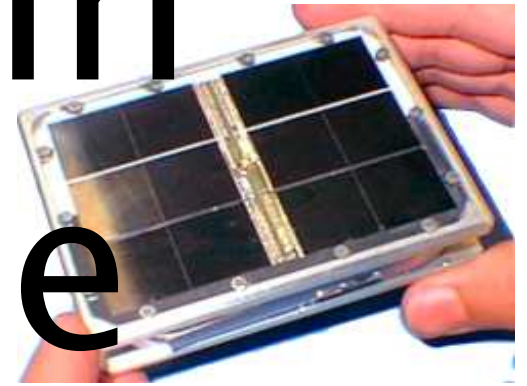
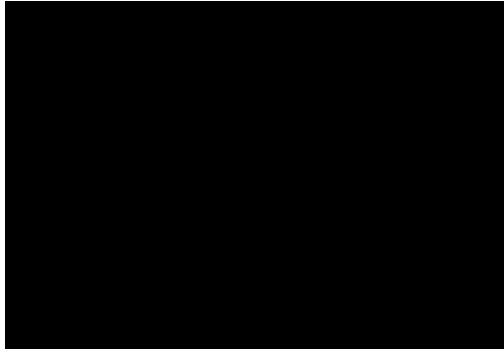


# 100 years in Microspace



Rick Fleeter, K8VK  
founder and CIO  
AeroAstro Inc.  
Ashburn, VA USA

# Possibility



Sputnik: 10/57  
84 kg

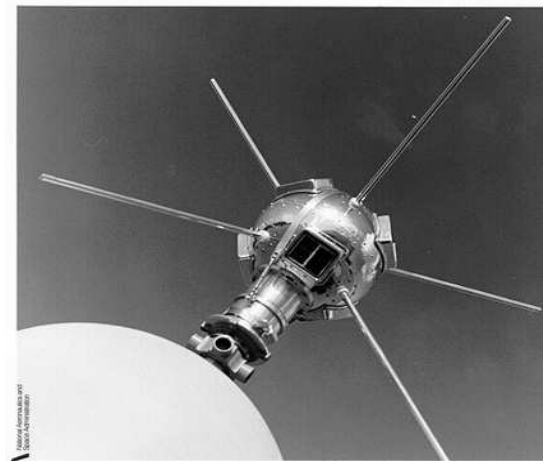
Pickering  
Van Allen  
Von Braun



