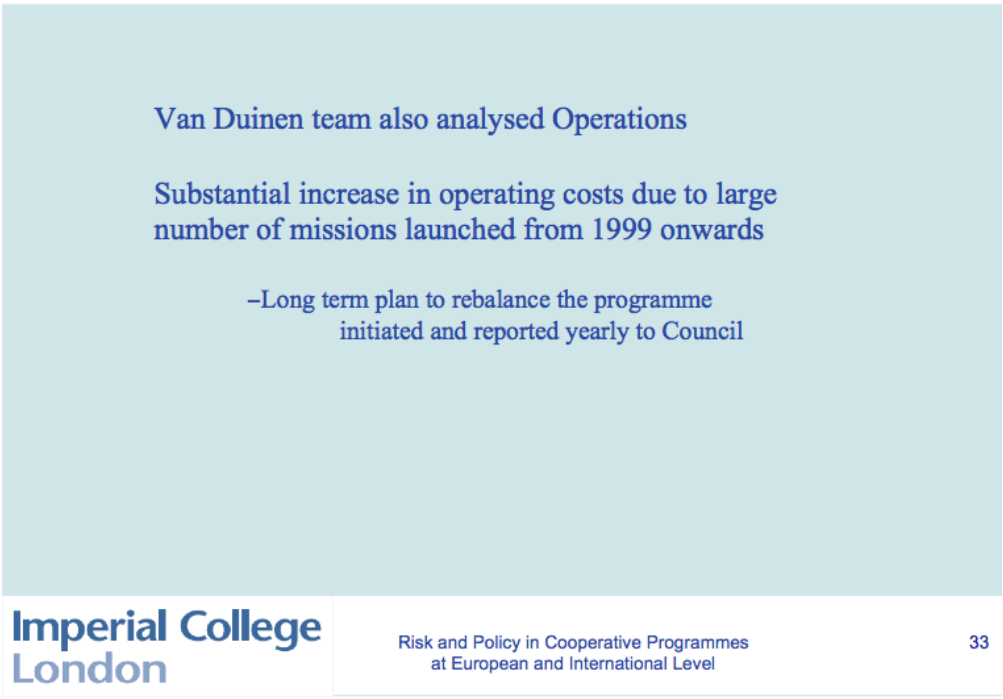
Van Duinen team also analysed Operations
Substantial increase in operating costs due to large number of missions launched from 1999 onwards
–Long term plan to rebalance the programme initiated and reported yearly to Council
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33

ANNEX II

CRITICAL POLICIES AND REGULATORY PROVISIONS AFFECTING SPACE PROJECTS
Professor Kai-Uwe Schrogl

CRITICAL POLICIES AND REGULATORY PROVISIONS AFFECTING SPACE PROJECTS

London Institute of Space Policy and Law
Seminar Series: Risks associated with space activity
27 October 2011

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ESA, Head of Policies
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Dr. Ulrike M. Bohlmann
ESA, Legal Department
Email: Ulrike.Bohlmann@esa.int

Overview

Policy issues

- *space policy issues*
- *industrial policy issues*

Regulatory aspects

- *national space legislation*
- *liability issues*
- *frequency allocation*
- *data policies*
- *insurance requirements*

Critical Policies and Regulatory Provisions 2 K.-U. Schrogl / U. Bohlmann

Policy: space policy

- Space policies are setting the stage for space activities, governmental as well as private
- Different levels and layers of space policies
  - *"European Space Policy"*
  - *Policies or plans of European actors (ESA, Eumetsat, EC, EDA)*
  - *National space policies*
- Risks
  - *Stability and reliability of crucial space policy elements as "philosophies of how to do space", focal areas, programme perspectives, industrial policies, regulatory frameworks, national as well as international partnerships (including PPPs)*

Critical Policies and Regulatory Provisions 3 K.-U. Schrogl / U. Bohlmann

Policy: industrial policy

- Industrial policies are intended to
  - *secure the availability of an independent industrial capacity in strategic sectors and*
  - *provide a reliable setting for the development of space industry*
  - *in the interest of a stable market for commercial interactions as well as for public procurement*
- Find your way through EU, ESA and national approaches and rules…
- Risks
  - *Investments can be based not only on market and business perspectives but also on specific industrial policy measures (e.g. specific SME programmes or sectoral support programmes), which might be changed, stopped or reversed*
  - *Related are numerous other issues based on dealing with industrial policies as project architecture, subcontractor management, TRL assessments, workforce development etc.*
  - *"Over-regulation"*

Critical Policies and Regulatory Provisions 4 K.-U. Schrogl / U. Bohlmann

Regulatory: national space legislation

- Different drivers for national space legislation
  - Implementation of international obligations (Art VII OST, LIAB, REG,…)
    → *Authorisation and licensing procedures*
  - Benefitting the national space sector
- Disparate picture worldwide and in Europe
  - Ranging from very detailed and sector-specific via general to non-existent
  - Article 189 II TFEU: no harmonisation of national law and regulations of Member States in Europe
- Risks
  - Evolution difficult to foresee, new requirements, legal uncertainties
  - "Flag of convenience" → competition among States

Critical Policies and Regulatory Provisions 5 K.-U. Schrogl / U. Bohlmann

Regulatory: liability issues I

- Status with regard to liability under public international law
  - Space law, LIAB
    - Absolute liability of the Launching State for damage on Earth or aircraft in flight
    - *Space debris (IADC, UN Guidelines)*
    - Fault-based liability of Launching State elsewhere
  - General international liability
    - due diligence requirements
- Risks
  - Indemnification in case of private activities?
  - How to prove fault?
  - Necessity to monitor technical advancements/ state of the art

Critical Policies and Regulatory Provisions 6 K.-U. Schrogl / U. Bohlmann

Regulatory: liability issues II

- Status with regard to domestic and interparty liability
  - General liability under domestic law
  - Liability among participants/ partners generally waived
  - Liability caps for private operators under national laws
- Risks
  - Validity of cross-waivers ?
    - *Explicitly foreseen under US law and under French law on space operations*
  - Validity of liability caps ?
    - *The French case:*
    - *French authorities notified liability cap and corresponding unlimited State warranty to European Commission under State-Aid procedures, then Art 87 seq TEC.*
    - *Commission decided:*
      - *State Aid (+)*
      - *Distorts competition (+)*
      - ***BUT** compatible with common market*

