

# What Future for the Discussions of the Geostationary Orbit?

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## 1. Introduction

The discussions of the geostationary orbit (GEO) have been conducted in the UN Committee on the Peaceful Uses of Outer Space and its two Subcommittees for many years. The main reason is the importance of the GEO for telecommunications. It is the only orbit which does not require a movable ground antenna. The satellite appears at all times at almost the same direction from a point on the ground, while satellites in other orbits have to be tracked on the sky. The less expensive fixed ground antennas are of particular importance for direct television broadcasting with many small antennas in households.

The fact that satellites in the GEO perform only minimal movements on the sky created the impression that the GEO is somehow closer connected with the Earth than orbits of other satellites and that underlying countries might have some special rights to the GEO. In fact, countries lying under the GEO have the advantage of a large arc of the GEO above their horizon and thus have the widest choice of nominal positions for satellites serving their countries.

Claims of preferential rights, or of sovereignty over segments of the GEO were made for the first time at a conference of equatorial countries which was convened in Bogotá, Colombia, in 1976. That document expressed the

concern of equatorial countries over the fact that developed countries were launching many satellites into the GEO at a time when developing countries were not yet prepared to avail themselves of that opportunity.

The physics of the GEO was well understood by the scientific community from the beginning. The GEO is a circular satellite orbit in the equatorial plane at a distance of 42.164 km from the center of the Earth, chosen so as to make the orbital period of the satellite equal to the period of rotation of the Earth. Such an orbit is, unfortunately, not "stationary" in the strict sense of the term because perturbations, caused by the attraction of the Moon and by irregularities in the distribution of mass inside the Earth, tend to push the satellite out of the equatorial plane and out of its nominal position. To counteract these natural forces, satellites, in order to keep them in the equatorial plane and within permitted tolerances of their nominal positions, have to receive at regular intervals corrective impulses, called station keeping.

## 2. Common understanding of the GEO

It took more than twenty years before the understanding of the physical situation of the GEO became an agreed opinion of the Scientific and Technical

Subcommittee. A Working Paper<sup>1</sup> was submitted by the Czech Republic in 1998 pointing out the physical facts that:

- (a) The existence of orbits of all satellites depends on gravitational phenomena generated by the entire body of the Earth, and
- (b) Geostationary satellites are not fixed over a point of the Earth's equator but are in a natural flight as all other satellites.

After a supporting statement by Ecuador and other delegations, the Subcommittee and later the COPUOS agreed on the above fundamental statements.

An important implication can be drawn from the above facts. Considering that geostationary satellites, like satellites in other orbits, move in outer space, it follows that the GEO is an integral part of outer space, that space law applies to geostationary satellites and that the COPUOS and its two Subcommittees are competent to deal with matters concerning the GEO.

The fact that the GEO is an integral part of outer space<sup>2</sup> was expressed at UNISPACE III, in July 1999, in the presence of some 120

<sup>1</sup> UN doc. A/AC.105/C.1/L.216.

<sup>2</sup> While the Draft Report of UNISPACE III, document A/CONF.184/3, was discussed in Committee I, several changes were made to Part IV, H.2, entitled International Space Law, paragraph 315, describing current activities of the Legal Subcommittee. The last sentence of that paragraph reads in the adopted version: "It is also true [that it is important to highlight developments dealing with some topics] for the progress that has been made in studying the topics on the basis of recent proposals and agreements in the Committee on the Peaceful Uses of Outer Space, in particular regarding the assertion that the geostationary orbit is an integral part of outer space". In the final version of the Report, paragraph 315 might be designated with some other number.

delegations. It would be useful to make it formally an agreed opinion of the COPUOS in a brief and clear wording.

### 3. The role of the ITU

Radio communications are coordinated by the ITU. It means that the ITU provides technical means and a forum for member States to choose technical parameters of individual radio stations in such a way as to avoid harmful interference. Coordinating radio stations in space is a difficult task. Radio signals to and from radio stations on satellites (called space stations by the ITU) have to avoid spillover of side-lobes into bands reserved for radio astronomy and for other telecommunication services and have to be consistent with many other technical requirements.

