Kosmos—1000 up

The Soviet Union has launched its thousandth Kosmos satellite. Vera Rich pinpoints some of the highlights of the series

KOSMOS satellites are not the most publicity-catching part of the Soviet space programme — indeed until Kosmos-954 made an “unscheduled re-entry” into Canada recently, the series had long since faded into the limbo of the unnewsworthy.

Yet, according to one of the creators of the series, Professor V. Mikhailov, speaking on the occasion of the launch of Kosmos-1000, the essentially routine nature of the series represents “a convincing example of the rational approach to the solution of the problems facing cosmonautics”.

The diverse research programme of the series, he said, is based on “several types of unified apparatus”, permitting the “series” production of satellites, irrespective of their particular scientific mission. This virtually mass-produced output of satellites has undoubtedly greatly assisted the high turnover speed of the series, which has reached the 1000 mark in 16 years and two weeks, with more than 500 launches in the past six years.

The Kosmos series began with the launch, on 16 March 1962, of an unnamed satellite, as part of a programme to be carried out “in the course of 1962”, and including:

- study of the concentration of charged particles in the ionosphere with the aim of investigating the properties of radio waves;
- study of the energy states of the radiation belts of the Earth, with the aim of estimating the radiation hazards for long-term space-flights;
- study of cosmic rays and variations of their intensity;
- study of the magnetic field of the Earth;
- study of short-wave radiation of the Sun;
- study of the upper layers of the atmosphere;
- study of the action of meteor matter on space objects;
- study of the distribution and formation of cloud systems in the Earth's atmosphere.

The name Kosmos-1 was applied to this satellite only retrospectively, when three weeks later TASS reported the launch of Kosmos-2. Soon Kosmos satellites were going into orbit so rapidly that the world press grew tired of reporting them—particularly since their purpose was never announced. In the early days, the aim of the programme was repeated from the original TASS statement of 16 March, 1962;

later this was usually reduced to a brief formula. In this respect, Kosmos-1000, which was specifically declared to be a navigational satellite, is something of an anomaly. However, this “new direction in the extensive use of space technology” was doubtless chosen to coincide with the thousand-mark.

The lack of news-interest in the Kosmos series has had a number of advantages from the point of view of the Soviet planners. The name Kosmos is noncommittal: it could be used, if necessary, to conceal a failure or a trial run. Thus Kosmos-41 is thought to have been an unsuccessful communications satellite (or perhaps simply a “dry run” for the later Molniya-1). Kosmos-96 is presumed to have been a Venus probe left (or stranded) in orbit. The mysterious Kosmos-146, which arrived in orbit with a length of approximately 14 metres, and by next day had contracted to about 9 metres after emitting two capsules is thought to have been a Soyuz precursor.

In an interview last week Georgii Narimanov of the Institute of Space Research of the Soviet Academy of Sciences said that Kosmos satellites

have been used to test long-range communications systems, piloted re-entry installations, life-support systems, and assemblies for the lunokhod moon-rover, as well as automatic docking procedures (Kosmos 186–188). Only in the last case, however, could outside observers deduce at the time the purpose of the launch.

The lack of information soon led western observers to speculate about possible military applications — particularly after Kosmos-57, which was launched on 22 February, 1965, and which blew up (or was blown up) the same day, but which was reported by TASS the following day to have “all systems functioning normally”. Such speculation can, of course, lead to false conclusions; a number of events in the Kosmos series are most easily explained as hunter-killer tests, one satellite exploding in the vicinity of another (though without the direct attack which would contravene international agreements banning weapon testing in space). The Soviet Union, of course, denies all allegations that it is developing satellite-killing satellites, attributing this “myth” to opponents of a new SALT agreement who wish to “obstruct progress towards the completion of such an agreement”.

The wide-spread speculations at the end of 1976 that killer satellite tests are aimed at Chinese, rather than US reconnaissance satellites, being carried out at a relatively low altitude, have

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Novosti

Right: a Kosmos satellite Left: lift-off of a Kosmos carrier-pocket in assembly with the intercosmos satellite (1969-73)

proved premature. Subsequent tests of this nature have taken place at a wide range of altitudes, including those favoured by the US satellites. The presence of a nuclear pile, rather than an isotope source, aboard the ill-fated Kosmos-954 led to speculation about high-powered radar installations; since, however, Soviet scientists are currently working on the use of radar for oil-slick detection, Kosmos-954 might well have been engaged in monitoring nothing more sensitive (in the military sense) than environmental pollution.

Certainly the "eight-day" satellites, which re-enter within a few days of launch and before their orbit has naturally decayed suggest some kind of photographic reconnaissance operation—particularly since they typically have fairly low altitudes. Undoubtedly, the general name Kosmos could provide a cover-all for a number of undisclosed purposes—not all military (there has been recent speculation that Kosmos-929 was in fact the test flight of a space-tug, particularly in the light of evidence that the Soviet Union is working on a reusable space-shuttle).

