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NEXT STEPS IN PRESERVING GEOSTATIONARY ORBIT

Abstract

A 2016 study produced an initial feasibility assessment of a system to collect uncontrolled satellites in geosynchronous orbit and re-locate them at a long-term storage facility, kept under indefinite control. The system, called "Necropolis" (a graveyard away from centres of population), consisted of two independent spacecraft launched together on an Ariane 5 or 6 and placed above both geostationary and graveyard orbits. Once on station, the "Hunter" spacecraft separates and, using ion propulsion, rendezvous with drifting satellites, and returns them to the "Terminus" storage facility, where they are permanently stored. The study showed that between six and twelve satellites could be removed from the geostationary environment by the system. The study also identified three areas that required attention in subsequent work.

The first area was an exploration of the legal liability of the owners and sponsoring states of non-functioning satellites. An important and previously unconsidered issue is how the proven ability to reduce risk by removing satellites changes liability, as reasonable preventative action can be taken. It is important to establish the legal liability of the various actors as this forms the basis of the business plan and split between public and private funding sources. Furthermore, international rules and guidance are necessary to enable remediation action to take place as soon as possible to protect and keep this orbit usable.

The second area was the starting assumption that the collision risk in geostationary orbit was significantly lower than in low Earth orbit, it was discovered that the concentrating effect of the libration points was likely to be significant. Subsequent research has found that only one risk analysis, conducted by the University of Colorado, had included this effect and even this analysis did not fully account for the unexplained concentration of satellites stable at the libration point longitudes. It was concluded the real risk is currently not known with any certainty however it is significantly higher than the widely held consensus view.

The final area was the actual status of the drifting satellites. As details of the satellite capture process were examined, it became clear the knowledge of factors such as spin behaviour; the condition of external thermal surfaces; and, the actual debris environment, all need to be better understood before final development of "Necropolis" could be undertaken. It was concluded that a precursor "Scout" spacecraft would be required and subsequent work has established preliminary requirements for such a mission.