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INTERNATIONAL INTERACTION AND PROFITS REGARDING
LAUNCHING OF SATELLITES

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The launching of an artificial manned or unmanned object into space, entails that its launching course, its orbit around the earth if applicable, and the radio communication it will require, are carefully planned in advance. Such was relatively easy when planners were confident they found empty space to launch their vehicles in. But the matter has become increasingly complicated when not only the number of spacecrafts launched is being multiplied, but also when ever more governments enter the launching activity. It must be reckoned that besides the U.S.A. and the Soviet Union, also the European countries, Japan and India have acquired the capability of launching space objects. The People's Republic of China may soon be joining and other countries or group of countries are bound to follow. On the other hand, according to recent figures, about 1300 spacecrafts are presently in operation around the earth, while another 5400 payloads or parts thereof (debris) have been abandoned to endless orbiting (1).

In those circumstances, there is no doubt that the task of the launching planners will grow ever more complex. In addition to the physical properties of the planned payload, and the orbit requirements imposed by its projected function, account has to be taken of existing spacecraft or debris, present in space and liable to hamper its operation. The computer has already been called in to help. Yet, as it will become apparent in this paper, the present state of the matter is unsatisfactory.

Launching planners, as mentioned in the beginning, need to compute a safe flying course from the earth's surface to the outer space. If the payload is to remain in orbit, a completely empty orbit must be found, where no risk of collision exists during the lifetime of the payload. When that orbit would be the geostationary one, a suitable segment must be selected, where the payload

can operate undisturbed. In addition to these flying courses, orbits or geostationary segments, an available radiofrequency must be obtained not only for commanding the spacecraft, but also for drawing from it the expected use and benefits.

Essentially, planners ought to know, on the one hand, which spacecraft and debris is at any one time in space, and what their position is or will be in the future. On the other hand they need to know on what radiofrequency those spacecrafts operate, if at least they still make use of a radiofrequency. Planners can rely therefore on only two instruments: the relatively recent Convention on Registration of Objects launched into Outer Space (2), and the coordination and registration procedures provided for in the Radio Regulations belonging to the ITU Convention. (3)

The Registration Convention

The Registration Convention imposes on the subscribing states (presently 35, of which all present "space powers") to keep a register of all spacecraft launched under their authority, and to communicate to the Central Register kept by the U.N. Secretary-General the relevant information including the basic orbital parameters. The Convention concerns itself with all spacecraft, including the launcher and all its parts. The obligation to furnish information is firm and could give rise to international liability in case of non-compliance. However, the basic orbital parameters required for communication are not even sufficient to locate the object. In addition, there are two flaws inherent to the Convention and hampering its efficiency. First, the Convention does not impose an obligation to communicate the information concerning payloads launched before the Convention entered into force for the state concerned. Hence, the Central Register can not be expected to become an efficient and reliable instrument before the outer space is cleaned of pre-Convention space objects.

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Second, it does not provide for deadlines before which the required information is to be furnished. Article IV.1. of the Convention only imposes that it be done as soon as practical (French: réalisable). If the launching activity intensifies, as it is expected to, a reliable Register can be obtained only if registration of launched objects with the U.N. Secretary General is completed before launching. Similarly, changes in the basic orbital parameters ought not "stricto sensu" to be communicated. Article IV.2. states that governments "can from time to time" furnish additional information concerning a payload registered under their authority. Finally, a spacecraft that was registered as an orbiting craft, but that is not orbiting anymore, must again be notified only as soon as practical.

Clearly, the information collected on the U.N. Central Register will not, for the years to come, be adequate to guide launching planners. Even less, it cannot serve in its present state, as a proper base for coordinating the launching activities.

I.T.U. Convention

As a matter of fact, the Radio Regulations enacted under the auspices of the I.T.U. constitute at present the most specific rules dealing with coordination of space activities. Their object, in so far as this paper is concerned, is to "ensure the rational use of the radio spectrum and of the geostationary satellite orbit" (Article 33 of the International Telecommunication Convention).

