4.5.4 Start Building the Consensus Early in the Process

I propose a global convention that would involve all state members at the UN General assembly. The question of whether any limits should be placed on the initiation of multilateral treaty negotiations is important. I refrain from establishing any explicit restraints because it would be impossible to agree to an agreement that is compatible with the rights of all states to participate in the discussion, and negotiating of proposals in any international organism, or in which it participates. As a result, the multilateral negotiating process that will take place before agreeing on the text of the space debris convention will require strong consensus building.

To start the process, I propose that a World Space Debris Congress (WSDC) be convened by UNOOSA. For the convention to be successful, I have argued that it is crucial that it reaches out to as many groups, associations, and experts from the private and civil society and seek their views on the opportunities and difficulties it presents to draft a convention. During the drafting process, representatives from all space-faring nations must be included along with those involved: private industries, space agencies and other professional organizations sharing an interest in space technology. The convention must be open to the public and interested parties and would provide a platform for the stakeholders to engage in a meaningful dialogue.

Consensus building is important for succeeding in agreeing on a space debris convention. As discussed earlier in the paper, diverse groups of people with different interests must be involved in the drafting of the convention. It includes policy-makers from space-faring nations and new countries entering the market, civil society, space industry and the scientific community. I propose that consensus building be enacted early in the process. This is important for the parties to the convention and all other interested stakeholders to fully collaborate on solving the complex problem of space debris in ways that are acceptable to all. More importantly, the consensus-building process must include a great variety of people, rather than leaving the process to a small group of nations or experts. Ideally, through the process of controversial decisions up to a small group of nations or experts, the relevant interests and stakeholders will be discussed and taken into consideration in order to reach a unanimous agreement during the final drafting of the convention.

I propose that the World Space Debris Congress take place as soon as possible with a gathering of all stakeholders. The Congress would have the following goals:

1. Defining the scope of the problem and a joint fact finding process: This is the initial stage where the space debris problem is identified and defined. Before actions can be taken, it is important to have an objective assessment of the situation. Many consensus-building processes involve technical issues in which scientific facts are in dispute. In the case of space debris, the scope of the problem is unusually well defined. As a result, it is likely that the process of "adversary science" so common in many international environmental negotiations will be a major constraint in the drafting process. Still, it is vital to define the problem and share information and resources. During the Congress, experts, decision makers, and key stakeholders from opposing sides will be asked to work together. The task of convening the Congress will be assigned to UNCOPOUS's secretariat, which can either perform it with its own resources, or with specially engaged staff backed up by consultants.

2. Identifying stakeholders: Before the Congress takes place, it is important to mobilize all potential participants. The space debris problem will be resolved only if the interests of multiple stakeholders are addressed. In addition to the obvious parties, i.e. space agencies from space-faring nations, there are other parties not as visible but who need to be involved and get their needs met, e.g. space industry, civil society.

3. Delimiting the legitimacy of representatives: Each party that would participate in the drafting of the convention must ensure that the people involved in the consensus effort really represent who they say they represent and can speak for that group with legitimacy. For instance, traditionally the NGOs are seen as informal and disorganized in their approach, splinter groups forming on ideological and breaking away from the original stakeholder group. It is important that each group speaks with a unique voice and be organized for the drafting process to work smoothly. The World Space Debris Congress would constitute a unique opportunity to identify leadership in each interest group and discuss how the organizations will mobilize resources.

4. Convening of the Congress: I propose that the UNCOPOUS convene the World Space Debris Congress. However, it is important to extend the coverage because the present group working at the UN under the UNCOPOUS banner (STSC) is too limited in participation. For instance, it does not directly include the views from the corporate world and the civil society. It does however, have the required resources to secure the funds, find a location, and choose a convener for the discussion to take place. This is why I suggest that the United Nations is the ideal place to locate such a Congress and provide the technical and financial resources. In this sense, the convening of the Congress will be seen as "neutral." Other forums exist and could be used for the purpose of discussing the space debris agenda. For instance, in September 2007, the 58th Session of IAC will be hosted in Hyderabad, India under the theme "Touching Humanity: Space for Improving Quality of Life." About 2,000 space professionals engaged in space activities all over the world will participate in this week-long Congress. The issues discussed range from new technology and infrastructure to exploration and society. Among a large number of technical workshops, a space debris symposium will convene with the objective to address the
complete spectrum of technical issues of space debris: measurements and space surveillance, modeling, risk assessment in space and on the ground, reentry, hypervelocity impacts and protection, mitigation, and standards. However, such large forums have the major disadvantage of being too large in scope to address the space debris problem in full. Moreover, they tend to focus on technical issues and not on aspects related to liability, dispute mechanisms, and legal regime. Hence, I propose an independent and specific Space Debris Congress.

5. Designing the process and setting up the agenda: Prior to the convening of the Congress, participants would have the opportunity to propose an agenda. The initial agenda must be constructed carefully so no legitimate stakeholders feel their interests are being ignored. It must also include a reasonable timetable. Typically, each stakeholder has different interests and concerns, and defines the problem somewhat differently. For example, some nations prefer to have a binding system for enforcing mitigation guidelines while other nations argue that voluntary guidelines are sufficient. The purpose of the Congress is to bridge the gap as long as all the issues are identified in advance. With a carefully crafted agenda, a more complete picture of the problem will emerge as stakeholders share their perceptions and come to understand how all their concerns and interests are interrelated. Recognizing this interdependence is crucial to consensus building, it ensures that each interested party will have at least some power in the negotiation process.

