Abrahamson: SDI can help realize Ehricke's projects for space

The following excerpts are from an interview with Lt.-Gen. James Abrahamson, director of the U.S. Strategic Defense Initiative, published in the Rome daily Il Tempo *on May 22, and translated from the Italian by* EIR.

Over the last few months, the Strategic Defense Initiative (SDI) has been the object of vast attention, and so it will be in the future. A brief overview of what has already been accomplished and is being attempted in this area may be useful, in order to back up my conviction that this program will have a positive catalytic function vis-à-vis the civilian use of space.

The target of the strategic defense program is to conduct research on technologies that will allow the placement of defensive systems to intercept and destroy ballistic missiles after launching, rendering them incapable of striking their targets. In our view, the technologies now under investigation are so promising that, in the future, if we follow through on what we have begun, the new administration and new Congress will have—if they so wish—a very concrete possibility to decide on the projection, construction, and installation of an effective defense against ballistic missiles.

I want to emphasize that this research of ours is not limited to defense from intercontinental ballistic or submarine-launched missiles, but includes also defense from the lower-trajectory missiles which threaten our allies. Our conception is that an effective defense is that which protects our allies as well as the United States. But because the American decision to launch an advanced system of strategic defense is an idea with a view toward the future, we ought to continue to pursue both the modernization of our deterrent forces, as well as equitable and verifiable agreements for arms reduction. Let it be clear, that the Strategic Defense Initiative has in no way modified the commitment of the United States to these two objectives.

With respect to research, we face formidable and exceptional obstacles, but our objectives can be realized. In order to render more comprehensible the defensive technologies we are studying, it is useful to divide schematically the trajectory of a ballistic missile into four phases: the boost phase, the post-launch phase, the mid-trajectory phase, and the terminal phase. Each one of these stages offers different possibilities, and at the same time different problems, for a defensive system. To meet a massive missile attack with the maximum effectiveness, it would be necessary to have a multilayered defense that would neutralize the enemy missiles at each phase, such that any remaining missiles not thus neutralized would be too few to be militarily useful. This defensive system would have to carry out a series of essential functions at each level, including: surveillance, acquisition of target, tracking, and kill assessment, whose initials in English form the acronymn SATKA; aiming and tracking of the defensive weapons; interception and destruction; battle management. Although our technological capacities in each of these categories are still insufficient to guarantee a valid defense against possible threats and potential countermeasures, our capabilities are increasing rapidly. The technologies currently available offer new possibilities for the realization of an active defense against ballistic missiles, possibilities which 10 or so years ago did not exist.

Our programs in the area of SATKA functions will culminate in a series of technical tests expected for the end of this decade. One of them will serve to test an advanced system for identifying warheads at the initial boost stage. Another test will deal with the identification and discrimination of missiles in the median phase of their trajectory. The capacity of infrared sensors (placed in space) to identify and track objects in the reentry phase will be tested through a system of optical mirrors, also installed in space.

In the area of directed-energy laser weapons, our technological efforts will include research on high-potency excimer lasers (a mixture of noble gases), free-electron lasers, and short-wave chemical lasers. Notable research efforts will deal with critical aspects, such as targeting and tracking functions and the development of light-weight large-scale lenses. One of the most interesting experiments in the field of directed-energy weapons will serve to verify the potential of laser beams situated on Earth (and redirected by mirrors in space) in the interception of objects in the initial boost phase.

Our technologies in the area of kinetic energy will be used to demonstrate the possibility of conducting interceptions in all four phases of a ballistic missile trajectory. We are already studying small endo- and exo-atmospheric self-guided interceptors in the infrared, and very high velocity rotary cannons.

The technological developments that emerge from the SDI must be flanked by systems analysis; I believe, in fact, that the systems side is the most critical sector at present. Other crucial aspects are combat management and the so-called three Cs: command, control, and communications.

We must create error-proof laboratories, resistant to radiation, such as to be able to survive in a space or hostile nuclear environment, and we must ready the software necessary for an integrated anti-ballistic missile defense.