Explorer I: 1/58 14 kg



OSCAR I: 12/61: 10 kg

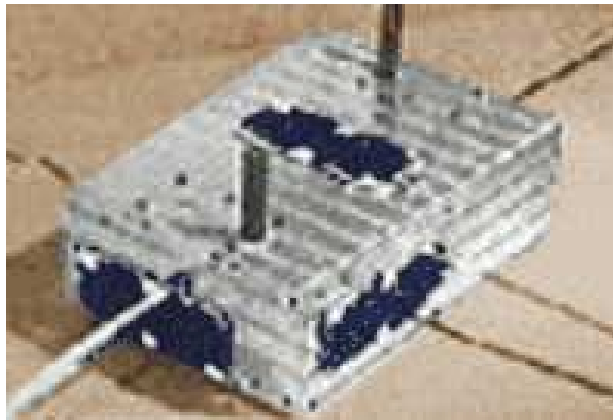


Vanguard: 3/58 1.4 kg

# Capability



Explorer 6: 8/59  
Earth Imaging  
Earth/Space Science  
65 kg



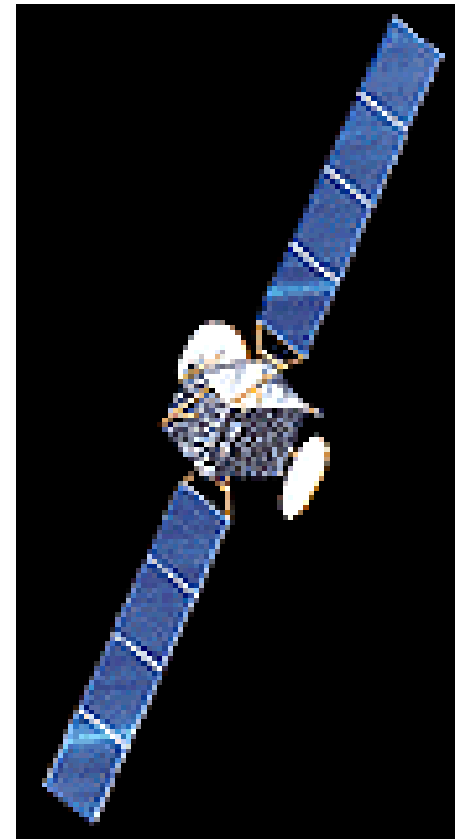
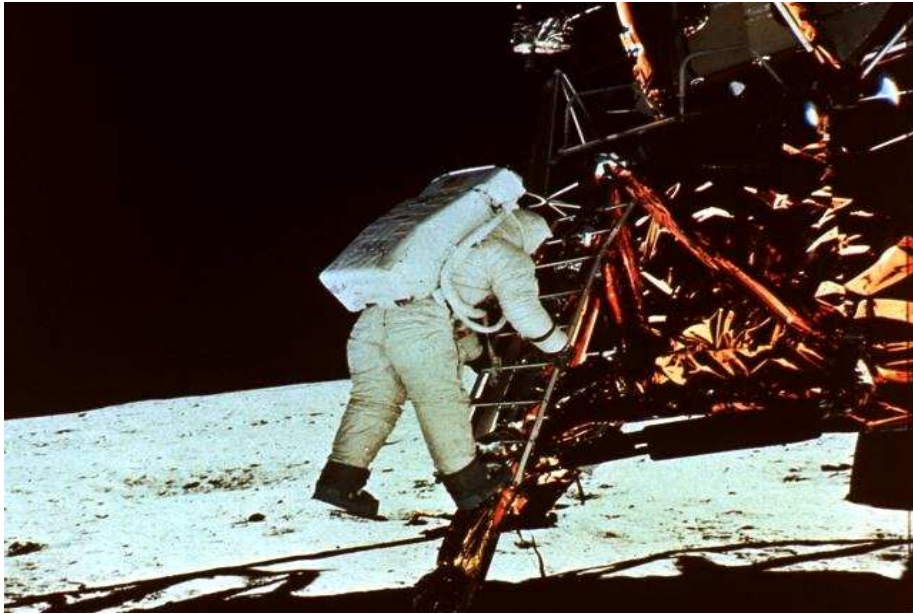
OSCAR III: 3/65  
LEO transponders  
14 kg



