Archive-name: space/controversy

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These issues periodically come up with much argument and few facts being offered. The summaries below attempt to represent the position on which much of the net community has settled. Please DON'T bring them up again unless there's something truly new to be discussed. The net can't set public policy, that's what your representatives are for.

Despite a widespread belief to the contrary, the Saturn V blueprints have not been lost. They are kept at Marshall Space Flight Center on microfilm.

The problem in re-creating the Saturn V is not finding the drawings, it is finding vendors who can supply mid-1960's vintage hardware (like guidance system components), and the fact that the launch pads and VAB have been converted to Space Shuttle use, so you have no place to launch from.

By the time you redesign to accommodate available hardware and re-modify the launch pads, you may as well have started from scratch with a clean sheet design.

Investigators associated with NASA missions are allowed exclusive access for one year after the data is obtained in order to give them an opportunity to analyze the data and publish results without being "scooped" by people uninvolved in the mission. However, NASA frequently releases examples (in non-digital form, e.g. photos) to the public early in a mission.

There has been extensive discussion on this topic sparked by attempts to block the Galileo and Ulysses launches on grounds of the plutonium

thermal sources being dangerous. Numerous studies claim that even in worst-case scenarios (shuttle explosion during launch, or accidental reentry at interplanetary velocities), the risks are extremely small.

Two interesting data points are (1) The May 1968 loss of two SNAP 19B2 RTGs, which landed intact in the Pacific Ocean after a Nimbus B weather satellite failed to reach orbit. The fuel was recovered after 5 months with no release of plutonium. (2) In April 1970, the Apollo 13 lunar module reentered the atmosphere and its SNAP 27 RTG heat source, which was jettisoned, fell intact into the 20,000 feet deep Tonga Trench in the Pacific Ocean. The corrosion resistant materials of the RTG are expected to prevent release of the fuel for a period of time equal to 10 half-lives of the Pu-238 fuel or about 870 years [DOE 1980].

To make your own informed judgement, some references you may wish to pursue are:

A good review of the technical facts and issues is given by Daniel Salisbury in "Radiation Risk and Planetary Exploration-- The RTG Controversy," *Planetary Report*, May-June 1987, pages 3-7. Another good article, which also reviews the events preceding Galileo's launch, "Showdown at Pad 39-B," by Robert G. Nichols, appeared in the November 1989 issue of *Ad Astra*. (Both magazines are published by pro-space organizations, the Planetary Society and the National Space Society respectively.)

Gordon L Chipman, Jr., "Advanced Space Nuclear Systems" (AAS 82-261), in *Developing the Space Frontier*, edited by Albert Naumann and Grover Alexander, Univelt, 1983, p. 193-213.

"Hazards from Plutonium Toxicity", by Bernard L. Cohen, Health Physics,

Vol 32 (may) 1977, page 359-379.

NUS Corporation, Safety Status Report for the Ulysses Mission: Risk Analysis (Book 1). Document number is NUS 5235; there is no GPO #; published Jan 31, 1990.

NASA Office of Space Science and Applications, *Final Environmental Impact Statement for the Ulysses Mission (Tier 2)*, (no serial number or GPO number, but probably available from NTIS or NASA) June 1990.

[DOE 1980] U.S. Department of Energy, *Transuranic Elements in the Environment*, Wayne C. Hanson, editor; DOE Document No. DOE/TIC-22800; Government Printing Office, Washington, D.C., April 1980.)

From time to time, claims are made that chemicals released from the Space Shuttle's Solid Rocket Boosters (SRBs) are responsible for a significant amount of damage to the ozone layer. Studies indicate that they in reality have only a minute impact, both in absolute terms and relative to other chemical sources. The remainder of this item is a response from the author of the quoted study, Charles Jackman.

The atmospheric modelling study of the space shuttle effects on the stratosphere involved three independent theoretical groups, and was organized by Dr. Michael Prather, NASA/Goddard Institute for Space Studies. The three groups involved Michael Prather and Maria Garcia (NASA/GISS), Charlie Jackman and Anne Douglass (NASA/Goddard Space Flight Center), and Malcolm Ko and Dak Sze (Atmospheric and Environmental Research, Inc.). The effort was to look at the effects of the space shuttle and Titan rockets on the stratosphere.

The following are the estimated sources of stratospheric chlorine:

Industrial sources:  300,000,000 kilograms/year

Natural sources:  75,000,000 kilograms/year

Shuttle sources:  725,000 kilograms/year

The shuttle source assumes 9 space shuttles and 6 Titan rockets are launched yearly. Thus the launches would add less than 0.25% to the total stratospheric chlorine sources.

The effect on ozone is minimal:  global yearly average total ozone would be decreased by 0.0065%. This is much less than total ozone variability associated with volcanic activity and solar flares.

The influence of human-made chlorine products on ozone is computed by atmospheric model calculations to be a 1% decrease in globally averaged ozone between 1980 and 1990. The influence of the space shuttle and Titan rockets on the stratosphere is negligible.  The launch schedule of the Space Shuttle and Titan rockets would need to be increased by over a factor of a hundred in order to have about the same effect on ozone as our increases in industrial halocarbons do at the present time.

