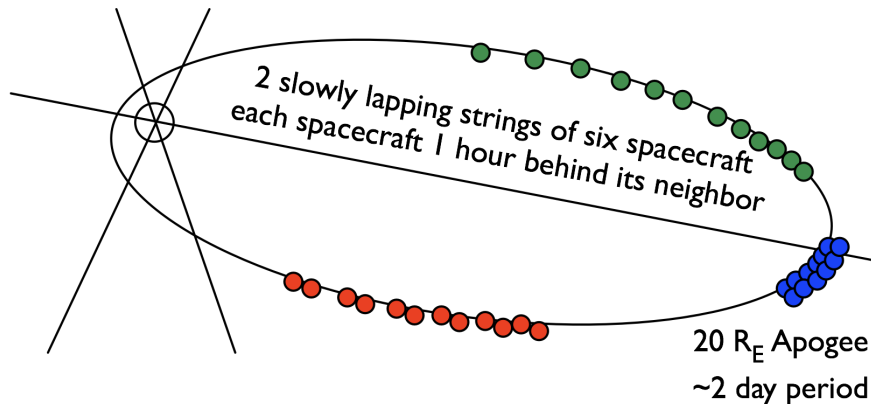


The Profile mission

- Profile achieves multiple science objectives by using different formations throughout the mission.
- “lapping” string-of-pearls formation (two identical strings of six spacecraft each per mothership) allows evolution of Profile over time (e.g. red, blue, and green formations below will naturally result from orbital dynamics)



Mission Implementation Description:

- 12 daughter spacecraft per mothership (for 24 spacecraft, use two motherships with opposing apogees)
- 7000 km x 20-25 R_E , 10-15 degrees inclination
- Spin stabilized, no propulsion
- Vector magnetometer, 3-D plasma analyzer (<30 keV)
- in situ measurements using high-TRL instruments
- bus+payload requires 17 kg, 30 W, 2 kbps orbit-averaged

Measurement Strategy:

- Simultaneous data from all x-y cross-sections during a year as apogees precess.
- Tight “superclusters” near apogee
- Separation of spatial from temporal variations
- Repeated passes in quick succession through important regions
- Simple identical instruments provide the most science return per dollar

Science Objectives:

- Understanding of the effects of disturbances from the Sun, the dynamics of substorms from the tail, and the nature of boundary layer motions on the flanks
- How do these disturbances propagate? What roles are played by large-scale, medium-scale, and small-scale structures?
- What is the global structure (convection, magnetic field, plasma density and temperature) of the plasma sheet and how does it change during substorms?

Associated RFAs:

- F1: Understand reconnection as revealed in... geospace storms
- F2: Understand processes that accelerate and transport particles
- H2: Determine changes in the Earth's magnetosphere... to enable specification, prediction, and mitigation of their effects.
- J1: Characterize the variability, extremes, and boundary conditions of the space environments that will be encountered by human explorers.
- J4: Understand and characterize the space weather effects on and within planetary environments to minimize risk in exploration activities.

Enabling and Enhancing Technology Development:

- Mass-production of 12 (or 24) identical daughter spacecraft, based on ST-5 bus
- Centrifugal slingshot deployment system that can accommodate 12 daughter spacecraft per mothership
- Similar miniaturization as required for MAGCON
- For extended Profile mission (beyond 2 years), up to 6 hour eclipses could be mitigated by improved battery technology – not needed for prime 2 year mission
- Another possibility would be the use of non-volatile memory and no batteries, letting the spacecraft go to sleep during eclipse periods