The coordination by the ITU is highly respected by all countries. It is realized that without a proper coordination space systems could interfere with each other and most communications would be of low quality or outright impossible.

### 4. The role of the COPUOS

With this situation in mind, what role is there for the COPUOS to play? It would make little sense to duplicate the work of the ITU. The COPUOS, by its definition as a focal point for space activities, has a more general mission. After all, there are more aspects of geostationary satellites than radio communications.

We see the role of the COPUOS in the following areas concerning the GEO:

- (1) Upholding the scientific basis of discussions,
- (2) Supporting and maintaining an orderly and rational conduct of space activities,

- (3) Supporting a wider adherence of Member States to instruments of space law, in particular to the Registration Convention,
- (4) Supporting mitigation of risks posed by space debris and the systematic use of disposal orbits, and
- (5) Establishing a closer liaison with the ITU.

Some of the items might require keeping GEO on the agenda of the COPUOS and its Subcommittees, other items, such as "Space Debris in the GEO", could be considered in the context of the item on Space Debris, and still other items could be acted upon in other ways.

#### **4.1 Upholding the scientific basis of discussions**

It is a time-proven procedure, first to establish a basis of facts which are important for the issue at hand in the Scientific and Technical Subcommittee and then to decide in the COPUOS on further steps. This procedure has not been adhered to in some instances recently:

As an example, a Working Paper<sup>3</sup> was put before the Legal Subcommittee without discussing first its technical aspects in the Scientific and Technical Subcommittee. The working Paper proposed to confer preferential rights to groups of States on access "to all frequency bands outside of those whose assignments have been made by planning". But without a taxative enumeration of the bands concerned and a consideration of the technical aspects, it would be difficult to reach a meaningful decision.

#### **4.2 Supporting and maintaining an orderly and rational conduct of space activities**

In the past years, the discussions of the GEO in the COPUOS were aimed, *inter alia*, at the question of equitable access to the orbit. It is, indeed, a very important issue which should be solved to the satisfaction of all countries, but it does not go deep enough. The final product of a satellite in the GEO is the service which it provides, not the existence of the satellite itself. Up to now, the COPUOS did not have before it any document on services provided from the GEO on an international basis. Moreover, the COPUOS has no updated information on the number of active satellites, on the number of all trackable objects in the orbit, or, for that matter, on the number of requests for assignments of nominal positions and frequency channels. Such information is available and should be put before the COPUOS.

A very important task is the prevention of harmful interference between various space missions. One aspect, prevention of interference in radio communications, is in the hands of the ITU but there are other forms of harmful interference among space objects, namely collisions or close encounters. An evasive maneuver is expensive in terms of fuel consumption. Even if it is successful, it may affect the continuity of service.

Evasive maneuvers have been performed on several occasions in the past using information made available by national facilities for tracking space objects. The question of establishing an international warning system would be worth discussing either in the COPUOS or among space agencies of space-faring nations. Such a system could be

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<sup>3</sup> A/AC.105/C.2/L.200.

operated by a country possessing relevant facilities<sup>4</sup>.

If an evasive maneuver is not performed, or if it fails, a collision may occur. An active satellite may be damaged or destroyed, an inactive satellite may break up into a large number of debris, increasing thus the probability of further collisions. In any case it would be helpful to know which objects are active and which are not. In the GEO – fortunately – active satellites can be recognized by the fact that they are close to their nominal positions and that their drift is small. A large drift in longitude and a large inclination may be signs of inactive and abandoned objects. On the other hand, a drifting satellite may be changing its position in the GEO or it may be a satellite on a scientific mission, or it may be having difficulties with its station-keeping system. It is only the owner or the operator of the satellite who can provide the authoritative information on the true condition of his satellites. And the Registration Convention has a mechanism for such announcements. A recommendation of the COPUOS to Member States to use for this purpose the Registration Convention could prove useful.