Theoretical results of this study have been published in _The Space Shuttle's Impact on the Stratosphere_, MJ Prather, MM Garcia, AR Douglass, CH Jackman, M.K.W. Ko and N.D. Sze, Journal of Geophysical Research, 95, 18583-18590, 1990.

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Also see _Chemical Rockets and the Environment_, A McDonald, R Bennett, J Hinshaw, and M Barnes, Aerospace America, May 1991.

If you *don't* try to hold your breath, exposure to space for half a minute or so is unlikely to produce permanent injury. Holding your breath is likely to damage your lungs, something scuba divers have to watch out for when ascending, and you'll have eardrum trouble if your Eustachian tubes are badly plugged up, but theory predicts -- and animal experiments confirm -- that otherwise, exposure to vacuum causes no immediate injury. You do not explode. Your blood does not boil. You do not freeze. You do not instantly lose consciousness.

Various minor problems (sunburn, possibly "the bends", certainly some [mild, reversible, painless] swelling of skin and underlying tissue) start after ten seconds or so. At some point you lose consciousness from lack of oxygen. Injuries accumulate. After perhaps one or two minutes, you're dying. The limits are not really known.

References:

_The Effect on the Chimpanzee of Rapid Decompression to a Near Vacuum_, Alfred G. Koestler ed., NASA CR-329 (Nov 1965).

_Experimental Animal Decompression to a Near Vacuum Environment_, R.W. Bancroft, J.E. Dunn, eds, Report SAM-TR-65-48 (June 1965), USAF School of Aerospace Medicine, Brooks AFB, Texas.

The Challenger shuttle launch was not destroyed in an explosion. This is a well-documented fact; see the Rogers Commission report, for example. What looked like an explosion was fuel burning after the external tank came apart. The forces on the crew cabin were not sufficient to kill the astronauts, never mind destroy their bodies, according to the Kerwin team's medical/forensic report.

The astronauts were killed when the more-or-less intact cabin hit the

water at circa 200MPH, and their bodies then spent several weeks underwater. Their remains were recovered, and after the Kerwin team examined them, they were sent off to be buried.

You can't use the shuttle orbiter for missions beyond low Earth orbit because it can't get there. It is big and heavy and does not carry enough fuel, even if you fill part of the cargo bay with tanks. Furthermore, it is not particularly sensible to do so, because much of that weight is things like wings, which are totally useless except in the immediate vicinity of the Earth. The shuttle orbiter is highly specialized for travel between Earth's surface and low orbit. Taking it higher is enormously costly and wasteful. A much better approach would be to use shuttle subsystems to build a specialized high-orbit spacecraft.

[Yet another concise answer by Henry Spencer.]

There really is a big rock on Mars that looks remarkably like a humanoid face. It appears in two different frames of Viking Orbiter imagery: 35A72 (much more facelike in appearance, and the one more often published, with the Sun 10 degrees above western horizon) and 70A13 (with the Sun 27 degrees from the west).

Science writer Richard Hoagland has championed the idea that the Face is artificial, intended to resemble a human, and erected by an extraterrestrial civilization. Most other analysts concede that the resemblance is most likely accidental. Other Viking images show a smiley-faced crater and a lava flow resembling Kermit the Frog elsewhere on Mars. There exists a Mars Anomalies Research Society (sorry, don't know the address) to study the Face.

The Mars Observer mission will carry an extremely high-resolution camera, and better images of the formation will hopefully settle this question in a few years. In the meantime, speculation about the Face is best carried on in the altnet group alt.alien.visitors, not sci.space or sci.astro.

V. DiPeitro and G. Molenaar, *Unusual Martian Surface Features*, Mars Research, P.O. Box 284, Glen Dale, Maryland, USA, 1982. $18 by mail.

R.R. Pozos, *The Face of Mars*, Chicago Review Press, 1986. [Account of an interdisciplinary speculative conference Hoagland organized to investigate the Face]

R.C. Hoagland, *The Monuments of Mars: A City on the Edge of Forever*, North Atlantic Books, Berkeley, California, USA, 1987. [Elaborate discussion of evidence and speculation that formations near the Face form a city]

M.J. Carlotto, "Digital Imagery Analysis of Unusual Martian Surface Features," *Applied Optics*, 27, pp. 1926-1933, 1987. [Extracts three-dimensional model for the Face from the 2-D images]

M.J. Carlotto & M.C. Stein, "A Method of Searching for Artificial Objects on Planetary Surfaces," *Journal of the British Interplanetary Society*, Vol. 43 no. 5 (May 1990), p.209-216. [Uses a fractal image analysis model to guess whether the Face is artificial]

B. O'Leary, "Analysis of Images of the `Face' on Mars and Possible Intelligent Origin," *JBIS*, Vol. 43 no. 5 (May 1990), p. 203-208. [Lights Carlotto's model from the two angles and shows it's consistent; shows that the Face doesn't look facelike if observed from the surface]

NEXT: FAQ #13/15 - Space activist/interest/research groups & space publications