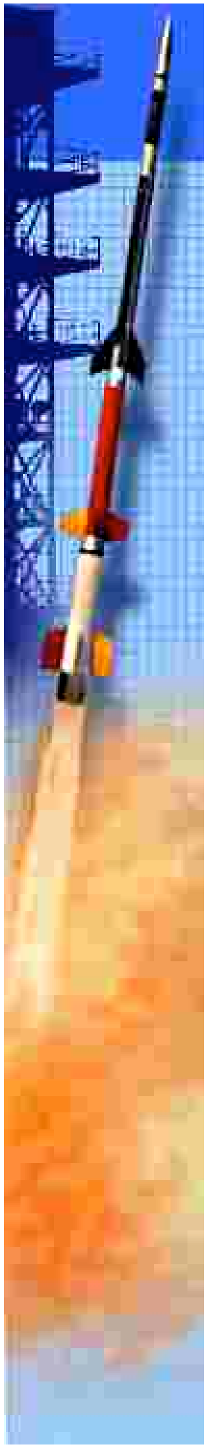
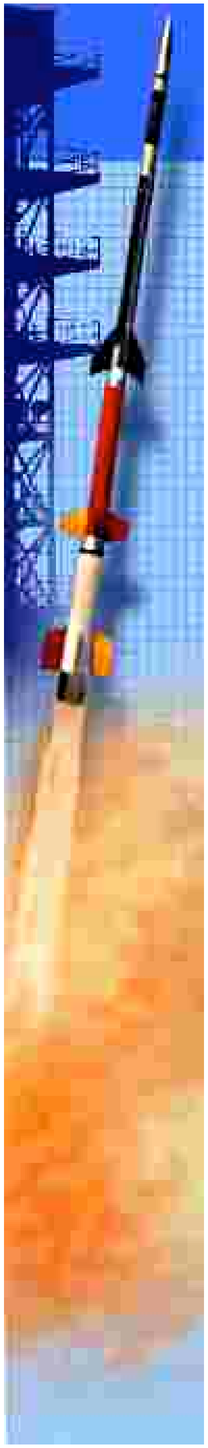


Sounding Rocket Working Group

SRPO Summary

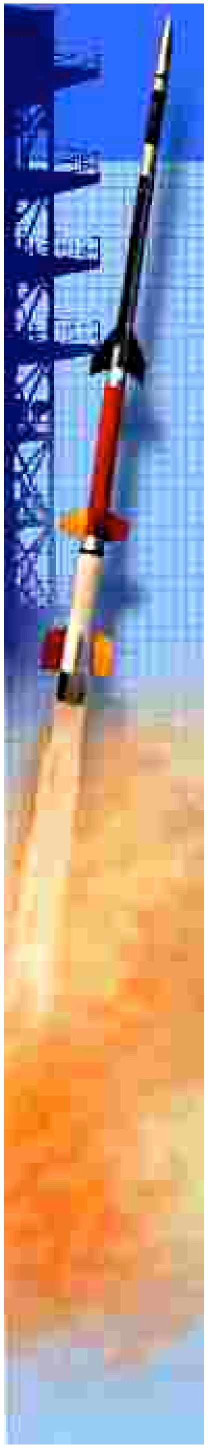
June 21, 2007

Philip Eberspeaker



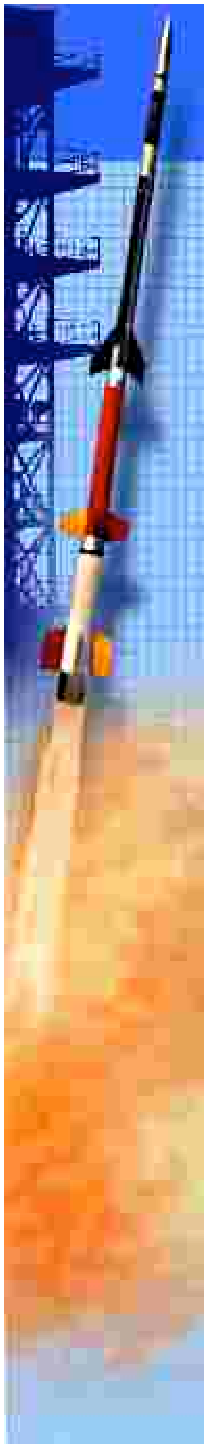
Presentation Outline

- Mission Results Summary (since last meeting)
- FY07-FY08 Manifest
- Anomaly Investigation Status
- Norway Mission Status
- Education/Training Missions
- Budget
- Technology Update
- Rocket Motor Status
- Findings from January SRWG Meeting



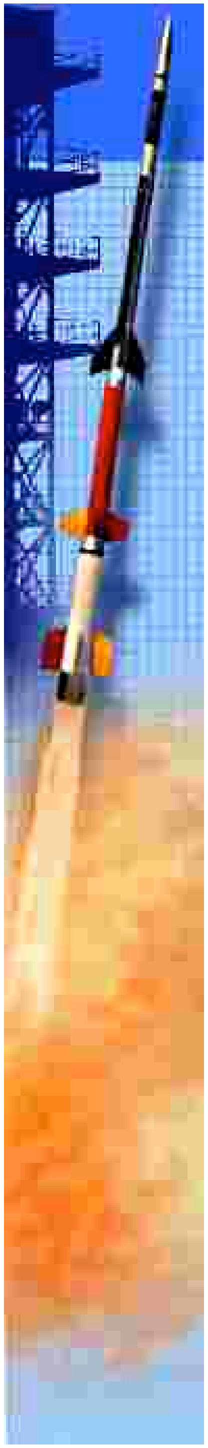
Mission Results Since Last SRWG

- 10 Science
  - Larsen
    - 4 closely sequenced vehicles (BBV, BBIX, Terrier-Orion (2ea))
    - Successful
  - Lessard
    - Complex payload w/ rocket assisted sub-payloads
    - Successful
  - Craven
    - BBX tailored horizontal trajectory w/ 3 Terrier-Orion vertical trajectories
    - Successful
  - Labelle
    - Single BBXII
    - ACS Failure – Pyro shock
- 0 Educational
- 0 Technology
- 3 Reimbursable



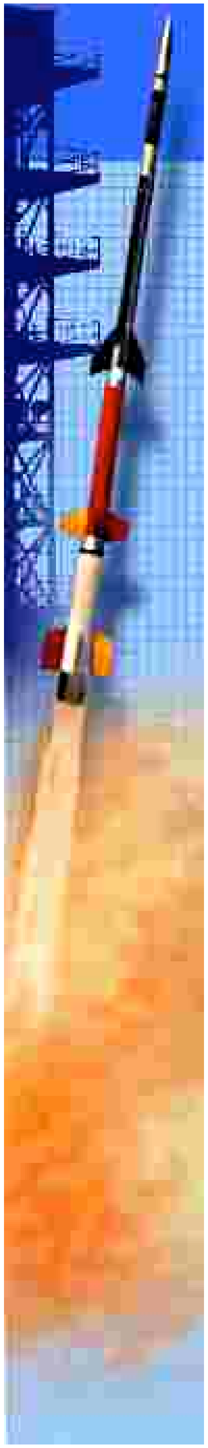
FY07 Manifest

			FY 2007	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
#	Vehicle Type		Mission												
			WALLOPS ISLAND												
1	Black Brant IX	36.173 UG	EARLE/UNIV. OF TEXAS-DALLAS												△
2	MLRS Dart	12.065 GT	SMITH/NASA											△	
3	MLRS Dart	12.066 GT	SMITH/NASA											△	
4	Terrier Orion	41.055	Player/LaRC											△	
			WSMR												
5	Black Brant IX	36.236 US	JUDGE/USC		▲	Success									
6	Black Brant IX	36.233 UE	WOODS/UNIVERSITY OF COLORADO	▲	Failure										
7	Black Brant IX	36.224 UH	CASH/UNIVERSITY OF COLORADO		▲	Success									
8	Test Flight	12.059 GT	COSTELLO/NASA-NSROC									△			
9	Black Brant IX	36.220 UG	MCCANDLISS/JHU										△		
10	Black Brant IX	36.225 UG	CHAKRABARTI/BOSTON UNIVERSITY												△
11	Terrier Brant IX	36.221 DS	MOSES/NRL												△
			NORWAY												
12	Terrier Orion	41.069 UE	ROBERTSON/UNIV. OF COLORADO											△	
13	Terrier Orion	41.070 UE	ROBERTSON/UNIV. OF COLORADO											△	
			PFRR												
14	Black Brant VB	21.138 UE	LARSEN/CLEMSON UNIVERSITY				▲	} Success							
15	Black Brant IX	36.234 UE	LARSEN/CLEMSON UNIVERSITY				▲								
16	Terrier Orion	41.064 UE	LARSEN/CLEMSON UNIVERSITY				▲								
17	Terrier Orion	41.065 UE	LARSEN/CLEMSON UNIVERSITY				▲								
18	Black Brant XII	40.020 UE	LESSARD/UNIV. OF NEW HAMPSHIRE					▲	Success						
19	Terrier Orion	41.061 UE	CRAVEN/UNIVERSITY OF ALASKA					▲	} Success						
20	Terrier Orion	41.062 UE	CRAVEN/UNIVERSITY OF ALASKA					▲							
21	Terrier Orion	41.063 UE	CRAVEN/UNIVERSITY OF ALASKA					▲							
22	Black Brant XII	35.037 UE	CRAVEN/UNIVERSITY OF ALASKA					▲							
23	Black Brant XII	40.019 UE	LABELLE/DARTMOUTH COLLEGE					▲	Payload Support System Failure						



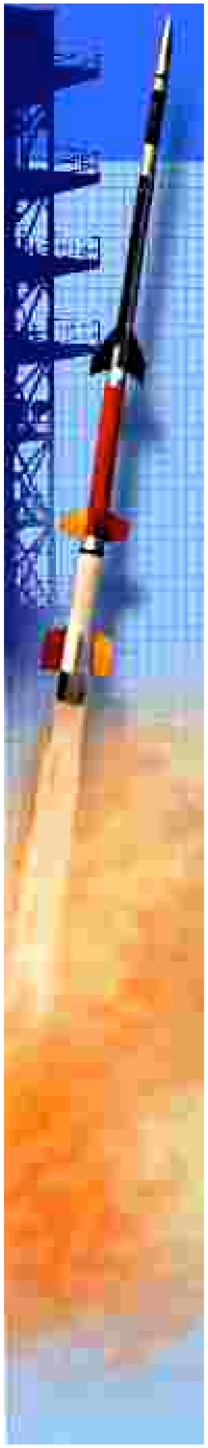
Manifest

- FY08
  - 12 assigned missions (Blue Book)
  - 4 additional candidate missions
    - 2 needing MIC’s
    - 2 place holders
- FY09
  - 6 assigned missions (Blue Book)
  - 6 additional candidate missions
    - 3 needing MIC’s
    - 3 place holders
    - More likely to emerge



Poker Campaign

- 90% flight success (metric that is tracked)
- 75% on mission success
- Lots of NASA oversight during the operations
  - Not intended to be the norm
- SRPO would like feedback on field operations

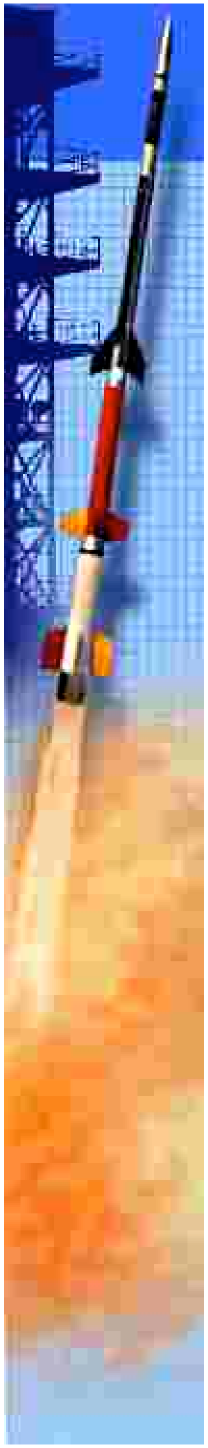


Active Mishap Investigation Boards (MIB)

Failure	AIB lead	Status
ACS Failure – 40.019 (Poker 2007)	NASA (Greg Smith)	Final report submitted

Anomaly Assessments

Issue	Assessment lead	Status
BBXII Dispersion	AETD (Phil Ward)	Dynamic analysis completed. Effects being incorporated into Black Brant models

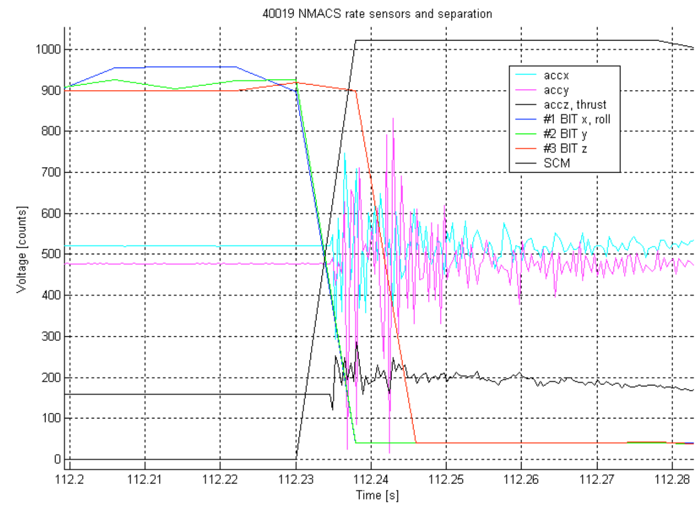


40.020 LaBelle ACS AIB

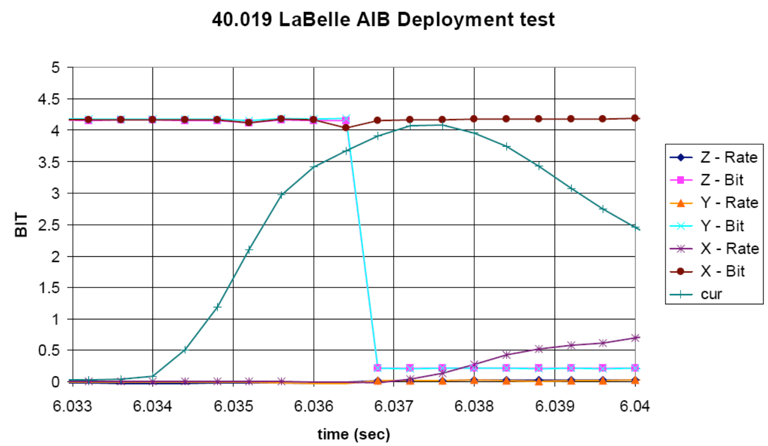
- **Mission Failure on the last mission of the Poker 2007 campaign**

- **Proximal Cause:**
  - **The NMACS BEI QRS-11 Rate sensor failed during the payload separation event. Post mortem assessment showed fracture of all of the 4 quartz sensor arms.**

