United Nations Office for Outer Space Affairs

UN/Austria Symposium

Greening Space Systems Engineering

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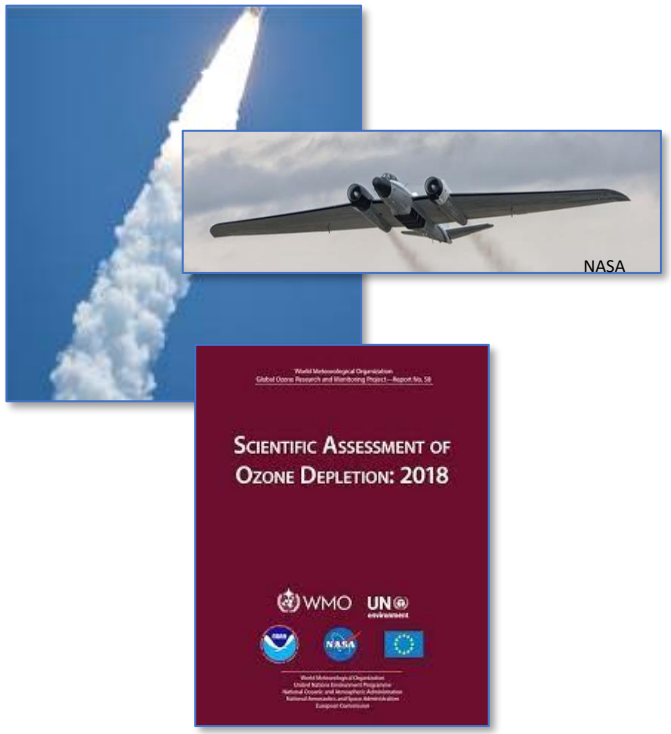
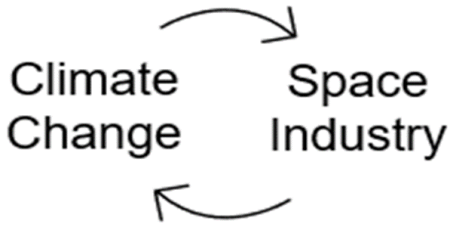
Introduction

- The Aerospace Corporation has pioneered research concerning the global impact of space systems since 1990s
- Aerospace guided research on ozone depletion caused by solid rocket motors with innovative data collection programs
- Coauthor/Contributor to UNEP Ozone Assessments
- Encourages communication between the space system engineering, atmospheric science, and relevant policy communities
- Promotes space industry growth and innovation within the context of the growing Climate Crisis

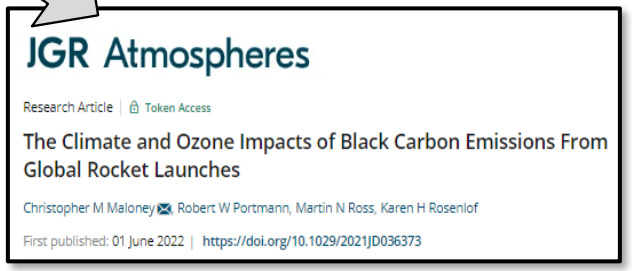




Spaceflight and the Global Atmosphere

- Launch and reentry emissions affect climate and stratospheric ozone

- Spaceflight emissions and their global impacts are complex and not well constrained
- Recent research (NOAA, MIT, ESA) significantly advanced scientific understanding



- An effort to constantly improve spaceflight emissions science benefits the industry and policymakers:

  - anticipate emissions growth and new space technologies
  - better align with faster space system lifetime cycles
  - promote industry/science collaboration
  - reduce uncertainty and the potential for bad regulation

- At some increased level of spaceflight activity (yet to be defined) mitigation for climate or ozone protection may be required (yet to be defined)

Long-term Challenges to Space Industry Sustainability

- The space industry is an indispensable part of the global economy and provides critical information for humanity to manage climate change
- Interest in the dual impacts of spaceflight on climate and ozone is growing in proportion to the pace of space activity and to the intensity of climate change
- Future stratospheric pollution protection (geoengineering?) must allow for space industry emissions
- Life-Cycle Assessment (LCA) norms must be defined
- Sustainable growth and innovation
- Anticipate the end of low-cost fossil hydrocarbons

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