SCATHA: Getting a charge in orbit

A spacecraft in high orbit around the earth may be free of the grasping fringes of the atmosphere, but it is not in an unassailable position. It is bombarded regularly by electrons and ions from the sun, from elsewhere in space, even from earth's own magnetic field, which traps large quantities of charged particles to form the planet's radiation belts. And, as spacecraft engineers have become increasingly aware in recent years, the bombardment takes its toll.

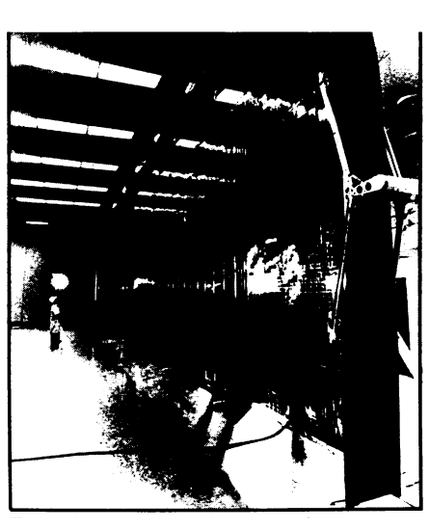
Awash in this sea of positive and negative electrical charges, a largely metallic object will pick up a charge of its own, essentially as though being sent into orbit was having its toe stuck into a light socket. Often such charges are negligible as far as the spacecraft's performance is concerned, but sometimes, particularly at geosynchronous altitude, where increasing numbers of satellites are being sent, the consequences can be serious — or even fatal.

In 1973, for example, a satellite in the military Defense Communications Satellite System failed from a malfunction in its power supply, apparently due to false commands produced by charging. The National Aeronautics and Space Administration's ATS-5 and 6 satellites both are said to have shown "anomalies" in their data that have been tentatively assigned to charging problems. Similar anomalies — some serious, some trivial — have been noted in other satellites, but the charging phenomenon is only partially understood.

One key reason is that most geosynchronous satellites have been designed for other tasks, such as communications, rather than measuring anomalous charges. In the early 1970s, both civilian and military satellites were showing the symptoms, but, says Lt. Col. John Durrett of the USAF Space and Missile Systems Organization, "At the time, people believed they were random part failures." It took time and data from a variety of sources to establish that the charging effect was a very real culprit.

Now Durrett is program manager for a satellite designed to seriously study the problem. Called SCATHA — Spacecraft Charging At High Altitudes — it carries 13 experiments to study the sources of charging, the effect on typical (and some experimental) spacecraft materials, and the potential for damage. The probe was launched Jan. 30 toward an orbit that will carry it slightly above and below geosynchronous altitude so that it can study the region "coming and going."

There are a variety of suspected charging mechanisms. Electrons striking a spacecraft, for example, can build up a negative charge of tens of thousands of volts, but photons of sunlight can drive off electrons from the spacecraft structure, reducing the net charge. When the spacecraft is in the earth's shadow, however, the sunlight is cut off, and the charge can build up again. The problem could be more severe for large structures such as proposed solar power satellites, whose higher electrical capacitance could subject them to currents of tens of thousands of amperes. SCATHA could contribute much to tomorrow's space designs. □



NASA

Test solar panel typifies large future structures possibly prone to charge damage.

Laetrile's 'secret' cancer weapon

The controversy over the purported effectiveness of the cancer drug Laetrile is not about to vanish. In fact, it may grow even larger with the addition of information given out this week by Andrew A. Benson of the Scripps Institution of Oceanography in LaJolla, Calif. According to Benson, Kenji Sakaguchi of the Kasei Institute of Biological Sciences in Machida, Japan, has found that a chemical present in Laetrile, not Laetrile per se, is effective against human lung cancer. This substance is benzaldehyde.

Important questions must be answered, however, before one automatically concludes that benzaldehyde is Laetrile's "secret" cancer weapon: What gave Sakaguchi the idea of testing it instead of Laetrile on cancer patients? How many cancer patients did he inject with the chemical, and how many of them did it help? How does benzaldehyde stack up against conventional cancer drugs in efficacy? Finally: Is it really true, as Sakaguchi purportedly claims, that benzaldehyde must be injected into the body to exert a pharmacological effect because bacteria in the human intestine are not able to break down ingested Laetrile into benzaldehyde? Other evidence implies the opposite — that Laetrile (amygdalin) is capable of being degraded by enzymes in the body to yield dextrose and mandelonitrile, which is benzaldehyde plus hydrogen cyanide (SN: 8/6/77, p. 92). □

Skylab: Preparing for the end

Having already abandoned plans to try keeping Skylab aloft for a salvation attempt by the space shuttle (SN: 12/30/78, p. 439), the National Aeronautics and Space Administration last week took a step which is actually likely to hasten the big orbiting workshop's demise. For several months, Skylab had been oriented so as to minimize the atmospheric drag that tends to pull it down.On Jan. 25, however, NASA flight controllers repositioned the structure so that its solar panels would always face the sun — with the additional effect of nearly doubling the drag.

When the orbit-prolonging effort was dropped, NASA estimated that Skylab would probably begin its final descent between June and September (though with the possibility of May or even April). Now the estimate is May through August, with the "50-50 point" in July. The agency says that the recent reorientation maneuver was to ensure electrical power (some of the workshop's batteries have failed in recent months) on the slight chance that it can enable additional maneuvers to determine the orbit during which Skylab will actually reenter. There is also some thought that the earlier reentry may find onboard components in better condition, again perhaps offering some minimal possibility of control. There is virtually no possibility of guiding the massive object in on a specific trajectory — NASA asserts merely that there is a slim chance of affecting which orbit will be the last, in hopes of picking one with minimal populated surface beneath it.

An interagency working group is meeting periodically to discuss the possible ramifications of a mishap caused by large pieces of Skylab reaching the surface. Chaired by NASA, the group includes representatives from the Departments of Defense, State and Justice, and the Federal Preparedness Agency. Topics range from the planning of emergency measures to legal questions such as the potential liability of the United States if damage should occur in a foreign country.

Meanwhile, however, it has been asserted that NASA should have taken its precautions long ago, perhaps even when Skylab was being designed, and that the agency is now soft-pedaling the possible consequences of some of Skylab's tons of metal hitting the ground. A small, Washington-based group called Chicken Little Associates says that, for example, some of the workshop's heftier components may strike the surface considerably faster than the 200 to 300 feet per second cited by NASA. The group has announced a $100-per-month subscription service for those interested in receiving periodically updated information on Skylab's times of passage over a given city. □