NASA PRINCIPAL CENTER FOR REGULATORY RISK ANALYSIS AND COMMUNICATION

Unique Capabilities and Expertise: Going Green Within NASA

Regulatory Risk Analysis and Communication

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CH2M HILL
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From Yesterday's Discussions…

"Compliance is the most expensive environmental option – we can do better than that."

COMPLIANCE

- Reactive
- Meet the letter of the law
- Need a cop for enforcement

GREEN

- Proactive
- Meet the intent of the law
- Need a crystal ball to foresee future requirements

What is the RRAC Principal Center?

- **NASA resource sponsored by HQ Environmental Management Division**
- **A core team…**
  - managed by Sharon Scroggins
  - based at MSFC
  - with access to wide variety of environmental and safety subject matter experts
- **Available to provide regulatory expertise to both Centers and Programs**

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How does the RRAC PC support “greening”?

- **Agency-wide regulatory analysis and communication**
  - Review, track, analyze emerging regulations
  - Evaluate potential impacts to both Programs and Facilities
  - Communicate significant regulatory changes to the NASA Community
- **Interface with NASA Programs for regulatory risk analysis and interpretation**
- **Represent NASA interests to regulatory agencies**
  - Provide expert technical collaboration with EPA on regulatory risks to Program hardware and support facilities during rulemaking efforts
  - When necessary, work with NASA Programs and Facilities to seek regulatory relief

CONTACT

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Where's the "green" part?

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Proactive part

Crystal Ball part

Intent of the Law part

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Analysis and Communication of Emerging Regulations

What shade of green is your design?

Wash your hands with it

Wear a space suit just to open the lid

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What shade of green is your design?

Wash your hands with it

Wear a space suit just to open the lid

How do you know?

Usually – by checking the regulations

Checking once is not enough…

1970
Use Freon™?
Sure!

1990
Hey - you weren't planning to keep using that Freon™, were you?

Checking once is not enough…

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Use Freon™?
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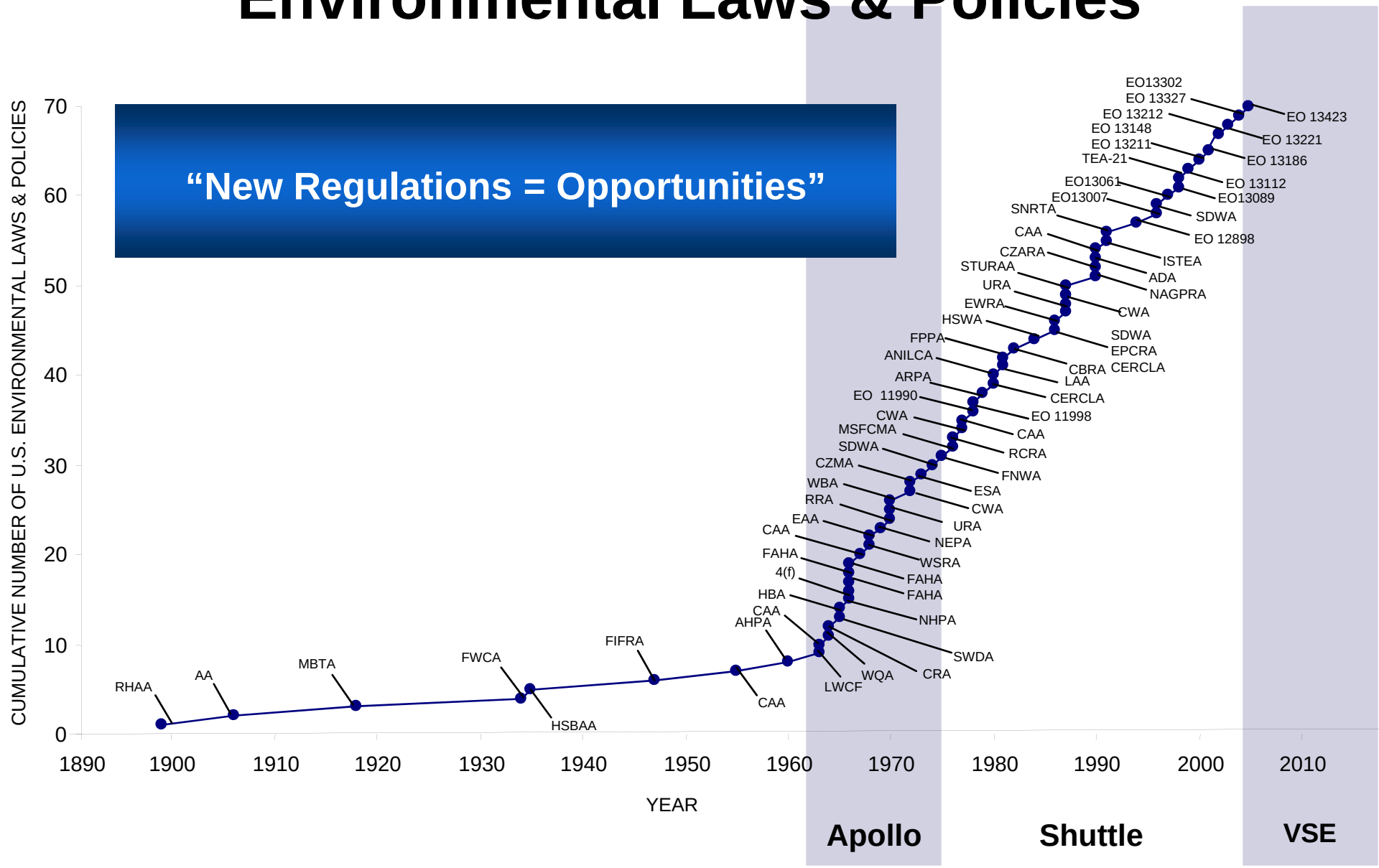
Hey - you weren't planning to keep using that Freon™, were you?

