SOUNDING ROCKET WORKING GROUP

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Sounding Rocket Project Office
GSFC WFF
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Program Summary Charts

FY 02 Mission Summary

- 36 missions planned for FY 02 (+ 4 met rockets)
- 27 Missions Launched *(100% success)*
  - Disciplines
    - 1 Solar System Exploration
    - 18 Geospace Science
    - 3 Solar and Heliospheric Science
    - 2 Outreach
    - 2 Special Projects
    - 1 UV/Optical Astrophysics
  - Sites
    - 4 WFF
    - 11 PFRR
    - 8 WSMR
    - 2 Hawaii
    - 2 Norway
- Also supported 3 Viper-Dart developmental launches

FY ’03 Launch Schedule

{ Combined flights supporting a single scientific study

#	Vehicle Type	FY 2003 Mission	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
		WALLOPS ISLAND												
1	Terrier Orion	VALPE/AIRFORCE RESEARCH LAB		▲										
2	Terrier Malemute	HOWLETT/UTAH STATE UNIV.					△							
3	Black Brant XI	HERCULES/LINCOLN LAB							△					
4	Black Brant XI	HERCULES/LINCOLN LAB							△					
5	Orion	LAUFER/UNIVERSITY OF VIRGINIA							△					
6	Nike Black Brant VB	EARLE/UNIVERSITY OF TEXAS							△					
7	Terrier Orion	EARLE/UNIVERSITY OF TEXAS							△					
8	Terrier Orion	EARLE/UNIVERSITY OF TEXAS							△					
9	Terrier Orion	EARLE/UNIVERSITY OF TEXAS							△					
10	Terrier Orion	VALPE/AIRFORCE RESEARCH LAB								△				
11	Terrier Orion	KANE/PENN STATE UNIVERSITY								△				
		SWEDEN												
12	Terrier Orion	GOLDBERG/GSFC				△								
13	Terrier Orion	GOLDBERG/GSFC				△								
		PFRR												
14	Black Brant IX	LABELLE/DARTMOUTH				△								
15	Black Brant IX	LARSEN/CLEMSON UNIVERSITY					△							
16	Black Brant VB	LARSEN/CLEMSON UNIVERSITY					△							
17	Terrier Orion	LARSEN/CLEMSON UNIVERSITY					△							
18	Terrier Orion	LARSEN/CLEMSON UNIVERSITY					△							
19	Black Brant X	CONDE/UNIV. OF ALASKA					△							
20	Terrier Orion	CONDE/UNIV. OF ALASKA					△							

11 Missions

2 Missions

7 Missions

FY ’03 Launch Schedule (Continued)