6. Identifying alternative solutions: Before deciding on any single course of action, it is best to explore a variety of options or alternative solutions. This is extremely important in multiparty negotiations of legal regimes because it is unlikely that any single option will satisfy all parties equally. During the Congress, participants should be encouraged to develop creative options that satisfy their interests and others'. As a variety of options are explored for drafting the space debris convention, participants become able to think in terms of trade-offs and to recognize a range of possible solutions. During the Congress, I suggest that an outline or the headings of a possible convention be exchanged. This is in lieu of a complete draft text that completely spells out substantive provisions, even if only tentatively. It is preferable to start with only "heads of agreement," i.e., just indications of the principal issues and how it is proposed to resolve them. The formal or "final clauses" may be omitted at this stage and be discussed at subsequent meetings.

It is not the scope of the Congress to narrow the choice to one approach. It is the first step of a consensus-building approach. The drafting of the convention, the approval and implementation, can be discussed but will need to be fine-tuned during subsequent meetings.

4.5.5 Overcoming United Nations Convention Constraints

One of the criticisms this proposal may face is that most of the existing specialized agencies of the United Nations are saddled with an overbearing bureaucracy, insufficient resources, and limited powers of enforcement. It has been argued by state members of the UN that the General Assembly is overburdened with treaties and conventions. The treaty-making process is constrained by the global interplay of politics of member states and issues of sovereignty.

Moreover, the power of secretariats implementing and monitoring conventions is often limited. As a result, not surprisingly, many conventions do not produce the desired results or are difficult to amend. For instance, I noted earlier that it is unlikely that the Outer Space Treaty can be amended in the foreseeable future. The reason is that many space-faring nations seem to believe that discussing a new space agreement or amending the Outer Space Treaty would be time consuming and ultimately futile, because of entrenched differences regarding resource appropriation, property rights, and other issues relating to commercial activity.

Unfortunately, any other approach to drafting a convention will face the same constraints. The key to success is therefore to get as many parties with vested interests involved as soon as possible. Other bureaucratic constraints that have to be overcome are worth mentioning:

- The likelihood that the proposed instrument will be accepted by a sufficient number of significant states
- An anticipated and realistic time schedule for the project to reach a consensus
- The costs of formulating and adopting the proposed instrument, both to the UN and to the states participating in the process
- The time and cost to carry out extensive scientific studies or research to determine the parameters of the problem and the lines of potential solutions

4.5.6 Ratification Threshold for a Space Debris Convention

For a new space convention to be fully implemented, it is crucial that it be ratified by member states and incorporated into the national laws of the states involved. National space agencies must also be closely involved in the drafting and implementing of conventions. As stated in "Environmental Diplomacy," if too few countries "ratify an agreement, the cumulative efforts of those living up to their promises may be insufficient to reverse the problem."

In the list of treaties and conventions mentioned in Chapter 4, only the Moon Treaty did not achieve success. It has only 12 signatories. Most knowledgeable observers consider it to be a failed treaty because of its limited acceptance. The Moon Treaty, on the other hand, is limited in scope. UN delegates apparently intended that the Moon Treaty serve as a new comprehensive treaty which would supersede or supplement the Outer Space Treaty, most notably by elaborating upon the Outer Space Treaty's provisions regarding resource appropriation and prohibition of territorial sovereignty.

In terms of acceptance of other space treaties and convention, they have been largely accepted by national governments. The Outer Space Treaty is the most widely adopted. As of January 2006, 98 countries are party to the treaty. Another 27 have signed the treaty but have not yet completed ratification. Concerning the Rescue Agreement, as of 1 January 2005, 88 States have ratified, 25 have signed the Agreement and one international intergovernmental organization (European Space Agency) has declared its acceptance of the rights and obligations provided by the Agreement. The Liability Convention has been ratified by 82 nations and two international
Protocol for a Space Debris Risk and Liability Convention

The registration Convention, which can serve as a useful model for the tracking and cataloging of debris, was built on an existing 1962 resolution for maintaining a record of launches. The Convention was opened for signature on 14 January 1975. It entered into force on 15 September 1976. Two international inter-governmental organizations (European Space Agency and European Organization for the Exploitation of Meteorological Satellites) declared their acceptance of the rights and obligations provided for in the Convention. Under this Convention, all objects launched into earth orbit or beyond into outer space must be recorded with an appropriate national space agency. Information on the object launched into space, including the date and territory or location of the launch, essential orbital parameters, and the function or role of the object in space is to be communicated to the UN Secretary-General.

As a result, I believe that a convention on space debris could be successful. Issues related to space activities have acquired high level of attention and recognition in the past.

4.5.7 Designing the Liability Mechanism: Benchmark from other Conventions

The greatest difficulty is related to the design and implementation of the liability regime for space debris. The question is how to start working on the design of such a system. Perhaps past oil pollution conventions, many of them which include a liability and compensation mechanism, could serve as a benchmark.

In the late 1970s, discussion about the liability and compensation regimes for pollution damage caused by oil tankers began with the Torrey Canyon incident in 1967. Following this incident, it became evident that existing maritime legislation was inadequate to solve the numerous legal problems arising from catastrophes of that kind. As a result, two Conventions were adopted; the 1969 Convention on Civil Liability for Oil Pollution Damage (Civil Liability Convention) and the 1971 Convention on the Establishment of the International Fund for Compensation for Oil Pollution Damage (Fund Convention). Both the 1969 Civil Liability Convention and the 1971 Fund Convention were preceded by two industry agreements, the Tanker Owners' Voluntary Agreement concerning Liability for Oil Pollution (TOVALOP) and the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL).

The ratification success of the 1969/1971 conventions and their subsequent 1992 amendments is addressing questions of liability and compensation for oil spills is obvious from the standpoint of their purpose and timeliness. In the case of the 1969/1971 and 1992 conventions, we have a set of very well targeted instruments related to oil pollution damage. When the fund was set up in 1978 under the 1971 Fund Convention, it had just 14 Member States. By 1 September 2004, the 1992 Fund had 86 Member States. Today, 91 States ratified the 1992 Fund Convention, representing 88 percent of world merchant shipping tonnage. One hundred and four States have ratified the 1992 Civil Liability Convention, (93 percent). This is a major achievement that makes implementation and compliance much easier.