Those darn regulations keep changing!

Greener:
what is the mid-term regulatory risk?
what about the long-term trend?

Evolution of U.S. Federal Environmental Laws & Policies



RRAC Greening Tools – Changing Regulations

- **Biweekly regulatory summaries**
  - Emerging federal and state regulations specifically prepared for NASA community
- **Regulatory alerts**
- **Detailed overviews of specific issues**
- **Analysis of trends and associated risk**
- **Help Desk – if you need regulatory help, ask for it!**

Website Archive

http://www.nasa.gov/offices/rrac/home/index.html

Email

sharon.scroggins@nasa.gov

Interface with NASA Programs

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"HOW CAN THEY GET RID OF FREON??!!"

"Our satellite just failed…??"

"But it always passed NVR before!"

"They'll make us 3 more batches before they permanently shut down the line."

"The sole source vendor just said they are changing the formulation."

"HOW CAN THEY GET RID OF FREON??!!"

"Is that Shuttle hardware supposed to be pink?"

""But we NEED asbestos!"

"No! I can NOT use pure tin solder!"

"Our satellite just failed…??"

"But it always passed NVR before!"

"A new VOC limit on coatings? What's a VOC?!"

"What do you mean you can't buy my critical tape anymore?"

"They'll make us 3 more batches before they permanently shut down the line."

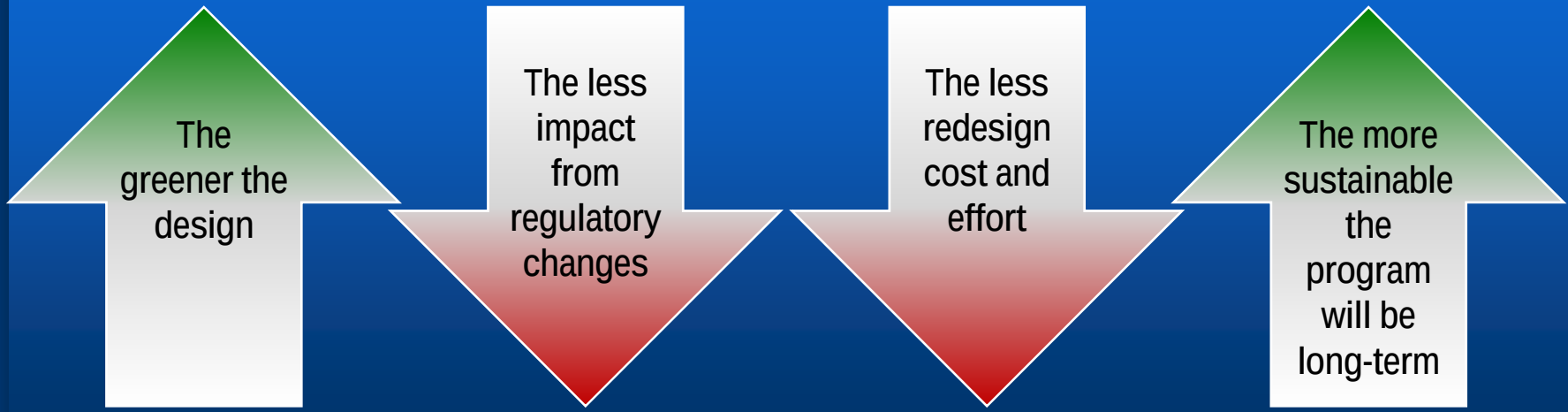
"The vendor moved the production line to another state – OF COURSE we have to requalify!"

