

Scientific-Legal Roundtable

S. E. Doyle: In connection with D. McKnight's observation that he hopes provision will be made soon for publication of the approved IAA Position Paper his paper summarizes: the paper has been published in Acta Astronautica, Vol. 31, October, 1993 at pp. 169-191.

In connection with that study, it is to be regretted that the working group did not involve an expert from a propulsion system manufacturers. It has been known for many years that there is a practical solution to the pattern addressed concerning the geostationary orbit in Recommendations 4, 5, 6, and 7 of the IAA study. Especially for satellites weighing more than one thousand kilos, beginning of life, wet weight on orbit, it is cost effective to consider the use of integrated axial propulsion for perigee burn, apogee burn, and end-of life orbital removal, employing a single integrated engine using storable, hypergolic propellants, and designing the attitude control system to work from the same propellant store. What has definded this solution to date is the fact that bipropellant engines that could do all these tasks, which have been designed and developed, and several such engines now exist, but have not been funded. Unless a multilateral program or a government sponsored program is established to prove this technology, which sits on the shelf collecting dust, it is unlikely that any single country or any single program will accept the financial burden of flight qualifying some or any of the candidate engines that exist. In this latter case, programs will continue to build and use separable perigee stages or

Comments and Discussion

apogee kick stages. Perhaps this is a potential area of interest to the Space Agency Forum !

With reference to the proposals made previously and repeated here today to make liability for damage in space an absolute liability, such approach requires that its proponents will have to address the issue of a limit on the amount of liability. It is not likely that States in general will accept absolute liability unless that liability has some finite limit and that limit will have to be defined.

S. Gorove raised the question of the possible establishment of a space based monitoring system of space debris in order to improve available optical or radar data collection which is crucial in connection with issues of liability.

Absolute liability for damage caused by space debris in outer space would be difficult to apply, no matter how good the idea may be, if the origin of space debris cannot be traced.

With respect to definitions of "space object", "space debris", and other crucial undefined or only partially defined phrases, he drew attention to the IISL Working Group on Definitional Issues, the report of which is expected to be given at the next IISL Colloquium in Jerusalem.

Professor Gorove expressed some doubt regarding instant custom arising automatically as a part of international customary law.

E. Fasan suggested in connection with the amendment of the Registration Convention as proposed by Ambassador E. Finch: Among the

data to be requested for information to the UN Secretary-General specification of a removal device should be required. Such removal device would enable the removal of a space object from the orbits mostly used /LEO and GEO/ immediately before its becoming space debris.

M. Bignier made a comment related to the presentation of Professor M. Martin. He mentioned the Optus B 2 Satellite which crashed in December 1992. What he said was right, but we are not at the end of the enquiry, the action has not been closed up. The Chinese first said: our launcher is perfect, no deficiency, no failure. Hughes Aircraft said: our satellite is perfect, no deficiency, no failure.

The insurance companies paid the full sinister because it was, without any contestation, a total loss. But they were not satisfied, they did not like the idea "it is the fault of nobody".

The nose cone /under the Chinese responsibility/ was suspected. The Chinese made all the parts of the nose cone and were finding the quasi totality of them. It is now clear that the nose cone was internally impacted. It was also indicated that, if the satellite was not alive, it was in a phase of preactivation. We are suspecting now that a pyrotechnic valve, internally in the satellite, could have had a malfunction and blow-up. New enquiry is being made in this direction.

Furthermore, M. Bignier addressed a question to D. McKnight who made recommendation to increase the orbits of the dead geostationary satellites of about 300 to 400 km above the geosta-

tionary orbit. M. Bignier agreed, but he was interested to know how much time the satellite would use for joining again the geostationary orbit: Years or centuries ?

D. Rex: The concepts of responsibility and liability which have been repeatedly addressed in the preceding presentations, are typical legal categories. In fact, these categories also do apply in respect to space activities, namely the responsibility of States for space activities originating from their territory and liability for the compensation of any damage caused by space objects, according to the respective international treaties in this field.

