



U.S. Air Force's Space and Missile Systems Center Development Planning Directorate

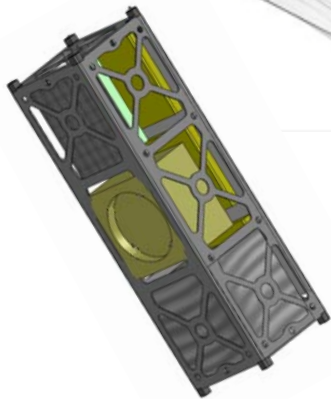
**Capt Peter Mastro
SMC/XR**



SMC/XR Development Planning

7 Procurement Wings that acquire space systems for AF space missions

- MILSATCOM
- GPS
- Space Superiority
- Launch and Range Systems
- Space-Based Infrared Systems
- Defense Meteorological Systems
- Satellite Control and Network



SMC/XR Development Planning Directorate builds plans and conducts demonstrations for the future of mission areas



Space Environmental NanoSat Experiment (SENSE)

- **Two 3U CubeSats**
 - **AF Operated**
 - **Data analysis similar to AF operations**
- **Assess military utility of CubeSats**
 - **Should the AF use them for operations?**
 - **Not a “pure” technology demonstration**
- **Focusing on Space Environmental Monitoring**
 - **Electron Density Profile**
 - **Ionospheric Scintillation**



SENSE

Reference orbit

- 600 km
- 45 deg Inclination
- 2-4+ downlinks/day with single terminal Site

NB: Final orbit dependent on launch host

Sensor Measurements

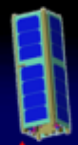
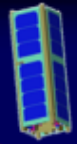
- Line of sight TEC, e^2 , e drift, E-field

Sensors are

- Supportive of NPOESS KPPs and DMSG Interests
- Technically Feasible
- Compatible with Ionospheric Models
- Flexible in terms of altitude and inclination

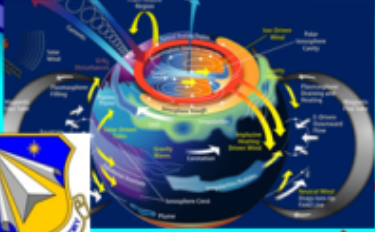
CubeSat 2

CubeSat 1



DATA ANALYSIS AND VALIDATION

GAIM Ionospheric Model



Demo Timeline				
1 Month	1 Month (High Ops)	10 Months (Low Ops)	1 Month (High Ops)	Extension Option
On-Orbit Check out	S-Band, multiple ground terminal sites	S-band, limited ground terminal	S-Band, multiple ground terminal sites	Option for 1 additional year

Remote Terminal

Remote Terminal

SD Control Center



SENSE Space Segment

- **Two 3U CubeSats**
- **AES 256 bit encryption for uplink and downlink**
- **3-axis stabilization**
- **GPS Position, Navigation and Timing**
- **Unified S-band for up and down links**
- **1-year mission life minimum**



What Comes Next

- **Focusing on:**
 - **Communication Missions**
 - **Intelligence, Surveillance, Reconnaissance Missions**
 - **Space Weather Missions**
- **We are always accepting CubeSat concept ideas that have military utility**
- **We are interested in working together on technology development**



Questions