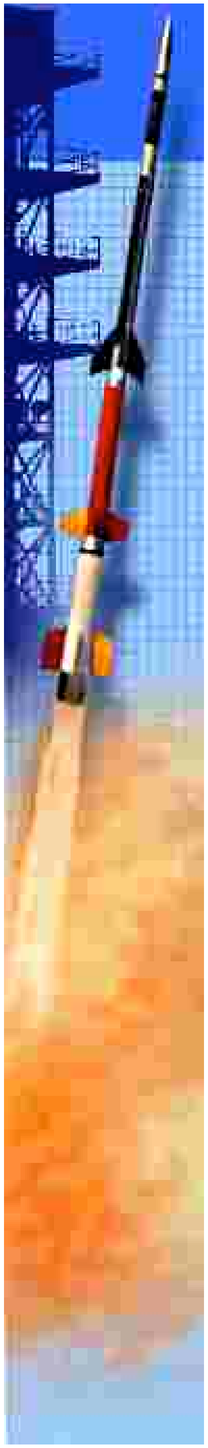
- **Root Cause:**
  - **Insufficient knowledge of or appreciation for the severity of the shock levels in the vicinity of the pyrotechnic cutter guns or the rate sensors sensitivity to mechanical shock.**
  - **Sound system engineering practices not employed.**
  - **Insufficient post-flight analysis of previous successful missions utilizing the QRS-11 Rate Sensor Triad.**



40.019 inflight separation event caused failure of all 3 axes of rate sensor

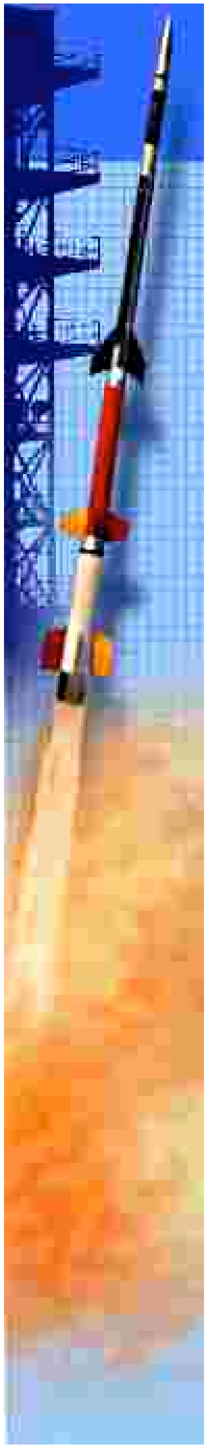


WFF AIB Deployment Test caused failure of 2 axes of rate sensor



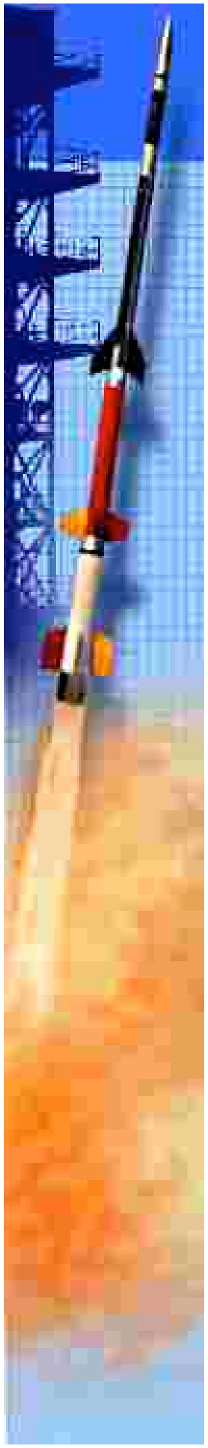
40.020 LaBelle ACS AIB

- AIB Recommendations
  - Institute a study to determine quantitative shock levels for various pyro subsystems
    - Develop shock maps around each subsystem
  - Employ Shock mounting if critical components must be placed in high shock areas
  - Incorporate ACS in-flight health self-test
    - Software could ignore sensor data that is tagged as questionable
  - Improve systems engineering and risk management



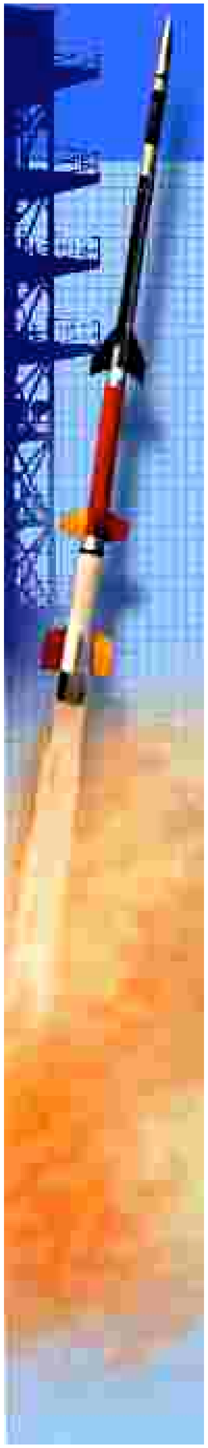
Black Brant XII Dispersion

- LaBelle
  - Impact Dispersion was slightly larger than 3-sigma
  - Dynamic behavior was “well behaved”
  - Aerodynamic phenomena associated with Brant tailoff
  - Detailed review of data shows that other BBXII have exhibited this behavior in the past, but issue did not arise since dispersions were less than 3-sigma
  - Effects can not be “designed out”, but rather must be accounted for in the dispersion analysis
  - New analytical technique developed, but doesn’t effect dispersions
- Lessard
  - Impact Dispersion was slightly larger than 3-sigma
  - Dynamic behavior was “not well behaved”
  - While this flight is subject to the newly identified phenomena, the observed behavior indicates a potential joint issue as well
  - This payload had four separate payload bodies and 7 manacle ring joints



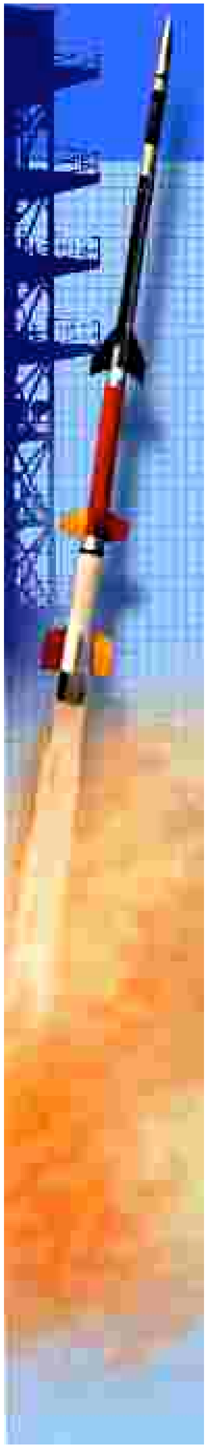
Background

- Impact misses in excess of 3_ on 40.019 & 40.020 provoked an inquiry into the cause
- Both missions had large coning angles at the time of Nihka ignition
- Analysis shows the cause of the large cone experienced by 40.020 was due to a shift in the principal axes after BB separation (hypothesized to be due to creep in the many v-band joints while left unsupported on the launcher for 2 wks.)
- Analysis shows that an attitude excursion during the tail-off of the BB was the initiating cause of the coning experienced on 40.019
- Further analysis shows this attitude excursion to be typical of BBXII & BBXI vehicles

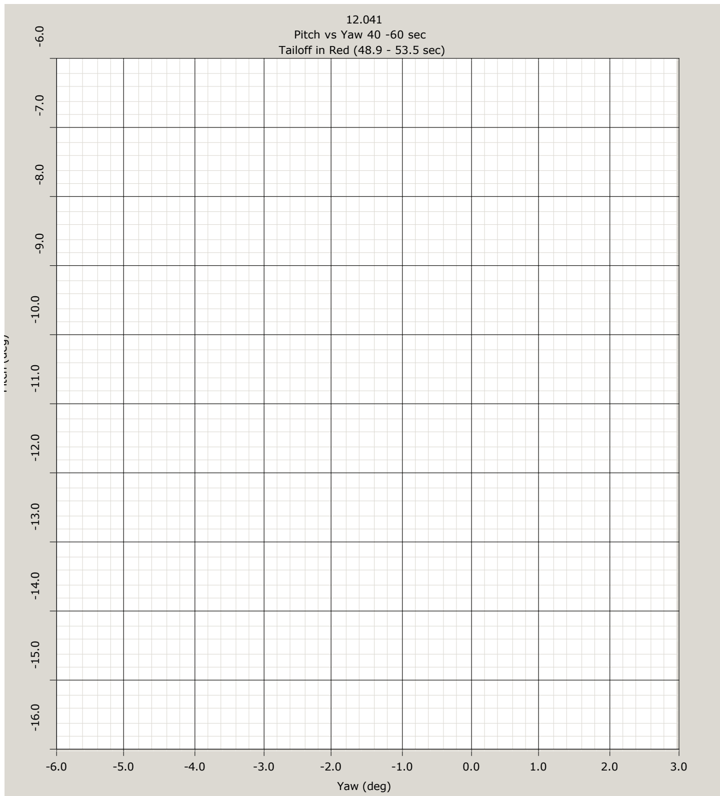


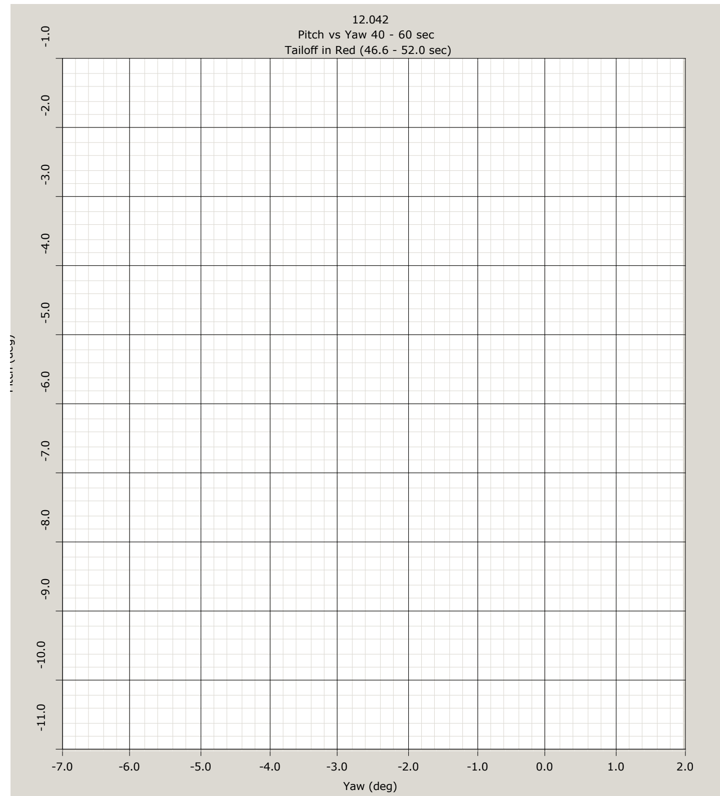
Issue Statement

- What is the source of the attitude excursion typically experienced during BB tail-off on BBXI & BBXII vehicles?
- Are the effects on vehicle impact dispersion being adequately accounted for?
- Are any changes in order?