At the outset it must be said that the Radio Regulations do not deal with all three items required for coordination. They do not concern themselves with coordinating launching courses. Admittedly, this is the least urgent problem since rarely more than one launcher quits the earth's surface at any one time, and since launchers fly through space areas of little use to payloads in operation. Yet conflicts may arise with payloads orbiting at low altitudes like future large spacestructures and traffic related to them, and not the least, with abandoned payloads and debris.

The Radio Regulations do not either concern themselves with coordinating the occupation of orbits around the earth. This is because the International Telecommunication Convention extends their applicability to the geostationary orbit only, and not to all orbits around the globe. That only the geostationary orbit was involved appears consistent with the general purposes of the International Telecommunication Union. Telecommunications people are indeed mainly, if not exclusively, interested in the geostationary orbit, the only one liable of granting them space relay stations, immobile in the sky.

There should however not be any misunderstanding. The regulation of the "rational use" of the geostationary orbit is not yet reality. As of now (Oct. 1984), there are no specific provisions dealing with the geostationary orbit. Two sessions of the World Administrative Radio Conference, the I.T.U.'s universal body dealing with Radio, are to be devoted to such regulation, i.e. to the Use of the Geostationary-Satellite Orbit and the Planning of the Space Services utilizing it. They are planned respectively for summer 1985 and summer 1988. Intense and difficult negotiations are expected between I.T.U. members, who are divided along North-South lines. Indeed "rational use" for the industrialized world means squeezing as many satellites in the geostationary orbit as possible, especially if those are to be western satellites. For the developing countries, "rational use" means preservation of vacant segments of the geostationary orbit, in order to make it easier for developing countries, once their time has come, to find and occupy a suitable segment. Their position, not unrightly, stems from the fear that overcrowding of the orbit will prevent them to "enter" it, under the present implicit first-come, first-served system.

In the expectation of a comprehensive regulation, the use of the geostationary orbit is indeed discreetly and indirectly being coordinated by the existing Radio Regulations as they apply to the use of the radiospectrum by satellites. This coordination is not thorough and therefore unsatisfactory, but nevertheless must be considered better than nothing. In order to

explain this, one must take a glimpse at how Radio Regulations operate.

As a general rule, radio frequencies are not shared among I.T.U. member states through exclusive attributions. Member states are at freedom to grant authority to their subjects to use any specific frequency. However, if they wish to procure their subject international protection in case of harmful interference, they ought to take two steps: 1) make sure that the subject assigns the frequency to a service (mobile-, fixed-, aeronautical-, astronautical-, etc.- service) in conformity with the I.T.U.'s frequency assignment plans, and 2) notify to the appointed body of the I.T.U., the International Frequency Registration Board (I.F.R.B.), that it has granted the authority for the use of the particular frequency. When its subject would then suffer harmful interference, the member state would be in the legal position to ask immediate discontinuance of the disturbing radio transmissions by the interferor. There is one condition however, namely that the I.F.R.B., when receiving the notification and registering the use of the frequency, did not annex to it an unfavourable opinion, warning of probability of interference with a former regularly registered user. The system, in operation since the beginning of the century, has been relatively effective in preventing undesired interference. It has however drawn criticism because it officialized the principle of "first come, first served" and because it has been inadequate in preventing speculative notification, i.e. "reservation" of frequencies well before they are actually put to use.

When space activities began in the late 1950's the above frequency arrangements were not substantially amended to accommodate them. Still, some frequency bands were allocated exclusively to space services, while others had to be shared between fixed and mobile ground services and space services. But something more than the existing system of notification to the I.F.R.B. combined with the opinion of the I.F.R.B., became needed. Additional practical and legal security was required for satellite systems because most often, the frequencies on which they operate are determined before launching once and for all, and because any interference with radio commanding

systems or with radio communication links could cause the satellite to be definitively lost or temporarily out of use. The main drive behind demand for additional security lied obviously with the size of the investments inherent in any satellite system.