Critical Policies and Regulatory Provisions 7 K.-U. Schrogl / U. Bohlmann

Regulatory: frequency allocation

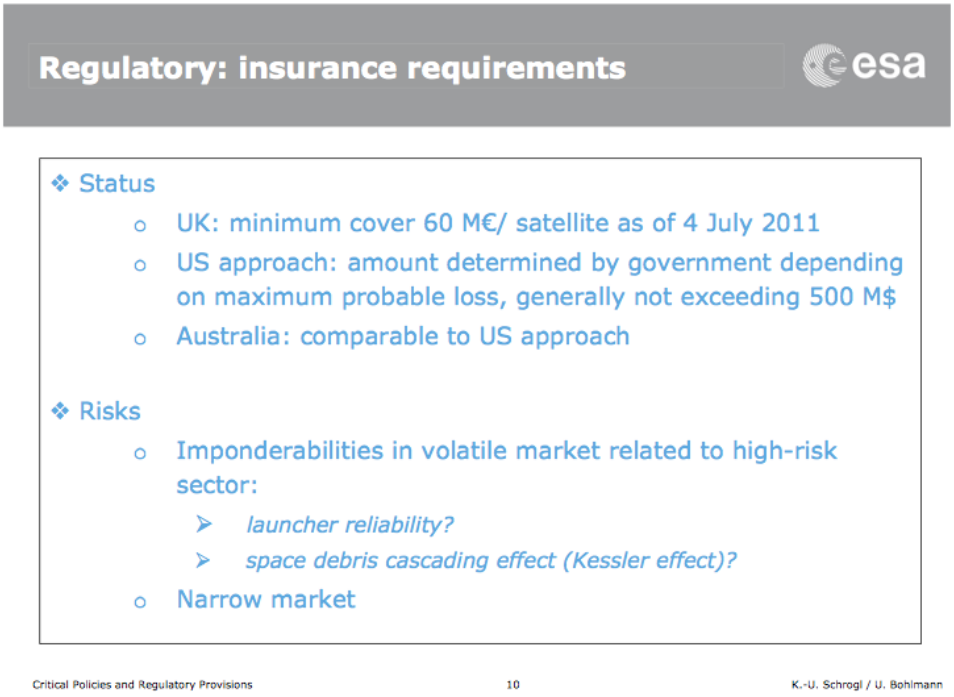
- Status
  - Limited Natural Resource
  - ITU Radio Regulations (← WRCs)
  - Informal international coordination, SFCG
  - Application/allocation by national authority
- Risks
  - International competition
  - National/regional allocation, e.g. EU telecommunications package
    - *Radical liberalisation ?*
    - *Technology/ service neutrality ?*
    - *Risk of allocation to other services/ uses ?*
    - *Competitive disadvantage of satellite services, depending on secure frequency use throughout lifetime of satellite*
  - Necessity to monitor all relevant ITU study groups, focus groups etc.

Critical Policies and Regulatory Provisions 8 K.-U. Schrogl / U. Bohlmann

Regulatory: data policies

- Heterogeneous policies driven by diverging priorities
  - Principle of unrestricted and non-discriminatory access
    - *UN Principles on Remote Sensing*
    - *Aarhus Convention*
    - *INSPIRE Directive*
  - Protection of data collection under IPR regime
    - *Database Directive: sui generis right*
- Risks
  - Policy changes during long-term projects, e.g. security considerations introducing new license requirements, e.g. SatDatSiG
  - Indirect influence of policy concerning governmental projects on commercial projects, e.g. GMES

Critical Policies and Regulatory Provisions 9 K.-U. Schrogl / U. Bohlmann


Regulatory: insurance requirements
esa
Status
UK: minimum cover 60 M€/ satellite as of 4 July 2011
US approach: amount determined by government depending on maximum probable loss, generally not exceeding 500 M$
Australia: comparable to US approach
Risks
Imponderabilities in volatile market related to high-risk sector:
launcher reliability?
space debris cascading effect (Kessler effect)?
Narrow market
Critical Policies and Regulatory Provisions
10
K.-U. Schrogl / U. Bohlmann

ANNEX III

MANAGING POLICY AND REGULATORY RISKS: CHANGE OF GOVERNMENT FOCUS AND EMPHASIS AND POLITICAL PRIORITIES

Stephen Gibson


Stephen Gibson
Commercial & Procurement Director SSTL 2009 onwards
ESNIS GmbH 2007 - 2009
Astrium SAS 2006 -2007
Astrium Ltd 2003 -2006
8 years experience in Commercial & Procurement roles in the Space Industry in the UK, France and Germany
Member of the DMC3 negotiation team in China.
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3


Regulation Definition and Quotes
Regulation = a rule or directive made and maintained by an authority: e.g. planning regulations
Oxford English Dictionary
"There is no such thing as free regulation"
John Hutton (UK Politician)
"Road testing the effects of regulation on European business must become second nature to the European Union"
John Hutton (UK Politician)
"We should favor innovation and freedom over regulation"
George Allen (US Politician – Republican)
"Virtue is more to be feared than vice, because its excesses are not subject to the regulation of conscience"
Adam Smith (Economist)
"Why has it seemed that the only way to protect the environment is with heavy-handed government regulation?"
Gale Norton (US Public Servant)
"As far as I know the regulations take effect immediately"
Guenter Schabowski (DDR Politburo member)
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Regulation - What is it?

- Regulation is dynamic
- Regulation is subject to change
- Regulation is political
- Nobody likes regulation being applied to them – restricts your freedom
- Regulation relaxation can be very popular but unrewarding
- Exception – everyone agrees (today) more regulation is good for 'bankers'!

- So regulation has an impact for the space industry and its impact is worthy of discussion.

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Regulation in the Space Industry

- Health and Safety regulation
- Space Licence regulation
- Export regulation (ITAR)
- Chemical-Environmental regulation (REACH)
- Taxation regulations
- Insurance regulations

- Talk about two cases:
  - ITAR – On going issue for last 2 decades
  - REACH and Hydrazine – Live Issue

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ITAR
• International Traffic in Arms Regulations
– "a set of United States government regulations that control the export and import of defense-related articles and services on the United States Munitions List (USML).1 These regulations implement the provisions of the Arms Export Control Act (AECA), and are described in Title 22 (Foreign Relations), Chapter I (Department of State), Subchapter M of the Code of Federal Regulations. The Department of State Directorate of Defense Trade Controls (DDTC) interprets and enforces ITAR. Its goal is to safeguard U.S. national security and further U.S. foreign policy objectives."
– Regulations that control the movement of hardware between countries and people and the movement of informatio between US and non US citizens
– These regulations are enforced by the Dept of State
– US Government actively enforces these regulations by taking legal action against Companies and individuals leading to heavy fines and incarceration.
– US Government action in this area has increased in the last two decades
– Space industry brought into the spotlight of ITAR in 1996 following the loss of Space Systems Loral built INTELSAT 708 Telecoms satellite aboard a Chinese Long march rocket. ITAR controlled cryptographic technology lost over the PRC.
– Items on the USML are essential in todays european space industry
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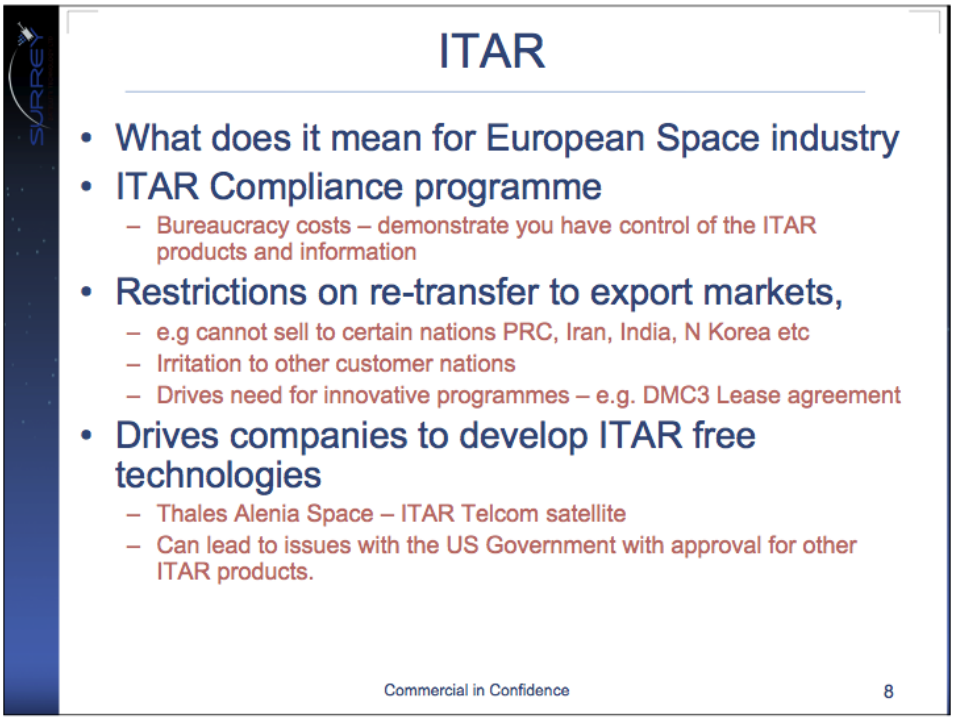
7