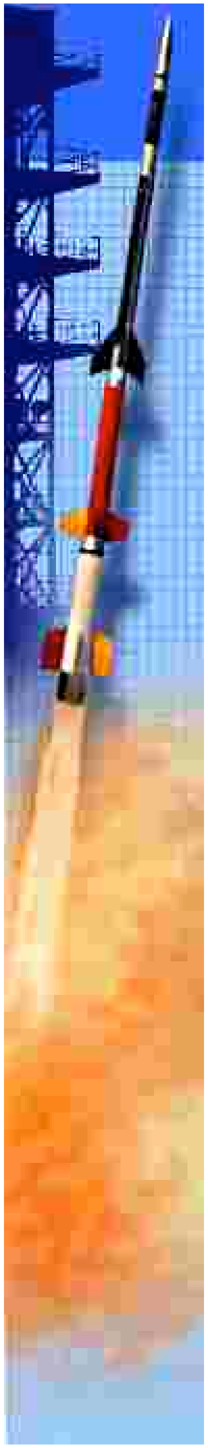


Example Data
12.041 & 12.042

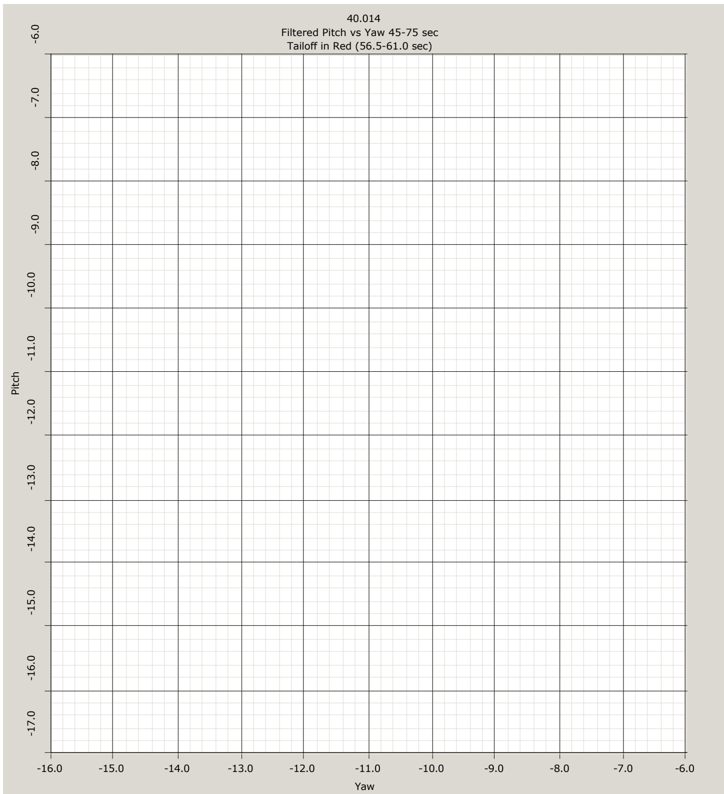


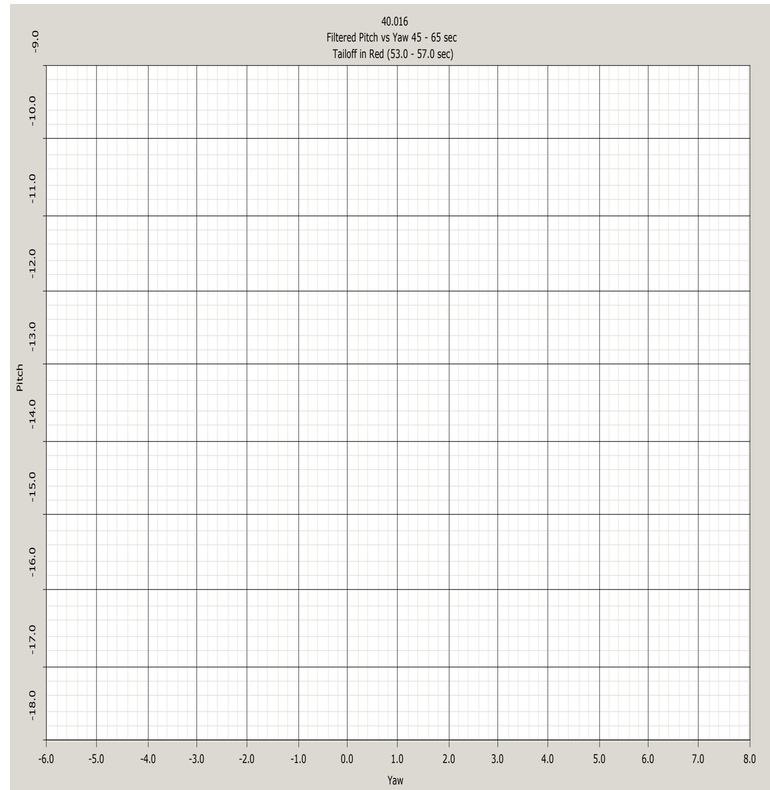


Prior to tail-off
During tail-off
After burnout



Example Data
40.014 & 40.016

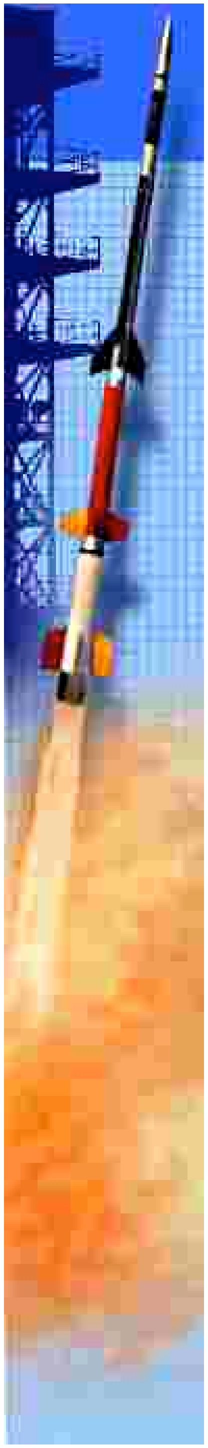




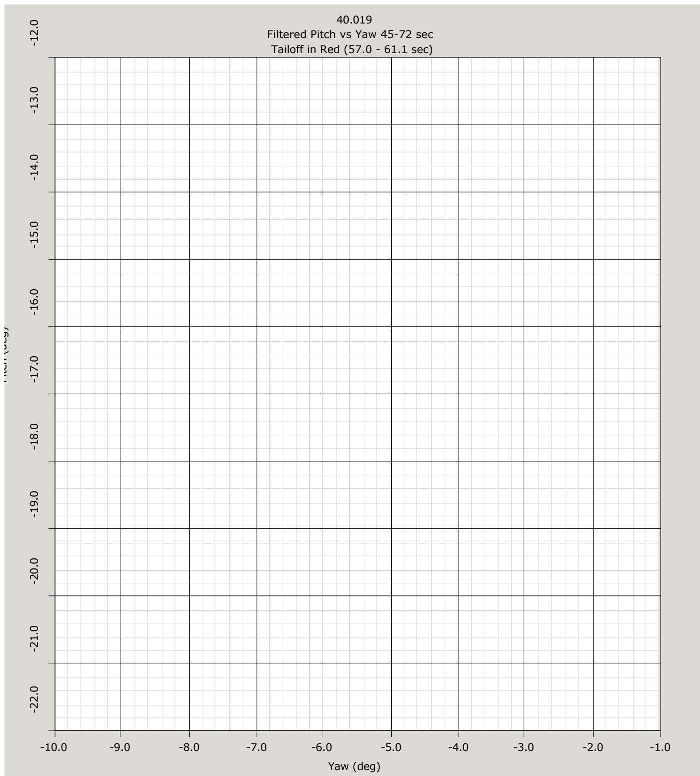
Prior to tail-off

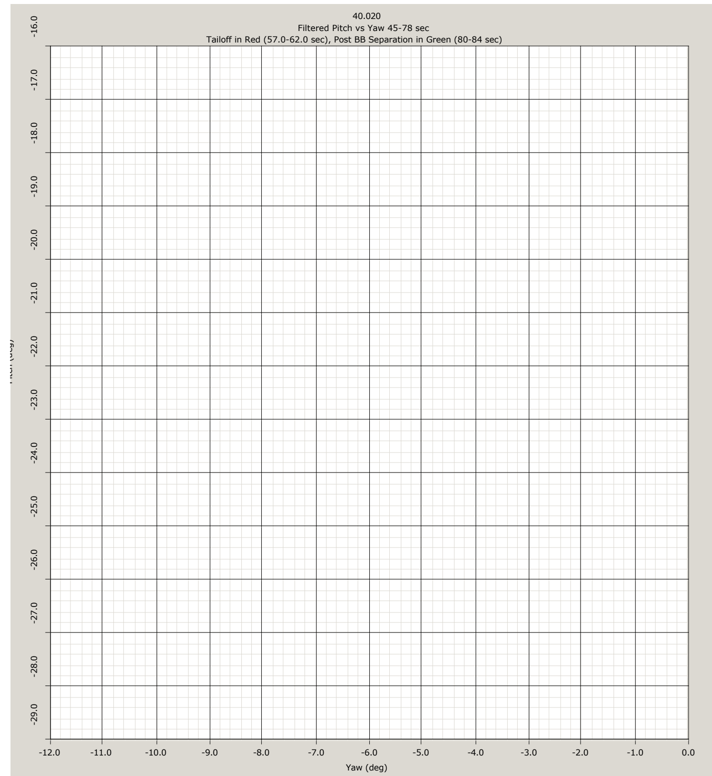
During tail-off

After burnout

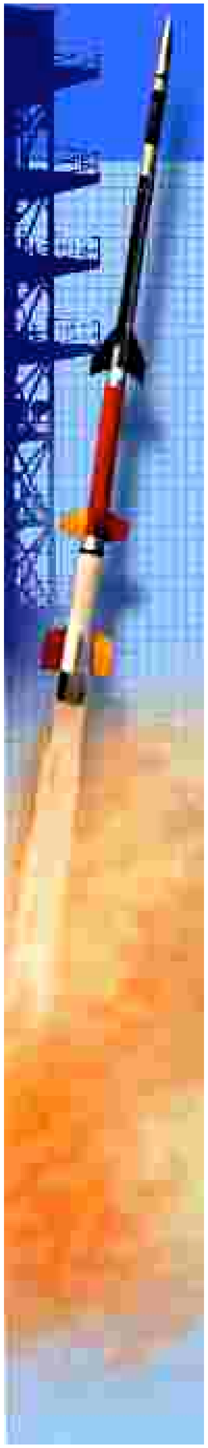


Example Data
40.019 & 40.020

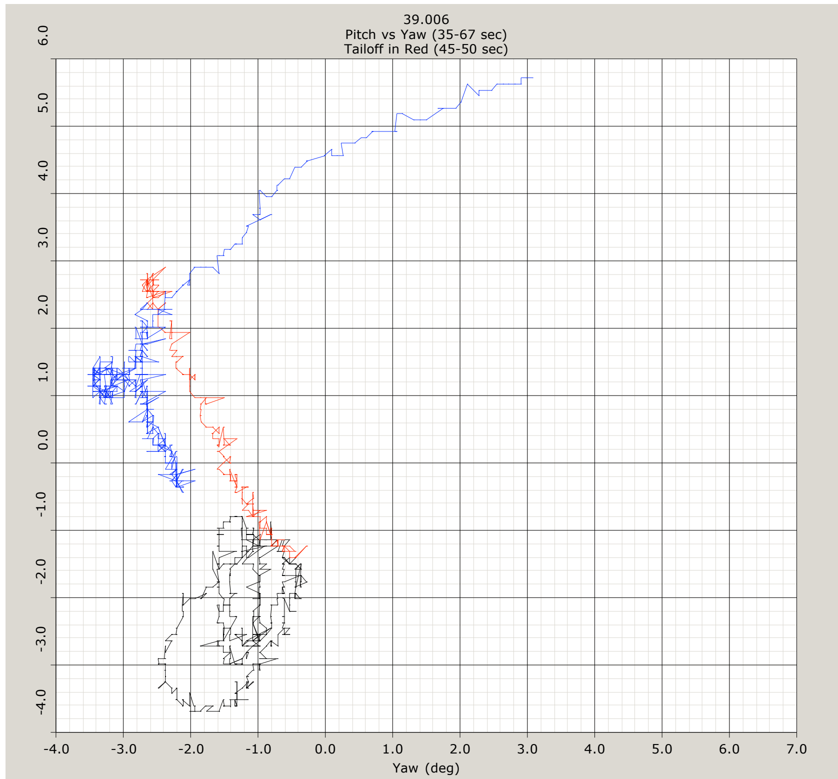




- Prior to tail-off
- During tail-off
- After burnout

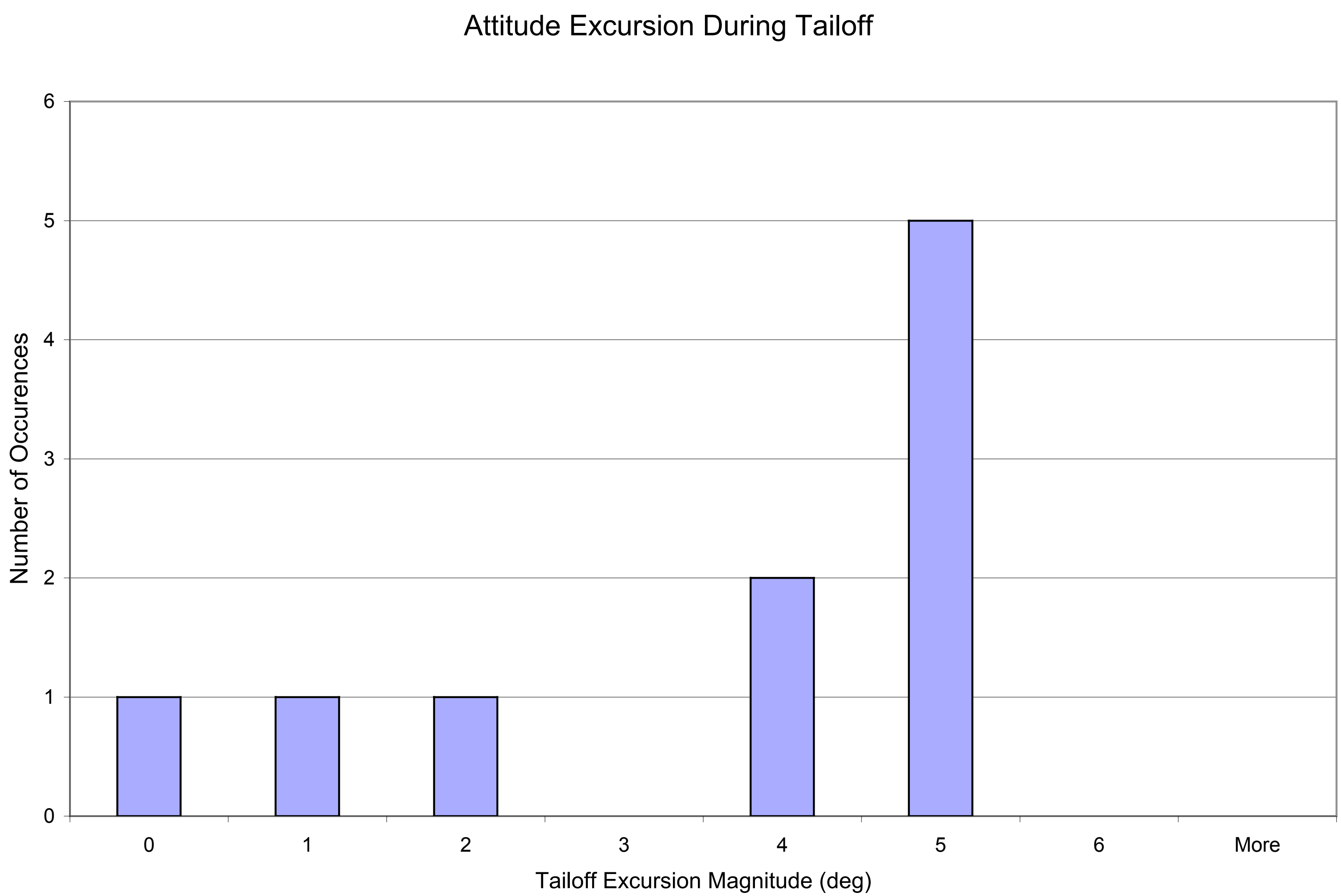


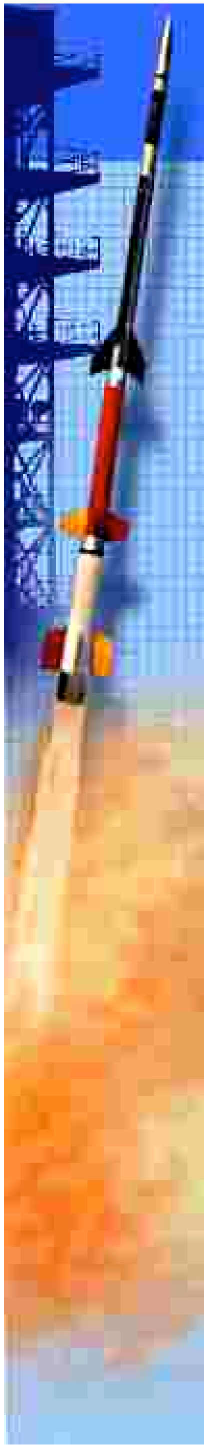
Example Data
39.006



- Prior to tail-off
- During tail-off
- After burnout

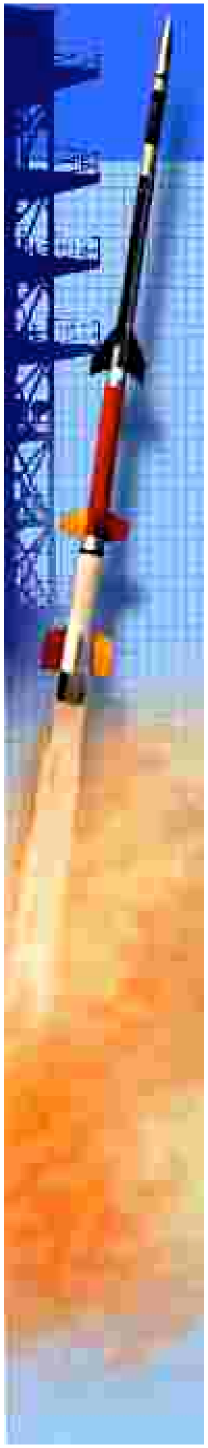
BBXI/BBXII Tail-off Excursion Histogram





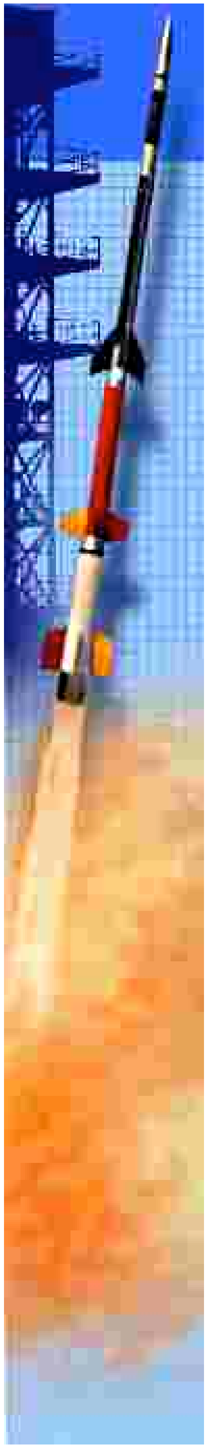
Observations

- The attitude excursion during tail-off loads the “aerodynamic spring” which is released at burnout. This “casts the die” for the subsequent coning.
- The “aerodynamic spring” rapidly grows softer as the dynamic pressure falls exponentially. This leaves the vehicle unable to damp the ensuing lateral rates as the vehicle exits the atmosphere.
- Phenomenon is correlated with tail-off of the BB motor
  - Onset coincides with beginning of tail-off and ends at burnout
- Phenomenon is **not** correlated with altitude
  - Observed onsets range from 114-170kft
- Phenomenon indicates the presence of a destabilizing **non-body** fixed moment
- Data show no orientation preference
- Distribution is non-Gaussian