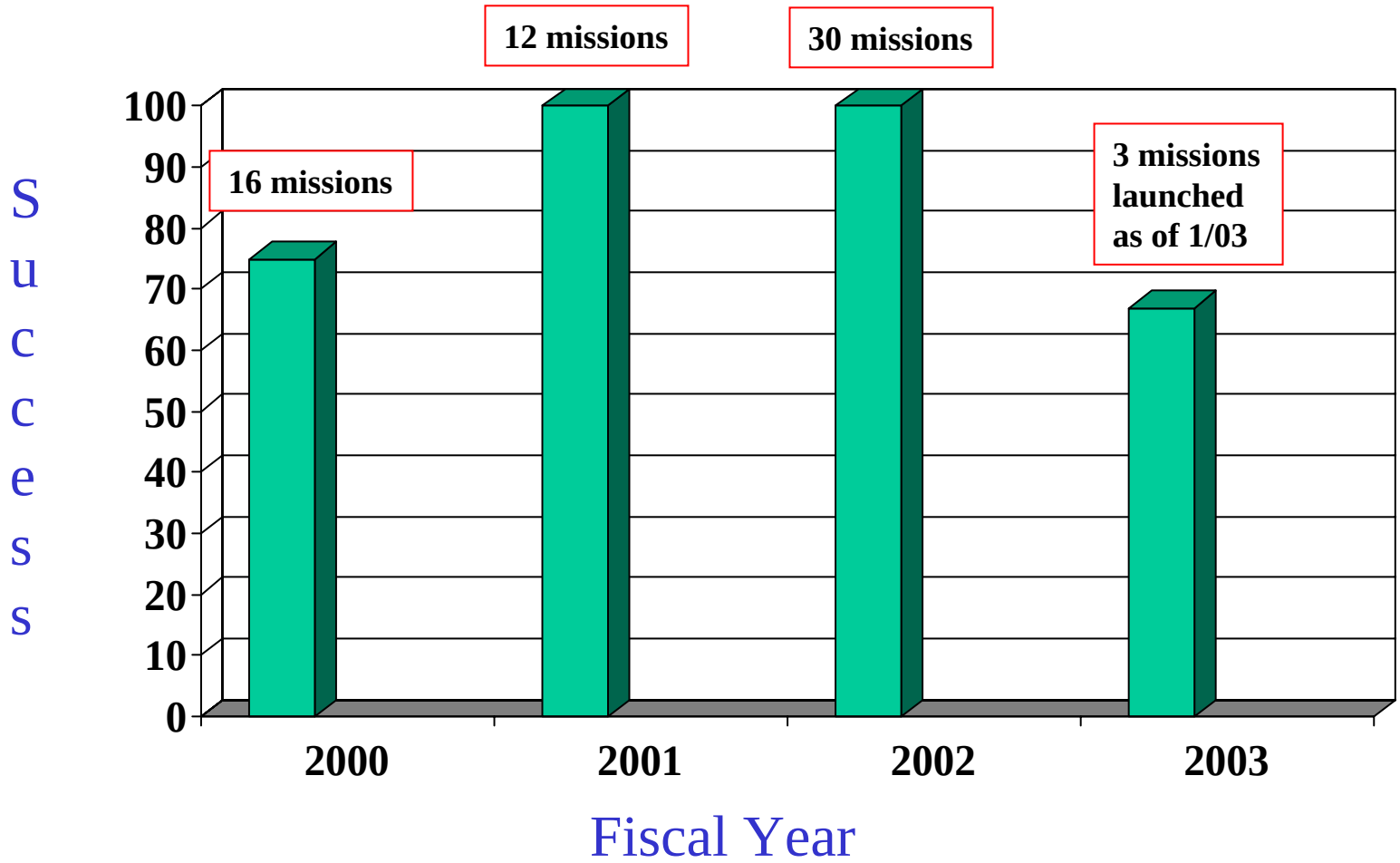
{ Combined flights supporting a single scientific study

#	Vehicle Type	FY 2003 Mission	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
		WSMR												
21	Black Brant IX	WILKINSON/UNIV. OF COLORADO		▲										
22	Black Brant IX	CLARKE/UNIV. OF MICHIGAN				△								
23	Black Brant IX	MARTIN/CAL TECH.					△							
24	Black Brant IX	STERN/SWRI							△					
25	Black Brant IX	CHAKRABARTI/BOSTON UNIV.							△					
26	Black Brant IX	MOSES/NRL							△					
27	Terrier Orion	ERDMAN/EMBRY-RIDDLE UNIV.								△				
28	Terrier Orion	ERDMAN/EMBRY-RIDDLE UNIV.								△				
29	Black Brant IX	DAVILA/GSFC									△			
30	Black Brant IX	WOODS/UNIVERSITY OF COLORADO									△			
31	Black Brant IX	NORDSIECK/U. OF WISCONSIN												△
		SVALBARD (NORWAY)												
32	Black Brant X	PFAFF/GSFC			▲									

