SPACE DEBRIS SYMPOSIUM (A6)
Political, Economic and Institutional Aspects of Space Debris Mitigation and Removal (Joint with Space Security Committee) (6)

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ISU TEAM PROJECT: SPACE DEBRIS MITIGATION AND REMOVAL

**Abstract**

Since the launch of Sputnik 1 on 4 October 1957, about 4800 launches have put 6700 satellites in orbit.Most of them are no longer operational and have either re-entered or become debris. Also about 2000 rocket bodies and 1000 -related objects" are currently circling the Earth. The major sources of debris, however, are the fragments from the more than 250 on-orbit explosions. It is estimated that about 700 000 objects larger than 1 cm are currently in Earth orbit. A critical density has been already reached

at an altitude of 800 to 1000 km. The Feng-Yun antisatellite test in 2007 created 3000 observable (i.e. larger than 10 cm) fragments at that altitude, and the collision in 2009 between Kosmos 2251 and Iridium 33 added another 2000 fragments. There is a high probability that one of the big satellites or spent rocket upper stages located at this altitude will be hit and destroyed within the next 5-10 years, creating another debris cloud. A NASA study has shown that the environment can be stabilized by implementing space debris mitigation measures and by removing annually just a few objects with large cross-section areas at the most critical altitudes. About 40 students from the International Space University are working on mitigation scenarios during a 9-week summer session at the Florida Institute of Technology. The tasks they are undertaking are: 1. Listing of all mitigation measures including their effectiveness; 2. Economic implications of space debris mitigation measures (cost vs. benefit); 3. Measure the degree to which the mitigation measuresare implemented, and analyse, when they are not implemented at 1004. Literature review to prove the necessity of debris removal; 5. Review of debris removal technologies; 6. Detailed description of the most promising debris removal concepts; 7. Definition of the structure of the organization which is in charge of debris removal; 8. Establishment of a business plan or financial planning of the debris removal; 9. Proposal of a legal framework for debris removal. In the paper the results of this international student project will be summarised and a way-forward how to tackle the space debris problem will be proposed. This shall serve as an input to the international efforts which are required to ensure the long-term sustainability of our space environment.