"But that's over in Europe – it doesn't affect us!"

Regulatory requirements continually evolve.

Even small regulatory changes can pose significant risk.

Changes in regulations are a major driver of Materials Obsolescence.



Best Example Award

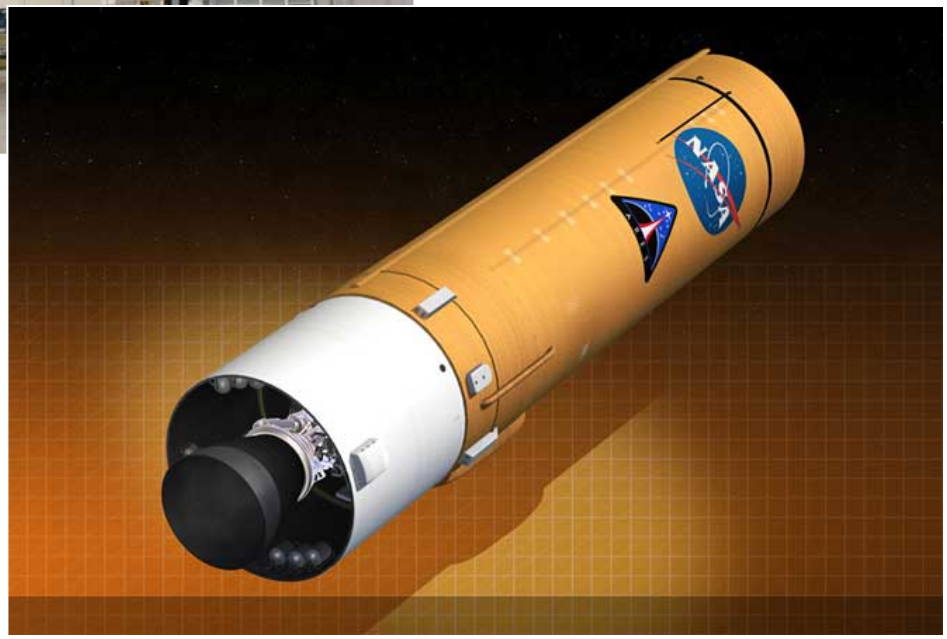
PRODUCTION PHASE-OUTS

- Vienna Convention for the Protection of the Ozone Layer
- Montreal Protocol on Substances that Deplete the Ozone Layer
- U.S. Clean Air Act Amendments of 1990
- U.S. EPA Stratospheric Ozone Phase-out Regulations