It is also very important for conventions to be easily amendable after they enter in force. In the case of Oil Pollution conventions, the International Maritime Organization (IMO) has been the ideal place for meetings to take place and organizing delegate review of new scientific and technical information. As such, the liability regime has been efficiently revisited whenever necessary and the claims mechanism has benefited from various improvements under the IMO banner. For instance, a Claims Manual has been drafted over time and is now implemented as the main ruling tool for oil pollution claims eligibility and compensation. In particular, it defines issues related to property damage, consequential loss, use of Advisors, submission and assessment of claims, etc.

The oil pollution conventions have been successful in terms of the compensation provisions adopted over the years. The 1992 Fund, for instance, was established in 1996 under the 1992 Fund Convention and is financed by companies and other entities in member states that receive certain types of oil carried by sea. The Assembly and the Executive Committee govern the Fund, an intergovernmental organization set up by member states. The Assembly is composed of representatives of the governments of all member states. The Executive Committee, composed of 15 member states, is a subsidiary body elected by the Assembly. Standard procedures are endorsed consistently by the governing bodies of the IOPC Funds and reflected in their Claims Manuals. A secretariat is also located in London with the necessary legal and expertise staff necessary to implement the standard operating procedures for settlement of claims. In the case of the 1992 Convention, most claims have been settled without the need to resort to litigation. This is another indicator of the success of the convention. When signatory members agree to use a multilateral system of settling disputes, the convention is providing a tremendous advantage.

It is not surprising that the oil pollution conventions have served as a model for other treaties or conventions. The success of the 1992 regime is reflected in the fact that the 1992 conventions have served as a models for a number of other regimes, notably for the planned regime in the 1996 Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS Convention) and, partly, the 2001 Convention on Civil Liability for Bunker Oil Pollution (Bunker Convention). Many of the provisions of those Conventions are identical to those in the 1992 oil regime. For instance, the obligation to maintain insurance included in the Athens Convention on Carriage of Passengers and their Luggage by Sea (Athens Convention) has been inspired by equivalent provisions in the 1992 conventions. Some traces of the oil model can even be found in the Basel Protocol on Liability and Compensation for Damage resulting from Transboundary Movements of Hazardous Wastes and their Disposal.

I argue that the liability and compensation mechanism for a space debris convention can be drafted from experience on the oil pollution conventions. This rule formulation and implementation of the 1992 conventions attests to the significance of legal norms in constituting new spaces of financial accountability for environmental harm. In the case of space debris, the convention is targeted to determining liability and evaluating damages in case of disputes. The oil conventions can serve as great precedent setter.

4.5.8 Raising Awareness on the Space Debris Problem on a Ongoing Basis

Because the space debris issue has not received coverage outside the scientific community, it is crucial to embark on a public education campaign before attempting a draft of the convention. This is important because space technology has advanced rapidly in recent years and a number of
Protocol for a Space Debris Risk and Liability Convention

countries still lack the technical and financial resources required to highlight the key issues and
dangers of space exploration. The Programme on Space Applications (PSA), implemented by
UNOOSA, is well placed to carry out the task of information sharing to the wider public. Since
UNOOSA has made substantial progress in furthering knowledge of and
its experience with space applications around the world. Provision of country capacity-building,
research and development support and technical advisory services by the program have helped to
reduce the gap between the industrialized and developing countries.

4.4.9 Organizational Development of a Secretariat and Financial Sustainability

I suggest that UNOOSA be allocated resources from the UN to form a dedicated secretariat for
drafting, implementing, and monitoring a space debris convention. The Office already serves as
the secretariat for the General Assembly’s committees dealing exclusively with international
cooperation: the Committee on the Peaceful Uses of Outer Space. It has 67 member states and 20
organizations with observer status, annual meetings, and two subsidiary bodies. As a result, it
already has some resources and experience that would be very valuable to the drafting of the
convention. At the moment, UNOOSA has existing capacity as a secretariat to ensure
coordination of the drafting of such an agreement (It has about 20 staff members working for two
sections: Committee Services and Research Section and the Space Applications Section). For
UNOOSA to agree to work on the entire drafting process, including the convening of a congress
and various follow up meetings, it means that additional financial resources are needed from the
UN regular budget.

From the outset, it is important to justify the commitment of the resources required to formulate
and adopt, and bring the instrument into force. A first estimate predicts the cost to be in the range of
USD 200-300 million for the three years envisaged for the drafting of the space debris
convention.45 Because this range is approximate at this stage, I recommend the development of a
Medium Term Budget Framework for UNOOSA to prepare the convention. Such a framework
may entail the following tasks:

- Initiating a process of rigorous analysis of the costs and sources of revenues for drafting
  specifically with the drafting of the convention at UNOOSA;

- Developing a three-year framework as a starting point and utilizing improved techniques for
  revenue and expenditure forecasting, and publishing the basis and assumptions for medium-
  term forecasts (It is important for member states to understand financial implications of the
  new instrument);

- Establishing a financial review team with the task of developing broad aggregates for
  revenues and sectoral expenditure ceilings.

To further improve the drafting of the convention, I propose that reporting systems, both for
accounting and performance purposes, are developed to provide quick and reliable coverage. In
order to monitor progress made on the drafting and negotiating of the convention, they should
allow for organizational goal-setting and performance measurement.

4.6 Proposed Dispute Settlement Design to Administer Space Debris Claims

I have advocated that it is important that the international convention on space debris incorporate
a proper dispute settlement mechanism to resolve space disputes. In the following section, I
propose a design for such a mechanism.