ITAR
• What does it mean for European Space industry
• ITAR Compliance programme
– Bureaucracy costs – demonstrate you have control of the ITAR products and information
• Restrictions on re-transfer to export markets,
– e.g cannot sell to certain nations PRC, Iran, India, N Korea etc
– Irritation to other customer nations
– Drives need for innovative programmes – e.g. DMC3 Lease agreement
• Drives companies to develop ITAR free technologies
– Thales Alenia Space – ITAR Telcom satellite
– Can lead to issues with the US Government with approval for other ITAR products.
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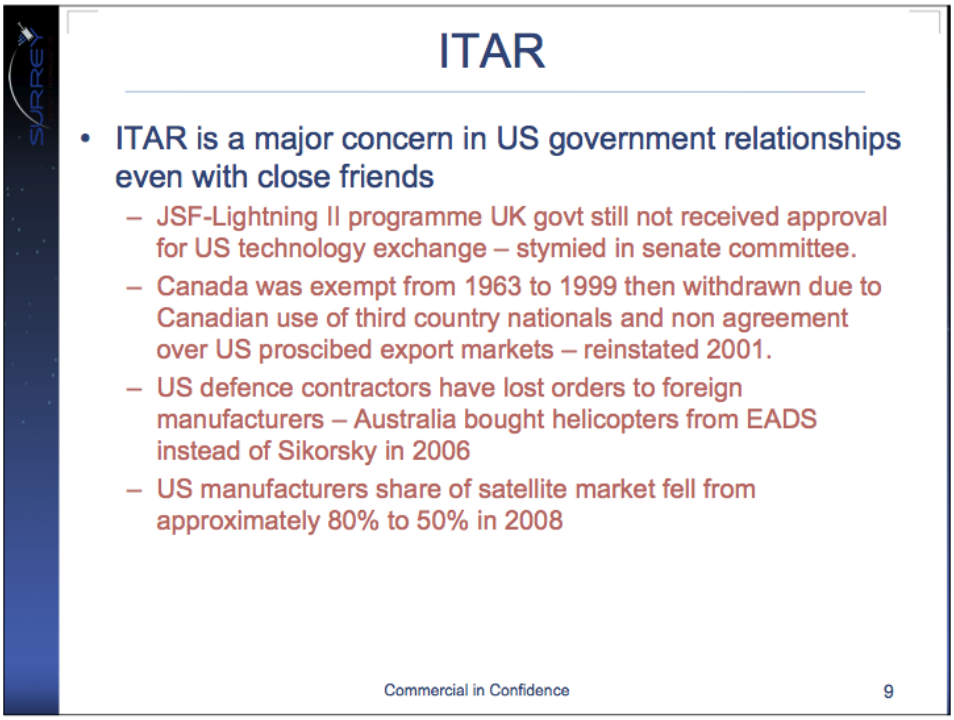
ITAR
• ITAR is a major concern in US government relationships even with close friends
– JSF-Lightning II programme UK govt still not received approval for US technology exchange – stymied in senate committee.
– Canada was exempt from 1963 to 1999 then withdrawn due to Canadian use of third country nationals and non agreement over US proscibed export markets – reinstated 2001.
– US defence contractors have lost orders to foreign manufacturers – Australia bought helicopters from EADS instead of Sikorsky in 2006
– US manufacturers share of satellite market fell from approximately 80% to 50% in 2008
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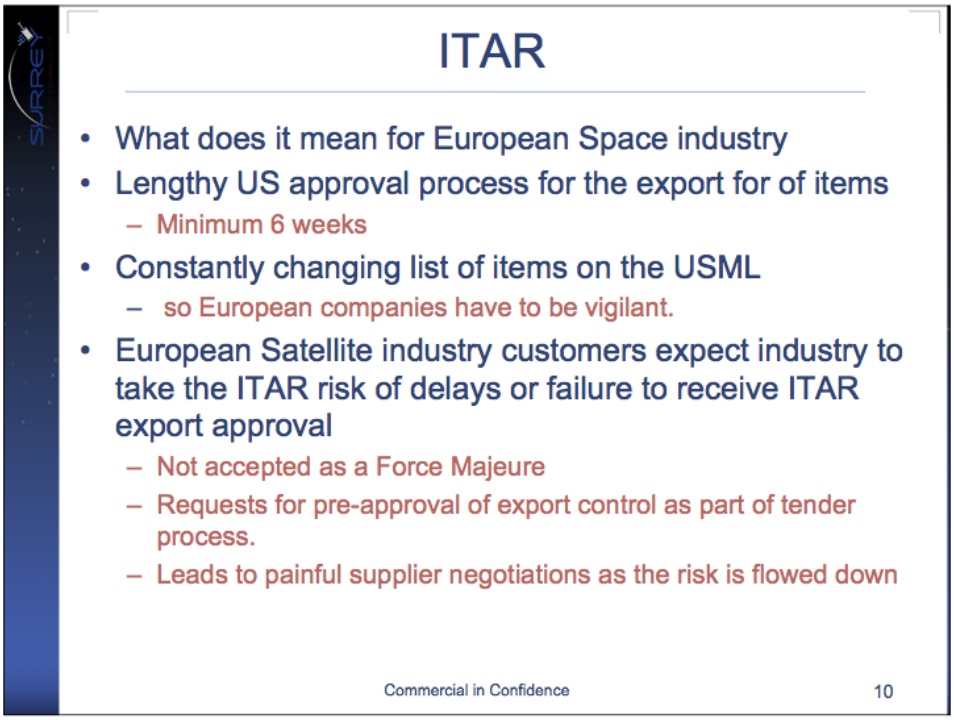
9


