SME satellite: A neighborhood project

The satellite was designed, built and tested in Boulder, Colo. So was its suite of instruments, an eminently practical step since 16 of the project's 17 scientists work for Boulder-based organizations. Once in orbit, it will be controlled and monitored by a flight team many of whose members are students at the Boulder campus of the University of Colorado, which also owns the laboratory housing the mission control center a few miles away.

Yet this is no privately financed, grassroots space endeavor like the astronomy satellite being developed by a group at Rensselaer Polytechnic Institute in New York, or the solar sail project in the works at the University of Utah. The Solar Mesosphere Explorer instead is a regular National Aeronautics and Space Administration satellite, funded by the agency and managed by Jet Propulsion Laboratory, which is also in charge of such major efforts as the Voyager missions to Jupiter and Saturn.

The somewhat awkwardly named device will be studying the mesosphere not of the sun but of the earth, where much of the atmosphere's ozone is created and destroyed. The goal of SME is to provide data on ozone, water vapor and nitrogen dioxide in the upper stratosphere and mesosphere, as they respond to changes in the sun's ultraviolet radiation and proton emissions. Scheduled for a mid-September launching, the satellite is funded to operate for a year (officials hope that another year or two will be possible), with controllers sending commands to reconfigure its instruments orbit by orbit to accommodate changing conditions and new observing plans. Past probes have conducted ozone studies, but the organization of the SME project represents a distinct departure from usual NASA procedure, in ways that could turn out to be relevant to cost-constrained space missions of the future.

The idea was first proposed in 1974 by Charles Barth and colleagues from the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP). Gathering nearly the whole of SME's scientific team from one city is anything but the constraint it might appear, when the city happens to be home not only for LASP but for the National Center for Atmospheric Research and the National Oceanic and Atmospheric Administration's Aeronomy Laboratory. The group's proximity facilitates the numerous meetings required by any spacecraft program, gives the researchers ready access to their data, and made it possible for the scientific payload to be assembled at one place — LASP — without the expensive and time-consuming extra step of integrating separately supplied instruments. Furthermore, the builder of the spacecraft itself, though not chosen for geographic convenience, according to project scientist Barth, is Ball Aerospace and Systems Division — about two blocks away.

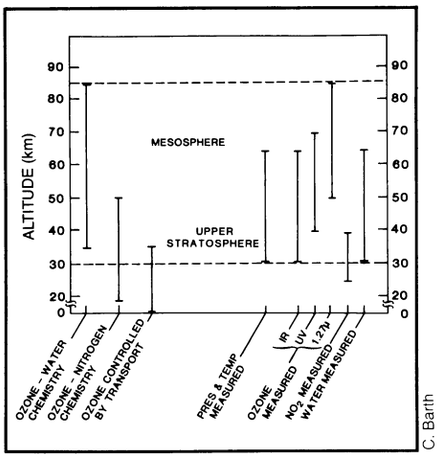


Chart shows altitude ranges covered by the SME *satellite's ozone-chemistry sensors.*

The control center, too, is at LASP, making UC apparently the first university to be in full and direct control of a spacecraft. Although SME's well-being is the responsibility of four full-time, professional controllers, the science commands and data are in the hands of 14 students—13 of them undergraduates — who are paid by the university (under a NASA contract) just as if they were working at the campus library or bookstore. Bulletins from NOAA's Space Environment Services Center help plan the resetting of the instruments, such as to take advantage of a solar proton outburst (for which SME can be alerted in as little as 10 minutes). The students, who have been practicing their upcoming task for months, were part of the SME plan from the beginning and seem entirely capable of handling the responsibility, says Elaine Hansen, who is the project's Mission Operations Manager — or MOM. □

Clean Air Act: Changes in the wind

Nine principles endorsed by President Ronald Reagan last week suggest a significant loosening of the 1970 Clean Air Act, although Environmental Protection Agency Administrator Anne M. Gorsuch pledged that the nationwide movement toward cleaner air will proceed, just at a "more reasoned pace." Congress will consider extension and revision of the controversial act when it returns from its August recess.