4.6.1 The Institutional Framework

This preliminary design of the international dispute settlement mechanism for space debris
liability claims is based on the assumption that the claims will be addressed and resolved under
the Space Debris Convention once it has been signed and ratified by parties. A key issue to
decide is whether a new, free-standing organization should be established to administer the
international dispute settlement mechanism, or whether the mechanism should be hosted and
served by an existing international organization, for instance UNOOSA.

A number of reasons suggest the latter solution, including the possibility of drawing on existing
administrative resources and, in particular, the faster operationalization of the mechanism.
However, I must note that no international organization is presently fully equipped to deal with
all aspects of the dispute process. Any organization would need time and additional resources to
become fully functional. Moreover, on balance, the importance of assigning the task to an
organization that is focused on and devoted to managing space issues at the United Nations and
whose decision-making structures, procedures, and funding mechanisms are designed to serve
the specific task at hand, outweighs the benefit of establishing an entirely new and independent
organization.

I propose that an organization be established at the headquarters of UNCOPUS. It would be
comprised of a secretariat in charge of developing and maintaining the dispute resolution
procedures. The Secretariat would also head the board, which would review and assess claims.
And finally, the Secretariat would maintain a list of arbitrators and experts that could serve on
the board.

4.6.2 Basic Design of the International Mechanism

The international dispute settlement mechanism must be designed in such a way that it will be
capable of organizing, managing, and resolving large and complex claims. The scale of the
international mechanism and the resources available to it must reflect these requirements. The
administrative, operational, and logistical requirements of such a mechanism are those generally
applicable to the implementation of large-scale international arbitration efforts. Experience
gained in these efforts should be taken into account, while keeping in mind the specific nature, scope, and complexity of the space debris issue.

The principal requirements applicable to the design of the dispute mechanism are outlined below:

1. **Effectiveness.** The requirement of effectiveness means that the process produces results and achieves its goals within a reasonable period of time. A precise temporal goal for the resolution of a claim should be established.

2. **Efficiency.** Efficiency means that the international dispute settlement mechanism be designed in such a way that it achieves its goals with minimum expenditure of resources. Consequently, the procedures of the mechanism should be designed to further this goal and adjust, as appropriate and necessary, traditional rules regarding the allocation of the burden of proof and standards of evidence. This is the reason why the Space Debris Convention should develop an independent tracking and cataloguing capacity. In order to promote efficiency, it is also important to ensure that the mechanism, including its key decision-making functions, is staffed on the basis of professional and technical competency and experience.

3. **Transparency.** Transparency means that eligibility and other criteria, including the types of loss covered and the valuation methods available for quantifying damages, and all principal documents be made public. The policy-making body for the international mechanism should also include representatives of the parties and the international community. However, this does not mean that these parties will have a decisive role in the decision-making process; this role should in principle be preserved for the independent arbitrators adjudicating the space debris claims. Standard operating procedures should be developed to guide the operation of the claims process. Rules of procedure should be adopted for the claims process that embody and reflect applicable international legal standards.

### 4.6.3 Valuation Standards for Damage Assessment

As a general principle, compensation in most cases would be calculated on the basis of internationally recognized principles of valuation found in arbitration, loss adjusting, and accounting professions. It is important that the basis of valuation for economic and non-economic losses related to space debris be based upon internationally accepted professional valuation standards.

At the general level, in the sake of efficiency, the guiding valuation principles would be as follows:

- Simple and consistent, rather than subtle and arbitrary. This allows easy and transparent processing of claims, consistency and accuracy of the valuation work.
- Seek to integrate generally accepted valuation standards and procedures in order to maximize accuracy and reliability of awards.

4.6.4 Claims Process and Dispute Board Members

Under the space debris convention, the claims process is essentially a quasi-judicial function and should be organized accordingly. As such, the design should incorporate the applicable international legal standards and the “best practices” of international claims resolution systems. The principal function of these standards and practices is to ensure that the minimum requirements of due process are respected while ensuring that the process is executed in an efficient and effective manner and without undue delay.

The principal unit of the claims process is the secretariat attached to UNCOPOUS in Vienna. The support services provided by the secretariat should include, in particular, legal support in processing the claims, technical support (both scientific and valuation expertise), administrative and financial support, and a claims registry (i.e., a procedure for filing claims).

Responsibility for the resolution of the claims should be vested with a dispute board comprised of arbitrators. Given the different types of expertise required, it is advisable to create a panel of arbitrators with different professional backgrounds (i.e., scientific as much as valuation knowledge). The members of the dispute board should be appointed by the policy-making body for the convention on the basis of a nomination by an appointing authority designated in advance. One member of the dispute board should be appointed to serve as Chairman of the Board.

In line with the independent, professional nature of their function, the members of the boards should serve in their personal capacity and not as representatives of their governments. The plenary of the dispute board, sitting as the claims commission, should be authorized to adopt its own rules of procedure or, alternatively, draft these rules and submit them for approval to the policy-making body.

The decisions of the dispute board should be final and not subject to review by the policy-making body. The extent to which appeals from the decisions of the dispute board will be allowed should be carefully considered in view of the number of claims to be processed and the mass nature of the process. It may be efficient to use other procedures, including external audits, to monitor the appropriateness and accuracy of the decisions.

### 4.6.5 Use of Independent Experts

Expert advice in settling disputes related to space debris may be important. Competent, objective, professionally developed valuations are required in all cases. As such, it will be important for the dispute board to be able to use various experts, including scientists, and loss adjusters and accountants to carry out the verification and quantification of claims. It is vital for the dispute board to have the opportunity to be able to ask the secretariat to appoint an expert to administer the proceedings. To make the right choice, the secretariat will maintain a list of potential independent experts, relying on its own extensive contacts. Expertise provided through
the secretariat can assist amicable settlement of a dispute or resolve a difference of opinion. It may do no more than remove uncertainty about a set of facts. If the parties wish, the findings can be binding.