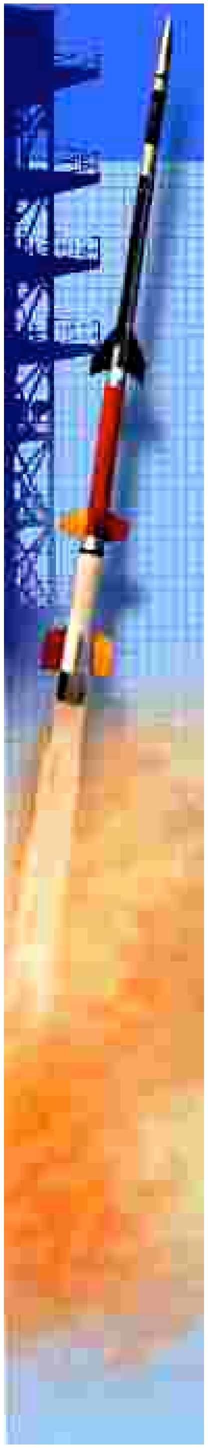
Other Considerations

- An attached oblique shock wave originates at the front of the extended nozzle flare which creates high surface pressures on the flare surface
- A detached bow shock forms ahead of the plume which further increases pressures in the extreme near field of the nozzle exit
- Sufficiently high external pressure at the nozzle exit will induce flow separation within the nozzle
- Pressure required to induce flow separation is directly proportional to chamber pressure
- At some point in the tail-off the nozzle exit pressure will be sufficiently low that the external pressure at the nozzle exit will induce nozzle flow separation. Calculations indicate this can occur early in the tail-off phase.
- An angle of attack will create asymmetry in the external pressure distribution at the nozzle exit



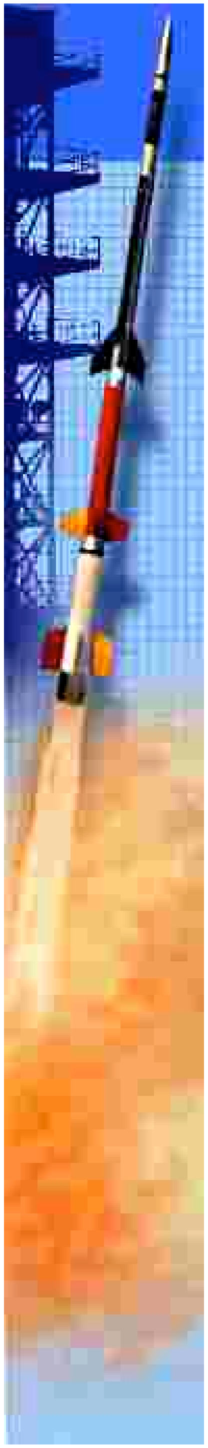
Current Hypothesis

- Attitude excursions typically experienced during BB tail-off are precipitated by asymmetrical flow separation within the nozzle due to asymmetrical external pressure associated with asymmetrical flow around the flare and plume when the vehicle is at a non-zero angle of attack



Conclusions

- One should expect an attitude excursion of 4-5° during BB tail-off of BBXI & BBXII vehicles
- The effect of this attitude deviation on 4th stage impact dispersion is adequately accounted for in the current practice of assuming 8° angular momentum shift at Nihka ignition

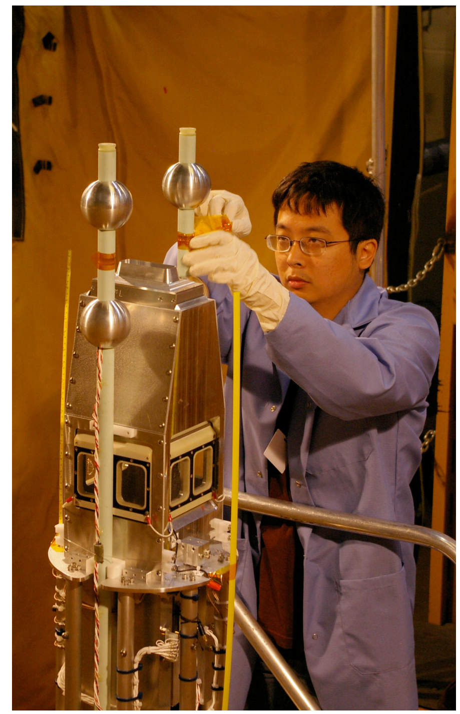


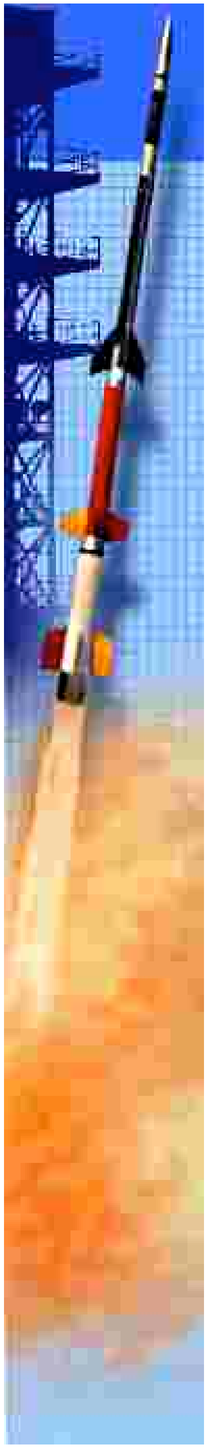
Recommendations

- Continue to use existing analysis practice for the present
- Begin analyzing the individual stage contributions to total impact dispersion as routine post-flight analysis
- Continue to collect data on this phenomenon with a long-term view of refining the dispersion analysis technique
- Measure Nihka joint run out on future missions
- Investigate possible joint creep phenomena

Norway Mission Status

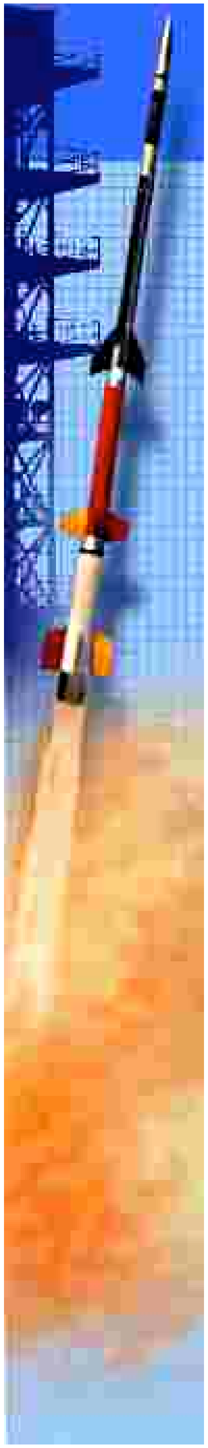
- Robertson (August 2007)
  - Athena launcher installation inprogress.
    - Allows Robertson mission to be stage in parallel with European missions
    - Kudos to the NASA Civil Service “Stop-gap Team” for jumping in and getting the launcher installed
  - Export license for the motors obtained on June 12, 2007
    - Rocket vehicles to depart port on June 23, 2007
    - Anticipated delivery date July 13, 2007
  - Athena Launcher installed
  - Payload integration complete
- Kletzing (December 2007)
  - Assessment of the Athena launcher foundation is under review. Design is potentially marginal for BBXII vehicle
  - Target date for the vehicle export license is TBD
    - Total impulse places BBX and BBXII in Category 1 export class
- Kintner (January 2007)
  - Norwegian U3 launcher will support this mission
  - Target date for the vehicle export license is TBD
    - Total impulse places BBXII in Category 1 export class





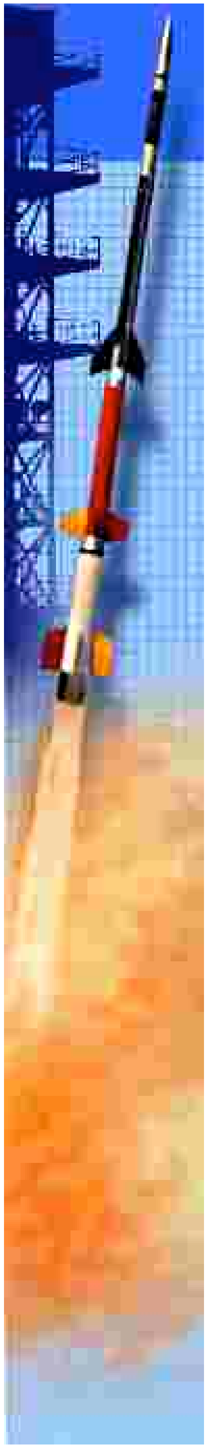
Andoya Rocket Range

- Athena Launcher Installation in progress
- Range costs are escalating
- European collaboration needed to get ESA rates



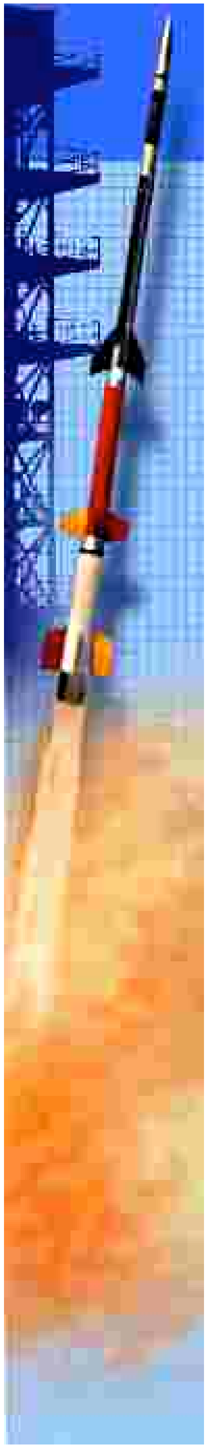
ITAR

- There is now a greater sensitivity to ITAR issues
- Export license required for motors and payload
  - “Temporary” export approach no longer viable
  - Application calls out specifics on motors and generic description of payload, and scientific instruments
- Technical Assistance Agreement needed between contractors and foreign entities
  - Approved by State Department
- Once the rules and process are fully understood we should be able to secure necessary documentation with little impact projects
  - Nominal process could take up to 6 months
- Complex issues associated with mobile campaigns my cause issues in the future
  - Experience gained by “doing things right” on smaller missions should help in the long run



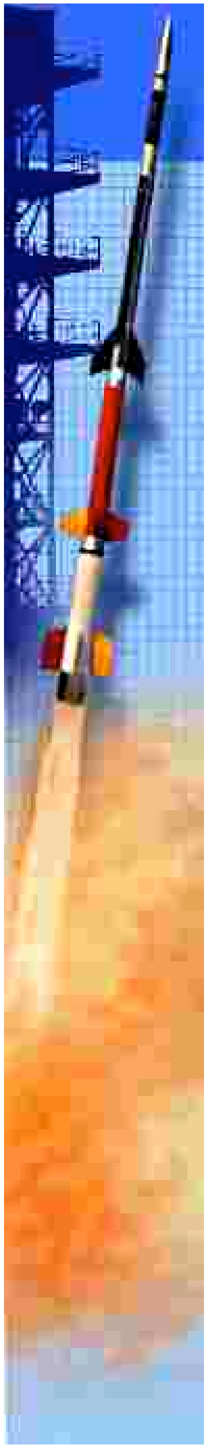
Education/Training Flight Opportunities

- Recent Flights
  - Air Force Academy (Cadet built rocket)
- Current Projects
  - UVa student scramjet
  - Naval Academy (Cadet built rocket)
- Moratorium placed on new selections of student missions
- Professional Development
  - NASA Systems Engineer Training
  - SR to serve as tool to develop PI Experience for bigger missions



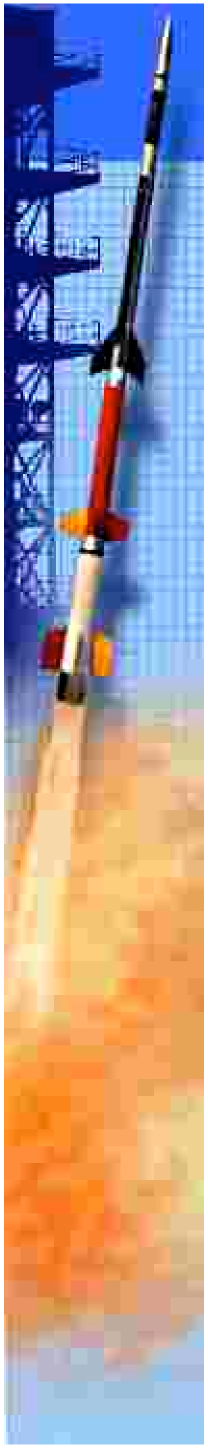
Budget

(Phil Eberspeaker)



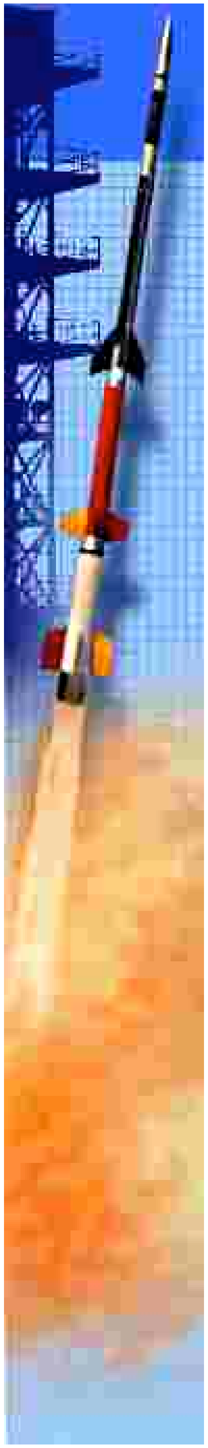
Marching Orders

- Alan Stern came to WFF to discuss Sounding Rockets two weeks after starting as Associate Administrator
  - Demonstrates strong support for the program
  - Defense of program has logical foundation
- Direction from the AA
  - Survive FY08
    - Maintain capability
    - Minimal budget augmentation can be requested
  - Push to become healthy starting in FY09
    - Targeting 20 flights in FY09
    - Targeting 24 flights annually FY10 and beyond
  - Proposed Mission Mix
    - Mix of surplus and Brant missions
    - Heliophysics and Astrophysics
  - No capability expansion over next several years
    - Immediate goal is to maximize number of missions