ITAR
• What does it mean for European Space industry
• Lengthy US approval process for the export for of items
– Minimum 6 weeks
• Constantly changing list of items on the USML
– so European companies have to be vigilant.
• European Satellite industry customers expect industry to take the ITAR risk of delays or failure to receive ITAR export approval
– Not accepted as a Force Majeure
– Requests for pre-approval of export control as part of tender process.
– Leads to painful supplier negotiations as the risk is flowed down
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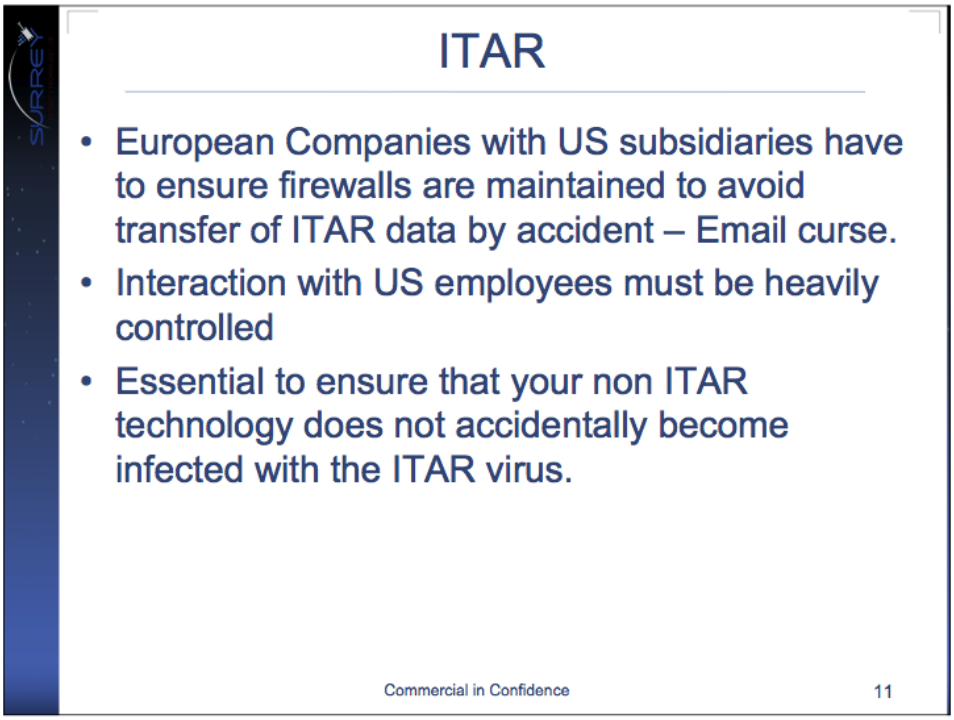
ITAR
• European Companies with US subsidiaries have to ensure firewalls are maintained to avoid transfer of ITAR data by accident – Email curse.
• Interaction with US employees must be heavily controlled
• Essential to ensure that your non ITAR technology does not accidentally become infected with the ITAR virus.
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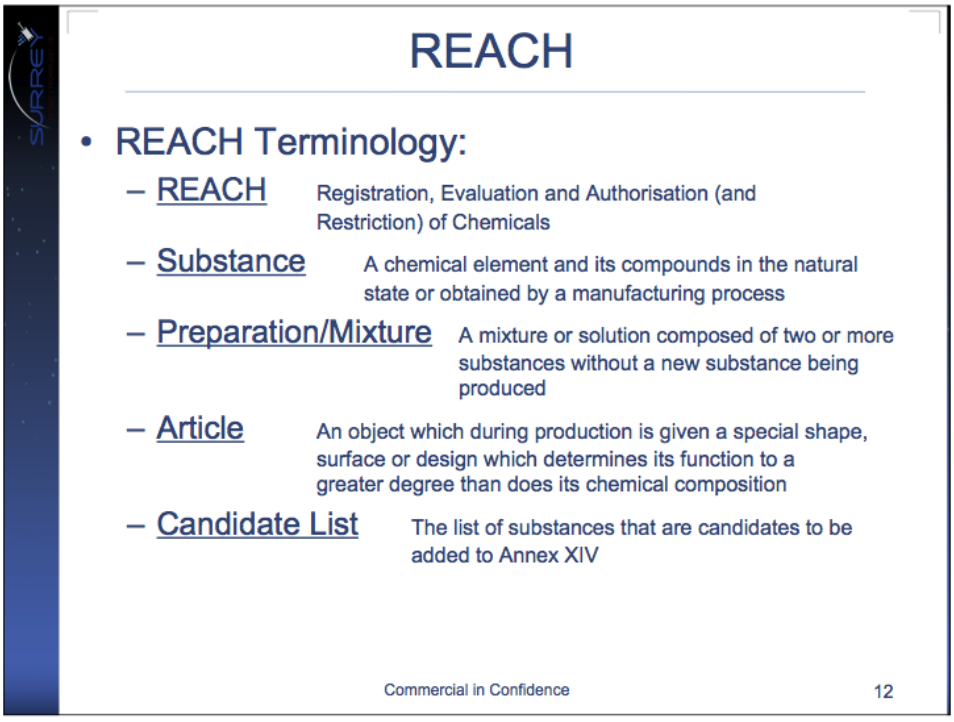
REACH
• REACH Terminology:
– REACH Registration, Evaluation and Authorisation (and Restriction) of Chemicals
– Substance A chemical element and its compounds in the natural state or obtained by a manufacturing process
– Preparation/Mixture A mixture or solution composed of two or more substances without a new substance being produced
– Article An object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition
– Candidate List The list of substances that are candidates to be added to Annex XIV
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REACH

- REACH Terminology, continued:
  - Annex XIV — A list of substances that will need European Chemical Agency (ECHA) Authorisation to use them once a pre-determined sunset date has passed.
  - Authorisation — The official permission required from ECHA to continue the use of a substance once it has been added to Annex XIV and the defined sunset date has passed.
- Satellites Terminology:
  - Chemical Product — Any substance or preparation used by satellite
  - Product — Any article produced by and delivered to an external recipient

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Legislation

The legislation consists of three separate regulations and amendments to them – 2250+ pages in all

Key aspects are as follows:

- Registration of Substances
  - All substances manufactured or imported in quantities of more than 1 tonne per year
- Identification of Uses
  - All registered substances must also have their uses identified on the SDS in accordance with a 5 part code
- Notification
  - Informing ECHA if we use more than 1 tonne of a Candidate List substance in a year

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Legislation

- CLP
  - Significantly enhanced requirements of SDS management, COSHH-type assessments, and labelling of containers
- Supplier Communication
  - SDSs and Article 33 Declarations
- Customer Communication
  - Article 33 Declarations
- Elimination of Substances
  - Candidate List, Annex XIV, & Authorisation

Only the elimination of substances affects the current hydrazine situation. This presentation is limited to that subject

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Substances of Very High Concern