### 4.6.6 Funding

Securing appropriate funding for the dispute resolution mechanism is crucial. State parties to the space debris convention must be expected to make a contribution to funding the liability and dispute settlement mechanism. The size of this contribution remains a matter of negotiations between the parties.

### 5. CONCLUSION AND RECOMMENDATIONS

In addition to introducing a renewed military dimension to space, the destruction of the Chinese satellite has sent a strong signal to the world that the problem of space debris has not been resolved. Today, orbital debris continues to be a growing problem for government and commercial satellite operators and manufacturers. Orbital debris will continue to grow as long as there are launches of satellites and other spacecraft. It is obvious that space corporations can take significant steps towards minimizing the amount of debris that remains in space. However, the greatest challenge is not a technological one. Rather, the greatest obstacle comes in our ability to successfully coordinate and implement, with force, a set of measures to deal with space debris in the coming years.

A global convention is thus warranted for the simple reason that the successful approval of voluntary guidelines has not been consistent over the last few decades. Furthermore, the convention would cast in stone some of the principles for dispute resolution and liability damages. The convention is to be organized around the following four objectives:

- **Objective 1:** Independent Tracking and Cataloguing of Space Debris. Before determining the most effective measures that should be taken to solve the space debris problem in Earth orbit, it is essential to quantify the problem not only in terms of the current orbital debris in the environment, but also in terms of future growth potential absent remedial action. I propose that a uniform database be maintained by UNOOSA secretariat. Specific procedures will need to be drafted and enforced to ensure that UNOOSA collects information and data in a timely and exhaustive manner.

- **Objective 2:** Adoption of Enforceable Space Debris Mitigation and Disposal Standards. I advocate the need for internationally agreed standards that can enforce appropriate debris mitigation and disposal measures for spacecraft and launch services providers.

- **Objective 3:** The “Space Preservation” Provision. The convention must propose that some orbital regions be protected because of their scientific and economical importance: the Low Earth Orbit (LEO), ranging from 200 km to 2000 km altitude, and the Geostationary Earth Orbit (GEO) between 33000 and 36000 km altitude.

- **Objective 4:** Liability, Compensation and Dispute System Design. The convention must settle out clearly the mechanism for resolving disputes under which a final and enforceable decision can be obtained in a cost-effective manner. I propose the creation of a Dispute Board set up at the outset of the convention. UNOOSA will ensure support to the dispute settlement mechanism.

With that in mind, I recommend the following milestones over the next 5 years for drafting and implementing a space debris convention:

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<th>Date</th>
<th>Tasks</th>
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| 2008 | - Convention objectives are established and an entry point defined (UNOOSA).  
- A dedicated staff within UNOOSA is identified to draft the convention agenda and organize a first World Space Debris Congress in order to share a common vision of the problem. Participants to the Congress are all members of space-faring and non space-faring nations, civil society, space industry and academia. This is the starting point for the consensus building process that will end up with the adoption and ratification of the convention.  
- Measure of success and targets are developed for the drafting of the convention.  
- Specific assessment studies are prepared and expert information is collected by UNOOSA.  
- Rigorous analysis of costs and sources of revenues for dealing specifically with the drafting of the convention at UNOOSA is completed. Resources mobilization takes place to ensure financial sustainability of the making of the convention. |
| 2009 | - A rigorous benchmark is carried out to highlight best practices and lessons from other conventions, space and non-space related.  
- The drafting of the convention is organized at UNOOSA and an agenda for approval by the UN General Assembly is set.  
- A second World Space Debris Congress is organized. In conjunction, UNPSA starts to organize workshops and seminars on space debris to continue to mobilize all participants to the 2008 and 2009 Congresses.  
- Working groups are established following the 2009 Congress to address key issues. The dispute mechanism is also discussed on a legal stand point. |
| 2010 | - A Drafting Committee is set up at UNOOSA and is composed of a representation of all stakeholders. A first draft of the convention is being circulated among the various stakeholders, including the private sectors and NGOs.  
- The negotiating process starts and conclusions with governments are carried out. Consultations with civil society are organized.  
- A third World Space Debris Congress is organized with the main objective to discuss the draft convention. |
| 2011 | - The adoption forum for the convention is the UN General Assembly (GA). As a result, the draft convention is now presented to the GA.  
- During the year, the working groups meet to finalize the convention. The following tasks are performed:  
  - Completion of the substantive negotiations - usually only on a few especially difficult points that the primary negotiations were not able to resolve;  
  - Perfection of the text with the help of the Drafting Committee. |
Protocol for a Space Debris Risk and Liability Convention

| 2012 | States parties embark upon implementation of national and corporate action plans and launching agencies start implementing measures for limiting space debris |
| 2012-2015 | The text is adopted by the GA and the monitoring body is implemented. |

It is important to look over the horizon and head off problems before they occur rather than waiting for the problems to find us unprepared. It is obvious that many development issues deserve great attention on Earth. However, this is not a reason to forget that our space environment needs protection in much the same way that our oceans, rivers, and forests have to be preserved for future generations. Recent activities in space have produced a considerable increase of knowledge about the debris population in the orbital environment. This should help motivate the design and implementation of a space debris convention. Even though the current space debris population may not represent an immediate danger, the risk of collision with debris is growing. The severity of damage and its consequences are also increasing as we rely heavily on equipment placed in orbit.

More than ever, the space debris problem is hindering space commerce, space tourism, the scientific exploration of space, the use of raw materials from space (including materials from the Moon), and even plans for the future settlement of space. A new space debris convention is thus warranted now.

