Interview: Gen. Giulio Macrí

'Beam weapons will make an industrial renaissance'

The following interview with Italian Army Gen. Giulio Macrì was conducted in Rome June 15 by Giuseppe Filipponi, the president of the Fondazione per l'Energia di Fusione, the Italian affiliate of the Fusion Energy Foundation. Gen. Macrì is a candidate of the Partito Operaio Europeo (European Labor Party) for the Chamber of Deputies of the Italian Parliament.

Filipponi: General Macrì, you have been a pioneer in promoting the military potential of space both in the field of satellites and in directed-energy weapons systems. What can you tell us of the status of scientific research and technology in space?

Macrì: The principal experiments and scientific researches which have been carried out in space and which certainly have a great future have been in the biological sciences, plasma physics, astrophysics, solar physics and atmospheric physics, physical science, and medicine and pharmacology.

Today we go into space to improve the conditions of life on earth, and later we shall also go into space to stay there.

With the STS (Satellite Transportation System) coming on line, the U.S. space ships Columbia, Challenger, and so on, we are entering a new era of space applications and exports.

There are important, long-range potential benefits that can be derived from this, even though we may not yet be able to comprehend and immediately assimilate what they are. On Sept. 30, the U.S. space ship will put the space lab into orbit, in which astronauts and scientists can carry out scientific experiments on a permanent basis, and do valuable industrial work. Thus begins the epoch of commercialization of space, which will have its natural development in the construction of a permanent orbiting platform and, in the future, the creation of real scientific and industrial colonies throughout the solar system.

Filipponi: What are the benefits that can be derived starting now from research and industrial work in space?

Macrì: There are many different benefits that can be obtained right away; and these will increase in number and quality when the research and experiments begin for a directed energy-beam anti-ballistic missile system which will be principally based in space.

In a zero-gravity or almost zero-gravity environment like that in outer space, it will be possible to create ultra-pure substances which are perfectly symmetrical in their atomic or molecular structure, something which is impossible in the earth's environment because of gravity. In this way we will be able to make available materials with exceptional qualities compared to what we know today.

It will be possible to manufacture materials which are more resistant than steel and lighter than aluminum and even self-lubricating. In the conditions of micro-gravity, medicinal substances can be produced by mixing different substances in a perfectly uniform mode; and substances can be obtained by separating them from ores with an extreme degree of purity.

The observations of the planet earth from space can supply data for the optimal exploitation of the various territories and single out pollution and diseases of harvests and forests. The accurate, and above all, continuous information which can be supplied on the humidity of a region and the possibilities for extraction of mineral deposits will be very valuable for countries like those of the Third World, in aiding them to improve their agriculture and the exploitation of resources of the subsoil. We can take telescopes beyond the atmosphere to study our galaxy and the solar system, and then we will be able to construct real celestial cities with space factories and everything that is needed for life and the reproduction of the human species.

Filipponi: You mentioned the project for beam weapons which President Reagan of the United States launched on March 23. What type of technological spin-offs for the economy is it possible to hypothesize from this military project?

Macrì: As you know, five different systems of directed-energy weapons (beam weapons) have been identified. They are: laser rays, particle beams, microwaves, plasmas, and electromagnetic impulses. Each type is in principle capable of generating the required power and energy to succeed in disarming a hostile target. The laser weapons systems, particularly the chemical ones, will probably be the first systems to be developed. Already many experiments are known in which this kind of laser has given good results.

In addition, a gas laser and an electric-discharge laser have been experimented with, yielding good results.

Two other types, x-ray lasers and free-electron lasers, still need to be perfected but they seem to have exceptional qualities in energy density and flexibility of usage. The x-ray laser is broadly recognized as the most promising laser in the long-run for defense against ballistic missiles. Given that x-rays are easily absorbed by the atsmophere, these weapons will be placed on satellites in low orbits. Because the x-ray laser easily reaches powers of the order of Terawatts and produces an energy which is very readily absorbed by any target, this system seems really to be the most effective laser weapon of the next generation.

Filipponi: What point are we at now in the application of laser technologies to industrial production?

Macrì: Already the little that can be seen in the applications of lasers to industry clearly demonstrates how vast the potential applications are in the various sectors, from the medical and biological to the metallurgical and mechanical.

In industry, lasers are already being used to cut metals and forge them, reducing the work-time by a factor of a thousand compared with conventional techniques. Here I wish to emphasize the enormous potential that laser technology has if it is applied to industrial chemistry and other related sectors. By intervening on a chemical reaction with laser light—that is, with a very precise wavelength—it will be possible not only to catalyze a vast range of different reactions according to the wavelength, but also to optimize the reactions, reducing waste and production costs practically to zero. It will be possible to obtain, therefore, materials, fibres, and substances of pre-selected physical and chemical qualities.

With lasers we will be able, and this is only an example, to sterilize and preserve in a practically perfect way vast quantities of surplus food. Today 50 percent of world agricultural production is lost because of the lack of an efficient method of preservation. The availability of food could thus be doubled on our planet.

With lasers of the power like those being used today at Lawrence Livermore National Laboratory in the United States, where the most potent laser in the world, the 35-Terawatt SHIVA, has been constructed, they are working on thermonuclear fusion research. With lasers like the x-ray type or gamma-ray type which, as I previously explained, are being researched for military aims, research into nuclear fusion will be enormously advanced. These lasers transform into coherent x-rays about one millionth of a tiny nuclear explosion (one kiloton or more). The real technical problem being studied today is how to manipulate and construct appropriate materials to contain these little nuclear explosions.

This line of scientific research on fusion, called inertial confinement, seems to be the most promising for constructing nuclear fusion reactors to be used in the most varied ways. This will give us electrical energy at a very low operating cost, because these systems use as fuel deuterium and tritium which are dissolved in sea water. With this energy source, reactors can also be constructed for space ships which are capable of moving us into the solar system just as today we move around our planet in jets.

This is not science fiction, but the result of the development of science and technology.