- Past legislation has focused on the short term effects of substances when defining them as hazardous – poisonous, explosive, etc.
- REACH introduces the long term effects on human health and/or the environment as also being definitions of hazardous:
  - Are carcinogenic, mutagenic, or toxic for reproduction (CMR)
  - Are persistent bioaccumulative and toxic (PBT)
  - Are very bioaccumulative and very persistent (vBvP)
  - Have endocrine disrupting properties
- REACH invokes a process whereby, after a public consultation the substance is classified in accordance with these criteria
- Once so classified, it is an SVHC
- Once it is an SVHC, the substance is under threat of being added to the Candidate List:
  - Currently there are about 3,500 SVHC to be processed by ECHA
- At this stage REACH does not impose any reporting requirements or place any specific restrictions on use using it, providing we comply with the REACH-Compliant Safety Sheet (SDS) and that every use is defined on SDS

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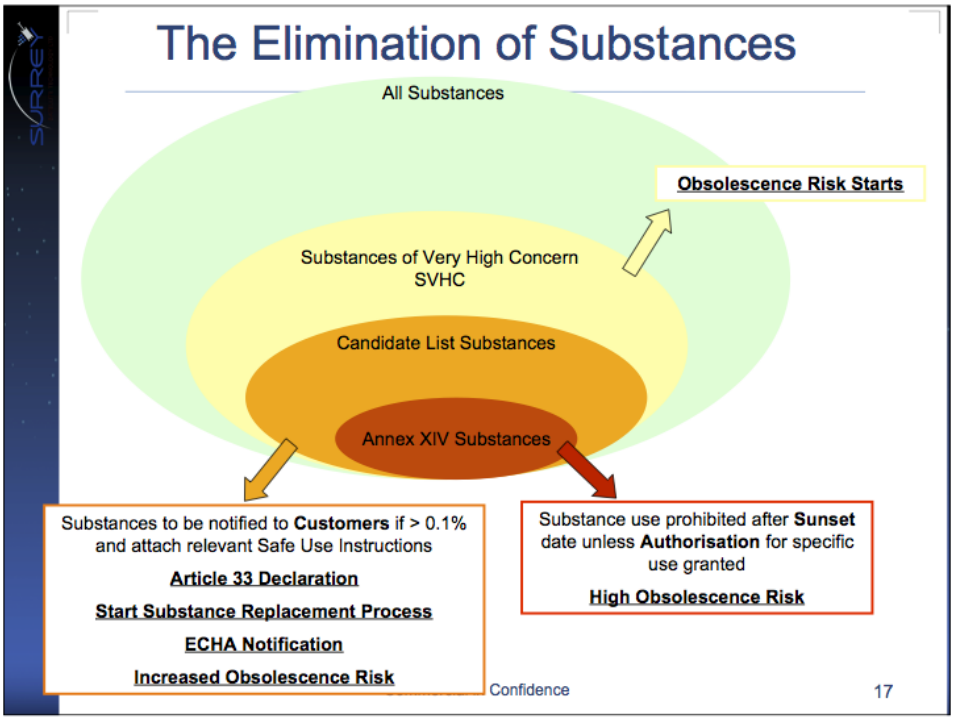
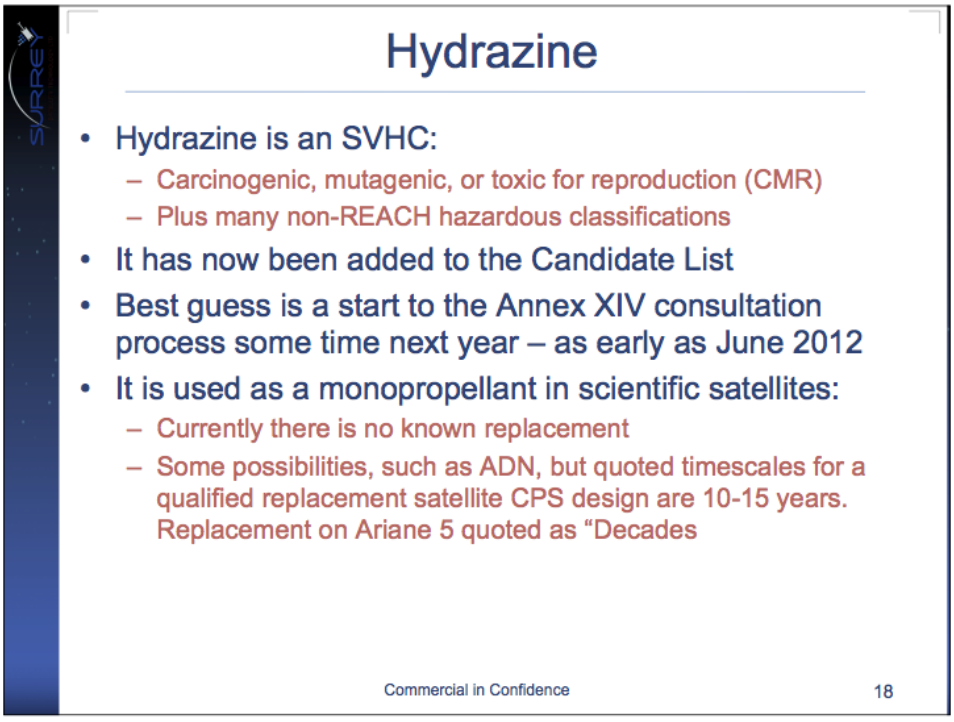

The Elimination of Substances
All Substances
Obsolescence Risk Starts
Substances of Very High Concern
SVHC
Candidate List Substances
Annex XIV Substances
Substances to be notified to Customers if > 0.1% and attach relevant Safe Use Instructions
Article 33 Declaration
Start Substance Replacement Process
ECHA Notification
Increased Obsolescence Risk
Substance use prohibited after Sunset date unless Authorisation for specific use granted
High Obsolescence Risk
Confidence
17


Hydrazine
Hydrazine is an SVHC:
Carcinogenic, mutagenic, or toxic for reproduction (CMR)
Plus many non-REACH hazardous classifications
It has now been added to the Candidate List
Best guess is a start to the Annex XIV consultation process some time next year – as early as June 2012
It is used as a monopropellant in scientific satellites:
Currently there is no known replacement
Some possibilities, such as ADN, but quoted timescales for a qualified replacement satellite CPS design are 10-15 years. Replacement on Ariane 5 quoted as "Decades
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Hydrazine
• The European space industry is a small player in the worldwide use of hydrazine:
– World wide manufacture is about 250,000 tonnes per year. The European satellite industry uses less than 50 tonnes per year
– Thus if hydrazine is eliminated elsewhere, the manufacture for space in Europe may become economically unviable
– No current plans to eliminate the use fo Hydrazine in the USA, Russia, China, India etc.
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19