### Abbreviations

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<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AECB</td>
<td>Canada’s Atomic Energy Control Board</td>
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<td>ASAT</td>
<td>Anti-satellite weapon</td>
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<td>Cm</td>
<td>Centimeter</td>
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<tr>
<td>CNES</td>
<td>Centre National d’Etudes Spatiales (French Space Agency)</td>
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<td>CNSA</td>
<td>China National Space Administration</td>
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<tr>
<td>COSPAR</td>
<td>Committee on Space Research</td>
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<tr>
<td>CRS</td>
<td>Corporate Social Responsibility</td>
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<tr>
<td>DoD</td>
<td>Department of Defense (USA)</td>
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<tr>
<td>ESA</td>
<td>European Space Agency</td>
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<tr>
<td>FAA</td>
<td>Federal Aviation Administration (USA)</td>
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<td>FKA</td>
<td>Federal Space Agency of Russia</td>
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<tr>
<td>GEO</td>
<td>Geosynchronous Orbit</td>
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<td>GTO</td>
<td>Geostationary Transfer Orbit</td>
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<td>HTO</td>
<td>High Earth Transfer Orbit</td>
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<tr>
<td>IAA</td>
<td>International Academy of Astronautics</td>
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<td>IAC</td>
<td>International Astronautical Congress</td>
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<td>IADC</td>
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<td>IAF</td>
<td>International Astronautical Federation</td>
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<td>Indian Space Research Organization</td>
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<td>International Space Station</td>
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<td>Km</td>
<td>Kilometer</td>
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<td>Low Earth Orbit</td>
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<td>National Aeronautics and Space Administration</td>
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<td>Medium Earth Orbit</td>
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<td>Memorandum of Understanding</td>
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<td>Space Debris Advisory Group (Europe)</td>
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<td>SSN</td>
<td>Space Surveillance Network (USA)</td>
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<td>Scientific and Technical Subcommittee (UNCOPUOS)</td>
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<td>United Nations</td>
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<td>United Nations on the Committee on the Peaceful Uses of Outer Space</td>
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<td>UNESCO</td>
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<td>United Nations Programme on Space Applications</td>
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<td>WSCC</td>
<td>World Space Debris Congress</td>
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</table>
Appendix 1: Draft space debris convention (A hypothetical example)

Preamble

The States Party to this Agreement,

Inspired by the great prospects opening up before mankind as a result of man’s entry into outer space;

Believing that the exploration and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development;

Recalling the promotion of the peaceful uses of outer space in the Treaty Banning Nuclear Tests in the Atmosphere, Outer Space and Under Water; the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies; the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space; the Convention on International Liability for Damage Caused by Space Objects; the Convention on Registration of Objects Launched into Outer Space; and the Agreement Governing Activities of States on the Moon and Other Celestial Bodies;

Recognizing the fragility of the outer space environment and conscious of the dangers of space debris in low earth and geosynchronous orbits;

Recognizing the necessity of international cooperation for limiting space debris;

Recognizing that it is in the interest of all mankind that space shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord;

Reaffirming that outer space is an indispensable medium for civil, scientific, and commercial endeavor, technological advancement, and national security;

Recognizing that incidents from space debris in outer space would impair the peaceful exploration and use of space;

Desiring to prevent outer space from becoming an arena of conflict;

Desiring to adopt uniform international rules and procedures for limiting, mitigating and eliminating space debris;

Desiring to ensure that adequate compensation is available to anyone who suffer damage caused by space debris;

Have agreed on the following:

Article I [Definitions]

For the purpose of this Agreement, the following definitions shall apply:

1. "Space debris" means all man-made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional.

2. "Space Systems" refers to spacecraft, orbital stages, and orbiting object designed to perform a specific function or mission (e.g. communications, navigation or Earth observation).

3. "Launch vehicle" means any vehicle constructed for ascent to outer space, and for placing one or more objects in outer space, and any sub-orbital rocket.

4. "Satellite" means a man-made body that revolves around the Earth, that transmits or receives an electromagnetic signal or that previously has transmitted or received an electromagnetic signal.

5. "Low Earth Orbit" (LEO) means an orbit within the locus extending from the Earth’s surface up to an altitude of 2,000 km. Given the rapid orbital decay of objects below approximately 200 km, the commonly accepted definition for LEO is between 200-2000 km (124-1240 miles). Geo Synchronous Orbit (GEO) means an orbit at about 36,000 km.

6. "Mitigation measures" means any reasonable measures taken by any space-faring State and organization, public or private, to prevent or minimize debris pollution and damage.

7. "Person" means any individual or partnership or any public or private body, whether corporate or not, including a state or any of its constituent subdivisions.

8. "Incident" means any occurrence, or series of occurrences having the same origin, which causes damage.

9. "Damage" means loss or damage caused by space debris, registered or not, and including costs of preventive and remediation measures and further consequential loss or damage caused by the debris, including business interruption and physical losses.

Article II [Purpose]

1. The exploration and use of outer space shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

2. Outer space, shall be free from debris and any kind of pollution that may prevent exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.
Protocol for a Space Debris Risk and Liability Convention

3. A "Space Preservation" Provision shall be adopted to ensure that orbital debris creation is controlled within these protected regions. To do so, the convention regulating space debris shall define and incorporate debris emissions quotas.

4. There shall be collaboration and coordination of activities for curbing the level of space pollution, and States shall facilitate and encourage international cooperation for investigation of damage. A dispute mechanism shall be designed to address questions of liability and compensation of such damage.

Article III [General Obligation]

1. Each Party shall conduct military, scientific and commercial exploration and use of outer space in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.

2. In accordance with the provisions of this Agreement, each Party shall seek to promote the peaceful uses of outer space by avoiding incidents and refraining from dangerous practices in space, including engaging in actions that increase the risk of debris, and using a directed source of power to disrupt, degrade, impair, or destroy a satellite and thus voluntarily creating debris.