WFF Range Now More Closely Linked to the NSRP

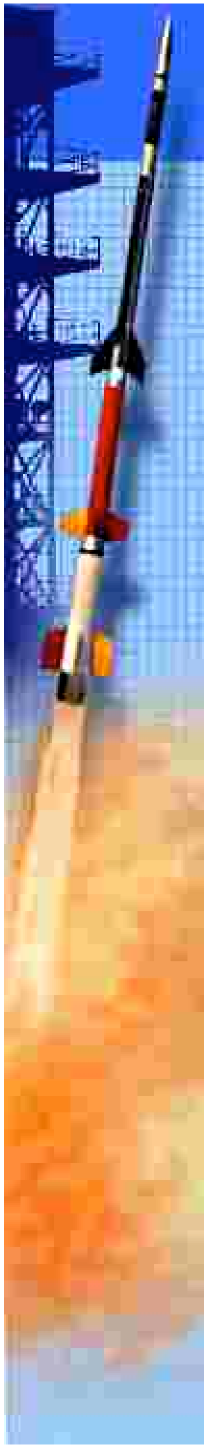
- WFF Mobile Range assets critical to SR program
  - Poker and Norway augmentation
  - Mobile campaigns
- WFF Range requires additional funding
  - Keep the assets functioning
  - Support operations



Plan for FY08

Survival Mode

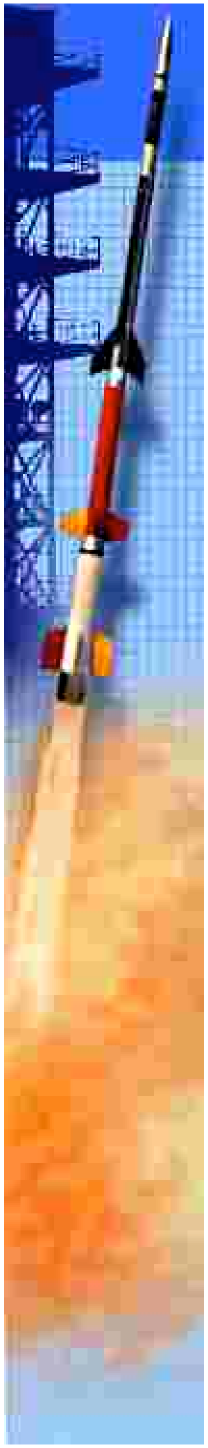
- Maintain Capability
  - Keep operational capability at Poker and WSMR
    - SRPO must implement costs savings at both ranges
  - Maintain appropriate level of NSROC WYE’s
    - Natural attrition will not be backfilled in FY08
    - Will limit number of missions that can be supported
  - Procure Black Brant motors as planned
- Minimize costs
  - Delay development of the Next Generation ACS
  - Delay final development of new Thrust Termination System
  - Delay redevelopment of Nihka
    - Investigate surplus alternatives
  - Delay select subsystem refurbishments when possible
    - Recovery Systems, S-19
    - SRPO proposed delaying 2 flights
- Offset Labor Costs
  - Continue to pursue reimbursable work



Outyears

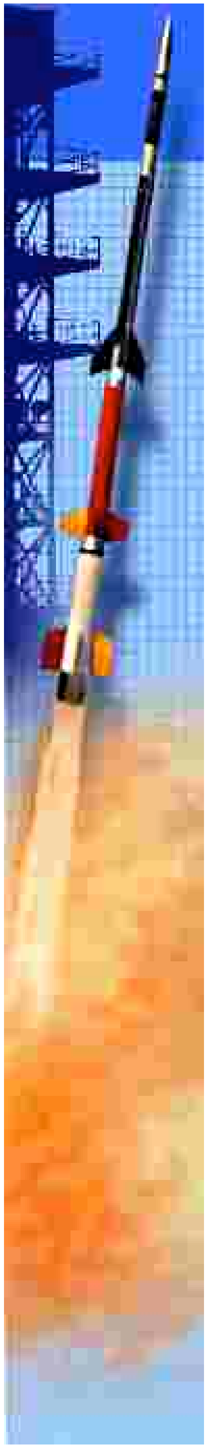
Proposed Straw man Program

- Return to 24 flights/yr by FY10
  - Establish appropriate staffing levels
- Standard operations at WSMR
- Annual Poker Operations
  - Up to 5 flights per year (single window)
- Accommodate Scandinavian missions
  - Andoya, Esrange, and periodic Svalbard
- Accommodate possible campaign every few years starting in FY11 timeframe
- Account for inflation

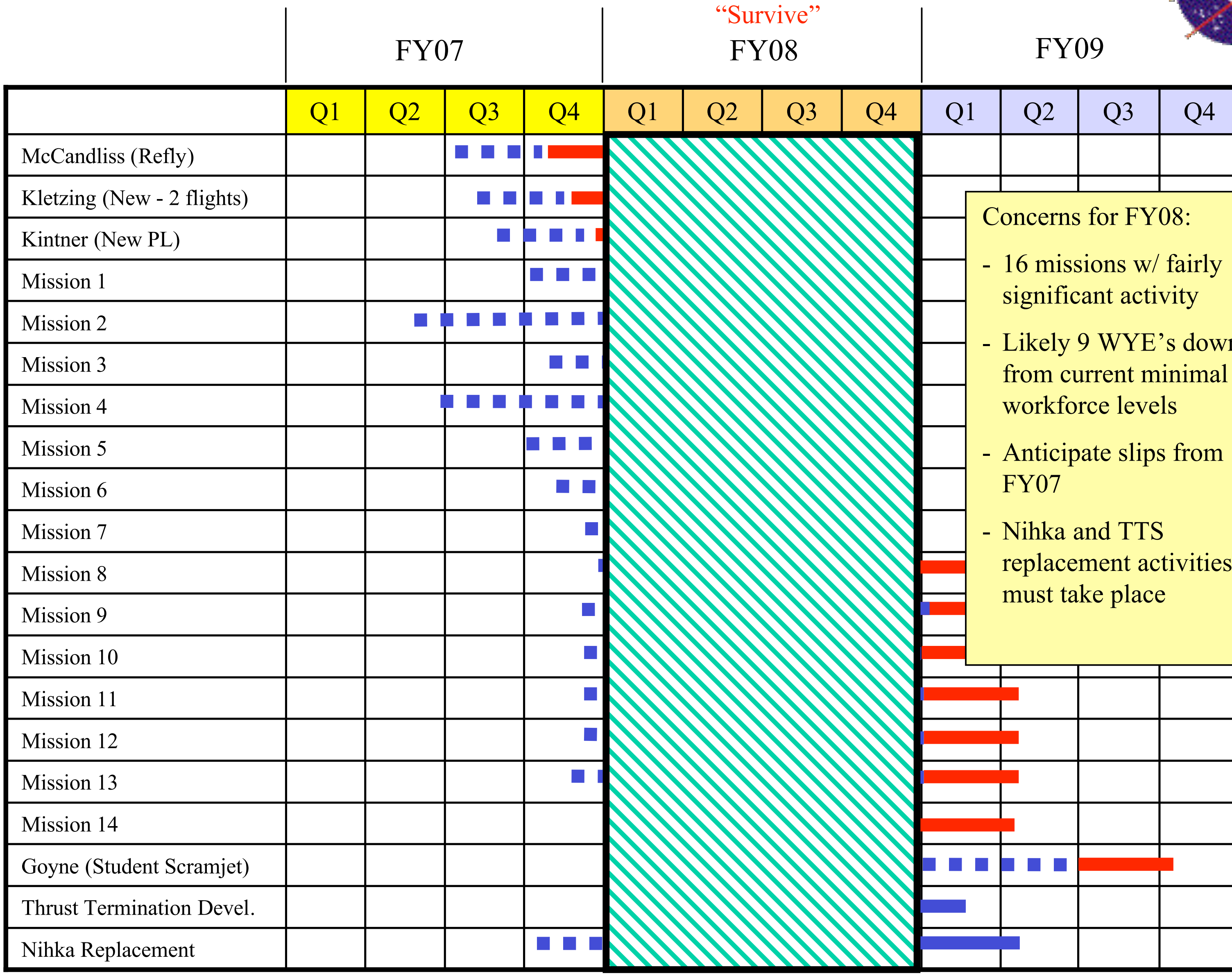


Status

- Budget proposal has been developed that is consistent with straw man program
  - Requested funding profile is being included in the NASA budget planning process
    - Includes NSRP and Range funding requirements
    - Funding strategy has not been established
- Situation for FY08 has not been fully resolved
  - Additional funding anticipated, but level unknown
- Four additional science proposals have been selected
  - Demonstrates commitment of AA

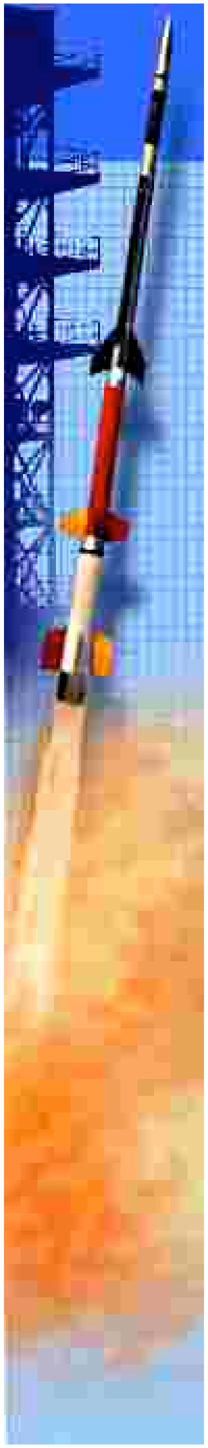


Workload



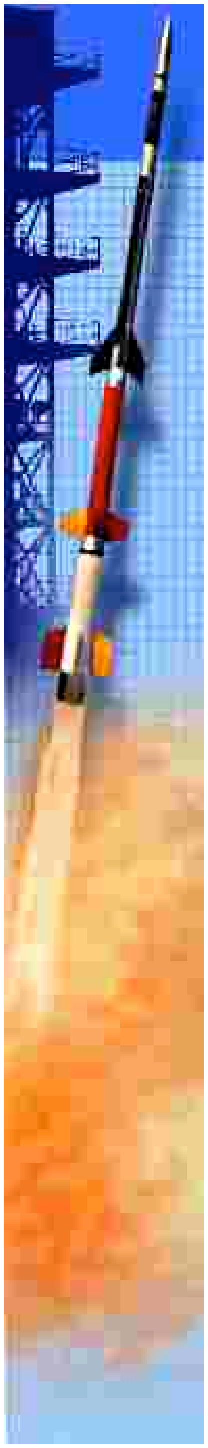
Concerns for FY08:

- 16 missions w/ fairly significant activity
- Likely 9 WYE's down from current minimal workforce levels
- Anticipate slips from FY07
- Nihka and TTS replacement activities must take place

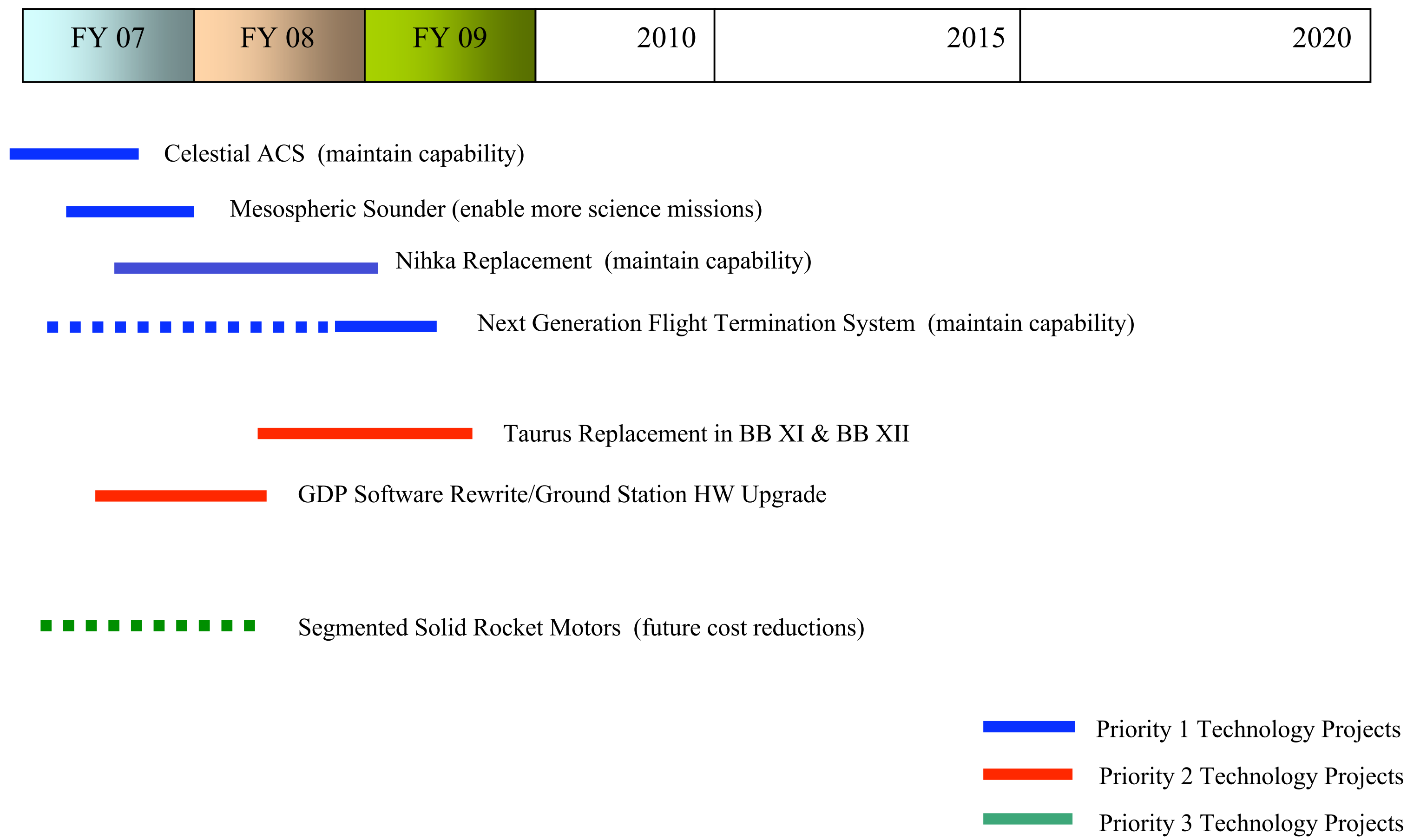


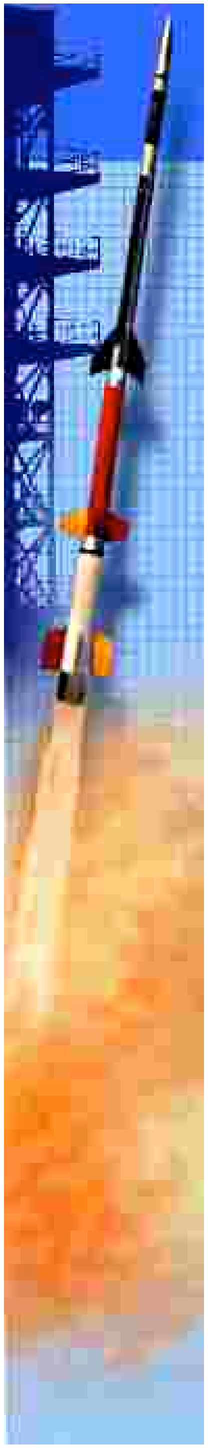
Technology Development

(Phil Eberspeaker)



