

Tragedy in space



Wide World

Space heroes' burial in Kremlin: Brezhnev shoulders bier with urn and ashes.

The soul of Mother Russia lay bare. What was to have been a heroes' welcome became a heroes' requiem last week for the three Soyuz 11 Cosmonauts, Lieut. Col. Georgi T. Dobrovolsky, Vladislav N. Volkov and Viktor I. Patsayev. Doleful Russian music replaced triumphant marches.

The cosmonauts had successfully completed another space first—24 days (a record) aboard the space station Salyut (SN: 6/12/71, p. 399). The crew's last transmission from their spacecraft "Amber" to ground control (code name "Dawn") had taken place about 22 minutes prior to Soyuz 11's reentry into earth's atmosphere. After undocking with Salyut about 9:30 p.m., Moscow time, June 29, flight commander Dobrovolsky said: "Everything on board is in order, feeling excellent, ready for landing." Flight engineer and space veteran Volkov had said, "I can see the station. It's shining beautifully in the sun. You look down there and you get homesick. You want some sunshine, fresh air and to wander in the woods." Then Dobrovolsky said: "I am starting orientation."

According to Tass reports, communication with the crew ceased after braking the engines for reentry. This was before radio blackout normally occurs. In vain, the ground tried to contact the crew: "Amber, this is Dawn. Come in. Amber, this is Dawn. Come in!"

The spacecraft landed on target, about 1:35 a.m. June 30. But moments later when the helicopter-borne recovery group opened the hatch, they found the crew in their seats, without any signs of life. One journalist reported that the men were found in a state of repose as if in a deep sleep. Their faces

were tranquil with no signs of a struggle before death.

This week the Soviet government had not yet made an official announcement of the cause of death, although autopsies had been performed. Speculation by both Soviet and Western journalists on the cause of death included death from sudden loss of oxygen—either from a malfunction in the environmental system (a combination of oxygen and nitrogen) or from a leak in the spacecraft (causing decompression). A third suggestion, discounted by most space experts, was that the men died from the effects of gravity after prolonged weightlessness.

"I would speculate," said Dr. George M. Low, Deputy Administrator for the National Aeronautics and Space Administration, on the day of the tragedy, "that the fault was with the spacecraft and not with the men. . . . Man has rapidly adjusted to new and different conditions, while machines have sometimes failed."

News out of Moscow gave no indication that the men died from the effects of the space environment. In fact, the opposite view was prevalent. Academician Mstislav V. Keldysh, president of the Academy of Sciences of the U.S.S.R. spoke of the deaths as "an unexpected occurrence." Writing in Pravda, Boris N. Petrov, also a member of the academy, said, "An accident can never be ruled out when such complex machinery is being tested."

"The mastering of the cosmos," continued Petrov, "is the difficult path on which man is now treading. . . . One can say with confidence that the 1970's will become an epoch in the development and wide use of long-term manned orbiting stations. . . ."

While the cause of death remained uncertain, the world wept. "This has been a sad day for all of us in the space program," said Dr. Low. The three men lay in state for eight hours in the hall of the Central Army House in Moscow prior to cremation. The funeral was held July 2. The urns with the men's ashes were placed on gun carriages and pulled through the streets of Moscow to Red Square. In the funeral cortege were the remaining cosmonauts, the families, Communist party leader, Leonid I. Brezhnev, Premier Aleksei N. Kosygin and President Nikolai V. Podgorny. United States Astronaut Col. Thomas P. Stafford stood by the urns.

Some results of the historic mission were returned to earth in the capsule with the men. They had carried on a variety of experiments: a study of the effects of weightlessness on the development of higher plants (a space kitchen-garden had been grown from which the men ate space food); multi-spectral photography of the earth's land and water; measurements of tissue dosages of radiation; measurements of the earth's ionosphere; and numerous astronomical observations.

This the world has not lost. □

NUCLEAR DETECTION

Seismology meets politics

One of the principal barriers to an effective ban on underground nuclear testing is the problem of enforcement. The United States has maintained that regular on-site inspections would be necessary to guard against clandestine tests, a condition the Soviet Union has thus far rejected.

The inspection problem could be bypassed if underground tests could be detected seismically. Last July, the U.S. Defense Department's Advanced Research Projects Agency (ARPA) sponsored a conference of leading seismologists at Woods Hole, Mass., to determine the accuracy with which underground nuclear explosions can be distinguished from earthquakes.

A summary of the conference's conclusions, written by one of the conferees, reported significant advances in the ability to distinguish between these events by the waves they produce.

Earthquakes generate four basic types of waves. Primary (P) and Secondary (S) waves, called body waves, travel through the earth. Rayleigh and Love waves are of much greater lengths than body waves and travel only on the earth's surface. There is a positive linear relationship between the magnitudes of surface and body waves for earthquakes; surface-wave magnitude increases as body-wave magnitude increases. This relationship holds for waves generated by explosions, as well, but

Industries miss deadlines

The most effective Federal instrument for dealing with water polluters is the recently resurrected 1899 Rivers and Harbors Act, which gives the Army Corps of Engineers authority to require permits for discharges into navigable waterways and their tributaries—meaning almost all waters in the United States. Meshing the law with state water standards, set under later clean water laws passed by Congress, the Corps hopes to make the permit system an effective cleanup device. The system allows a \$2,500 fine for each violation. The 1899 statute has already been partially effective in selected cases.

June 30 was the deadline by which all industries discharging into the nation's waterways were to have submitted permit applications to the Corps. The idea was that the states and the Environmental Protection Agency would then evaluate the applications so the Corps could take needed administrative or legal action against polluters.