The principles support the concept of primary standards based on health — that is, on "sound scientific data demonstrating where air quality represents real health risks" — rather than on cost-benefit analysis. Secondary standards, which protect the environment, visibility, and other values not related to health, would continue to be set at the federal level, and research on acid rain would be accelerated. The Reagan administration also recommended that standards for automobile emissions be relaxed to 1977 levels for nitrogen oxides, and that the program to prevent significant deterioration of air quality be maintained for park and wilderness areas but relaxed in other areas where protection would be based on uniform technology requirements. Other principles adjust deadlines for achieving primary air quality standards in some areas from 1982 to, perhaps, 1987, expand the toxic air pollutant program, and simplify state compliance rules and ease enforcement. Pollution control standards for new coal-fired plants would be based on uniform emission standards, which might free many facilities from the need to use costly scrubbers. □

New lobby for the defense of science

Billing itself as the first general public-interest lobby for science and technology, the Action Committee on Technology (ACT) amounted to little more than four ambitious University of Virginia students when it coalesced in January. By March it had registered as a lobby. Since May, it has written a space-policy bill, which Newton Gingrich (R-Ga.) introduced in the House on July 28, found Gingrich 15 co-sponsors for the bill, organized an informal congressional association of more than 50 staff members interested in space, and lobbied Republican congressmen — both on tax-cut legislation that would benefit technological entrepreneurs and on reinstating some of the funds cut from the National Science Foundation budget.

President, board chairman and dynamo of this shoestring operation is an enterprising man who seems born to the task. When not canvasing high-technology firms for seed money to finance ACT's pro-technology campaign, James Muncy is dropping by congressional offices or attending to the business side of lobbying. And while he lacks the experience and polish of many peers, this native Washingtonian exhibits what appears to be an almost intuitive political savvy. That will probably prove his most important asset, since the issues he's campaigning for most strenuously — space-science research, planetary exploration and science education — have all taken a fiscal beating in the first Reagan budget.

ACT was initiated in an effort to "defend science and technology on Capitol Hill," Muncy told SCIENCE NEWS, "and we've put a clear emphasis on the *defend.*" He said there is a resurgence of public interest and support for science that has not been effectively represented in Washington. Cer-

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *Science News*. www.jstor.org

tain organizations do lobby on behalf of their members, he notes, but Muncy claims that no group really plays the role of public science advocate.

Muncy is most proud of his space-policy bill. Modeled after Thomas Jefferson's Northwest Ordinance of 1784, Muncy says it provides for the exploration and peaceful colonization of Americans in space. ("An appropriate first step," the bill suggests, "would be the design, development, and construction of a permanent, manned, multipurpose space-operations center in low earth orbit.") The bill would also strive to ensure continuity for funding of appropriated space-science projects that must now fight on a yearly basis for their survival.

But space is only one of four foci outlined in ACT's June policy statement. The lobby plans to address issues and legislation affecting support for energy, basic research and education also. Among particulars spelled out are support for:

- increased basic research by industry, especially cooperative ventures with universities in technology-frontier areas such as cybernetics and cognition, planetary and stellar sciences, and molecular biology;
- increased emphasis on mathematics and the "hard sciences"—biology, chemistry, earth sciences and physics — at all levels in school;
- efforts to achieve national computer literacy, particularly among working adults;
- fusion-power development and standardization of fission-powerplant designs; and
- increased funding for science education projects at NSF and elsewhere that are aimed at "increasing the public's understanding of science, with the goal of sparking coordinated action by private and public-sector leaders to combat the nation's scientific illiteracy crisis."

As its name implies, ACT's priorities suggest a bias toward capital-intensive and high-technology programs. And as a lobby "for the public interest," it remains to be seen whether eventual supporters will in fact endorse those aims. (ACT plans direct-mail financial solicitations for individual, corporate and institutional members soon.)

Three of ACT's founders have already set up a Washington headquarters. However, their research base will remain in Charlottesville, Va., Muncy says, so that students can stay involved. And as a federal depository, "U.Va. has just as excellent a library for research purposes as the Library of Congress," Muncy boasts. ACT's advisory board shares a similar geographical representation. Members include: Leo Young (former president of the Institute of Electrical and Electronics Engineers); Mark Chartrand (executive director of the National Space Institute); David Ahl (publisher of CREATIVE COMPUTING); and Deborah Roberts (government professor at U.Va.). □

Subtle songs of cowbird courtship

A cowbird begins life as an invader in another species' nest. But it soon seeks the society of its own kind. Fitting into the flock requires social skills that include the singing of an appropriate song. An interplay of development, learning and communication can be observed in a cowbird's song. While the basic tune is genetically programed, variations are learned and moderated in response to the bird's social surroundings.