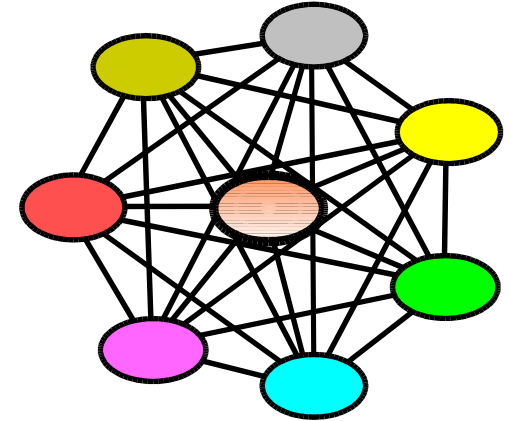
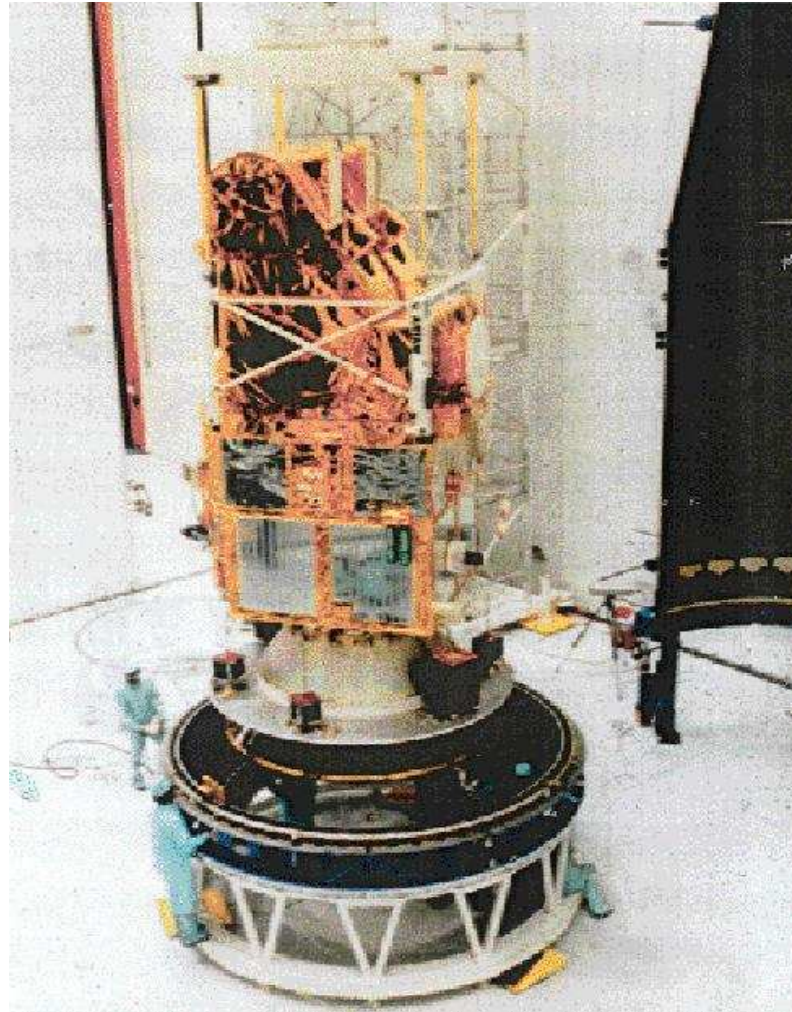
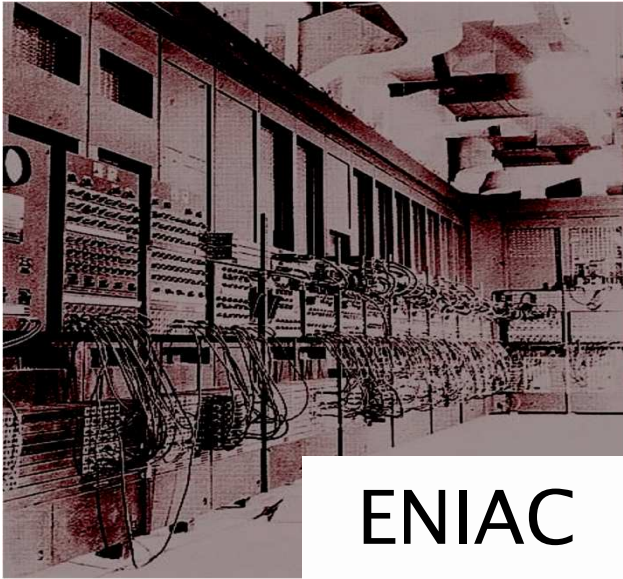
Syncom 3: 8/64  
GEO Comsat  
68 kg w. propellant