3. The Parties to this agreement agree to follow the fundamental principles mentioned below:

(a) Taking mitigation measures to prevent the accumulation of space debris

(b) Preventing on-orbit break-ups;

(c) Removing spacecraft and orbital stages that have reached the end of their mission operations from the useful densely populated orbit regions; and

(d) Limiting the objects released during normal operations.

Article IV [Tracking and Cataloguing of Space Debris]

1. An official independent catalogue of space debris will be maintained by the United Nations Office for Outer Space Affairs (UNOOSA).

2. In accordance with the provisions of this Agreement, each Party agrees to inform UNOOSA of any event generating new space debris.

3. UNOOSA shall be empowered to maintain an up-to-date catalogue of space debris and to make it available to the international community at large. The catalogue shall be maintained on-line. Under this agreement, UNOOSA agrees to provide the necessary financial means for developing models for tracking smaller-size debris (below 5 cm).

4. The Parties to this agreement agree to dispose of any object at end-of-mission. Debris created within the specified zones would have to be reported for tracking and cataloguing to the appropriate monitoring body created for this purpose under the convention.

5. Within the specified zones, the Parties agree to avoid creating debris intentionally by use of power and military actions. In case of malfunction of equipment or machinery breakdowns within the specified zones, the Parties agree to report the information to the specified body created under this convention.

Article VII [General Responsibility]

1. States Parties to the Treaty shall bear international responsibility for national activities in outer space, whether such activities are carried on by governmental agencies or by non-governmental entities, including commercial and military activities.

2. States Parties to the Treaty shall be responsible for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-
governmental entities in outer space, shall be done under the responsibility and supervision of the appropriate State Party to the Treaty.

3. States Parties to this agreement shall be absolutely liable to any damage caused by space debris falling under their responsibility and pay compensation for the damage caused on the surface of the Earth or to aircraft in flight.

4. As per the “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies”, each State Party to the Treaty that launches or procures the launching of an object into outer space is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space. The present agreement shall apply this definition for any damage caused by space debris whose origin is known.

Article VIII [Mediation and Dispute Handling Mechanism]

1. To promote the objectives and proper implementation of and compliance with the provisions of this Agreement, the Parties shall resolve to establish a system of consultation for the purpose of resolving expeditiously any incident, ambiguous development, or concern which may arise pertinent to the obligations contained in this Agreement. Mediation shall be conducted in accordance with the rules of UNOOSA.

2. In case of disagreement, the dispute handling mechanism will be as follows:
   a. A claims mechanism is created under the convention and its secretariat is hosted at UNOOSA in Vienna
   b. Parties to the convention are entitled to put forward any claim to the Claims Secretariat
   c. The Standard Operating Procedures developed under this convention for governing disputes shall apply in any circumstance.

5. In case of damage suffered from a space debris, claims from any Party shall be notified within 10 days after the incident has occurred to the appropriate body designed for administering the claims. Within a month after the date of the incident, a Dispute Board will be nominated in accordance with the Standard Operating Procedures (“The Rules”) established under the convention. The claims will then be administered according to the Rules.

Article IX [Communication and Notification of Debris Threat]

1. To promote the objectives and implementation of the provisions of this Agreement, the Parties shall resolve to establish a mandatory system of communication of information about potential collision and dangers posed by debris within forty-five days after this Agreement has entered into force.

2. To promote the objectives and proper implementation of the provisions of this Agreement, the Parties shall resolve to provide notice of launches into outer space to the other Parties in accordance with the system of communication of information established above.

3. The Parties shall agree to notify each other about the creation of new debris no later than 50 hours after the launch of all satellites from their territory, and the launch from foreign territory of all satellites owned or controlled by nationals or entities resident in their territory.

Article X [Monitoring]

1. For the purpose of providing assurance of proper implementation and compliance with the provisions of this Agreement, each Party shall use national or multinational technical means of verification and space tracking capabilities at its disposal in a manner consistent with generally recognized principles of international law.

2. For the purpose of providing assurance of proper implementation and compliance with the provisions of this Agreement, all Parties to this Agreement shall not interfere with national or multinational technical means of verification or space tracking capabilities of another Party or Parties to this Agreement operating in a manner consistent with generally recognized principles of international law.

3. For the purpose of providing assurance of proper implementation and compliance with the provisions of this Agreement, all Parties to this Agreement shall not conceal from national or multinational technical means of verification of another Party or Parties to this Agreement operating in a manner consistent with generally recognized principles of international law.

4. States Parties to this agreement shall provide the required financial means to UNOOSA to develop and maintain a Monitoring Office what shall be responsible for coordination and implementing the oversight function for this Convention.

5. To ensure the viability and effectiveness of this Agreement, each Party agrees on evaluating twice a year the outcomes produced by this Convention and therefore enhance reassurance of compliance of the undertakings established under the Convention.

Article XI [Entry into Force]

This Agreement shall enter into force on the date of its signature by the Parties.
Article XII [Withdrawal]

Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Agreement if it decides that extraordinary events related to the subject matter of this Agreement have jeopardized its supreme interests. It shall give notice of its decision to the other Party or Parties one month prior to withdrawal from this Agreement. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

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ESA Space Debris Mitigation Handbook, Release 1.0, April 7 1999.


European Space Debris Safety and Mitigation Standard, Issue 1, Revision 0, September 27 2000.

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Space Generation Advisory Council (SGAC) is a non-governmental organization http://www.spacegeneration.org.


For space surveillance data, I have used the following site: http://www.space-track.org.
Protocol for a Space Debris Risk and Liability Convention

Notes


4 See also the National Aeronautics and Space Administration (NASA), Space Debris Environment and Policy Updates, Presentation to the 44th Session of the Scientific and Technical Subcommittee Committee on the Peaceful Uses of Outer Space, United Nations, 12-21 February 2007.

