

High-Resolution Satellite Imaging of Nitrogen Dioxide from Low Earth Orbit
(Technical Report)

Discovery and Triumph: Promoting Space Exploration by Appealing to Values
(STS Research Paper)

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by

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Preface

Spaceflight is expensive, but space-based technology and research has contributed to innovations in many fields, including atmospheric monitoring, communication, navigation, and medicine.

How can atmospheric nitrogen dioxide data in cities be precisely imaged? In a multiyear team capstone project in the Department of Mechanical and Aerospace Engineering, students enrolled in MAE 4690/4700: Spacecraft Design I/II, advised by Dr. Chris Goyne, are developing a 3U CubeSat, a type of small satellite, that can image atmospheric nitrogen dioxide levels. NO₂ in nine major cities is to be imaged at high spatial resolution, using a spectrograph developed by the University of Virginia Department of Astronomy. NO₂, a byproduct of combustion-related emissions, is a strong indicator of anthropogenic pollution and is linked to adverse health effects. High-resolution imagery of NO₂ levels over a city can reveal pollution sources and inform public health policy. A final design report was delivered for the use of students in the MAE 4690 class of fall 2020, who will begin assembly of the CubeSat. If the mission succeeds, this CubeSat will provide the most informative intra-urban NO₂ measurements to date.

How do space organizations appeal to values to promote space exploration? Space organizations, nonprofits, and contractors cooperate to advocate general spaceflight and compete to promote their own ventures. They rely on public approval to advance their agendas, so they engage in public relations campaigns. Space groups promote space exploration by appealing to a wide range of values, especially the imperative to explore, the alleged interplanetary destiny of humanity, an innate human curiosity, national exceptionalism, global unity, and capitalist values. Evocations of such values are evident in the rhetoric of many advocacy campaigns, possibly indicating that value-laden rhetoric is effective for promoting ideas and ventures.