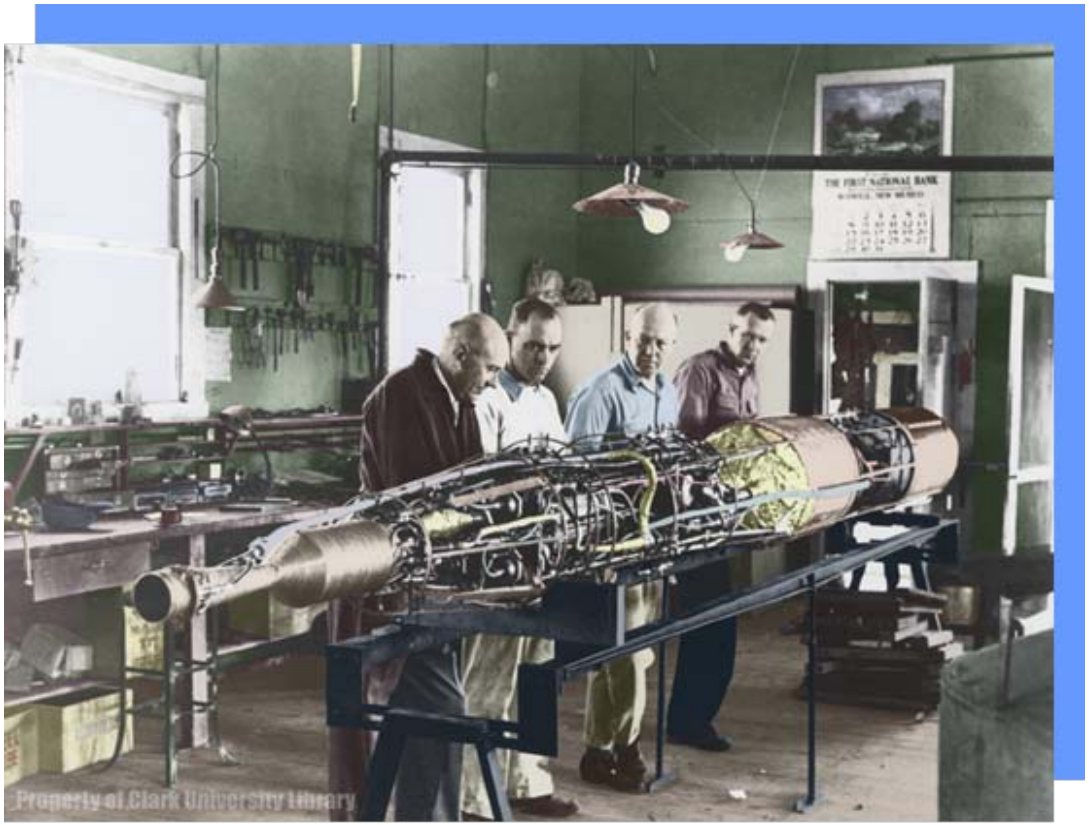
11 Missions

1 Mission

Sounding Rocket Success Rate Trend



Items of Interest



Svalbard Launch Ops

- First BBX from Svalbard (79 deg N. Lat)
- NASA mobile TM located at Svalbard & Andoya
- GPS wind weighting
- Rocket successfully launched on Dec 14, two days before the end of the window…
- TM GSE equipment being sent to PFRR directly from Norway

Poker Campaign Status

- Jack Vieira is Project Manager
- Post earthquake launcher inspection underway
- Labelle team is in the field
- First time the sounding rocket program will use FTS at Poker
- Extensive safety analysis effort is in progress to support Conde mission (pointed 3rd stage)
- Mobile Range Control Van and 2nd radar sent to the field to support Conde mission

Peru Campaign Status

- 14 missions have been approved
- John Hickman is Project Manager
- Draft MOU has been generated and reviewed by WFF
- Small support contract being established to acquire support for the upfront planning
- Range development work will be done under the MOU and associated JIP
- NSROC tasks are being put in place to get design effort started
- Airborne surveillance likely to be required (possibly a new requirement since last campaign)

Educational Outreach

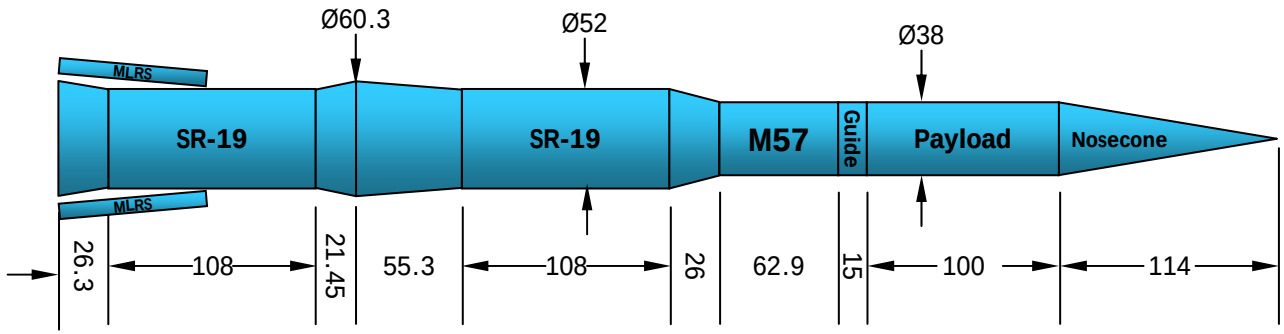
- Piggy-back experiments on WSMR flights
- Student rocket design projects (WFF range)
- Current manifest includes UVa, Penn State/Clemson, and VaTech
- Currently flying 1 Sub-SEM (high school) mission annually
- Establish additional university undergraduate flight opportunities
- International cooperative projects (?)
- Coordinator to be identified