# A few distractions



# What's the diff?



## Small-Satellite Database

Program	Sponsor	Spacecraft Contractor	Launch Mass (kg)	Launch Date	Launch Vehicle	Mission
<b>NASA Small Planetary Satellites</b>						
Clementine	BMDO/NASA	NRL	494	Jan 94	Titan II	Lunar mapping
NEAR	NASA	JHU/APL	805	Feb 96	Delta II	Asteroid mapping
MGS	NASA	Lockheed Martin	651	Nov 96	Delta II	Mars mapping
Mars Pathfinder	NASA	JPL	890	Dec 96	Delta II	Mars lander and rover
ACE	NASA	JHU/APL	785	Aug 97	Delta II	Low energy particle
Lunar Prospector	NASA	Lockheed Martin	296	Jan 98	Athena II	Lunar science
DS1	NASA	JPL/Spectrum Astro	486	Oct 98	Delta II	Technology demo
MCO	NASA	JPL/Lockheed Martin	629	Dec 98	Delta II	Mars remote sensing
MPL	NASA	JPL/Lockheed Martin	576	Jan 99	Delta II	Mars science
Stardust	NASA	JPL/Lockheed Martin	385	Feb 99	Delta II	Comet sample return
<b>NASA Earth-Orbiting Small Satellites</b>						
SAMPEX	NASA	NASA GSFC	161	Jul 92	Scout	Science experiments
MICROLAB	NASA/Orbital	Orbital	75	Apr 95	Pegasus	Lightning experiment
METEOR	NASA	CTA (Orbital)	364	Oct 95	Conestoga	Microgravity experiments
TOMS-EP	NASA	TRW	295	Jul 96	Pegasus XL	Ozone mapping
FAST	NASA	NASA GSFC	191	Aug 96	Pegasus XL	Auroral measurements
HETE	NASA	MIT/AeroAstro	128	Nov 96	Pegasus XL	High energy experiments
SAC-B	CONAE/NASA	CONAE	191	Nov 96	Pegasus XL	Science experiments
Seastar	NASA	Orbital	372	Aug 97	Pegasus XL	Ocean color
SNOE	NASA GSFC	LASP	132	Feb 98	Pegasus XL	Space physics
TRACE	NASA	NASA GSFC	250	Apr 98	Pegasus XL	Solar coronal
Clark	NASA	CTA (Orbital)	266	cancelled	Athena I	Science experiments
Lewis	NASA	TRW	385	Jul 98	Athena I	Hyperspectral imaging
SWAS	NASA	NASA GSFC	288	Dec 98	Pegasus XL	Astronomy
WIRE	NASA, JPL	NASA GSFC	255	Mar 99	Pegasus XL	Astronomical telescope
TERRRIERS	NASA, BU	AeroAstro, LLC	288	May 99	Pegasus XL	Space physics
FUSE	NASA, APL	Orbital	1360	Jun 99	Delta II	Space science



QuikSCAT	NASA, NOAA	JPL/Ball Aerospace	870	Jun 99	Titan II	Ocean wind measure
ACRIMSat	NASA, JPL	Orbital	115	Dec 99	Taurus	Sun-Earth atmosphere
IMAGE	NASA GSFC	Lockheed Martin	494	Mar 00	Delta II	Neutral atom/UV measure
<b>Other U.S.-Built Small Satellites</b>						
GLOMR I	DARPA	DSI (Orbital)	71	Nov 85	Shuttle	Message relay
PEGSAT	DARPA	DSI (Orbital)	68	Apr 90	Pegasus	Message relay
POGS/SSR	STP, ONR	DSI (Orbital)	68	Apr 90	Atlas I	Geomagnetic survey
SCE	ONR	DSI (Orbital)	56	Apr 90	Atlas I	Communications
TEX	STP, ONR	DSI (Orbital)	67	Apr 90	Atlas I	Communications
MACSAT	DARPA	DSI (Orbital)	61	May 90	Scout	Communications
REX	STP	DSI (Orbital)	77	Jun 91	Scout	Radiation
LOSAT-X	SDIO	Ball Aerospace	76	Jul 91	Delta II	Sensor experiments
MICROSAT	DARPA	DSI (Orbital)	26	Nov 91	Pegasus	Communications
MSTI-1	BMDO	JPL/Spectrum Astro	144	Nov 92	Scout	Sensor experiments
ALEXIS	DOE	AeroAstro	113	Apr 93	Pegasus	X-ray mapping
RADCAL	STP, NRL	DSI (Orbital)	91	Jun 93	Scout	Radar calibration tests
DARPASAT	DARPA/AF	Ball Aerospace	161	Mar 94	Taurus	Classified
STEP 0	STP	TRW	489	Mar 94	Taurus	Autonomy experiments
MSTI-2	SDIO	Spectrum Astro	170	May 94	Scout	Sensor experiments
STEP 2	STP	TRW	180	May 94	Pegasus	Signal detect/modulation
STEP 1	STP	TRW	352	Jun 94	Pegasus XL	Atmospheric physics
APEX	STP	Orbital	209	Aug 94	Pegasus	Power experiments
STEP 3	STP	TRW	295	Jul 95	Pegasus XL	Science/communications
REX II	STP	DSI (Orbital)	110	Mar 96	Pegasus XL	Radiation
MSTI-3	SDIO	Spectrum Astro	212	May 96	Pegasus	Hyperspectral imaging
FORTE	DOE	LANL/SNL	210	Aug 97	Pegasus XL	Science
STEP 4	STP	TRW	386	Oct 97	Pegasus XL	Science/communications
GFO	U.S. Navy	Ball Aerospace	357	Feb 98	Taurus	Radar altimetry
MIGHTYSAT	STP	CTA (Orbital)	69	Jul 98	STS/GAS	Science
STEX	NRO	Lockheed Martin	691	Sep 98	Taurus	Tether experiment
TSX-5	BMDO/STP	Orbital	249	Jun 00	Pegasus XL	Remote sensing