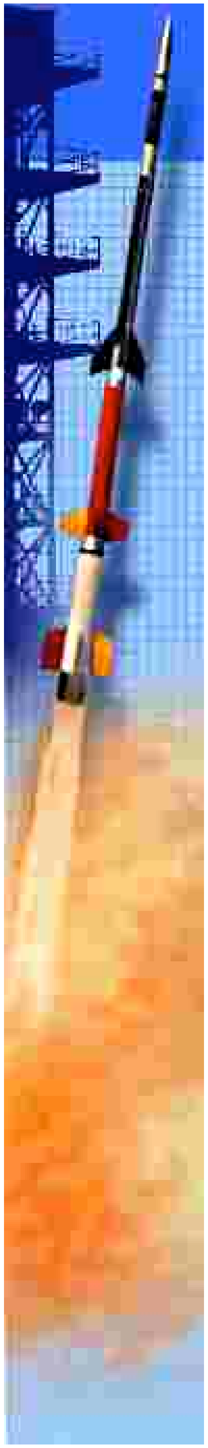
Technology Roadmap





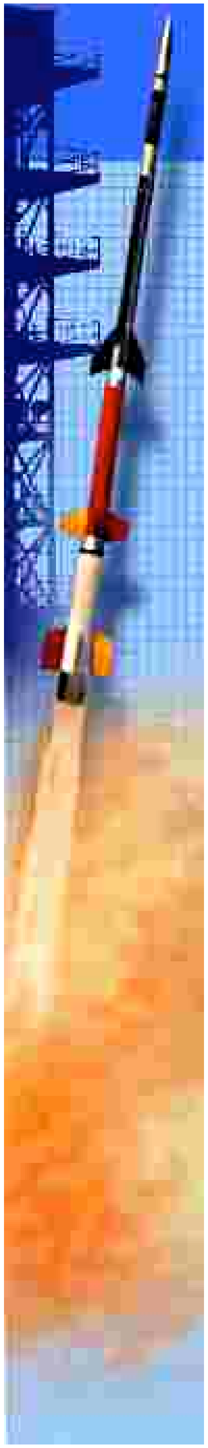
Technology Efforts

- Celestial ACS
  - Flight test this morning…
- Mesquito (MLRS-Dart)
  - Fabrication underway
  - First flights currently scheduled for August 2007
- Nihka replacement
  - Analyses of options underway



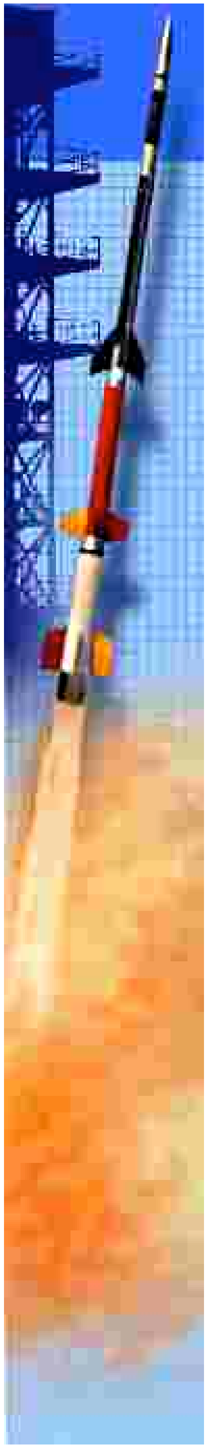
Motor Status

(Phil Eberspeaker)



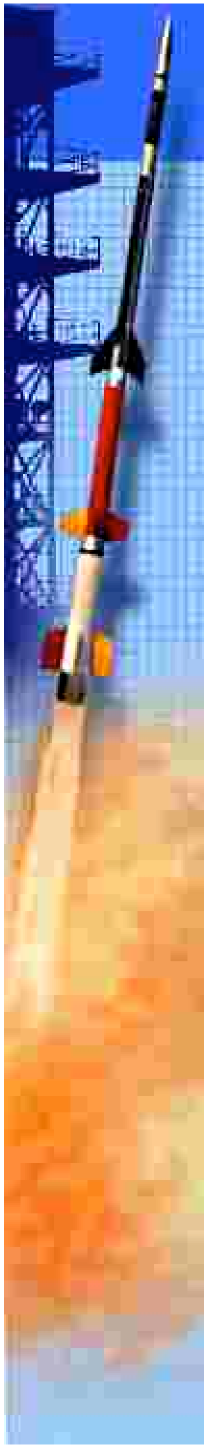
Black Brant Inventory

- Standard Black Brant
  - 5 remaining
    - 1 to be recertified due to age
    - 2 recently recertified and assigned
    - 2 in process or ready to stage
- Black Brant Mk1
  - 1 remaining from original lot (2003)
  - 30 motors from new lots
    - 8 have been received by NSROC (1 SF, 1 TF, 6 inv.)
    - 2 at Yorktown for x-ray
    - 2 to be delivered by end of June
    - 18 to begin delivery in November, through June, 2008



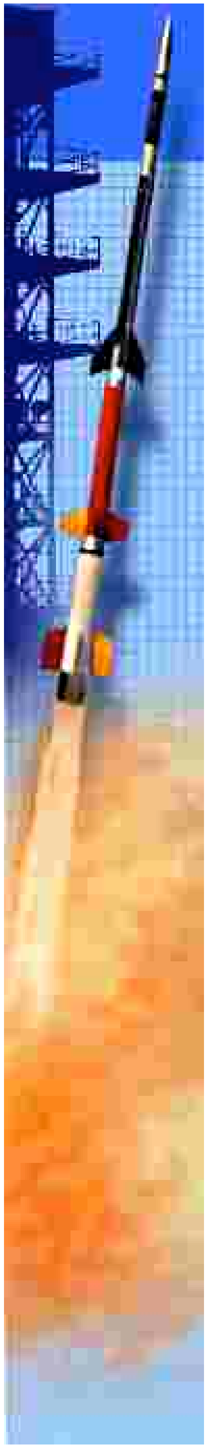
Brant Transition Timeline

- 36.220 McCandliss, July 2007: Standard BB
- 36.225 Chakrabarti, September 2007: BB Mk1
- 36.218 Earle, September 2007: Standard BB
- 36.221 Moses, September 2007: Standard BB
- 36.241 Rabin, October 2007: Standard BB
- 36.240 Woods, October 2007: Standard BB
- 36.226 Bock, May 2008: BB Mk1
- 36.219 Hassler, June 2008: BB Mk1



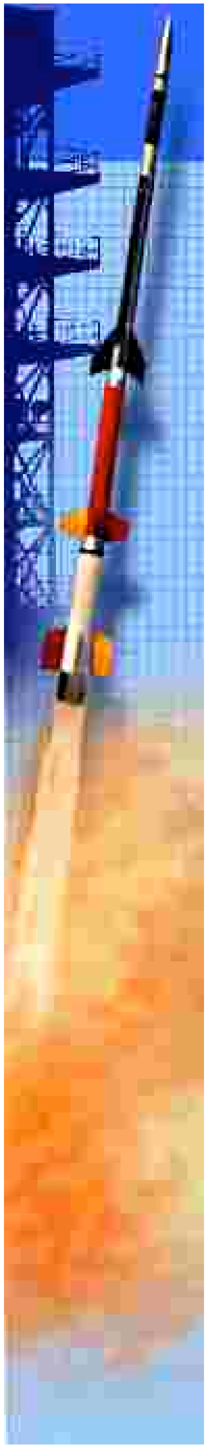
Nihka Motor Replacement

- Situation Critical
  - 6 usable motors available, 3 of which are assigned to upcoming missions
- We must take action on one of these options
  - Nihka Redesign
    - Moderate NRE
    - Does Bristol still have the capability?
  - Shift to 22” Cardinal (smaller sister to Oriole)
    - Unproven – none built to date
    - Expensive NRE
    - Bulbous upper stage?
  - Patriot
    - Proven motor (but not in high altitude application)
    - Performance potentially better than Nihka
    - 16” dia. may require smaller diameter payloads
    - Igniter development effort likely required
  - Other
    - Segmented
    - Low-cost liquid

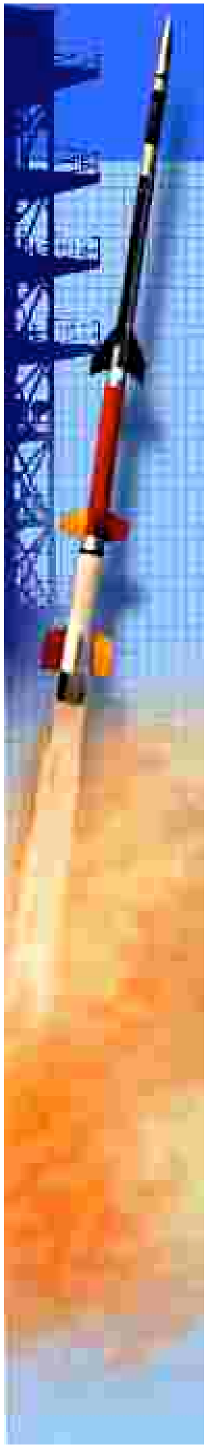


Other Motors

- Talos – 11 at WFF, 41 promised
- Improved Orion – 59
- Patriots – 10 to be delivered at any time
- MLRS – 6 at WFF



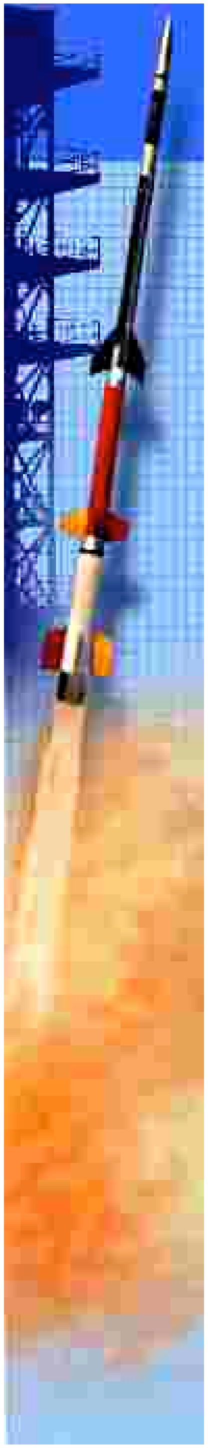
Findings from December 2006 SRWG



I. Program Funding Crisis

Budget reductions have put the Sounding Rocket Program in peril. Funding cut since 2005 should be reinstated…

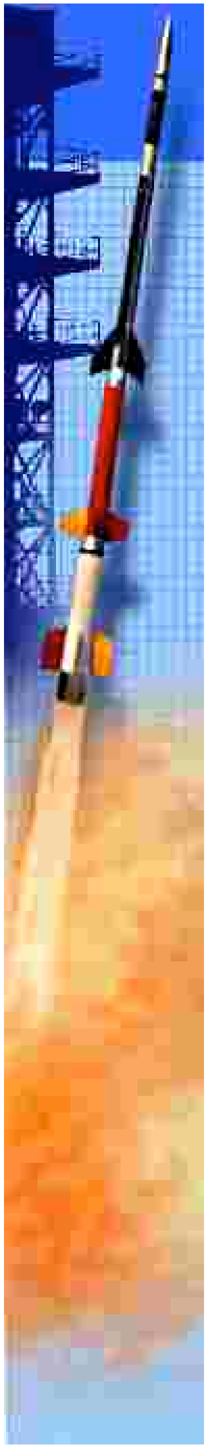
- Issue is three-fold
  - SRPO funding
  - R&A funding
  - Wallops Range funding (support for non-WFF operations)
- SRPO is cautiously optimistic about future funding
  - Future planning based on 24 flights/yr
- FY08 situation must still be resolved
  - SRPO directed to go into “survival mode”
- Details already provided in the budget discussion…



II. Reducing Cost per Mission

Ways to mitigate costs per rocket. Information on subsystem costs. Cost reduction incentives under NSROC

- Less complex payloads result in lower "per-rocket" costs.
- Cloned payloads do cost less. However, most cloned payloads are of the lowest complexity levels (i.e. chemical payloads) and thus savings are not "significant".
  - Data to be provided at the SRWG Meeting



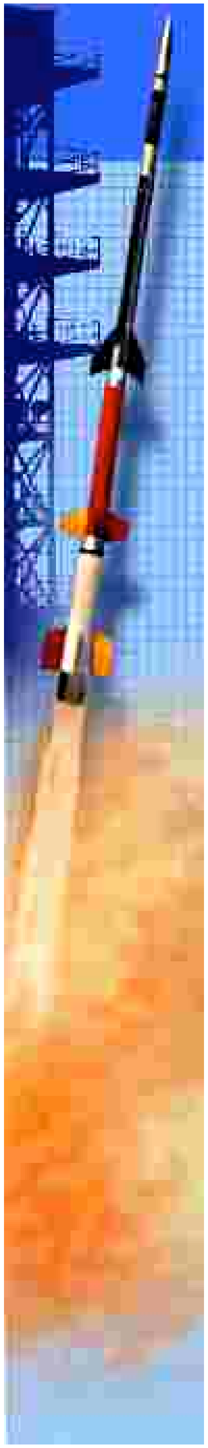
Random Comparison of Mission Complexity Levels

TASK #	Complex Level	Labor Cost	Hardware Cost	Other	Total	
S947	4					Black Brant
S305	4					BBXII
S203	3					BBXI
S220	3					Nike-Brant
S117	2					Terrier-Orion
S304	2					BBIX
S312	1					BBIX
S213	1					Terrier-Orion

Data to be provided at the meeting

Actual NSROC Cost Data

Not for public distribution



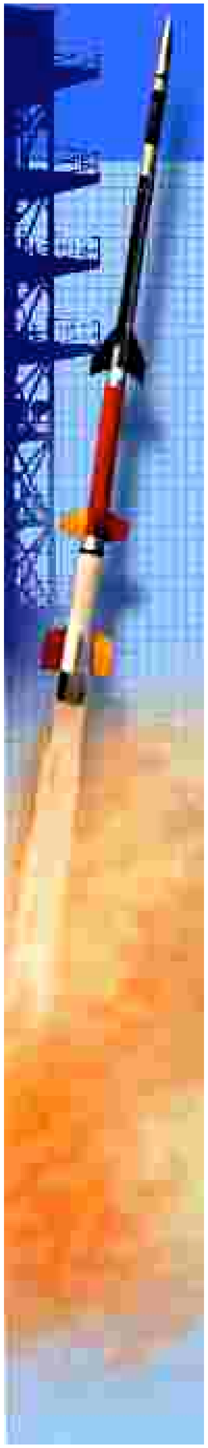
Comparison of “Identical” Payloads

TASK #	Complex Level	Labor Cost	Hardware Cost	Other	Total
S524 - original	1				
S525 - copy	1				
S517 - original	3				
S518 - copy	3				
S519 - copy	3				