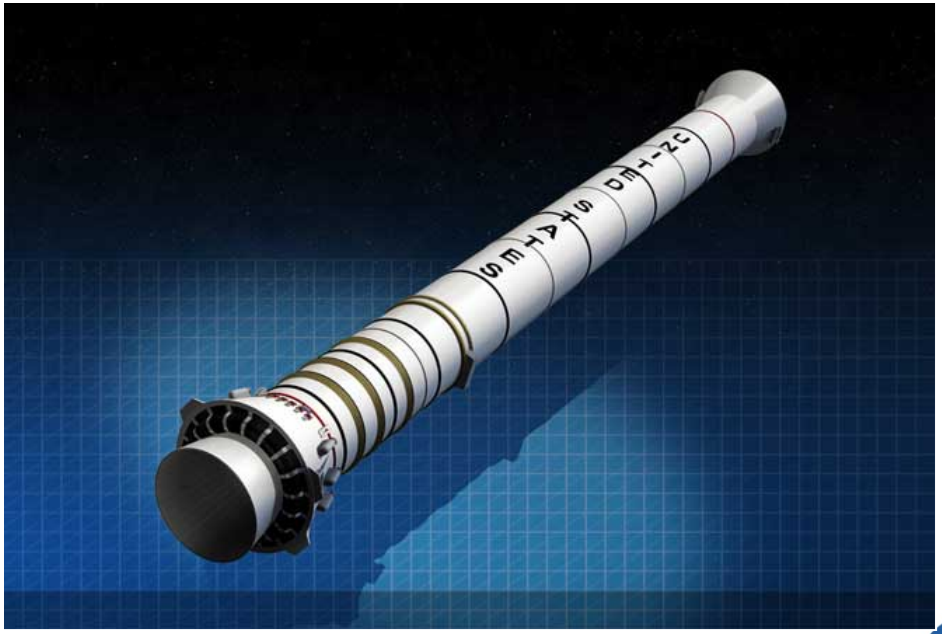
PRODUCTION PHASE-OUTS

The phase-out of
Ozone Depleting Substances (ODS)
has had a
substantial impact upon
Human Spaceflight Programs