[Close this window](#)



56 on List  
exclude:  
non-US  
(UoSat, KitSat)  
commercial  
(Globalstar)  
AmSat  
(OSCAR)  
Students  
(CubeSats)  
Classified  
CRO



# Amateur Satellites

2008-2057



(not)

**Hint**



# Enhancing Nature



**Synthetic  
Ionosphere  
re**

**brought to you by...**

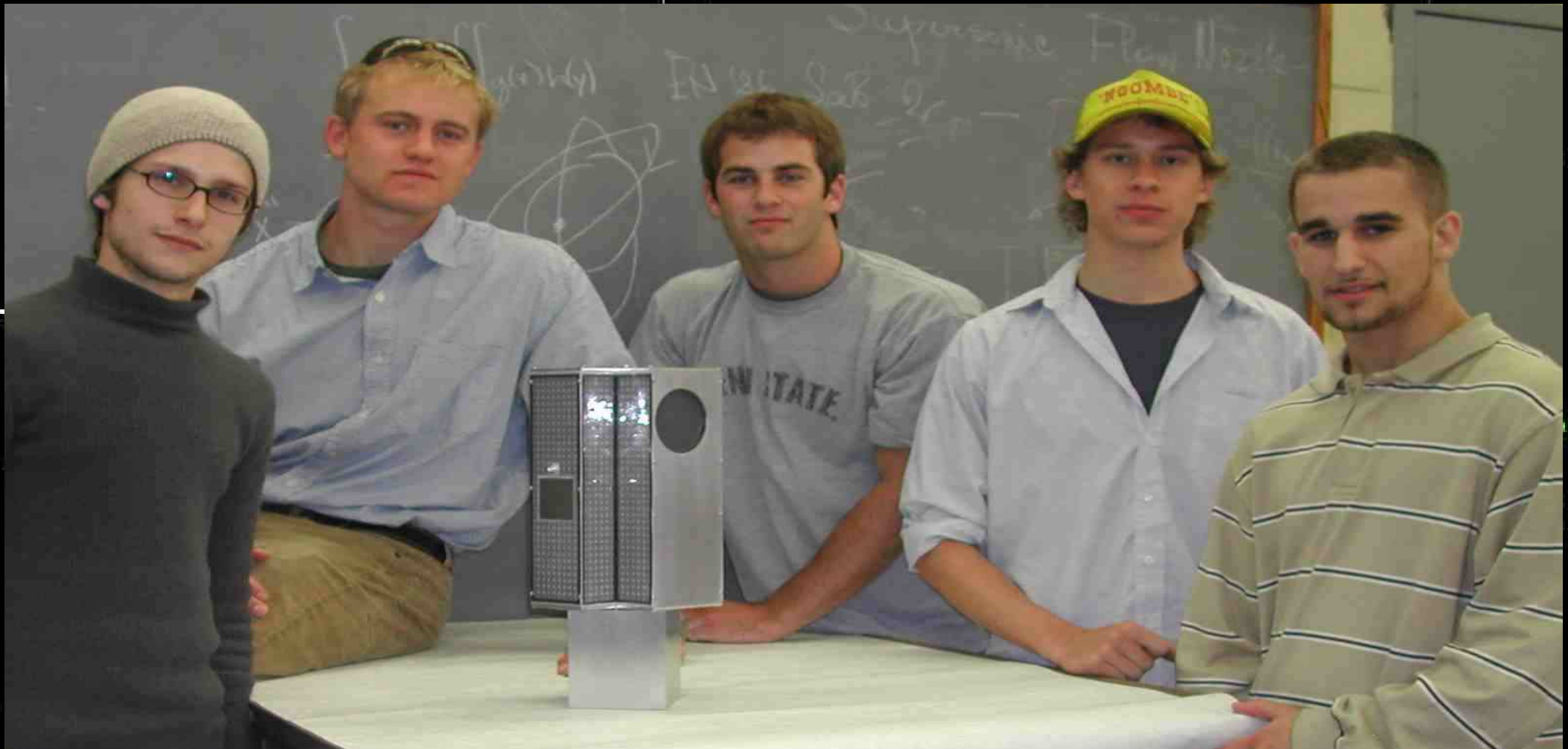


**Cubesat Kits**

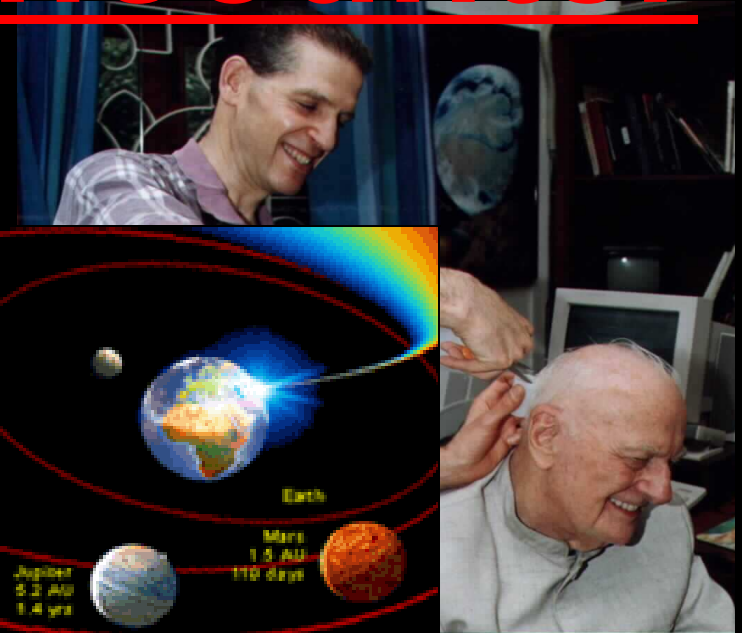
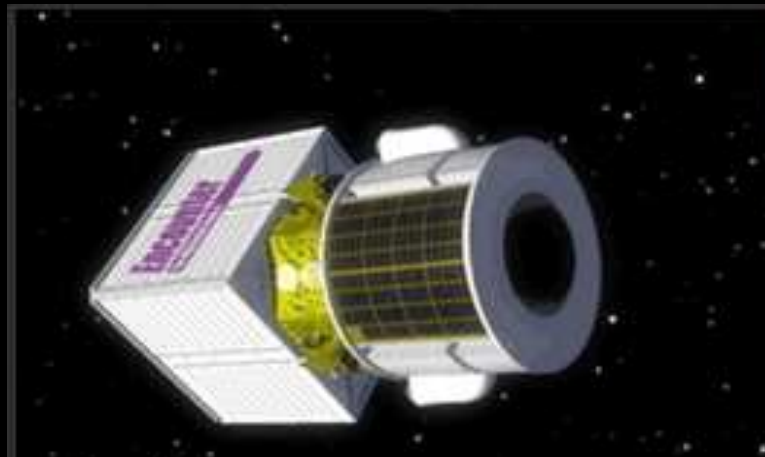
**Low Cost  
Launch  
Vehicles**