We are studying the possibility of also solving problems respecting the destruction and hardening of targets. Further, we are paying particular attention to the field of space logistics, which comprises the discovery of carriers suited for transporting space platforms *in situ* and the maintenance of space components.

Grounds for optimism

In short, our progress so far allows us to be optimistic. Furthermore, this summer we received significant encouragement when the Army's Organization for Anti-Ballistic Missile Defense demonstrated the feasibility of defense in the terminal phase, intercepting and destroying, in simulation, a Minuteman warhead in Kwajalein (in the Marshall islands, Oceania). This test consisted of, so to speak, the destruction of a projectile with another projectile.

We have also experimented successfully with the puncturing of teleguided vehicles by using high-energy lasers. Meanwhile, the work being done at Picantinny Arsenal and the University of Texas on high-velocity rotary cannons, is proceeding satisfactorily, while work on the production of prototypes is moving at a sustained pace. Our requirement for powerful and low-cost reactors is also being determined. Furthermore, we have already picked some candidates for the first phase of our studies on the architecture of the systems.

In brief, the SDI is proceeding well. Our program shows daily that the Fletcher-Thayer Commission was correct when it said that the technologies necessary for the creation of a strategic defense system are realizable, and are even partially already available.

In the coming months we will be informing the country on other technical progress achieved. But this will only be the tip of the iceberg. There is, in fact, a limitless range of benefits that will result, both on the level of defense as well

Accomplishments of the German rocket scientists

1923: Publication of Hermann Oberth's book, *By Rocket to Interplanetary Space*.

1927: Establishment of the German Society for Space Travel, in Breslau.

1929: Release in Berlin of the Fritz Lang film, *The Woman in the Moon*.

1930: First test of the "Mirak" rocket motor by the German Society for Space Travel. This was the first test in Europe of a liquid-fueled rocket motor, in static test stand, not in flight. The "Raketenflugplatz" test facility established by the Society in an abandoned ammunition facility opened, to start testing of liquid-fueled rockets. Wernher von Braun meets rocket pioneer Hermann Oberth, space writer Willy Ley, and other members of the Society.

1931: Johannes Winkler, working on his own, successfully flies Europe's first liquid rocket using liquid methane for fuel.

1932: The second-generation Mirak II is launched in tests at Raketenflugplatz outside Berlin. Wernher von Braun is hired by Captain Walter Dornberger to establish a liquid-fueled rocket research program for the Army at the Kummersdorf Experimental Station.

1934: Kummersdorf facility is increased to 80 people, who begin testing the A-2 rocket, using liquid oxygen and alcohol fuels. The Germany Society for Space Travel is disbanded due to political tensions and the inability to finance further research due to the worsening depression.

1935: Development of the A-4 rocket, later to be re-named the V-2, is begun at Kummersdorf.

1937: The von Braun Army rocket team is transferred to new facilities in northern Germany, called Peenemünde. First launch of an A-3 rocket without guide rails, achieving stability through rotation of the missile.

1938: Successful launch of the A-5 rocket.

1942: First successful launch of the A-4 rocket, now named the V-2. This is world's first guided rocket, with a range of 200 miles, carrying a one-ton warhead. This event is heralded by the scientists as the beginning of the space age.

1943: Royal Air Force bombing raid on Peenemünde, which led to the V-2 production facilities being moved to an underground factory.

as in the increase of productivity, and the program of strategic defense infuses in all Americans an extraordinary sense of pride, of hope and optimism.

Commercial spin-offs from the SDI

However, technological progress alone is not sufficient to guarantee the success of the SDI program. We are well aware that the essential factors of such success are the greater comprehension and acceptance on the part of public opinion of the very dynamic technologies which we are studying. Connected to this greater comprehension and acceptance, is then the necessity to guarantee the most fruitful and effective use of resources allocated to the SDI program. In other words, we have to continue to make an effort to keep alive the interest and appreciation of public opinion in this initiative, and ensure that it will be realizable from the financial standpoint—as far as possible—making available to everyone the results of our research.