In fairness to TASS and the Soviet authorities, it must be admitted that the majority of Kosmos research is more scientifically valuable than newsworthy. Its place is in journals such as *Kosmicheskie issledovaniya*, not the headlines of *Pravda*.

Such news as is released to the general press is of the more eye-catching type—the laser experiments on Kosmos-97, the biomedical experiments (using dogs) of Kosmos-110, meteorological photographs from Kosmos-122 and -144. The launch of Kosmos-122 was witnessed, incidentally, by General de Gaulle on his visit to the Soviet Union—the only non-Socialist head of State to be so honoured. And the announcement that the originally routine Kosmos-5 (launched 28 May, 1962), had picked up high altitude radiation from the USS "Starfish" nuclear test (9 July, 1962), provided a valuable incentive towards the conclusion of a test-ban treaty.

There is now a serious lag in the publication of scientific results from Kosmos satellites. Typical papers published in *Kosmicheskie issledovaniya* in 1977 present data from Kosmos 225, 261, 348, 391, 426, 461, 484 and 490.

Broadly speaking, the more important it is for future developments, the more likely it is that a given satellite will receive an early "write-up". Thus the cosmic-ray shielding system tested on Kosmos-605 was reported in *Kosmicheskie issledovaniya* No. 5, 1975. This system, to judge by the diagram (a cutaway sketch of a shielded cabin, with a human figure at the centre), is designed for a manned station.

The effects of radiation exposure have been a cause of worry ever since the flight of the dogs "Veterok" and "Ugolek" in Kosmos-110. This satellite was orbited high in the Van Allen belts, possibly to test a new "antiradiation serum". Little is known about biological experiments for the next few years; however, Dr N. N. Gurovskii observed (on the occasion of the launch of Kosmos-1000) that the biomedical work of the Kosmos series had "facilitated such notable achievements" as the flight of the Vostok, Voskhod and Soyuz spaceships and the Salyut spacestation—suggesting an on-going programme throughout the 1960s.

At the time, however, it appeared that there was a lull in the biomedical aspect of Kosmos, until October 1970, when Kosmos-368 carried "scientific apparatus for testing experimental life-support systems for laboratory animals, for the future study of space-flight on living organisms, and for the continuation of the investigation of the physical characteristics of space".

Whatever the routine biomedical work in the meantime, this aspect of the Kosmos series came, once again, to the fore with Kosmos-782 launched at the end of 1975. This was an international event, carrying experiments not only from the Socialist block (Poland, Czechoslovakia, Hungary and Romania), but also France and America, as well as the Soviet contribution. The main concern of Soviet space medicine is the genetic hazard—hence this craft carried *drosophila* (once banned to Soviet research by Lysenko) as well as seeds and unicellular organisms. Higher life forms included tortoises, rats and fertilised fish. A special Soviet-US cooperation experiment investigated the effect of space conditions on tumour cells.

A second such 'international bio-laboratory' was launched as

Kosmos-936 in August, 1977. Special emphasis was placed in this flight on "problems of radiation safety in protracted space flights". A TASS correspondent, Nikolai Zheleznov, commented that the work of US and Soviet cosmonauts on board the Salyut and Skylab orbital stations had now "removed from the agenda" the question of whether man can leave the Earth for a long period. The main medical problem, he said, is now to ensure the proper functioning of a "space dwelling" in all respects from safe "habitation conditions" to the provision of consumables. A special feature of the biolaboratories (though there are conflicting reports as to when it was first introduced), is a gravity-simulating centrifuge allowing the effects of reduced as well as zero gravity to be investigated.

The main purpose of the Kosmos series, remains, however, geophysical and astrophysical surveys. In accordance with current Party doctrine, which stresses the service of science to the community, it is continually stressed that the whole programme aids the national economy by giving a better understanding of natural environmental processes, as well as providing data for geological surveys, weather-forecasts, and the mapping of the movements of fish shoals.

The individual experiments may be apparently abstruse—but officially the whole Kosmos programme (as, indeed, the whole space programme, manned and unmanned) is designed to serve the national economy.

How, then, has the economy benefited? To mark Kosmos-1000, *Pravda* published a kind of symposium of comments by those closely connected with the programme. Academician Obukhov emphasises the practical aspect: "The experience accumulated in the course of the geophysical experiments of the 'Kosmos' satellites was used in the concrete development and realisation of the 'Meteor' meteorological system". Others stress the basic research: "The launch of Kosmos-321 gave a picture of the distribution of the magnetic field over 94% of the surface of the terrestrial globe" (Dr Sh. Dolginov); "For the investigation of the upper atmosphere, the aurora, and the magnetosphere, the 'Kosmos' programme made direct measurements in circumterran space a reality" (Dr Yu. Gal'perin).

Pravda's concluding comment was, however, entirely utilitarian: "The satellites of the Kosmos series have made and are continuing to make an enormous contribution to science and technology, and facilitate the further practical use of circumterran space for the good of mankind". □

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The Kosmos that crashed on Canada earlier this year, on show to the press.