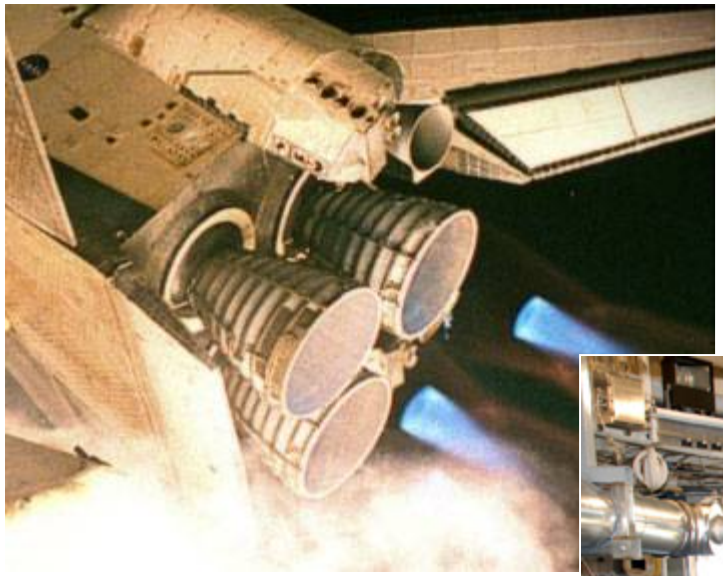
ODS – Foam Blowing



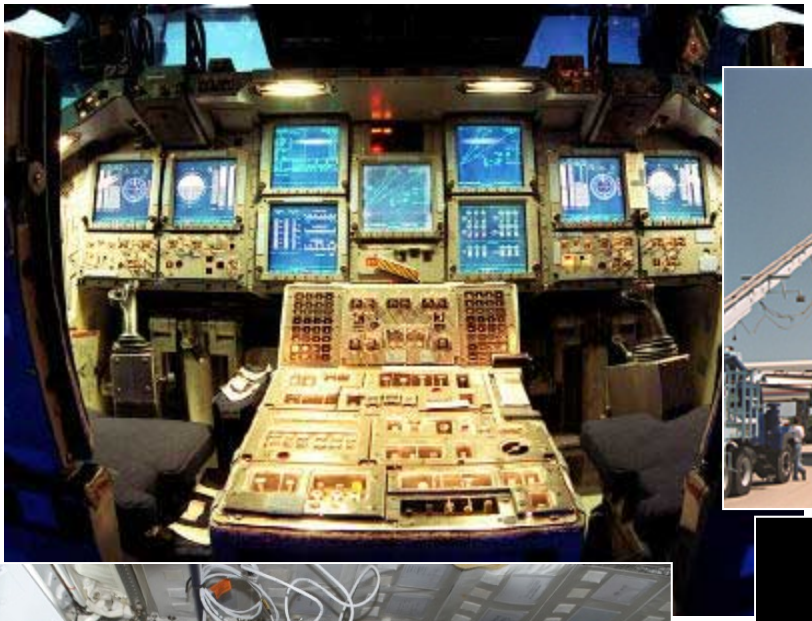
ODS – Rubber Cleaning and Bonding

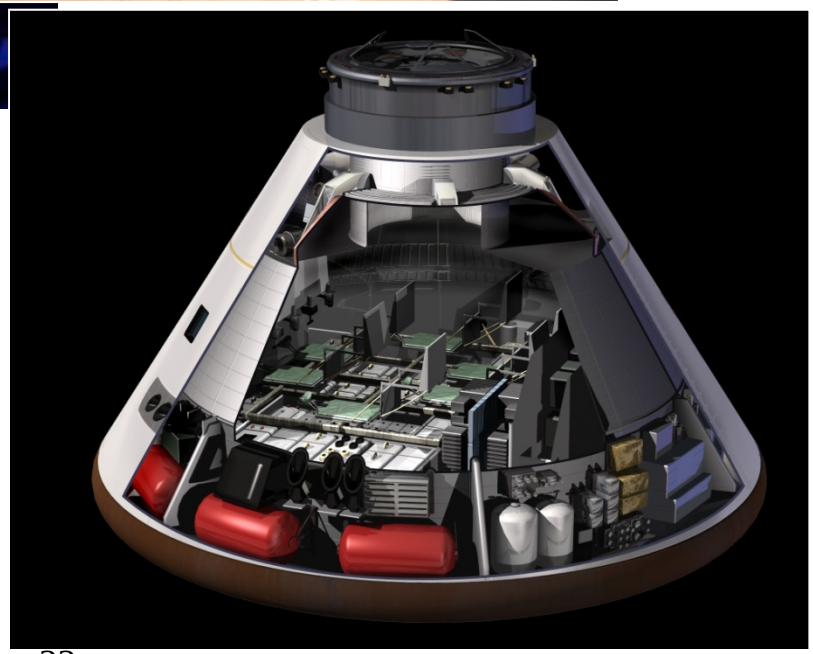


ODS – Precision Cleaning

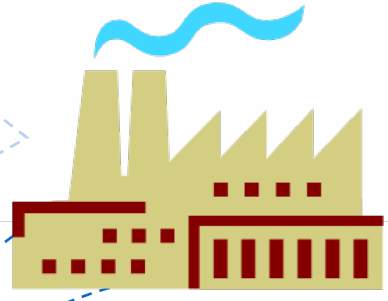


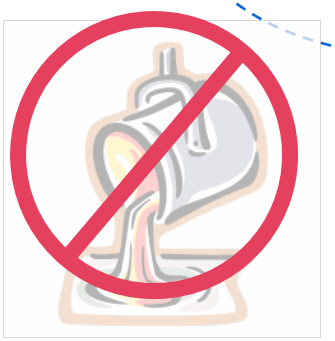
ODS – Fire Suppression and Refrigerants





Requirements abroad can also affect materials availability and drive materials obsolescence.





VIRTUAL PRODUCTION PHASE-OUTS

When foreign regulatory bodies prohibit or severely limit usage of a substance, suppliers sometimes reduce or cease production either from economic factors or pressure from the public.

New electrical and electronic equipment in Europe may not contain significant quantities of the six banned substances:

- lead
- cadmium
- mercury
- hexavalent chromium
- polybrominated biphenyls (PBBs)
- polybrominated diphenyl ethers (PBDEs)

More to come…

RoHS: Restriction on Hazardous Substances (European Union regulation)

Materials in the Crosshairs

Polybrominated Diphenyl Ethers
flame retardants, "BFRs"

Perfluorooctane Sulfonate &
Perfluorooctananoic Acid
Scotchgard, waterproofing, processing aid

Endocrine Disruptors
Bisphenol A, Perchlorate

Carbon Dioxide

Fluorinated Greenhouse Gases
hydrofluorocarbons, perfluorocarbons…

Coming Attractions

~30,000 Common Chemicals
must be registered & evaluated

Substances of Very High Concern
must be registered & evaluated, and must be authorized to be placed on the market; must pursue alternatives

includes substances that are carcinogenic, mutagenic, toxic, persistent, bioaccumulative, endocrine disruptors, etc.