Hydrazine
• Hydrazine has not been registered for use as a satellite fuel:
– The substance manufacturer must register all uses of the substance or the use becomes illegal
– In June 2012, use as a satellite fuel will become illegal
– We cannot apply for an exemption or authorisation against a use that is not legal
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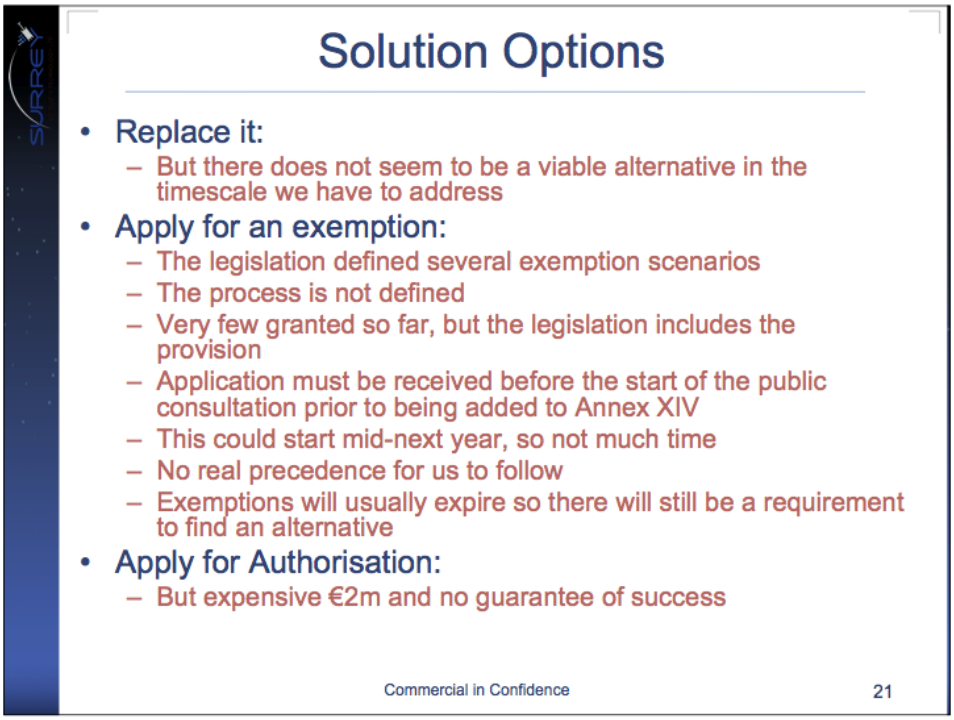
20


Solution Options
• Replace it:
– But there does not seem to be a viable alternative in the timescale we have to address
• Apply for an exemption:
– The legislation defined several exemption scenarios
– The process is not defined
– Very few granted so far, but the legislation includes the provision
– Application must be received before the start of the public consultation prior to being added to Annex XIV
– This could start mid-next year, so not much time
– No real precedence for us to follow
– Exemptions will usually expire so there will still be a requirement to find an alternative
• Apply for Authorisation:
– But expensive €2m and no guarantee of success
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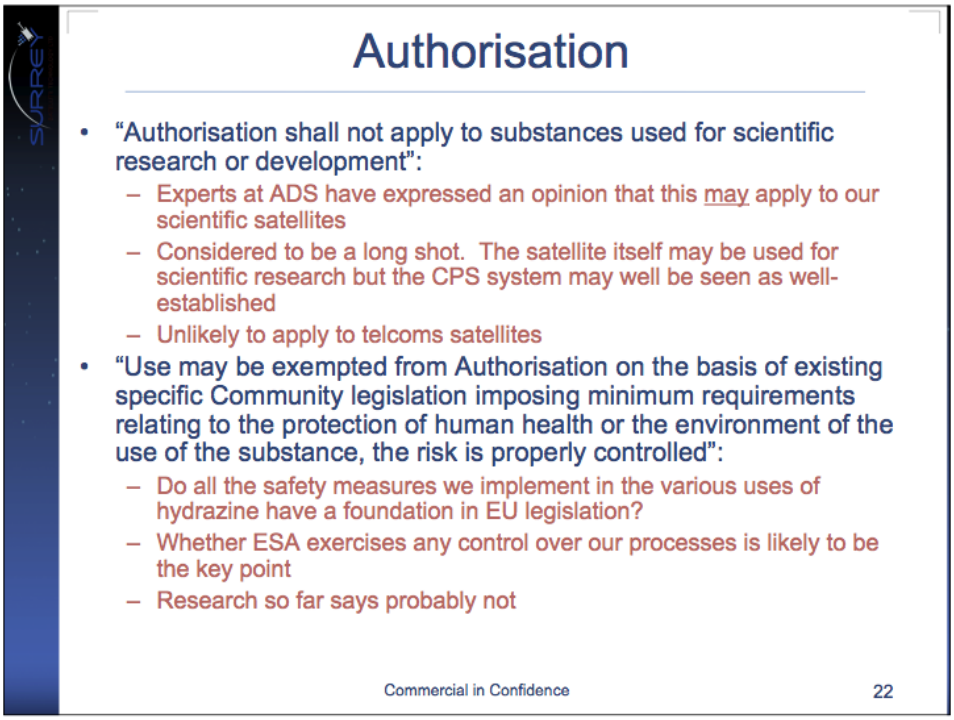
Authorisation
• "Authorisation shall not apply to substances used for scientific research or development":
– Experts at ADS have expressed an opinion that this may apply to our scientific satellites
– Considered to be a long shot. The satellite itself may be used for scientific research but the CPS system may well be seen as well-established
– Unlikely to apply to telcoms satellites
• "Use may be exempted from Authorisation on the basis of existing specific Community legislation imposing minimum requirements relating to the protection of human health or the environment of the use of the substance, the risk is properly controlled":
– Do all the safety measures we implement in the various uses of hydrazine have a foundation in EU legislation?
– Whether ESA exercises any control over our processes is likely to be the key point
– Research so far says probably not
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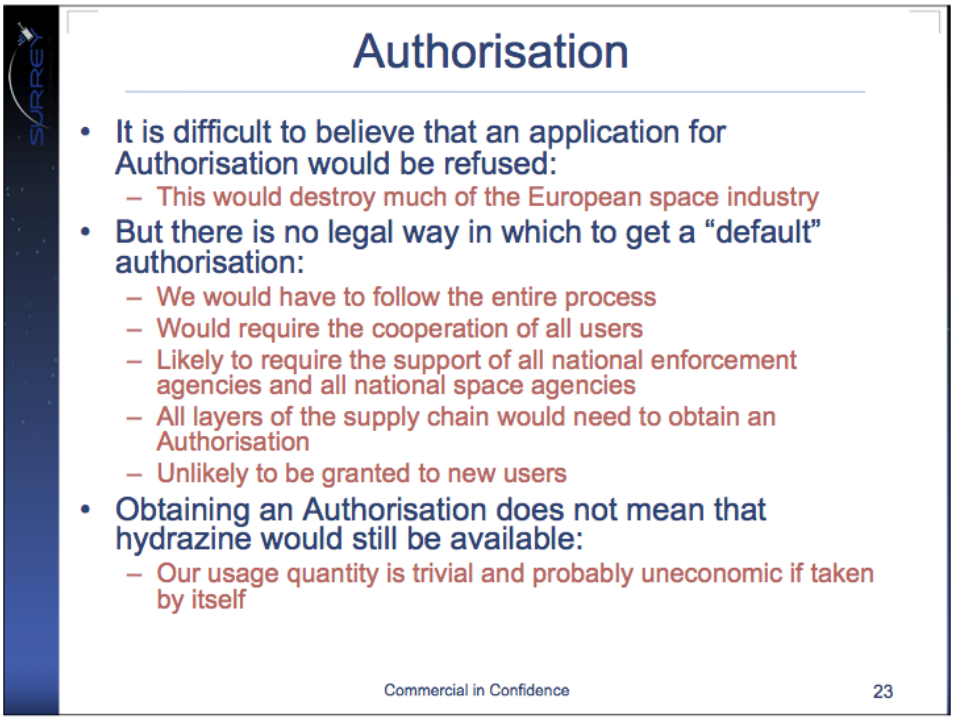
Authorisation
• It is difficult to believe that an application for Authorisation would be refused:
– This would destroy much of the European space industry
• But there is no legal way in which to get a "default" authorisation:
– We would have to follow the entire process
– Would require the cooperation of all users
– Likely to require the support of all national enforcement agencies and all national space agencies
– All layers of the supply chain would need to obtain an Authorisation
– Unlikely to be granted to new users
• Obtaining an Authorisation does not mean that hydrazine would still be available:
– Our usage quantity is trivial and probably uneconomic if taken by itself
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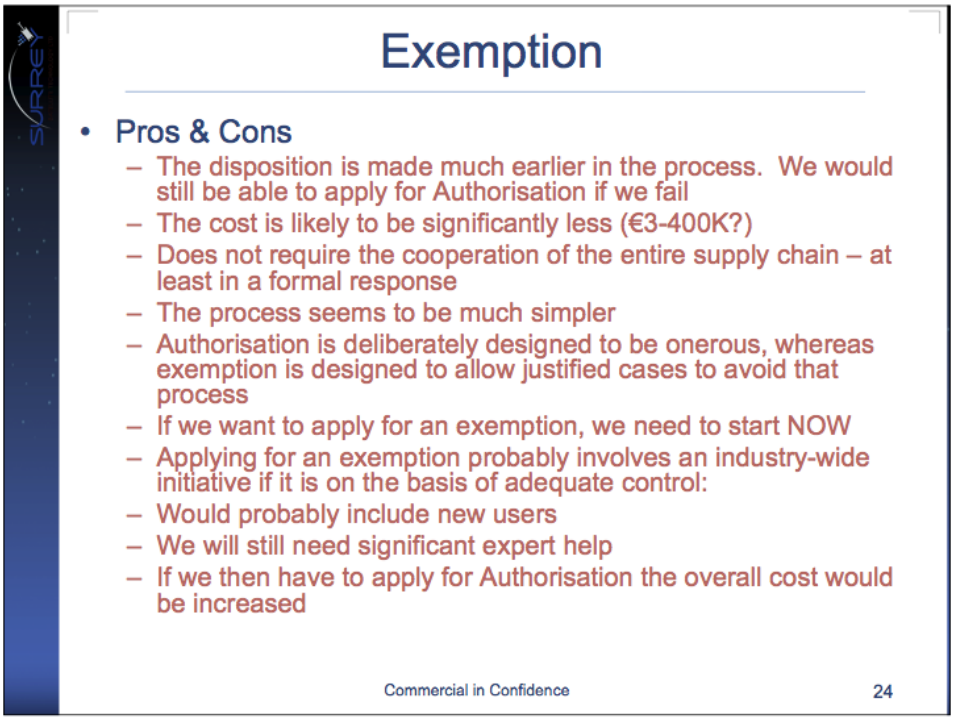
23


