Dynamic Launch Decisions for Satellite Constellation Operators

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Abstract

Over the last 10 years new technology has make low earth orbits (LEOs) more accessible, and the resulting increase in LEO satellites has increased the risk of collision. Because debris in orbit generates more debris through collisions with objects in orbit and the debris created during launch and operation imposes a negative externality on other operators, optimal use of orbits is believed to not occur under free entry. This paper develops a dynamic model of satellite operation incorporating two effects not considered in previous models. The first effect is complementarity between satellites within the same operator's fleet (called a constellation). The second effect is collision avoidance efficiencies that exist within constellations. The primary result is a theoretical model and the resulting analysis of the difference in survival ratios between constellation operators and society.

Keywords: Orbits, Pollution, Economies of Scale, Externality

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