

# Science and the Military in Space



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# Conflict and Cooperation over 50 yr

- DoD support for basic and military-related science (Explorer 1, STP, X-ray sounding rockets)
- Military threats to the use of space for science and threats to the space environment (debris, radiation, light pollution)
- Military concerns impacting development and conduct of scientific space projects (e.g. ITAR, orbital data restrictions)

# Environmental Threats

- Debris from weapons: Soviet IS (Kosmos) ASATs (1968-1982) and US F-15-launched MV (1985) significant contributor to debris population
- Debris from other military systems: USAF West Ford dipoles (1963) - still 100000 pieces in orbit at 3000 km
- Radiation: STARFISH PRIME (1962) at 400 km created new radiation belt, lasted several years, damaged several science satellites; Soviet US-A reactor satellites contaminated low orbit (and Canada) and interfered with gamma-ray astronomy satellites. (Other environment issues: radar, ionosphere mod?)
- RFI: Sidebands from GLONASS navigation satellites interfered with radio astronomy.
- Overpopulation: future large constellations could impact space operations (COLA), astronomy (light pollution)

# Earthbound problems

- ITAR regulations hobble international cooperation on science (and even public outreach efforts). Our Canadian postdoc wasn't allowed to sit in meetings on the Spitzer infrared camera she's the world expert on. Lockheed wasn't allowed to release a detailed digital model of the Cassini probe for use in animations. And then there are the **real** problems - can't work effectively with European or Japanese collaborators on almost any hardware , even when their tech is even better than ours. (cf.Huygens problem)
- New and confused regulations on Space Command orbital data are causing problems for academic space debris studies