***REACH: Registration, Evaluation, Authorization and Restriction of Chemicals (European Union regulation)**

RRAC Greening Tools – Program Outreach

- Presentations on emerging environmental drivers of materials obsolescence and other regulatory issues
- Detailed overviews of environmental posture of specific materials
- Participation on risk analysis and mitigation teams
- Help Desk – if you need regulatory help, ask for it!

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Represent NASA's Interests to Regulatory Agencies

Program determines there is a potential regulatory issue

Is there a technical work-around?
Greener material? Greener process?
Do without it?

No?
RRAC works with regulators to explore regulatory options

Regulatory Issue – Aerospace NESHAP*

Could have… Set unrealistic limits on VOC* and HAP* content of space vehicle coatings, cleaners, strippers, and other materials

Action: Negotiated with EPA* and other stakeholders, providing technical justification for required materials

Result: Special considerations for space vehicles – no effect on materials or process selection

*NESHAP – National Emission Standards for Hazardous Air Pollutants
VOC – volatile organic compound HAP – hazardous air pollutant
EPA – Environmental Protection Agency

Regulatory Issue – Other Coatings NESHAPs*

Could have… Set unrealistic limits on HAP* content of coatings and other materials used on ground support equipment

Action: Negotiated with EPA* and other stakeholders, continuing participation in working group

Result: Exclusion from other coatings rules. Development of special, consolidated rule specifically for NASA and military

*NESHAP – National Emission Standards for Hazardous Air Pollutants
HAP – hazardous air pollutant EPA – Environmental Protection Agency

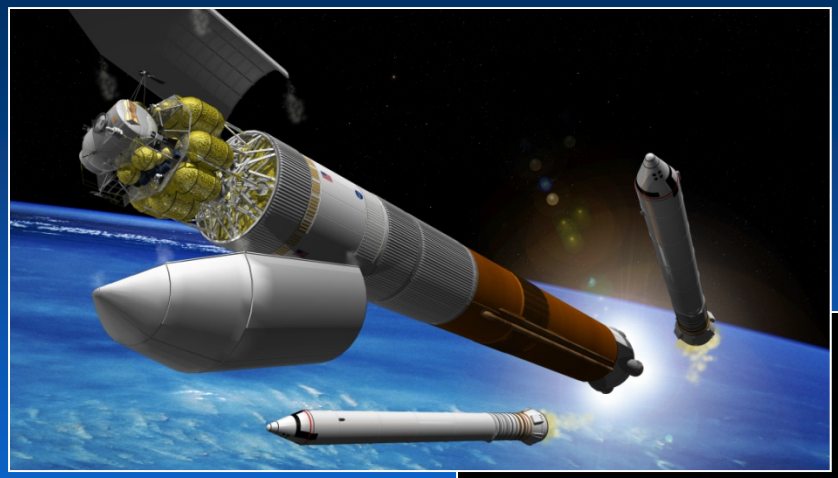
Regulatory Issue – Phase-out of HCFC*141b