That means essentially to make sure that it offers to the American taxpayer who has invested his money in it, profits that will generate other benefits beyond the strengthening of deterrence.

The reaching of this objective can be facilitated by studying and exploiting the commercial possibilities of the researches undertaken in the framework of the SDI, and taking financial advantage of it for other defensive programs. For example, the realization of tangible secondary and derived products would be very useful to increase comprehension and to single out collateral civilian uses of some of the technologies utilized in the framework of the SDI program. Fundamental in this respect would be to coordinate the present applications of research conducted in the past or still ongoing, with its potential applications, and to make clear the economic advantages which the country could derive from it.

It is certainly not an unusual idea: We have all shared, directly or indirectly, in this process, which has been moving forward already for years. In a vast gamut of sectors (among them electronics, air transport, and data automation), military investments have played a catalyzing role for the most flexible, adaptable, and innovative elements of our industry. The space program produces and will continue to produce substantial advantages for the United States. Its influence has contributed notably to maintain the competitiveness of many sectors of our industry.

1944: After the Allied invasion at Normandy, the first V-2 is successfully launched against London. Before the end of World War II, over 2,000 V-2 rockets are launched.

1945: The German scientists flee from Peenemünde, which is being approached by the Russian Army. Six days before the German capitulation, von Braun, General Dornberger and other members of the rocket team surrender to the Americans. Von Braun comes to the United States, and arranges for the transfer of 118 top rocket scientists to the U.S. under Operation Paperclip.

1946: Testing begins at Ft. Bliss, Texas of V-2 rockets brought to the United States from Germany.

1955: The German rocket team is transferred to the Army Ballistic Missile Agency under the command of General Medaris, in Huntsville, Alabama. Here they develop the Redstone, Jupiter, and Pershing intermediate range ballistic missiles.

1958: The von Braun team launches the free world's first orbital satellite, Explorer I. President Eisenhower sends the proposal to Congress to establish a civilian space Agency, the National Aeronautics and Space Administration. Work on the big booster, the Saturn, is begun for the Army.

1960: The rocket team is transferred to NASA's new Marshall Spaceflight Center, which is directed by von Braun. With the team, the Saturn rocket program is transferred from the Army to NASA.

1961: Astronaut Alan Shepard makes his suborbital flight on a Mercury/Redstone capsule and rocket. The first Saturn SA-1 rocket, being developed at the Marshall Center, is test flown. President Kennedy announces the program to go to the Moon.

1962: Development of the Saturn V rocket is approved by NASA. John Glenn becomes the first U.S. astronaut to orbit the Earth, on a Mercury/Atlas. The Atlas is built by a team at the General Dynamics Company, which includes German space scientist Krafft Ehricke. Ehricke also works on developing the world's first liquid hydrogen rocket, the Centaur.

1964: Two-man Gemini flights begin, using the Titan missile to launch manned missions. These missions continue through 1966, demonstrating docking and space walks in orbit.

1968: Unmanned tests of the giant Saturn V booster. After only one manned mission, NASA flies Apollo 8 out of the orbit of the Earth for the first time, as astronauts Borman, Lovell, and Anders orbit the Moon on Christmas Eve.

1969: The first landing of men on the Moon. Conceptual studies are begun on lunar roving vehicles which had been suggested by Hermann Oberth in the 1950s, and on a reusable Space Shuttle.

For their part, computer technologies, communications, propulsion, and lasers can offer interesting derivatives for research into strategic defense systems. That could, in fact, constitute a vehicle for the possible commercial aspects of the SDI and contribute to the solution of technical problems in related sectors.