Data to be provided at the meeting

Estimated NSROC Cost Data

Not for public distribution



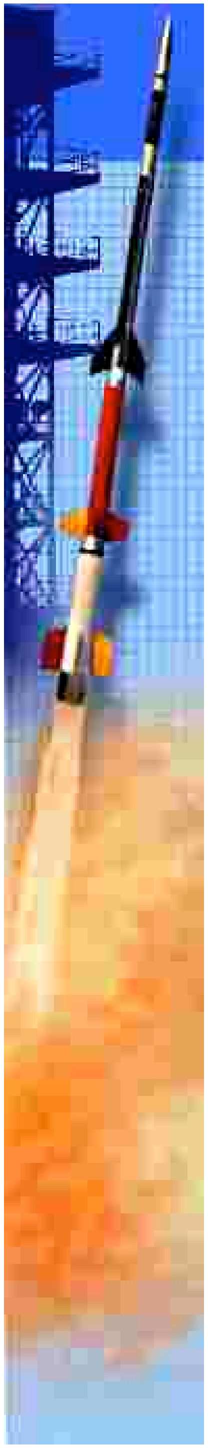
Comparison of New vs. Refly Payloads

TASK #	Complex Level	Labor Cost	Hardware Cost	Other	Total
S123 (36.201 - new)	2				
S312 (36.210 - refly)	1				

Data to be provided at the meeting

Actual NSROC Cost Data

Not for public distribution

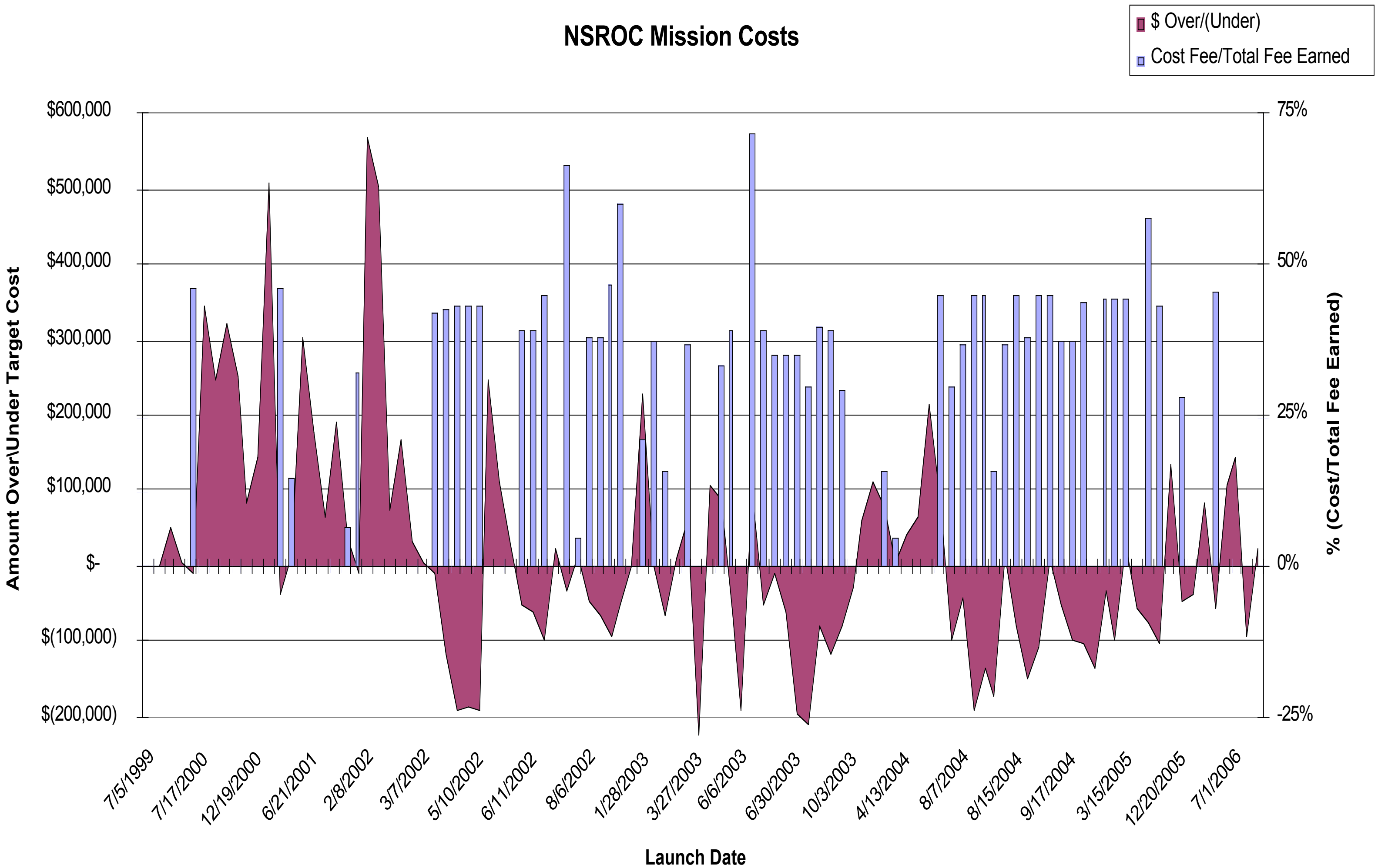


Cost Incentive

- Missions costs were established as part of the contract competition
  - Bidders bid labor hours and hourly costs for the four mission complexities for entire 10 years of the contract
  - The bidder with the lowest mission costs was selected (was not the only driver…)
- Fee is based on estimated cost, not the actual cost
  - Driving up cost does not increase fee – it reduces it…
- The NSROC includes a cost incentive
  - Fee is maximized when actual costs come in less than the estimate (all other things constant)

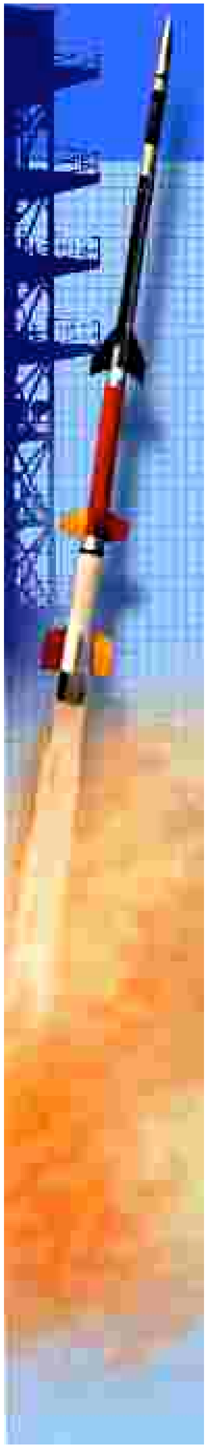
RED = over/under run (depicted as area plot to distinguish from fee bars

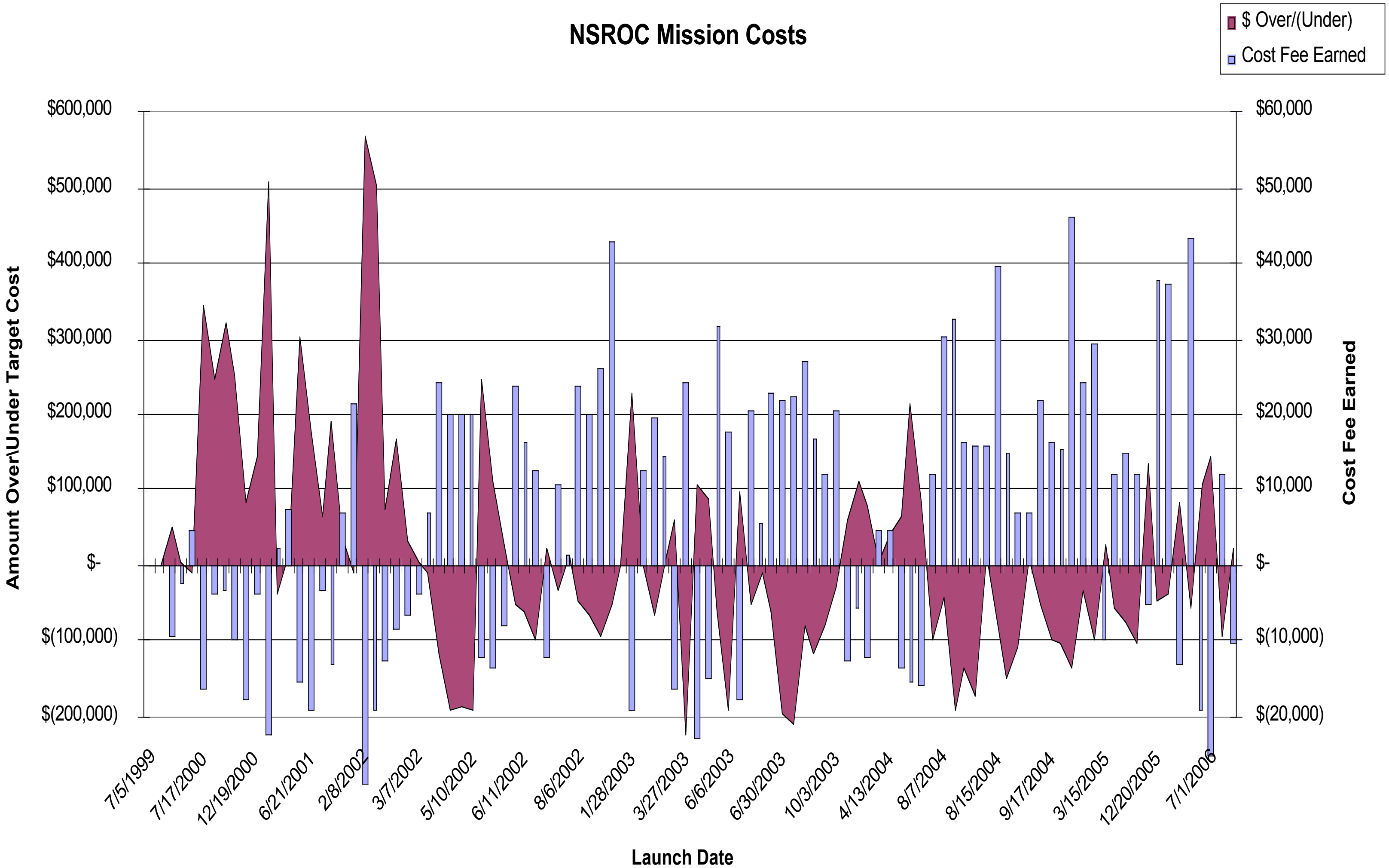
BLUE = ratio of cost fee to total fee earned

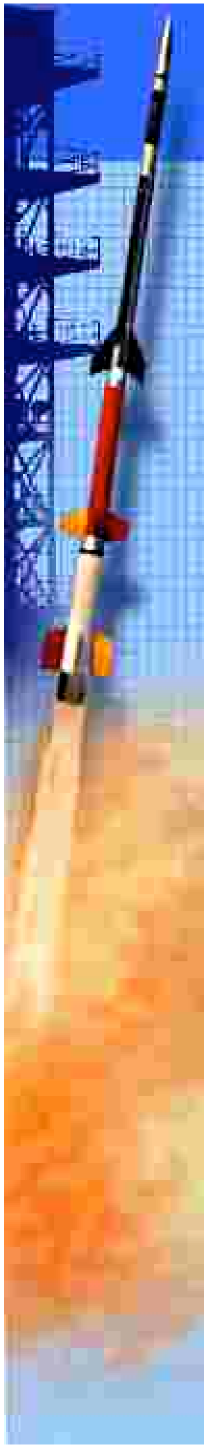


RED = over/under run (depicted as area plot to distinguish from fee bars

BLUE = cost fee earned or lost



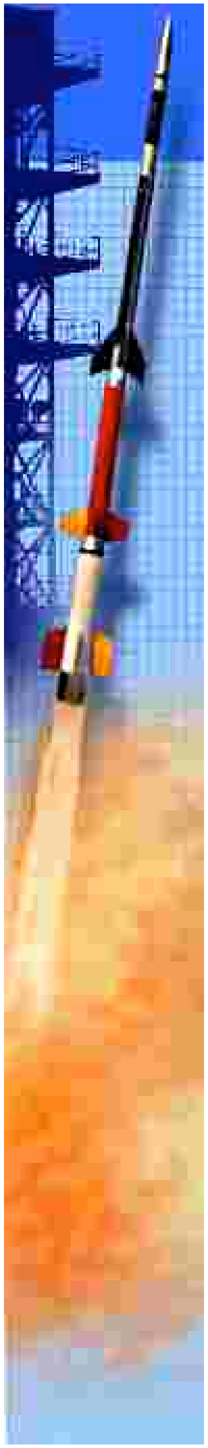




III. Impact of "Reimbursable" Missions on the Science Program

There is a concern that reimbursable missions inflict undue stress on NASA-funded science missions. Will improved planning and management help?