However, I want to point out that the concept of liability, either on fault or absolute, will have little or no effect for solving the space debris problem. In order to make that clear I have to elaborate for a moment on the situation which is there in space presently and also for the foreseeable future. I refer to the orbital environment up to an altitude of about 3000 km, commonly called LEO. I exclude here the geostationary orbit /GEO/, although similar observations could be made there too. Let us consider the population of objects in LEO which undoubtedly would be harmful in a collision, i.e. objects down to a size of 1 cm. Very roughly, these are 100,000 objects of which only about 7,000 are known individually, it means that they can be attributed to a certain launch and a certain operator. More than 90% are small-sized objects /mainly fragments from disintegration processes/ which, while it is clear that they are man-made, cannot be

traced back to a certain origin. They move around the Earth on individually unknown, mainly statistically distributed orbits. According to their number, they will be responsible for more than 90% of all collisions which may damage an operable satellite. It is obvious that in such case the owner of the damaged satellite never has the chance to find someone who is liable. Therefore also the potential positive effect of liability, namely that the launcher of a space object would take care for no disintegrations and collisions of his space object in his own interest to avoid being made liable, is not effective.

Even in the very rare cases where two of the 7000 individually known objects would collide, there again the concept of liability does not help. If the two known satellites A and B collide, would then the owner of A be liable for the damage of B or would the owner of B be liable for the damage of A? There are no traffic rules, neither is there an intention or a basis to establish such traffic rules.

From that it can be concluded that the concept of liability does not have any effect on reducing the risk of collisions or reducing the space debris environment. These urgent goals rather have to be reached by direct regulations on space debris avoidance. There are clear technical measures identified to avoid the further build-up of the space debris environment. These measures must be agreed upon internationally in order to avoid any cost imbalance in the international competition. For instance the NASA Handbook on Space Debris, re-

ferred to earlier in the discussions, defines such mitigation measures in detail and could well become a possible basis for an international discussion in the field.

H. Safavi: A definition of space debris should be prepared and approved officially by an international convention, an academic definition is not valid.

The Registration Convention should be amended because some launching authorities did not register their space objects in the UN registration documents. Therefore it is not possible to recognize the launching authority which is responsible according to the Liability Convention.

The authorities which launch a satellite will get benefit, therefore they must be responsible to pay damage according to the Liability Convention.

Some colleagues proposed to send a satellite before its death to a higher orbit above the geostationary orbit. Consequently the conclusion of an international convention on this subject is necessary.

M. Orrico Alarcón: Most Latin American countries express their concern in the evaluation of safety concerning NPS. They remind the lack of proceedings for notifications by the United Nations on the matter. They emphasize the need for reviewing the principles adopted by the UN General Assembly as soon as possible.

M. Orrico also recalled that Mexico repeatedly warned in the UN COPOUS of the threat

posed by debris in space and therefore proposed elaboration of an international agreement specifically destined to deal with the matter. Consequently, there is an urgent need for initiating the study of legal aspects regarding the definition of space debris, jurisdiction and control over space objects and responsibility for damage they may cause both in outer space and by their eventual fall to earth among other things.

L. Perek: I support the view that the Registration Convention has some weak points. Beside the launching announcements being submitted with an undue delay, they do not list all space objects which have been launched. E.g., some of the INTELSAT satellites do not appear in the UN Register. Some States announce only the launching of payloads while other States announce also non-functional objects.

As regards the disposal orbits beyond the GEO, the risk of some debris /after a collision/ returning into the belt of the GEO cannot be entirely excluded. It is, however, considerably smaller than the risk of collision with debris left in the GEO. The reason is that the region of disposal orbits is much larger than the belt of active satellites. Moreover, the presently proposed limit of disposal orbits /at least 300 km above the GEO/ can be raised in the future should it be required.

C. Q. Christol: Liability depends on identification of facts as to harms produced by debris: if none, no liability; if it exists, liability.

The reasons for existence of liability are: To induce care in operation of satellites, and to establish basis for compensation.

Many examples can be mentioned where there are ceilings on compensation where activities are extremely hazardous. This rule can be applied to debris.