

Israel Shoots for a 'Moon'

Civilian space program claims to target economic, not military, goals

By Simson L. Garfinkel

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TEL AVIV

ISRAEL is aggressively pursuing its space program for economic, not military reasons, said Akiva Bar-nun, coordinator of the Israel Space Agency (ISA), a few days before the country launched its second satellite last month. "This is not a spy satellite. It has no cameras," Dr. Bar-nun said.

Although Israel's exports are primarily agricultural, "you can only sell so many oranges," Bar-nun said in an interview. By demonstrating that it can produce and launch reliable satellites, Israel hopes to earn "a slice" of the world's \$10 billion-a-year space market, he said.

"The Israel Space Agency is purely civilian. We belong to the Ministry of Science and Technology. There is absolutely no military involvement," he said.

Nevertheless, the launch came the day after President Saddam Hussein of Iraq threatened to destroy "half of Israel" with chemical weapons if that nation attacked Iraq. Shimon Peres, the leader of Israel's Labor Party, told reporters the launch should remind Iraq's president "that if he wants to deal with Israel, he should look for other means than the military one."

Bar-nun dismissed attempts to relate the two incidents: "Everybody knows that in order to launch a satellite, you have to start a sequence of events that takes many days. So one can obviously not react on a daily manner to such things."

But by demonstrating that it can launch a satellite into Earth orbit, says William Green, professor of international relations at Boston University, Israel has proved that it has perfected its ballistic missile technology.

"The difficulty of putting something in orbit, achieving the orbital velocity of 18,000 miles per hour, essentially means that you have captured the technology to put a ballistic missile anywhere in the world," Dr. Green says. "The satellite technology may be civilian, but the rocket technology has inherent military implications."

The satellite, named OFEQ 2 and built by Israel Aircraft Industries (IAI) Ltd., weighs 325 pounds and is designed to test IAI's satellite communication and control systems under actual

space conditions, according to a statement by the company. It is similar to OFEQ 1, launched on Sept. 19, 1988, which remained in low-Earth orbit for 118 days. Both were placed in orbit with a three-stage rocket, which foreign reports have speculated is a modified version of the Israel's military Jericho II rocket.

Because OFEQ 2 is in a lower orbit than OFEQ 1, it will stay up for a shorter time, Bar-nun said in a telephone interview after the launch. The purpose of the second satellite is to measure the performance of computer and ra-

off the shelf," he says.

Now the Israel Space Agency is developing a new generation of scientific satellites. These satellites will all use the same multipurpose "platform," says Giora Shaviv, head of the Asher Space Research Institute at the Israel Institute of Technology (Technion) in Haifa.

A platform provides the satellite with power, stability, navigation, and ground communications.

Although each design costs millions of dollars, platforms have traditionally been custom-designed for each satellite. By using the same design for all its satellites, Dr. Shaviv predicts that Israel will save "hundreds of millions of dollars" of research and development costs for each satellite. "The design of the first was more expensive, but if you send up 10, you save the cost nine times," he says.

Each platform will have one or two bays designed to hold an experiment of 20 kilograms (44 pounds). One experiment currently under development is an X-ray telescope designed to look at neutron stars, black holes, and white dwarfs in the far reaches of outer space, Shaviv says.

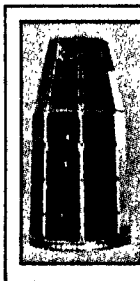
The telescope will be the first of its kind to use an array of small detectors, instead of a single large one, and will be able to see objects twice as faint as other X-ray telescopes, he says.

The X-ray telescope should launch "in two years if everything works fine, in three years if there are problems," Shaviv says.

Such a platform could also be the basis for an intelligence-gathering satellite, says Green. "It's just a matter of the sensors you put on board, and the Israelis have a lot of experience with airborne sensors. Their reconnaissance aircraft are famous."

Eventually, Israel hopes to build a set of two communications satellites, named AMOS, that will be able to provide telephone, telex, and direct-broadcast television for the entire country. The satellites will have a total of 12 transponders for ground communication, some of which Israel hopes to lease to other countries, Bar-nun says.

ISA has already contracted with Arianespace, the French and European space concern, to place the AMOS satellites into geostationary orbit, says Bar-nun. Reaching geostationary orbit with an Israeli-made rocket "would be very nice, but 36,000 kilometers [22,700 miles] high is somewhat much. It took other nations many years to do that," he says.



SPACE RACE

First satellite launches

USSR	Oct. 1957
US	Feb. 1958
France	Nov. 1965
Japan	Feb. 1970
China	April 1970
Britain	Oct. 1971
India	July 1980
Israel	Sept. 1988

dio communication systems that have recently been completed.