5 The Space Surveillance Network (SSN) is a worldwide network of 21 ground-based optical and radar sensors and one space-based sensor. Space surveillance involves detecting, tracking, cataloging and identifying man-made objects orbiting Earth, i.e., active/magnetic satellites, spent rocket bodies, debris, and fragments. Space surveillance accomplishes the following: Predict when and where a decaying space object will re-enter the Earth's atmosphere; Prevent a returning space object, which to radar looks like a missile, from triggering a false alarm in missile-attack warning sensors of the U.S. and other countries; Chart the present position of space objects and plot their anticipated orbital paths; Detect new man-made objects in space; Produce a running catalog of man-made space objects; Determine which country owns a re-entering space object; and Inform NASA whether objects may interfere with the orbits of the Space Shuttle and the International Space Station.

6 See an article on the ESA site at http://www.esa.int/spacecat/OGC-Article-full/Article_item_selected-2_1_01_par-40_11092735450198.html.


9 LEGEND (LEO-to-Geo Environment Debris model), is a high-fidelity three-dimensional discussion of the physical model developed by the U.S. National Aeronautics and Space Administration (NASA) that is capable of simulating the historical environment, as well as the evolution of future debris populations. The LEGEND future projection adopts a Monte Carlo approach to simulate future onorbit explosions and collisions (16). A total of 50 (17), 200-year future projection Monte Carlo simulations were executed and evaluated, under the assumptions that no rocket bodies and spacecraft were launched after December 2004 and that no future disposal maneuvers were allowed for existing spacecraft (few of which currently have such a capability). See Johnson, N. and Liou, J.-C., 20 January 2006, Risks in Space from Orbiting Debris, Vol. 311 Science, pp. 340-341.


11 See the ESA site for a complete review of the market http://telecom.esa.int/telecom/www/object/index.cfm?fobjec tedId=456.

12 For a complete business analysis, see the Frost & Sullivan report entitled World Civil and Military Space Systems Markets, 2 February 2006.


15 The author of the paper has conducted many interviews with Mr. Nicholas Johnson, Chief Scientist with NASA's Orbital Debris program Office.


17 See a study carried out by the Fulton Corporation entitled “Orbital Debris Mitigation: Regulatory Challenges and Market Opportunities”, 15 March 2006.

18 The updated version of ESA Space Debris Mitigation Handbook (July 2002) can be uploaded at http://www.esa.int/gsp/completed/excessum06_N06.pdf.


21 For more information on corporate social responsibility, one can access information on the website of the Mossavar-Rahmani Center for Business and Government at Harvard University: http://www.ksg.harvard.edu/m-r/cbr/CSR/home.html.


24 See the full text of the Outer Space Treaty at the Edwin Ginn Library of The Fletcher School, Tufts University (http://fletcher.tufts.edu/multi/texts/BHI00.txt).


27 COPUOS is organized by two subcommittees, the Scientific and Technical Subcommittee and the Legal Subcommittee. The COPUOS Legal Subcommittee has been the primary forum for discussion and negotiation of international agreements relating to outer space.

28 See the full text and the list of signatories on the U.S. State Department site at http://www.state.gov/actr/t/3181.htm.


31 According to many studies, when the rate of fragments being produced by random collisions exceeds the rate at which they are being removed by atmospheric drag, the debris population will start to grow exponentially as collision fragments cause more collisions, and so on.


35 Emissions trading systems have been designed in various contexts. For instance, such systems are set out in Article 17 of the Kyoto Protocol and it provides for Annex I Parties to acquire units from other Annex I Parties and use them towards meeting their emissions targets under the Kyoto Protocol. This enables Parties to make use of lower cost opportunities to reduce their overall cost of reducing emissions. See also the site of the United Nations Framework Convention on Climate Change at http://unfccc.int/2860.php.

36 See the article study edited by E. Butler and K. Boyfield "80 ideas in economic and social reform". It describes reform ideas illustrated by practical examples from around the World. The work has been done by the Adam Smith Institute (UK), 2002.

37 See Remarks on the Responsibility and Liability for Damages other than Those Caused by the Fall of a Space Object, Arnel Kerrett, IISL, 97, University of West Brittany.

38 Extracted from the NASA presentation of the 44th session of the Scientific and Technical Subcommittee of the UN Committee on the Peaceful Uses of Outer Space (COPOUS) in February 2007.

39 On 5 September 2001, the catalogue population consisted of 30.6% operational and non-operational payloads (2,567), 16.7% rocket bodies (1,400), 9.8% operational debris (821) and 42.9% payload and rocket debris (3,595). Only about 6% of the catalogue population can be assumed to be operational payloads.

40 Information on the drafting of such Convention can be found on the website of the Foreign Affairs and International Trade Department of Canada. See http://www.mines.gc.ca/menu-en.asp.


43 For more details on the IAC, one can visit the following website: http://www.iac2007.org/script/aboutthe%20congress.aspx


45 See details of these conventions on the International Oil Pollution Compensation Fund website, www.iopcfund.org.

46 The full text of these conventions is available at the Edwin Ginn Library of the Fletcher School of Law and Diplomacy, Tufts University. The Multilaterals Project, which began in 1992, is an ongoing project at The Fletcher School to make available the texts of international multilateral conventions and other instruments. The information is available at http://fletcher.tufts.edu/multilaterals.html.

47 Such estimation comes from the experience of the author in the United Nations system. The annual budget of developing the United Nations Compensation Commission in the mid-1990s has been about USD30 million a year to culminate to USD100 million a year once the organization was fully in place and staff deployed. On the conservative side, I have estimated that the costs of drafting a convention for space debris would be about USD200-300 million, including the World Space Debris Congress, the various meetings in Vienna, the Secretariat staff (about 5 professionals) and the various administrative expenses.