Exemption
• Pros & Cons
– The disposition is made much earlier in the process. We would still be able to apply for Authorisation if we fail
– The cost is likely to be significantly less (€3-400K?)
– Does not require the cooperation of the entire supply chain – at least in a formal response
– The process seems to be much simpler
– Authorisation is deliberately designed to be onerous, whereas exemption is designed to allow justified cases to avoid that process
– If we want to apply for an exemption, we need to start NOW
– Applying for an exemption probably involves an industry-wide initiative if it is on the basis of adequate control:
– Would probably include new users
– We will still need significant expert help
– If we then have to apply for Authorisation the overall cost would be increased
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Next Steps

- We have started to gather information about our supply chain
- We have started gathering information about previous exemption applications
- We have asked our consultants to evaluate whether any or all of the three exemption scenarios we have identified are viable:
  - Preliminary response received. The last one looks good so far
- We are evaluating whether we can cooperate with other satellite manufacturers (Thales, OHB, SSTL, CNES, etc) for a coordinated European strategy for the industry:
  - All manufacturers contacted plus ESA
- We are evaluating whether we can utilise ASD to provide a single application for exemption on behalf of the European satellite industry

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Next Steps

- Negotiate with ECHA that this initiative becomes a REACH Working group initiative
- One day meeting of satellite integrators to establish whether we have enough common ground to proceed with an industry-wide exemption:
- Confirm exact use codes for inclusion in safety data Sheets to establish a baseline for exemption
- Within Astrium Group, develop a detailed action plan, including budget

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Conclusions

- ITAR – is a US Government tool that is driven by US perception of the outside world including closest friends
  - Expensive overhead to carry
  - Always at risk of being fined for small error
  - Institutional customers not sympathetic
  - Irritates customers
- REACH & Hydrazine – Environmental and Health issue for the EC managed through the ECHA
  - Current threat to the European space industry
  - Safety is more important than business impact
  - Pushed by a non space prime country
  - Not currently an issue in the USA, Russia, China etc
  - Heavy bureaucratic process to obtain exemption or authorisation – no final solution
  - Will be a difficult and expensive issue to resolve
  - Will require co-ordinated effort from all european space stakeholders

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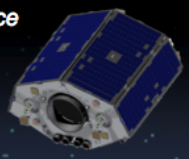
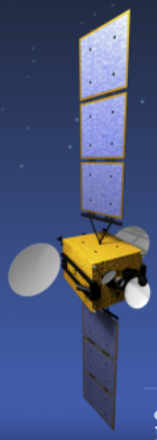
SURREY SATELLITE TECHNOLOGY LTD *Changing the economics of space*



Thank You

Questions?



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ANNEX IV

APPROACH TO POLICY AND REGULATION IN THE ISLE OF MAN

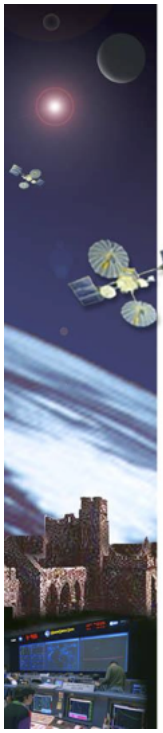
Dr. Don Jayasuriya

MAPSAC

Approach to Policy and Regulation in the Isle of Man

Don Jayasuriya

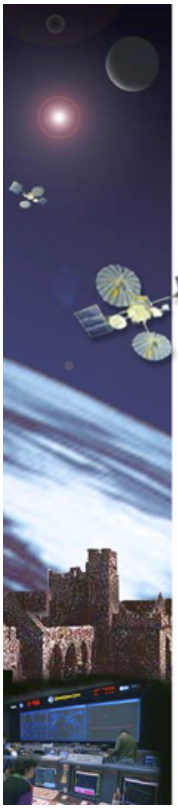
Presentation to the London Institute of Space Policy and Law
Practitioner and Industry Seminar, Thursday 27 October 2011