Reimbursable Missions

- Reimbursable missions will provide a larger customer base for the program and will help expand capabilities and maintain/expand expertise
- Missions include simple target missions as well as complex experiments
- Manifested Reimbursable Missions
  - Air Force Research Lab (2 ea)
  - Lincoln Labs (2 ea)
  - Utah State University
- Productive discussions are taking place with the Entry, Descent and Landing (EDL) community
  - Ames, JPL, MSFC, LaRC
  - Working with both JPL and LaRC on possible ST-9 proposals

Pushing the Envelope

- Tailored Trajectories
  - Divergence from typical ballistic trajectories
  - Applications for Geospace science missions and atmospheric entry experiments
- Larger Diameter payloads
  - 30” on Oriole vehicle
  - 22” on BBX
- Higher altitude and longer observation time
- More efficient ACS maneuvering
- New vehicle stacks to meet new customer requirements



One of the several high altitude rocket concepts

Technology Manager

Chris Shreves

1. Mechanical Engineer under AETD – Code 546
2. Experienced in payload design and sounding rocket recovery systems

Duties

1. Develop and maintain the technology road map
2. Manage the overall technology efforts
   a) Coordinate NSROC activities
   b) Manage Civil Service activities
3. Coordinate the manifests for the technology rockets
4. Seek funding for technology efforts
5. Work to increase SR user community
6. Attend technology conferences
7. Etc.

Technology Efforts

- ACS (Mag, Inertial)
- StarTracker 5000
- GPS Event Module
- High Altitude (3000 km) Rocket (feasibility stage)
- MLRS-Dart Vehicle (feasibility stage)
- Terrier-Patriot (feasibility stage)
- Talos-Oriole (feasibility stage)
- Autonomous Flight Termination (WFF Range initiative)
- Technology Rockets
  - Flights in May & Sept ’04
  - Validate ACS Performance before Peru
  - Other technologies and experiments

June 2002 SRWG Findings

I. Augmentation of Existing Technology

A. Coarse Attitude Determination and Control

1. Post Flight Attitude Determination
   - Being worked
   - Looking at 4 level of data product
2. Replacement of Space Vector Systems
   - Good progress is being made on the Magnetic and Inertial systems
   - 1st test flight of the magnetic ACS is tentatively scheduled for May ’03 from WFF.
   - 2nd test flight of the magnetic ACS, 1st test flight of Inertial ACS and test flight of ST5000 tentatively scheduled for Aug. ’03 from WSMR (single vehicle)
3. Miniature Daytime Attitude Sensor - NSROC(a)
   - Performance data is being assessed (on-going)

Augmentation of Existing Technology (cont)

B. Fine Pointing ACS and Star Tracker 5000

- Number of test flights on schedule (Balloon/July, Nordsieck/Sep & possibly Feldman/Aug)

C. DS-19 and S19-D Guidance System

- The S19-D (digital system w/ S-19 algorithm) was cleared for flight at WSMR and one flight has used the system
- WFF is working on an airborne, GPS-based, autonomous flight termination system that may enable the use of DS-19 in the future. Concept development is in the very early stages of development

II. New Technologies

A. GPS Event Module (GEM)

- NSROC has been tasked to develop the GEM system
- Prototype scheduled for delivery by Sept. 2003

B. Patriot Rocket

- A feasibility study has been completed, but the Patriot motors are currently not available.
- We are investigating possibility of getting two units for engineering development

C. Advanced Engineering Computer Design

- New tools will be integrated into the program (solid modeling, boom modeling, attitude visualization, etc)

III. Future Technologies

A. Technology Roadmap

- A technology roadmap is being developed to ensure a proactive technology effort
- Roadmap will assist in setting appropriate priorities for the near-term and long-term
- Roadmap will be a dynamic document

B. Big Gun

- Instrumented artillery systems (DoD project) fired at WFF have had instrumentation problems associated with high acceleration loads
- Detailed feasibility has not been assessed