Toward a unified SSA framework to address short- to long-term challenges

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SSA often amounts to the tracking and cataloguing of the *current* orbiting population, but it is only a part of the global picture. With ever-increasing launch traffic, deployment of large constellations and Cubesats, it is of paramount importance to build up knowledge on space activities spanning from past events to short- and long-term consequences of current behaviors and, in order to do so, to maintain a consistent representation of the orbital population across these different timelines.

The SSA office at the CNES currently provides analyses and statistics at each time horizon through various areas of application, such as support to regulation of space activities, re-entry predictions, cataloging, collision avoidance, uncertainty characterization, or modeling of the long-term evolution of the orbital population. These activities typically rely on bespoke descriptions of the orbital population, involving a specific blend of an individual-based, data-supported representation of catalogued objects and a collective, statistical representation of the remaining population. A key objective of the SSA office is to promote a unique, consistent representation of the orbital population across the different timeline of interest, in which individual information on catalogued objects progressively gives way to population statistics the further away in the future a given analysis is set. Such a unified framework would strengthen the synergy between the activities, and avoid inconsistencies between analyses based upon disjointed or outdated representations of the orbital population or, more generally, the space environment.

In this talk we will point out some leads for improvement towards such a unified framework of representation, and show how a dedicated framework can help bridge the gap between operational data and simulations.