#### **4.3 Supporting a wider adherence of Member States to legal instruments of space law**

The Registration Convention provides for registering space objects in national registries and in a Register maintained by the Secretary-General of the United Nations. By registering their space objects, Member States declare their responsibility for these objects.

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<sup>4</sup> The question was discussed at the AIAA International Space Cooperation Workshop "Solving Global Problems", held in Bermuda, 11-15 April, 1999. The reader is referred to the Report of the Workshop.

States may provide the Secretary General also with additional information on their space objects (Article IV,2). That additional information would be of particular importance if it contained the time of termination of activities. It would show which objects changed from valuable assets into unwanted debris. Some States already have availed themselves of that opportunity.

Only forty States adhere to the Registration Convention and only two organizations, the European Space Agency and the European Organization on the Exploitation of Meteorological Satellites, adopted a declaration of acceptance of rights and obligations of the Convention. There are, however, several intergovernmental organizations which do launch space objects, such as INTELSAT and INMARSAT, but do not register their satellites. The reason is that Article VII,1 of the Registration Convention imposes the obligation to register only if a majority of States members of the organization are State Parties to the Registration Convention and to the Outer Space Treaty. The situation is irregular: the spirit of the Registration Convention calls for registration of all space objects but the provision of Article VII,1 creates obstacles to registration. The remedy would be – without opening the Convention for changes – for more member States of launching organizations to accede to the Convention in order to form a majority. Alternatively, an additional protocol to the Registration Convention could open the way to organizations to register their satellites even if the condition set by Article VII,1 is not fulfilled.

The principle of having all satellites registered in accordance with the Registration Convention should be strongly supported by the COPUOS. The invitations to join the space treaties appearing yearly in the GA Resolution

on outer space matters do not seem to be very effective in increasing the number of State Parties to the Convention.

#### **4.4 Supporting mitigation of risks posed by space debris and the use of disposal orbits**

Mitigation of the risks posed by space debris is under discussion in the Scientific and Technical Subcommittee. The Subcommittee elaborated a Technical Report on Space Debris with the assistance of the Inter-Agency Space Debris Coordinating Committee (IADC) and of the International Academy of Astronautics (IAA), and adopted it in 1999. It is to be hoped that the report will lead to discussions in the COPUOS and that a decision will be made on possible further steps. The role of the IADC and IAA was highly positive and their assistance to the COPUOS should be continued also in the future.

In the GEO the practice has been instituted to re-orbit satellites at the end of their active lives into disposal orbits beyond the GEO. It should be noted that the COPUOS, at its forty-second session in July 1999<sup>5</sup>, agreed that the Scientific and Technical Subcommittee, at its thirty-seventh session in 2000, should review international application of the ITU standards and IADC recommendations concerning the disposal of satellites in the GEO. This will be done within the agenda item on Space Debris.

#### **4.5 Establishing a closer liaison with the ITU**

The ITU used to issue an annual Report to the COPUOS on its activities concerning space radio communications. A few years ago the

report was discontinued. Possibly a shorter version of the report, geared to the agenda of the COPUOS might be reinstated. As it is, COPUOS is directly informed by the ITU only by the oral statement of the ITU delegate. E.g., the problem of the so called "paper satellites" could be tackled by both, the ITU and the COPUOS.

The COPUOS should manifest its interest in the ITU work and should officially address its conferences dealing with space matters. Perhaps, after the agreement of COPUOS on the scientific basis of the GEO, there would be consensus within the COPUOS on such a step.

### **5. Conclusion**

The GEO is a valuable natural resource which can serve for the benefit of all countries. It can accommodate a very large number of satellites providing extensive services to most countries of the world. The international community should direct its attention to the GEO and not be discouraged by the very slow progress of past years.

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<sup>5</sup> Report of the COPUOS on its 42<sup>nd</sup> session, document A/54/20.