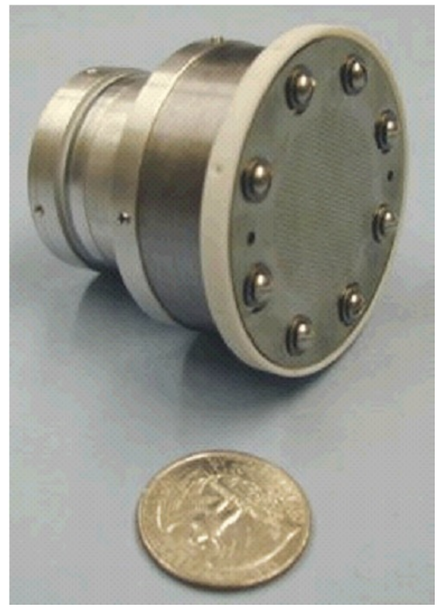
A CubeSat Ion Drive Lunar Orbiter Design

A feasible design for a triple CubeSat self propelled lunar orbiter

- The orbiter would begin its trip from a geosynchronous (communications satellite) launch transfer ellipse
- Xenon at 200-300 atmospheres (0.5-0.75kg) is the propellant
- The entire structure is graphite composite, with a fully loaded mass of 4.0kg
- All piping and valves are stainless steel and the rocket engine is stainless steel
- The ion engine has a thrust of 1.0 mN thrust
- There is sufficient propellent for reaching the moon, getting into lunar orbit, and continuing on to Mars if desired.
- The resulting design was created in the SolidWorks 3-D design software
- The high pressure xenon tank is carbon fiber composite
- Engine is the MiXI engine designed at NASA's Jet Propulsion Lab shown at right
- The electrical power for the ion drive comes from photovoltaic cells on the spacecraft and foldout panels



- The CubeSat with single fold out panels is shown at right
- Graphite composite panels and hollow graphite corner rails save 600g over aluminum
- Navigation is by a Novatel OEM-V1 GPS with COCOM speed and altitude limits removed
- Additional navigation is by star tracker camera built at Norwich University
- The navigation software is GPS Enhanced Onboard Navigation System (GEONS) developed at NASA Goddard Spaceflight Center
- GEONS, currently in C, will be rewritten in SPARK/Ada for increased reliability
- Side panels and foldout panels have photovoltaic cells (14W or 21W per side)
- The flight path is from the geosynchronous transfer ellipse via Lagrange Point, L1, to the Moon
- The flight path will follow the path of the 365kg SMART-1 spacecraft from the European Space Agency shown below
- Communication will be by 2.4 GHz and 440 MHz 5W radios in the ham radio bands
- A single CubeSat to test the navigation system has been selected by NASA for launch on a NASA mission in 2012
- Communication would be with GENSO university ground station network
- Total Δ**v** is 4,000 - 6,000 m/s
- There is a 10cm x 10cm x 10cm space for instruments