They could clearly allow the SDI program, and other programs for space defense, to finance itself. In fact the costs relative to other defense programs in space could be sharply reduced, provided the synergism generated by the SDI were exploited in the optimal way. For example, it should be possible to reduce the number of commissions relative to a single type of satellite, with the result of reducing the unit costs and the time for development and production, increasing instead inter-operationality and standardization. This is possible because it is now possible to translate into practice such projects as: the application of serial production techniques to the manufacture of satellites (with the probability of massive cost reductions); the production of multi-use satellites, differentiated and "personalized" via the use of interlocked modules; the transmission of energy over long distances and at low energy costs by means of laser beams; the production of reactors fed by particle beams; the generation, through solar-cell panels installed in space, of energy destined for remote and underdeveloped regions; the production of miniaturized and parallel computer-processors; the realization of an economic system to eliminate nuclear wastes by transporting them into space, where the Sun would destroy them without danger.

The vision of Krafft Ehricke

Another project which will perhaps be possible to realize is that of Krafft Ehricke, having do with the illumination of dark regions (including highways), by means of mirrored beams.

Twelve years ago, I had the occasion to hear Bill Price of the Scientific Research Office of the Air Force, who laid out the history of lasers in detail and illustrated what he considered their future applications. Apart from the military uses (research and determination of the target, production of weapons), the applications today of lasers exceed Bill Price's expectations. This technology is today used in supermarkets, in telephone systems, in the electronic and chemical industries, and in construction projects. Laser-aided surgery is spreading enormously, and the use of lasers and scientific instruments or laboratory instruments is very extensive. Research into lasers in the framework of the SDI can be broadened into these applications. We are capable of exploiting such technologies to create lines of communication and with almost unlimited width bands. Nothing can contribute to this process more than the SDI, and in my opinion there are very concrete possibilities for commercial expansion thanks to such technologies; I have in mind the introduction of new projects and services, and an increase in productivity. The prospects are very exciting and, apart from considerations of national security, the only limit to the applications of the new technologies (as Krafft Ehricke would say), is our inventive capacity. In fact, the majority of great innovations in the field of production—those innovations which create new markets and form the basis of new industries—is the fruit of technological victories, more than of any specific market demand. And in the future, technological progress will be the cause of even more powerful changes.

For a renaissance in space

The depth objective of the national space policy, launched on July 4, 1982, involves the strengthening of the security of the United States, the maintenance of American space superiority, and the exploitation of space for economic and scientific ends. The strategic defense program offers the possibility of satisfying some aspects of this objective, imposing the necessary premises for utilizing, in the best way, the contributions which the private sector is in a position to make.

In this sense, I like to think of the SDI as an integral part of a new renaissance in space. The science and technologies in the period of the [Italian 15th century] Renaissance were the instrument which man needed to complete his emancipation from the Middle Ages. In the twentieth century, the space program has created the basis for a new renaissance. Our activities in space have created new opportunities for us to expand our knowledge of the universe and improve the quality of human life. . . .

The SDI could become the nucleus of a new renaissance in space, the renaissance of the twentieth century, and would contribute to the generation of very many new technologies. Around such a program there is being created an alliance with scientific investigators, who form part of both the industrial and academic worlds, and this interdisciplinary quality will remain one of the most notable tendencies we will inherit from the SDI. Far from functioning as an obstacle to civilian use of space, I believe the SDI will strengthen and increase such activity. I maintain that it is obvious that our research program is not only a necessary activity, like the Space Shuttle. It will be seen as an object of national pride, capable of stimulating the national economy to the point of paying for itself.

. . . One hundred and fifty years ago, Alexis de Tocqueville demonstrated that he had intuited well what the state of the world would be in 1980. He wrote: "There are today on the Earth two great peoples who, starting from different standpoints, seem to be advancing toward a common goal: the Russians and the Americans. . . . The American fights against natural obstacles, the Russian against men; the one fights the desert and barbarism, the other fights civilization, armed with all his weapons. That is why the conquests of the American will be made with the ploughshare, while those of the Russian with the sword. Their starting points are different, yet both will someday be called by a secret design of Providence to hold in their hands the destinies of half the world."