# Beyond QSOs.

Student Telescope for Astronomical Research



# Entertainment: Encounter



ARCHIVAL DOCUMENT

ENCOUNTER 2001

A 000 000 730

NAME: CLARKE ARTHUR CHARLES  
LAST FIRST MIDDLE INITIAL

ADDRESS: 25, BARNES PLACE  
CITY STATE ZIP CODE

CITY: COLOMBO 7  
SRILANKA EARTH

COUNTRY: SRILANKA  
DATE OF BIRTH GENDER

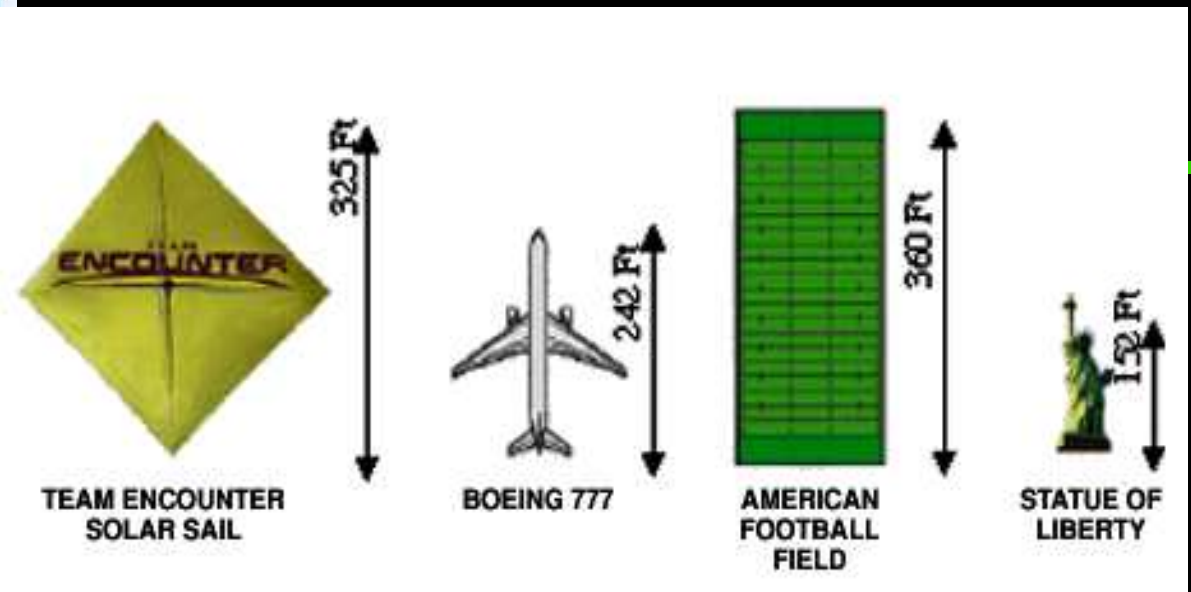
DATE OF BIRTH: 16 DEC. 1917  
 GENDER:  F  M

Please print or type in capitals all information below and affix photo (color or black & white). In main body of document (the large blank section) please write thoughts, poetry, lyrics, an essay, written music, or drawing (it's up to you) using only black ink or pencil.

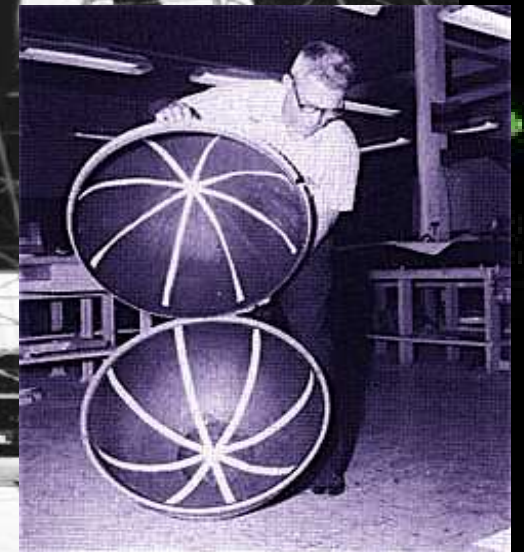
Submission Type:  POETRY,  WRITTEN,  MUSICAL SCORE,  GRAPHICS/ART,  OTHER,  INCLUDE HAIR SAMPLE?

FARE WELL,  
 MY CLONE!