But the Corps reports this week that of 60,000 applications in the hands of industrialists, only 12,000 had been turned in completed by July 2.

Part of the problem is that commercial laboratories have been so busy analyzing effluents for industries since the application forms became available in May that they are still way behind. For industries with complicated effluent-analysis problems, EPA and the Corps are granting extensions on reporting until Oct. 1.

But analysis may not be the only problem. From the forms already in, it appears that an unexpectedly large percentage of industries dump their effluents into municipal sewage systems. Liquid wastes from such systems are exempt from the 1899 act, and there is no Federal mechanism for dealing directly with the offending industries; only indirect pressures can be brought to bear, through unwieldy actions against municipalities or through withholding grants for new sewer systems.

Another problem may be that because the 1899 act provides for criminal penalties, executives of the industries may feel they are entirely within their Fifth Amendment rights in withholding information that might be self-incriminating.

EPA officials are not hesitant to say they hope Sen. Edmund S. Muskie's subcommittee on air and water pollution will clear the tangled problems away. They add that they hope new, uniform standards to be recommended by the committee will be tougher than what they consider to be the weak standards now in force in many states. □

plots of surface- versus body-wave magnitudes for the two types of events fall on different, roughly parallel, lines.

The original summary of the ARPA conference said new data indicate that discriminations on the basis of this difference can be accurately made for events with magnitudes as low as 4.0 on the Richter scale. This is a twenty-fold gain over the state of the science five years ago, and would permit detection of one- or two-kiloton bombs exploded in hard rock. The summary concluded that much progress had been made.

This summary, however, was not included in the final published report of the conference. Explaining that the original summary represented the views of only one man, ARPA wrote its own summary—a more pessimistic one.

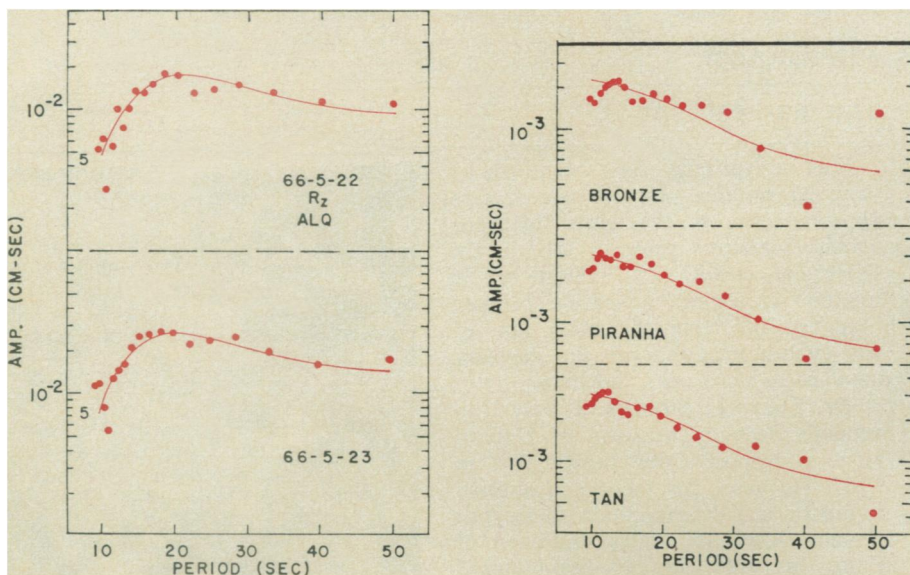
The ARPA summary, released May 24, said that it was only possible to distinguish earthquakes from explosions to some magnitude below 4.5—equivalent to about 5 to 10 kilotons. The new summary concluded that “a major result of the meeting was a clear impression that much research has yet to be done to resolve the discrimination problem.”

they said, more adequately represents their views about the present status of the discrimination problem.

Another group of scientists, Drs. Peter Molnar, Peter Ward and Max Wyss of Columbia University's Lamont-Doherty Geological Observatory, told Sen. Case they had not even been aware of the existence of the second summary until they had seen it reported in a newspaper. The first summary, they said, “adequately reported the many recent advances in seismic techniques for detection and discrimination and . . . expressed our impression of what was said at Woods Hole.”

Last week Sen. Case, read the letters on the floor of Congress to rebut ARPA's assertion that its version represents a truer consensus than the original. It is not uncommon for government bureaucracies to resist scientific findings, he said, especially when such findings conflict with entrenched interests. “When such bureaucratic resistance is translated into overt manipulation or suppression of the frank opinion of scientists, however, it becomes an abuse of authority which cannot be tolerated.”

Dr. Molnar, who has now seen the



Tsai and Aki/J. Geophys. Res.

Rayleigh amplitude patterns from quakes (left) and underground nuclear tests.

The question is which summary most accurately reflects the views of the conference participants?

In a letter to Sen. Clifford Case (R-N.J.), three participants from the University of California at San Diego, Drs. Barry Block, James Brune and Freeman Gilbert, expressed strong disagreement with the conclusion of the ARPA version. “On the contrary,” said the three, “we feel that the discrimination problem has essentially been solved down to magnitude 4.0 and what is required is an implementation of adequate instrumentation and analysis techniques.” The original summary,

revised summary, said this week he also strongly disagrees with its conclusion, and that it “is more pessimistic than it should be.”

Another conference participant, Dr. Don Anderson of the California Institute of Technology points out that there were statements in the first summary that were not made at the conference. All in all, neither summary appears to please everyone, but most of the participants seem to prefer the original. Where this leaves the beclouded ARPA summary, as well as public confidence in official statements on such matters, is not yet entirely clear. □