"Space industry is very demanding," he said. "You have to prove that your instruments work under space conditions." Only after such demonstrations can Israel hope to sell its space components to other countries.

Another capability that it demonstrates, says Boston University's Green, is that Israel can "collect overhead intelligence independently of the US." Although the OFEQ 2 satellite may not be a spy satellite, such an instrument could be launched with the same rocket system.

Bar-nun says that Israel developed a launch capacity so that it would not have to wait in line for American or European facilities. With space systems, delays mean that "you have to keep your equipment well protected in the right environment for many months or years, and this costs many millions of dollars."

For example, he says, Israel had planned to launch a satellite aboard the US space shuttle in 1987, but the launch was postponed after the Challenger accident, resulting in substantial costs to Israel's space program.

A small high-technology country that is new to space, Israel has many advantages.

Experienced aerospace companies "tend to use older equipment, that is heavier and more energy consuming, but which has been proven in space and which in many cases they can just take

Literary Friendship Sealed on Stationery

By Merle Rubin

IN 1955, the publisher, editor, and author Rupert Hart-Davis and his former teacher at Eton, George Lyttelton, began what proved to be one of the most charming and urbane correspondences - if not in the entire history of letter writing - then certainly in its recent history, when so few of us seem to have or take the time to communicate in this fashion.

These letters, exchanged at least once a week over a six-year period, were written largely for the pure pleasure of carrying on a literate, civilized conversation by means of pen and paper. Hart-Davis and his former teacher were separated by a 24-year age difference. Hart-Davis led the literary life in London; Lyttelton, a quieter existence in the Suffolk countryside.

Consideration and responsiveness are certainly the keystones of this shared enterprise, from its inception, when Hart-Davis agreed to take time out of his busy London life to correspond with his old teacher, who complained that no one wrote to him,

to the end, when Lyttelton, in declining health, valiantly continued to keep his end up. "This letter," he confesses a few weeks before his death, "is a striking example of the victory of mind over matter. I got up feeling like death and very nearly fell asleep in the bath. But I formed one resolve - to ignore all else but to write four sides to you, and though I must now go and lie down for a bit, I feel all the better for having done so."

Although Hart-Davis indubitably led a literary life, it would still be fair to say that it was Lyttelton who lived more exclusively in the world of books. Indeed, Hart-Davis himself observed as much in a letter addressed to his old friend 16 years after his death on what would have been his 100th birthday: "my share . . . was comparatively easy, since I was leading such an active life that all I had to do was to recount my week's doings, using you as the diary I never kept. But your task was far harder . . . you had little straw for your magnificent bricks . . ."

For Lyttelton, literature furnished ample straw, from marvelous quotations to keen discussions about books that he enjoyed having with his former pupil. By the time they took up the correspondence, the balance of the relationship had shifted so as to give the former student a shade more authority than his teacher. At times, Lyttelton's attitude toward Hart-Davis seems almost overly ingratiating. But in a correspondence like this, perhaps courtliness is the key to success.

Both men's love of books - and of literary gossip - is delightfully contagious, whether or not the reader happens to share their opinions about everyone from Jane Austen, Dr. Johnson, Trollope, Carlyle, and Matthew Arnold to Iris Murdoch, John Betjeman, and Kingsley Amis (Lyttelton's *bête noire*). In these last two volumes, they spend a great deal of time debating the question of D. H. Lawrence: Hart-Davis is one of those involved in defending "Lady Chatterley's Lover" against charges of obscenity; while Lyttelton disapproves of the book and its author, provoking the normally good-tempered Hart-Davis into exclaiming, "Your insistence on the suppression of *Lady Chatterley* is the only symptom of age that you have ever shown me . . ."

The more personal dimensions of the friendship are also captured in the letters. In confessing his concern about his own aging father, Hart-Davis unburdens himself while paying warm tribute to his friend: "He [Hart-Davis's father] reads all day and night, but enjoys very little, finding his adored Dickens now quite unreadable. . . . You could easily be my father - what a difference!"

What a lovely testimony to friendship - and the joys of letter-writing - this classic correspondence has proved to be!

Merle Rubin, who writes from Pasadena, Calif., specializes in reviewing literature for the Monitor.

BOOKS

THE LYTTELTON HART-DAVIS LETTERS:

CORRESPONDENCE OF GEORGE LYTTELTON AND RUPERT HART-DAVIS

edited and introduced by Rupert Hart-Davis
Chicago: Academy Chicago
(London: John Murray)
Volume V: 1960
Volume VI: 1961-62
193 pp., \$29.95 for both