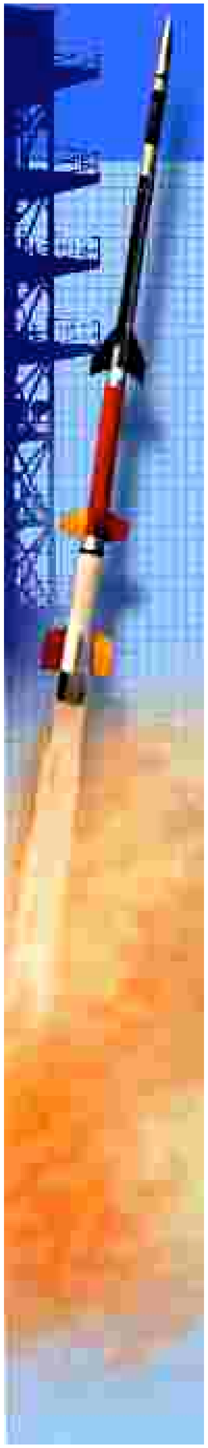
- Science Missions (the low point)
  - 2005: 6 (8 reimbursable)
  - 2006: 2 (14 reimbursable)
- Primary customer has been MDA
  - Extremely volatile manifest
- With restoration of the program budget, the SRPO will shy away from the pursuit of highly volatile customers
  - Will hopefully minimize planning issues



IV. Increase in Safety Requirements and Resources Impact

The SRWG wants to understand why there has been an increase in safety officers…

- There has not been a significant increase in “safety officers”.
  - Safety FTE levels are higher due to mission requirements
    - Complex missions required more analysis – tailored trajectory, rocket assisted sub-payloads, BBIX
    - Additional Operational Safety Supervisors (OSS) were required to cover Poker. Allowed for parallel operations, training of new NSROC WYE
  - NSROC has added 2 people to SQA office (independent OSS)
- NASA Mishap Reporting rules place burden on the program
  - Increased QA scrutiny to avoid failures - new level not excessive
- Safety is an independent organization that is out of the SRPO’s control
  - Tough to argue against safety scrutiny…
  - SPRO tracks safety FTE levels on monthly basis to ensure reasonable charges



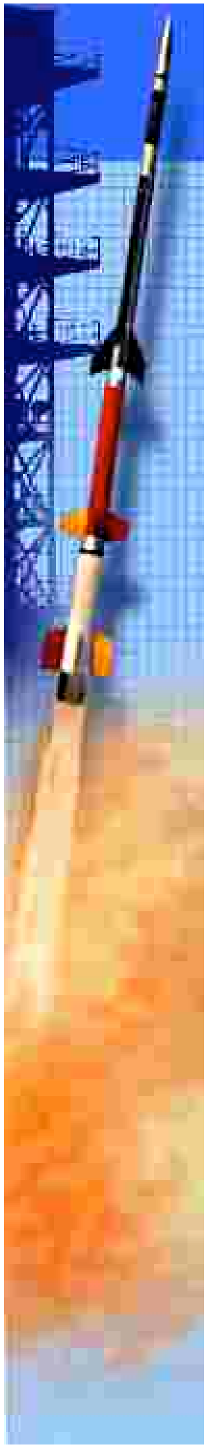
Safety and Q&A

Program Workforce

	FTE’s
NASA CS	26
NSROC – NSRP	150
NSROC - Reimbursable	15
Other Support Contractors	6

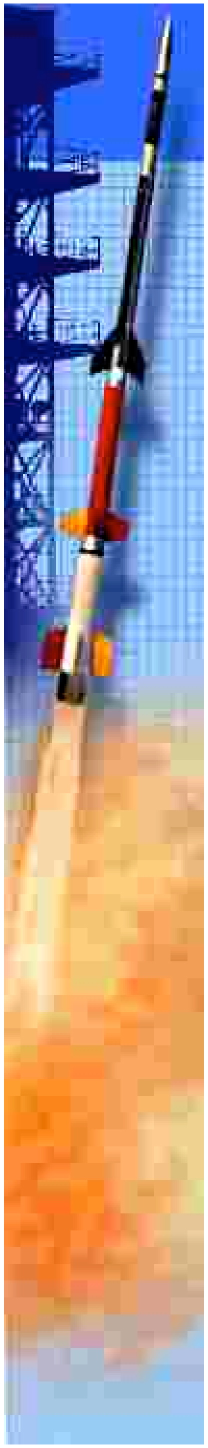
Safety and Q&A

	FTE’s
NASA Safety (NASA & CSC)	8
NSROC Safety and Q&A	6

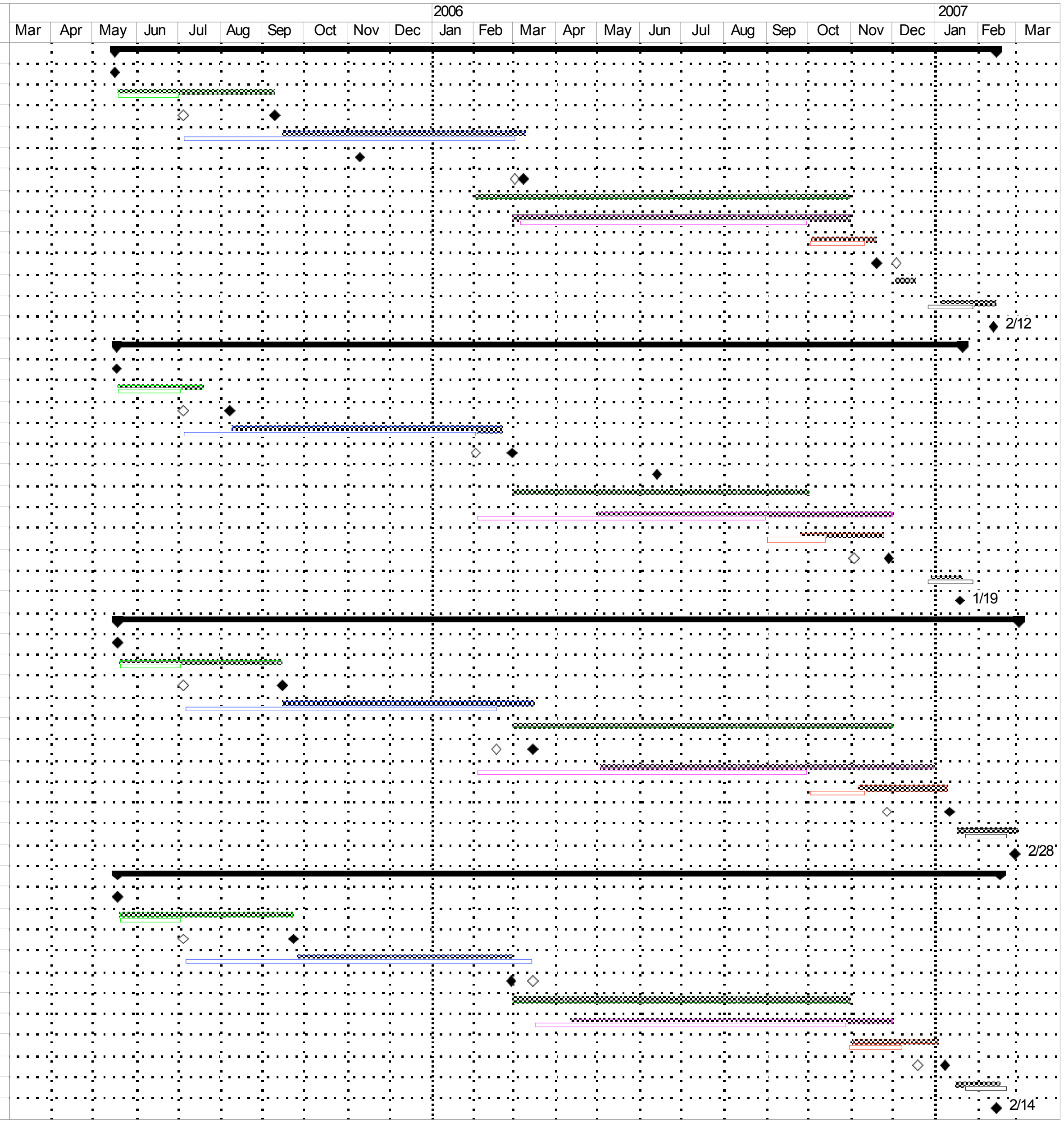


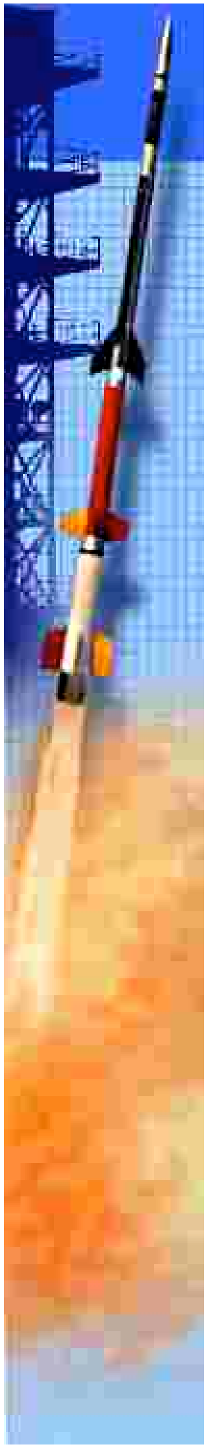
V. Recent "Extended" Integrations and Procedures

Recent integration took far too long. Extended integrations are expensive for the payload teams. Chief concern is procedures and communications



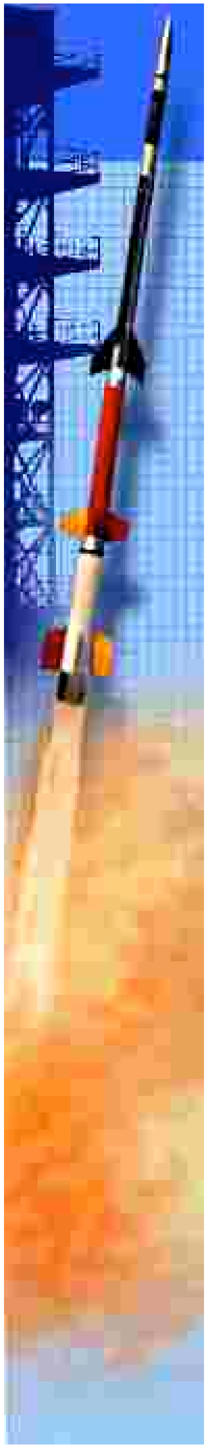
ID	Task Name
26	Lessard/ROPA
27	MIC
28	Define Requirements
29	RDM
30	Design
31	PDR
32	DR
33	Mech print submit
34	Fabrication/assem
35	Integration
36	MRR
37	Field Ops 1
38	Field Ops 2
39	Launch
1	Larsen/JOULE2
2	MIC
3	Define Requirements
4	RDM
5	Design
6	DR
7	36.234 DDR
8	Mech print submit
9	Fabrication/assem
10	Integration
11	MRR
12	Field Ops
13	Launch
14	LaBelle/CHARM
15	MIC
16	Define Requirements
17	RDM
18	Design
20	Mech print submit
19	DR
21	Fabrication/assem
22	Integration
23	MRR
24	Field Ops
25	Launch
40	Craven/HEX2
41	MIC
42	Define Requirements
43	RDM
44	Design
45	DR
46	Mech print submit
47	Fabrication/assem
48	Integration
49	MRR
50	Field Ops
51	Launch





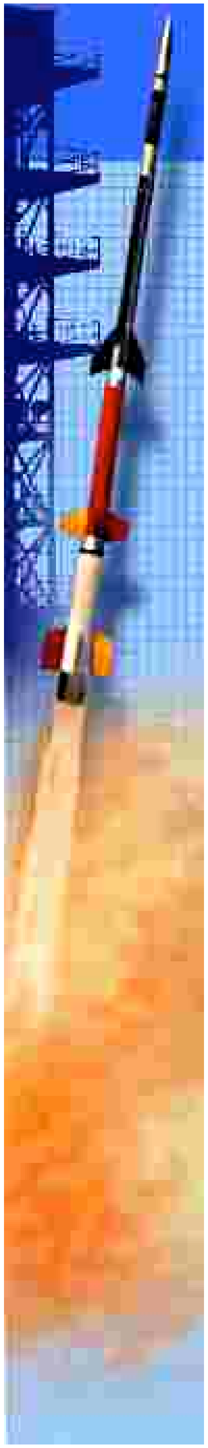
Requirements Definition Phase

- Much longer than baseline
- All RDM's very late
- Very few engineering hours used
  - Average of 2% of total



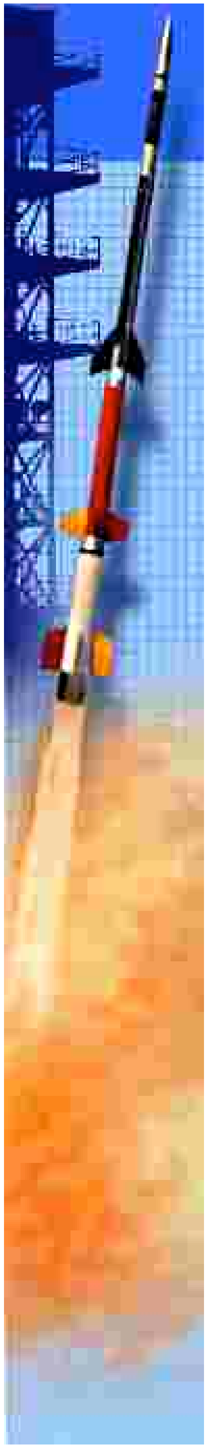
Design Phase

- DR’s within 1 month of baseline
- ME group in flux
- Engineering hours expended
  - ROPA: 12%
    - Held PDR early
  - JOULE: 17% & 20% (DDR)
    - Significant AI’s at DR required DDR
    - Many mechanical changes
  - CHARM: 9%
    - Significant AI’s at DR required DDR
  - HEX: 6%
    - Very similar to previous missions
    - Minimal engineering required



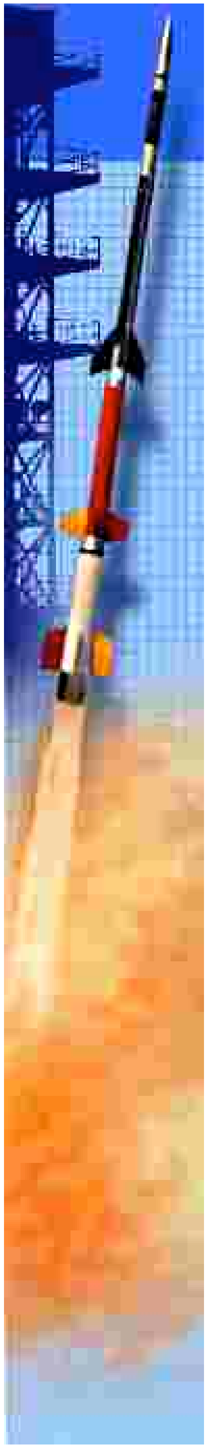
Fabrication Phase

- Shortage of stock electrical parts
- Fabricated parts late
- Issues with fabrication scheduling



Pre-Integration Review

- Held for all missions
- Documented
- SRPO invited
- Evident that fabrication was behind but couldn’t move launch date so proceeded with integration

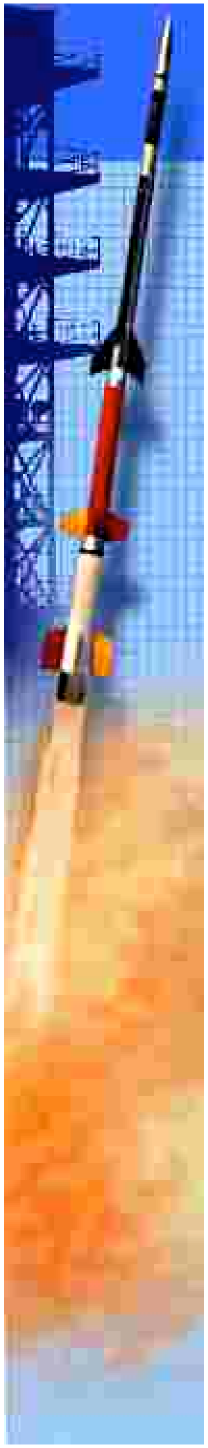


Integration Phase

- 2 started late – 2 on time
- 1 slightly longer – 3 much longer
- Only 2 or 3 Mech Techs available five
- Schedule slips caused overlap, resource conflicts
- Late hardware delivery
- Experiment problems

Summary

- Need to do more engineering earlier – exp design would have to start sooner
- Estimate stock requirements early
- Manage mechanical fabrication better



VI. High Precision Star Tracker for Astronomy Payloads

- Status to de addressed in the technical session