Accordingly, the 1963 Space Radiocommunication Conference of the I.T.U. established, in addition to the above referred to notification system, coordination procedures which were to be complied with prior to putting a space radiolink into service. Those coordination procedures were considerably improved in 1973 and to a lesser extent in 1979 (4). Still they do not arrange that users of space radiolinks are "fitted" on the radiospectrum. They ensure only that users of radio links get an opportunity to clear the problems among each other. The procedures set in with mandatory advanced warning of putting into use a space radio link. The warning is being duly publicized by the I.F.R.B., after which national governments, or more often their competent administrations, are invited to comment. Already at this stage administrations can get together and solve the problem, but this is not yet, properly speaking, the coordination procedure.

The latter sets in when the administration projecting the radio link individualizes the counterparts with whom it might conflict, and sends them specific information. In its search of competing administrations it will be assisted by the information available from the I.F.R.B. Register for occupied frequencies, and from the I.F.R.B. itself for frequencies about to be put into use. Terms and delays are quite specifically provided for in order to ensure that the procedure goes forward, i.e. that solicited administrations respond and take a clear yes or no position versus the proposed radio link. Eventually the I.F.R.B. can be called in to help. It has strong powers to do so, not the least by cancelling the frequency registrations of solicited administrations who do not take the trouble to affirm a position.

After the coordination, one reverts to the traditional notification procedure aimed at obtaining international I.T.U. protection for the use of the

frequency. If the competing administrations agreed to the new assignment in the coordination procedure, then the registration can go ahead with a favourable opinion of the I.F.R.B.. If the matter remained in dispute, or if the projected assignment meets strong opposition of the administrations solicited during coordination, then it is still possible to have it registered, though it will receive an unfavourable opinion and be denied international protection.

Similar procedures apply when conflicts are expected between space radio links and simple surface radiocommunications, but it is of no relevance to our concern about coordinating space activities among themselves.

In this latter regard it is to be emphasized, that an administration with whom coordination is sought, may object to a new space radio link for any reason that would disturb its own use of a space radio link. It can therefore of course object the use of a same frequency. But also, it can object the use of a different frequency, when the direction, the amplitude or the vicinity of the projected transmission or of the projected emitting and receiving stations would cause harmful interference. For this reason, the position on the geostationary orbit of the space station is to be communicated to administrations solicited for coordination, along with other information relating to the projected space radio link.

Yet, it would not be possible for an administration to object to a new satellite system for other reasons than radio interference, and in this, the I.T.U. Radio Regulations provide only for an imperfect way to organize activity in space. Such other reasons might be physical vicinity, insufficient stability of the projected system, absence of safeguards, or absence of ejection mechanism when exploitation is finished. All these elements threaten on the short or long term the peaceful exploitation of satellite systems by other users, without affecting directly their radio link.

Coordination of radio links for space activities is moreover only required where a geostationary satellite is being exploited (Radio Regulations provisions 1515 and

1517). This means that when a non-geostationary satellite is being launched, reliance can be had only on the traditional notification and registration cum I.F.R.B. opinion procedure. This really is disappointing because coordination procedures provide for extensive exchanges of information on existing and projected satellite systems. They have provisionally been successful in avoiding accidents on the geostationary orbit. Thus when administrations project a satellite system that does not use the geostationary orbit, they cannot count on the exchange of information relative to the orbital parameters of existing non-geostationary satellites. As a matter of fact, even the rules pertaining to mandatory advanced warning, which is to be echoed by the I.F.R.B. before any coordination sets off, and before any space radio link is put to use, do discriminate against non-geostationary satellites. While they clearly establish that any space radio link, also those involving non-geostationary satellites, are to be the object of advanced warning, they do impose the publicity of orbital parameters only for geostationary satellites (Radio Regulations provision 1044).

It is further almost needless to add, that the notification and registration with the I.F.R.B. of the use of a radio frequency not involving a geostationary satellite, does not require communication of orbital parameters.

It must be concluded from the above that complete coordination does occur for radio frequencies, but not at all for orbits or for orbital positions. Only in the case of the geostationary orbit are orbital parameters to be communicated. They are then taken into account only in so far as the orbital positions affect the use of radio frequencies, but not for other reasons.

Space law is defaulting here and it is quite surprising because the variety of possible orbits around the globe is such that they are intertwined and show multiple crossing points. Payloads operating on conflicting orbits are permanently at risk to enter in collision with each other.

