

28th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Constellations and Distributed Systems (7)

ASSESSMENT OF THE HUMANITARIAN BENEFITS AND RISKS OF SATELLITE
CONSTELLATIONS

Abstract

Technological improvements and increasing commercial demand are enabling a new era in the development of the space economy. Satellite activities in Low Earth Orbit have been increasing significantly in recent years due to the deployment of large telecommunications constellations by providers such as SpaceX, OneWeb, and Amazon. With the number of planned launches into LEO assured to rise and the potential deployment of over 100,000 satellites, the impacts on other human activities in space and on Earth are inevitable. Recently, concern has been expressed in particular for the astronomical community, which has witnessed its ability to observe the night sky being reduced. Questions also arise concerning space traffic management, the growing crowding of low Earth orbit, and the escalating risks of further space debris production. On the other hand, these constellations, particularly Starlink, are proposed as revolutionary tools given their plan to connect even the most remote terrestrial areas through fast and reliable internet.

Therefore, the purpose of this paper is to evaluate the benefits brought about by the advancement of these constellations, setting them against the well-known risks that they introduce. A review of the risks is conducted, considering what has already been highlighted by the astronomical community and any other prospects that emerged during the investigation. With a solid knowledge of the risks, the potential benefits that constellations aim to achieve are investigated, through the study of their application plans and interviews with representatives of the satellite industry. Furthermore, the paper analyzes how and to what extent these plans can be implemented in practice and with what benefits. In conclusion, the paper assesses these risks and benefits deriving from large constellations activities to find a balance between the different interests at stake. Recommendations for satellite operators and other relevant stakeholders are finally provided to guarantee the safety of space activities and sustainability of the outer space environment.