Sir Arthur Clarke  
 3 Mar 1999



Big is the new Small



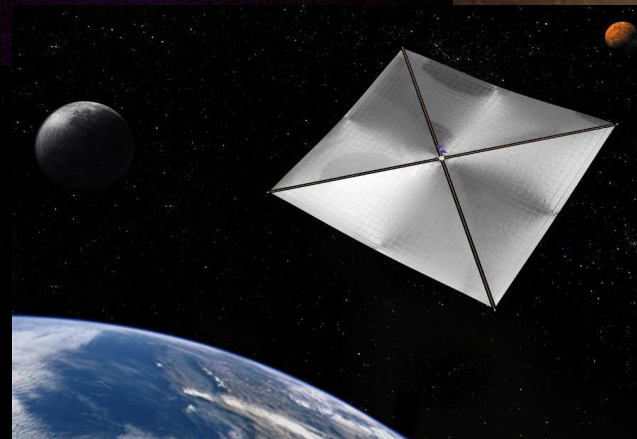
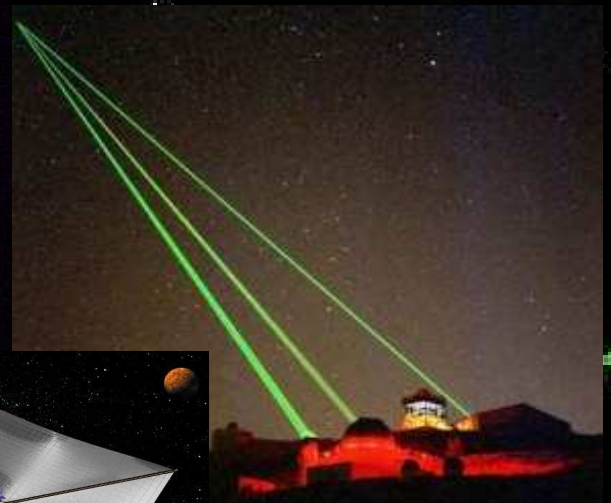
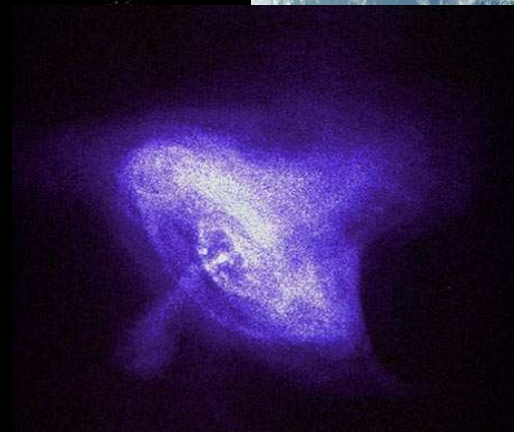
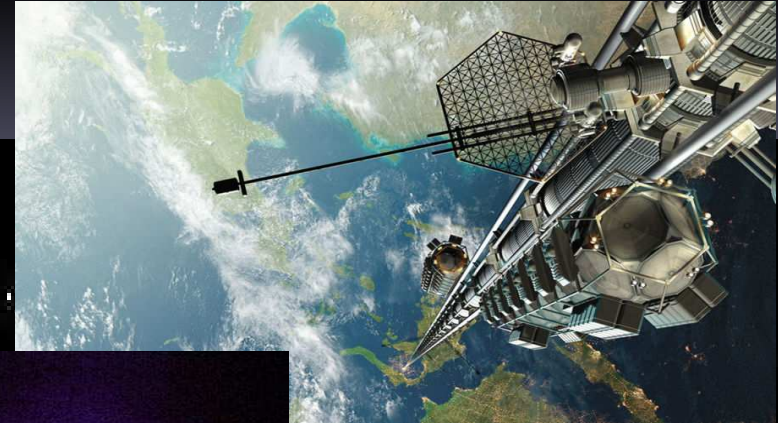
# When Size Matters

- \*Power Generation/Propulsion
- \*VLF Propagation
- \*Teather:
- \*Particle Population
- \*Prototype Space Elevator

- \*Antenna:
  - \*Radio astronomy
  - \*Killer VHF / UHF DF
  - \*Intersatellite relay

- \*Sphere (Echo redux)
  - \*Pseudo EME
  - \*Optical tracking
  - \*Optical comms links

- \*Solar Sail:
  - \*Orbital Flashlight
  - \*First AmSat to leave LEO

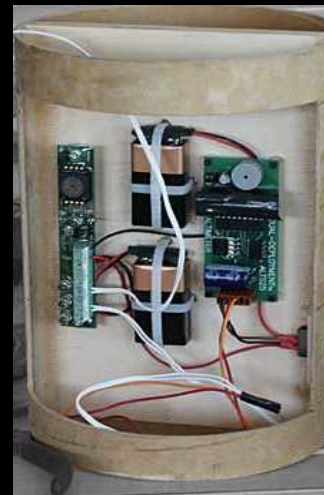


# When Size Doesn't Matter

- \*Space Weather:
  - \*Fluxes & Fields
  - \*Sun imaging: UV
  - \*Broadband Beacons

- \*QRP:
  - \*Radio astronomy
  - \*Robotics
  - \*Slow Scan of Self

- \*Cansats





**My  $\mu$ space killer app...**

**Putting space in the hands of the maximum number, and diversity, of users, to do whatever they want to do.**