That such has not happened yet is not explained by careful planning

aimed at avoiding the selection of orbits where such danger occurs. It is rather the result of the present low probability of collision, considering on the one side the huge dimensions of the outer-space around the globe, and on the other side, the relatively small number of payloads revolving in it.

Probability statistics are however bound to be revised when the number of payloads increases, which is certain to occur at ever accelerating pace. Prospects are further negatively influenced by the fact that the old payloads are not retrieved from space as new ones are launched into it. Only a small amount of space waste and debris is indeed expected to ultimately burn up in the atmosphere.

Indication of an emerging demand for coordination can already be detected. Both the United States and the Soviet Union go through considerable expenditures to dispose of a reliable and up to date register of existing objects in outer space. With the emerged European launching capability, the United States have asked and obtained an agreement with Arianespace aiming at exchange of information relative to any object launched into space by Arianespace. And not the least, NASA goes through thorough checking of available "working space" each time a shuttle mission is being planned. Doubtlessly, with the multiplication of launching capable states or entities, the demand for coordination is expected to go a rising trend.

In view of the coordination vacuum, attention is drawn to the informal Space Frequency Coordination Group (S.F.C.G.). The bare fact of its existence points to the insufficiency of the existing conventional international law. No memorandum or letters of agreements provide it with legal existence. Still, the Group comprises representatives from national administrations and/or international organizations, comprising presently the United States, Japan, E.S.A. countries and E.S.A. itself, India, Argentina, Australia and Brazil. It was set up to achieve better coordination of radio frequency selection and use for space systems, and adopts a more pragmatic and cooperative approach. Important entities like N.A.S.A., E.S.A. and the Japanese N.A.S.D.A. have in its

frame agreed among themselves on bilateral "Procedures Manuals for Mutual Coordination of Frequency Use." The procedures are a step forward on the existing I.T.U. Radio Regulations, because they are faster and much more detailed and because they aim at the collective search for a solution. They do however not replace the Radio Regulations, to which the states concerned have subscribed as to a treaty. Their main result is that the actual coordination is achieved informally, and that the I.T.U. coordination ends up to be only paperwork. The I.T.U. coordination remains indeed necessary for the international protection, and not the least, for insuring the Soviet Union, the most significant space power left out of the Group, against harmful interference.

Interestingly, the discussions taking place under the Procedures Manuals are broader than those required by the Radio Regulations. For instance, the manual agreed upon between E.S.A. and Japan in 1982 provides for communication of data relative to, among other, the space mission description, the mission's milestones, and the general orbit/trajectory characteristics, (Manual's articles 7.1. and 7.2). The Group thereby extended its activity beyond the bare coordination of frequency use. Doubtlessly it reacted in a pragmatic way to a perceived need. Its fairly homogenous western composition is understood to have facilitated such an approach. But this shows at the same time its limits to become a model for a universal solution.

Concluding Remarks and Prospects

Space law is remarkable in that it has developed almost at the pace of actual space activity. As far as coordination of orbital activity is concerned one can track in existing conventional instruments, the assertion of general principles. Article IX of the Outer Space Treaty of 1967 (5), contains reference to a duty (not an obligation) for governments responsible for space missions, to consult whenever there is reason to believe there exists incompatibility between space programmes. This is obviously insufficient to organize coordination. Yet it points to the conviction of the international community that the organization of

space activity is not to be centrally determined by a supranational body. Organization should evolve from mutual check and balances among space users, and should gradually grow stronger when the necessity arises.