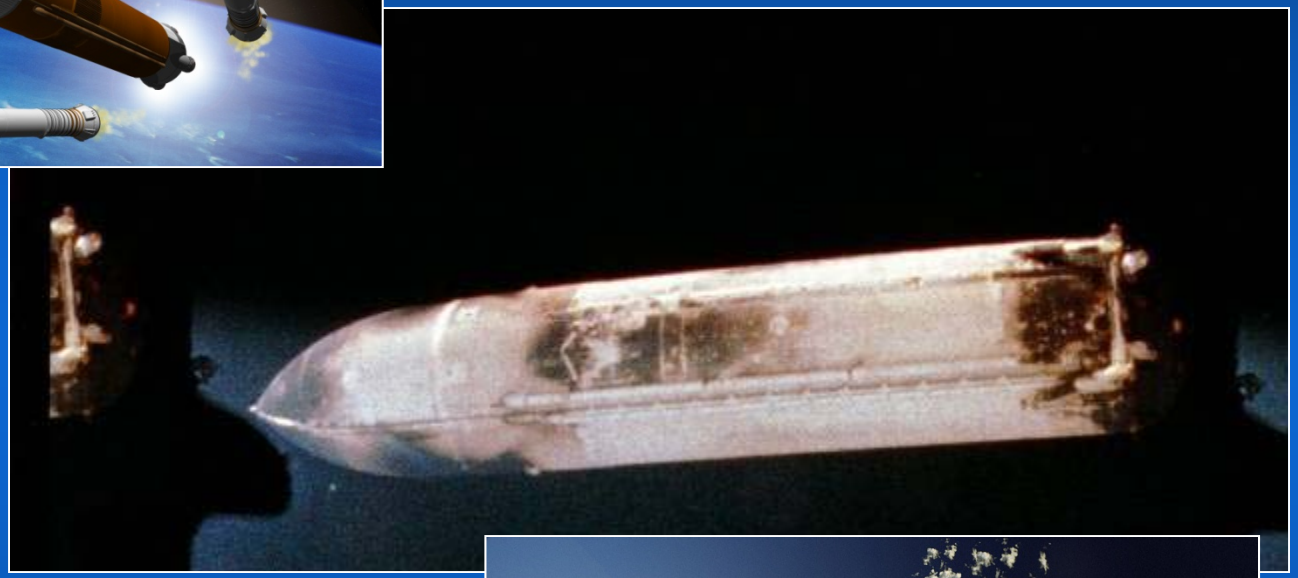
Could have… Prevented SSP* from using flight-qualified thermal protection system foam

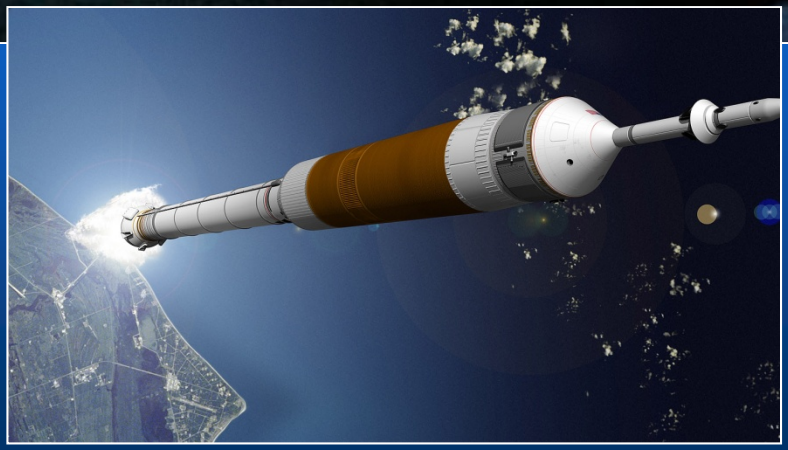
Action: Negotiated with EPA*, providing technical justification for continued use

Result: Exemption Allowance for continued access to HCFC 141b

*HCFC – Hydrochlorofluorocarbon SSP – Space Shuttle Program
EPA – Environmental Protection Agency







Regulatory Issue – Phase-out of HCFC*141b

BONUS!

When we also had to negotiate an Exemption Allowance for Ares I foams, it raised awareness of the obsolescence risk and spurred research and development of greener substitutes.

- Less future obsolescence risk
- More supportable and sustainable long-term

*HCFC – Hydrochlorofluorocarbon

Regulatory Issue – Phase-out of HCFC*124

Could have… Made obsolete a refrigerant being considered for a Constellation system even before first flight

Action: Explained the obsolescence risk to CxP. Engineering reevaluated use of the material and decided to use a non-ozone depleting substance.

Result: Technical workaround to implement a greener, more supportable material.

*HCFC – Hydrochlorofluorocarbon CxP – Constellation Program

RRAC Greening Tools – Regulator Outreach

- NASA participation in interagency and stakeholder working groups with insight into emerging requirements
- Long-term working relationship of trust, collaboration, and cooperation with EPA
- Experience with the regulatory process and history of successful resolutions
- Help desk – if there are potential regulatory issues – early communication is critical!

In conclusion, RRAC can…

- help you determine your level of risk due to changing environmental regulations
- work with you to evaluate technical and regulatory risk mitigation options
- help with regulator communications and negotiations, when that is the only feasible option