THE ITALO-YUGOSLAV ANTI-HAIL DEFENSE

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1. INTRODUCTION

It is well known that Italy participated in Grossversuch IV and its results are now common knowledge. When these results were published in Italy, they had negative repercussions on the official and public bodies engaged in research in this field. The Italo-Yugoslav defense project, provided by the Italo-Yugoslav Convention and signed in Trieste on April 6, 1982, was consequently delayed for several years in order to stop and think objectively about the conclusions reached by Grossversuch IV, and understand better what Italy could propose as an acceptable program of defense in the attempt to win the battle against hail. At this point the conviction grew that it would be necessary to produce studies and research work, even that of a basic nature, both in natural and in artificial conditions.

When the Italian financing body (the E.R.S.A. of Gorizia, a Regional Body for the Development of Agriculture) realized that the Italo-Yugoslav system of defense could include a large number of research activities, it was possible to start the cooperation. On April 6, 1984, Italy ratified the agreement for the activation of the defense system. This agreement was published in the Gazzetta Ufficiale (Official Journal) on July 10, 1984.

This paper, therefore, has only the aim of announcing in a concise way, the work that Italy and Yugoslavia will do as soon as possible, if no particular difficulties arise in the near future. (It is perhaps useful to point out at this point that the Yugoslavs, during the period that the Italians were "reflecting", never had any doubt about the efficacy of the defense method that had been the object, in the final analysis, of the planned cooperation.)

2. THE ITALO-YUGOSLAV ANTI-HAIL SYSTEM

The Italo-Yugoslav anti-hail system first began to be organized in 1975. This system of anti-hail defense is based upon ideas developed in the Soviet Union, and uses high-altitude ground-to-air rockets. The Italo-Yugoslav system is the most recent achievement in this field. It is, moreover, a bi-national project, and has its own specific features both from the technical and operational points of view.

The area to be defended is a polygon of about 350,000 hectares. Its shape and size are similar to those used in the Soviet Union. It should be pointed out that this is the first time that an area to be defended is crossed by an international border.

The defense will be not randomized, but will be conducted day and night without interruption from April to September, and will be carried out for an initial period of ten years. Half of the Italo-Yugoslav activity will be proper defense, while the other half will be devoted to research. Toward this purpose, there will be two Centres: the Operating Centre in charge of the defense operations, and the Research and Documentation Centre where studies and tests will be carried out. Half the staff employed will be Italian, and half Yugoslav. At the present moment, tenders for the contracts have been published to buy the installations of the basic structures for the Centres.

3. THE OPERATING CENTRE

The Operating Centre (Defense Centre) will be built in Yugoslavia on Trstelj mountain (Nova Gorica). The practical organization of the defense will almost be completely automated, and the radar data will be processed differently from the way in which they are handled in the Soviet Union in order to better define the procedures of intervention. A radar with a wavelength of 5 cm, with a Doppler effect and double polarization, is expected to be used to study the hailstorms.

The volume of the hailstorms will be continuously monitored and particular attention wil be paid to horizontal sectors situated at given altitudes.

When calculating the possibility or the probability of a hailfall during the critical moment in the defense activity, it will be possible, according to the Hydrometeorological Institute of Ljubljana, to save as much as 90% of the time needed by the Soviets to activate the defense.

Rockets will be launched when a maximum in radar reflectivity 45 dBz is observed at an altitude of 1.4 km above the 0°C level. The rockets will have to reach a height of 8.5 km, with an angle of 85°. This specification will soon be checked by a special Italian body.

The defense material (launching tracks and rockets) will be made in Yugoslavia. Silver Iodide will constitute 20% of the 400 g of pyrotechnic mixture. About 60 launching tracks will also be installed, i.e. one every 56 km^2, and each of them will be able to launch several rockets.

4. RESEARCH AND DOCUMENTATION CENTRE

The Research and Documentation Centre will be located at Gradisca (near Gorizia), in Italy. This Centre will have as its main tasks, to be carried out gradually:

the definition of the scientific aspect of the system

the organization of checks on the effectiveness of the defense based upon the radar data and data collected on the ground

the study of meteorological situations in the context of the physics of the atmosphere

the study of the procedures of intervention and the proposal of possible improvements in the defense action

5. CONCLUDING REMARKS

The Italo-Yugoslav system, as it is currently presented, represents an auspicious occasion to begin studies and activities that should lead to an improvement in our knowledge and in the techniques used in weather modification. It also gives us the opportunity to begin the work against hail with today's technology, even with all its limitations.

Locally, we realize that this commitment may also lead to negative results in terms of effectiveness, but we realise that the study and the research activity will be in any case positive, both in terms of the human energies employed and in financial terms, since at the end of the project we should have a better knowledge of hail-generating phenomena.