To date, Article IX of the Outer Space Treaty has not been invoked even once (6). Moreover it is surprising to note that the international community has thought of solving the problems caused by potential accidents, even before establishing mechanisms to prevent them. Such is indeed exactly the purpose of the Liability Convention (7). Interestingly, this convention stipulates that liability for damages caused in outer space is dependant upon the existence of fault. Fault is inevitably linked to the concept of an obligation of carefulness, for which however the convention provides no standard. Can a government be held liable of fault when the rocket it fired enters in collision with an orbiting payload, while no means were available to it to verify with certainty that the launching course was clear? Two of the present three entities actively launching and travelling into and from outer space, presumably have a fairly reliable catalogue of existing space objects (U.S. and Soviet Union). The fault concept could perhaps be held to apply to them. But such is much more disputable towards other, mainly future space powers. The enormous investment required for making such a catalogue would lay upon them an unacceptable burden and thus price them out of the space club. It would ultimately be prejudicial to space exploration and exploitation, and not the least, to space use to the benefit of all countries.

Therefore, the duty of care implied by the Liability Convention, has to receive actual content in a way that is reasonable to all future users of outer space. One straightforward way to realize this, is to impose advance publication of all satellite or any other relevant space program, and couple it with mandatory coordination. All parameters should in such a frame be exchanged in order to put other governments or organizations in a position to examine and conclude on the compatibility. For the system to be efficient, as can be inferred from I.T.U. experience, there must however likewise be an obligation for governments or organizations to

respond to coordination, with a compelling sanction at the end. For instance, claims by entities who failed to respond during coordination could be foreclosed.

The attractiveness of such a system is that it hardly departs from existing and well known procedures in the field of radio, and that it requires almost no international administrative infrastructure. It can work very well even when states and organizations launching into space are not a limited number, and does not lay any impediment to the joining by new space powers.

The duty of care referred to above could then start with compliance with the advance coordination procedure. It would further be in everyone's interest to cooperate, considering the importance of the investments involved. Insurance premiums could as a consequence also be lowered.

Gradually, the system could be improved according to traffic density. Certain imposed launching courses could be agreed upon and some orbits prohibited for incompatible uses. Mandatory debris concentration could be underwritten and at some future point, collectively financed clearing up could be organized.

Probably specific provisions will have to apply to military satellites which superpowers deliberately want to keep beyond interference by the international community. Yet it is to be noted that the possibility to oppose a projected space system does not necessarily imply communication of full details and particulars about the functions of the existing system thought to be incompatible. Such is as a matter of fact presently the case with radio frequencies. Anyhow, at some later stage even military powers can be expected to prefer to admit use of a frequency (or an orbit for our purpose) than to run the risk of harmful interference (or destruction pursuant to collision), following upon inadequate coordination.

As a matter of fact, much inspiration can be drawn from the by now 100 years of coordination of the use of the radio spectrum. The approach has evolved from a long history of cautious negotiations, and is therefore a precious source of ideas. Admittedly, account will have

to be taken of its bias towards establishing permanent priority rights. Demands from space powers-to-be are becoming even more pressing to that effect. It is indeed expected to become a major difficulty in the nearby talks on the rational use of the geostationary orbit, planned for respectively 1985 and 1988. The claim for timesharing of orbit space occupation lays actually already on the negotiating table.

- (7) Convention on Liability for Damages Caused by Space Objects, January 14th, 1975, (effective September 1st, 1972).

NOTES

- (1) Dr. Amanda Lee Moore, Comeups: Conditions essential for maintaining outer space for peaceful uses, Proc. 27th Colloquium on the Law of Outer Space.
- (2) Convention on Registration of Objects launched into Outer Space, January 14, 1975; 15020 UNTS; (effective September 15, 1976).
- (3) International Telecommunication Convention, Nairobi, November 6, 1982; International Telecommunication Union, Geneva (effective Jan. 1st, 1984); and Annexed Radio Regulations, elaborated by the Administrative Conferences of the I.T.U..
- (4) It may be noted that use of space radio links for scientific research and astronomy enjoy "softened" procedures in terms of delays and advanced warning. Also, the coordination procedures do not apply to Direct Broadcasting Satellites since the 1977 Radio Conference allotted frequencies country by country for regions 1 and 3, and the 1983 Conference for region 2, covering thus all countries of the globe.
- (5) Treaty on Principles governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, January 27th, 1967.
- (6) Dr. Amanda Lee Moore, Comeups: Conditions essential for maintaining outer space for peaceful uses, Proc. 27th Colloquium on the Law of Outer Space, p.7 of the paper.