The Isle of Man

- Crown Dependency
- Located at the heart of the British Isles
- 83,000 Population.
- Independently self governing
  - In Custom Union with the UK, hence within free movements of goods within the EU
  - UK responsible for Foreign Affairs and Defence

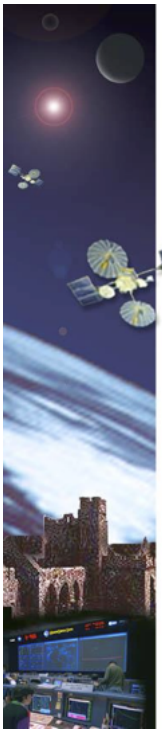
2 MAPSAC



Isle of Man Government & Space

- Predominantly Two Government Bodies
  - Isle of Man Communications Commission
  - Department of Economic Development, Office of Space Commerce
- Chief Minister's Office, Honorary Representative for Space

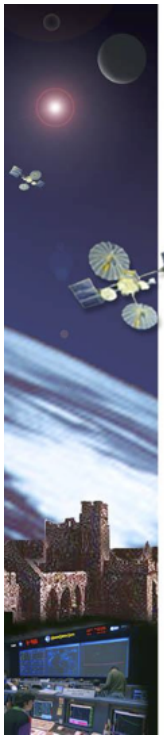
3 MANSAC



Isle of Man Government & Space (contd.)

- The Isle of Man is not a financial cost to the UK
- The Isle of Man contributes a positive balance to the UK economy – inward investment to the City of London at $38.9 billion as of Q2 2011 – Source, Ernst & Young
- The Isle of Man bring investment, jobs, and opportunities to the UK economy … this includes the space sector.

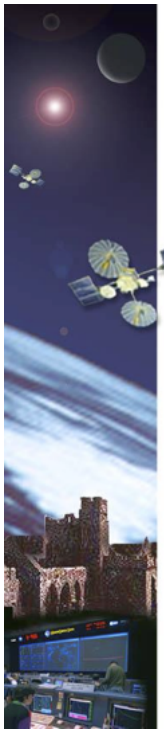
4 MANSAC



Isle of Man Government & Space (contd.)

- Isle of Man Government's objective is to expand the space sector by creating the right climate for the sector. To this end ManSat assists the Government under the banner "spaceilse.com"

5 ManSat



Isle of Man Government & Space (contd.)

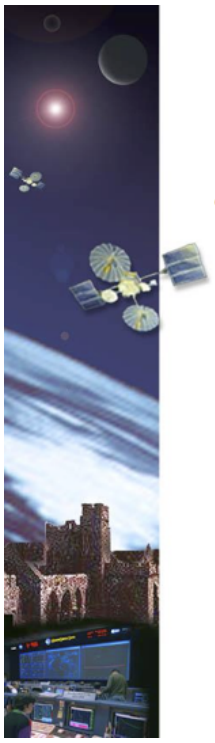
SPACEISLE.COM
THE ISLE OF MAN IN SPACE

6 ManSat

Regulations

- Regulations concerning space commerce in the Isle of Man
  - ➢ Regulations relating to satellite filings etc are primarily under the purview of the UK regulatory, Ofcom [Note: Ofcom has been empowered by the Secretary of State to carry out ITU functions for CDs and OTs]
  - ➢ Outer Space Act has been extended to the Isle of Man under the Statutory Instrument 1990 No. 596 [for application of the Act to bodies incorporated under the laws of the Isle of Man]

7 ManSat

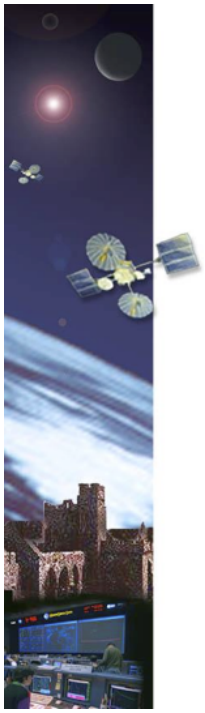


Regulations (contd.)

- Application of the Regulations in the Isle of Man:

  "*Public Private Partnership*" for Satellite filings
  - ➢ ManSat works under a "*Public Private Partnership*" with the Isle of Man's Communications Commission to carry out satellite filings on behalf of the Isle of Man.
  - ➢ ManSat has established the same conditions imposed by the regulations of Ofcom as the basis for making satellite filings through the Isle of Man
  - ➢ The above provides for a seamless process managed by ManSat

8 ManSat



Regulations (contd.)

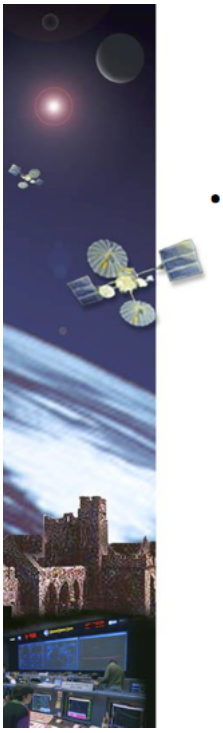
- Outer Space Act
  - OSA regulations enforced by the Isle of Man Government and applications for OSA licence for consideration by the UKSA
  - the Isle of Man Government has taken steps to protect its potential liability by taking out an appropriate level of insurance cover which is on top of the protection provided by the cover required by the UKSA for a launch licence

9 ManSat

Application of Regulations

- Satellite filings:
  - Several major satellite companies carry out satellite filings through the Isle of Man
  - ManSat providing this exclusive service in the Isle of Man, it engages directly with Ofcom
  - ManSat brings specialist knowledge and therefore adds value to the process
  - Close management of filings by ManSat ensures efficient and effective management of satellite filings

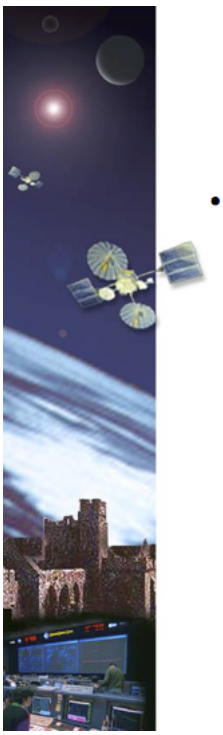
10 ManSat



Application of Regulations

- OSA licence:
  - Applicants seek advice from the Isle of Man Government;
  - Applications are made to the UKSA in the UK
  - Companies based in Isle of Man have obtained 11 OSA licences for the launch and/or operation of space objects

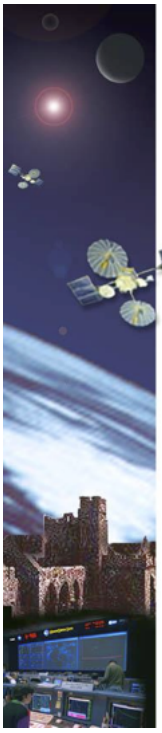
11 MANSAC



Application of Regulations

- An example for discussion:
  - Recently launched ViaSat-1 as published in the media

12 MANSAC



Conclusions

- Isle of Man provides a least burdensome regulatory environment for space commerce
- ManSat manages satellite filing without placing an additional burden on industry
- OSA licensing is assisted by the Isle of Man Government
- Isle of Man provides the freedom to flourish

13 ManSat