

**A SPACE-BASED SOLUTION TO IMPROVE ROADWAY SAFETY AND
EFFICIENCY IN VIRGINIA: REAL-TIME WINTER WEATHER DATA
FOR NAVIGATION**

(Technical Report)

ORBITAL USE FEES STIFLE DEVELOPING SPACE PROGRAMS

(STS Research Paper)

An Undergraduate Thesis Portfolio
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by

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Preface

Satellites gather and transmit valuable data, for example about weather, but they contribute to hazardous space debris. To mitigate space debris, an annual orbital use fee for satellite owners is proposed.

Road congestion contributes to costly delays and to traffic hazards. Inclement weather can exacerbate such effects. In the U.S., weather data are collected from Doppler radar systems, through direct observation at local ground-based weather stations, and from weather satellites such as the National Oceanic and Atmospheric Administration's Geostationary Operational Environmental Satellite. Data are then combined and distributed publicly, for example as browser-based weather maps. Drivers can consult weather reports before driving, but few services offer drivers real-time weather data on the road, for route planning or rerouting. This project produced a conceptual design report for a satellite system that detects snow and ice cover on roadways in northern Virginia.

A proposed method for limiting the production of space debris is the Orbital Use Fee (OUF). By charging commercial satellite operators for each satellite in orbit, an OUF would make operators responsible for their satellites until they leave orbit or enter a graveyard orbit. An OUF would cause operators to maintain liability for their satellites until they are removed from orbit or placed into a graveyard orbit. Fees could vary by orbit, by satellite, and by the risk of space debris production. OUFs would introduce problems of equitable application that may have to be considered.

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