The quantitative key to appreciating cowbird song is the dramatic female response to a mating call. Meredith West of the University of North Carolina and Andrew King of Duke University first described this copulatory posture. Within seconds of hearing a male cowbird sing during breeding season, a female cowbird will adopt a "hunkered down, tail up" position. West and King put a female in a soundproof chamber and play it a recording of a male song. The percentage of the trials in which the female reacts with the copulatory posture indicates the "potency" of the song.

Cowbirds raised in isolation from other members of the species sing an acceptable mating call. In fact, they sing the most potent version. West describes the call as a liquid-sounding "glug-glug" followed by a shrill whistle. Males raised in isolation always stress the first high-frequency note following the low-frequency "glugs."

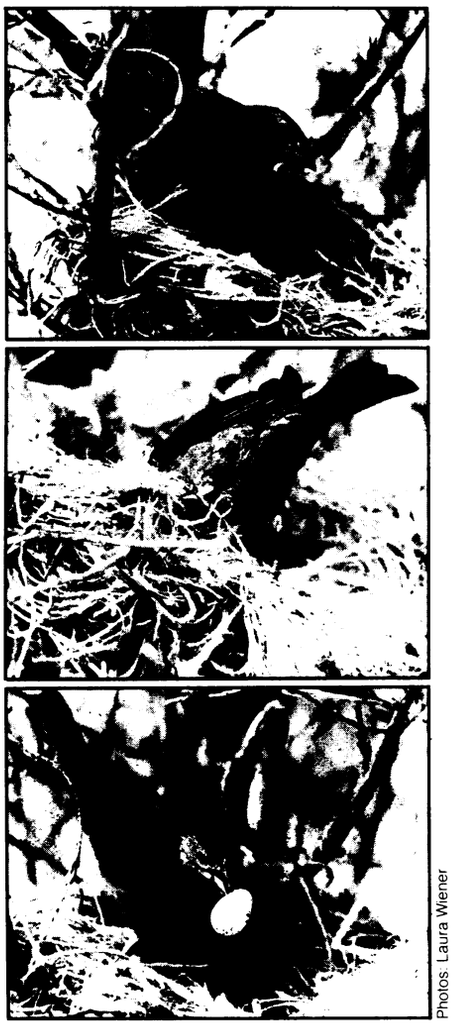
While singing the most potent song makes the isolate a hit with the females, it gets him in trouble with the other males. The birds in a flock have a stable dominance hierarchy, which scientists document by keeping track of which bird leaves when two light on the same perch. Only the males at the top of the hierarchy are allowed to sing the most potent song. If an isolate sings it, he will be viciously attacked by the other males.

In nature, training before the breeding season ensures that a male sings the appropriate song. West says there are two aspects to this training in which a male sings and experiences the consequences. One aspect is the reaction of other males — that is, whether they attack. The other aspect is the more subtle response of females, whether they stay near the singer or move away.

West describes one example of females teaching a male what to sing. Eastern cowbirds and southern cowbirds sing slightly different dialects. A male of one locale surrounded by females of the other will alter his dialect to improve the female response. West and King even observe variation among females of the same locale in which individual male's song they prefer, although all prefer the class of songs sung by dominant males (or isolates) over the songs of the rest of the flock.

By breeding season, the songs of the males are fairly well set, West says, but she points out that the males always are ready to change their tune to exploit circumstances. If a dominant male is moved out of the flock, others start courting the desirable females and singing the more potent songs.

West plans to extend studies of vocalization and their responses to interactions between human infants and their parents. She hopes to find out whether the characteristics of this "motherese," the way people speak to a baby, are controlled by feedback from the infant. By precisely measuring the sounds produced by the parent and playing them to the baby, she plans to determine their effect on such infant behaviors as head-turning, smiling and vocalizing. West says, "This may begin to tell us which sounds are important for early language development and why some babies don't respond as well and as early as others." □



Photos: Laura Wiener

Changeling in the brood: A female cowbird finds newly laid eggs in another bird's unguarded nest, she impales one with her beak and drops it to the ground. The next day she will lay her own egg in the nest and leave it to be tended by the nest's occupant.