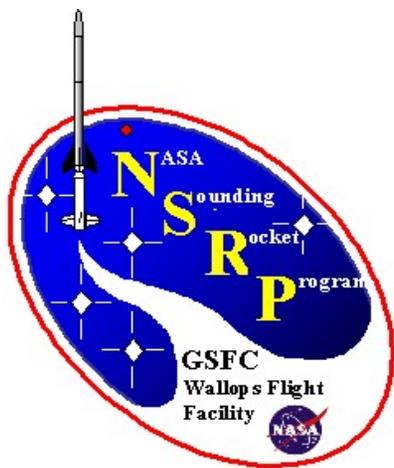




Sounding Rocket Working Group



SRPO Summary
January 14, 2004
Philip Eberspecker



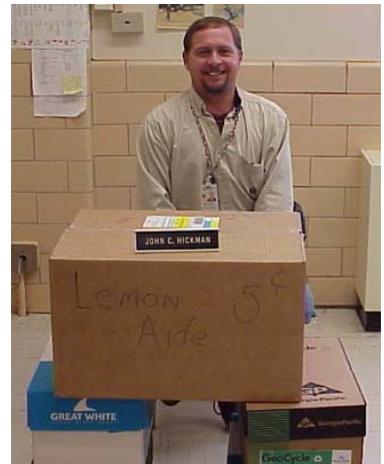
Presentation Outline

- Key Personnel Changes
- Photo Journal
- FY03 Mission Results Summary
- Significant Accomplishment Summary
- FY04 Launch Schedule
- NASA Philosophy Trends
- Budget
- Technology Summary
- Findings from June SRWG Meeting
- Kwajalein Status



Significant Personnel Changes

- New NSROC Program Manager selected
 - Rob Maddox is the new PM
 - Royce Cutler left to manage a contract on the West coast
- New SRPO Technology Manager selected
 - John Hickman is the SRPO TM
 - Will coordinate technology efforts and manage technology budget





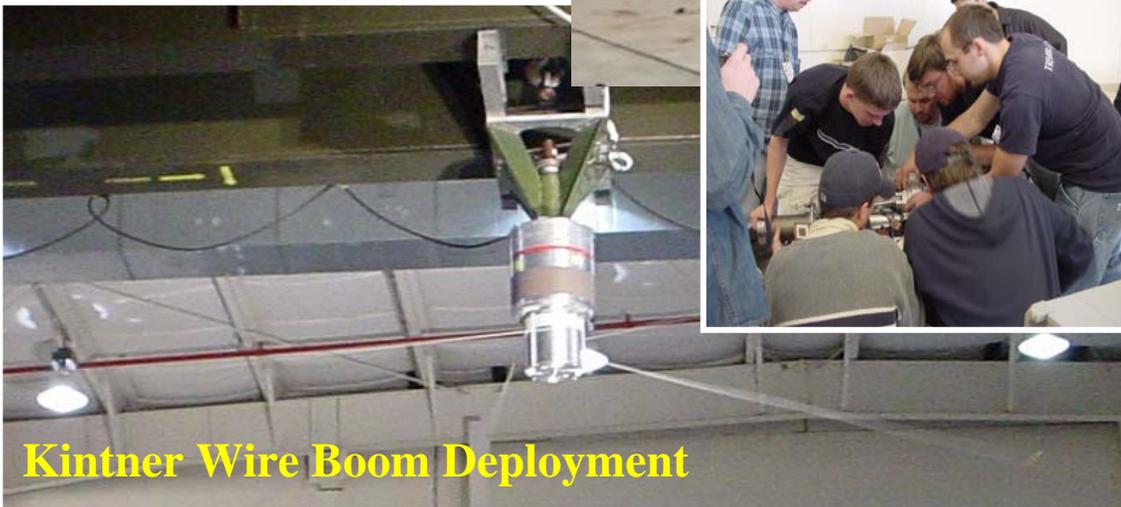
Earle Chemical Release



SubSEM Student Mission



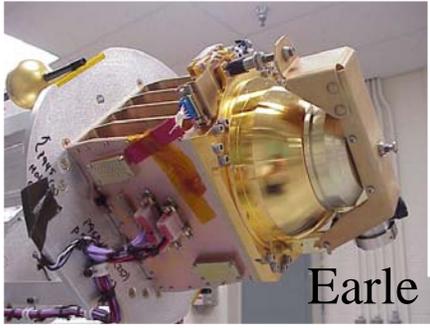
Ames Lifting Wedge



Kintner Wire Boom Deployment



Photo Journal



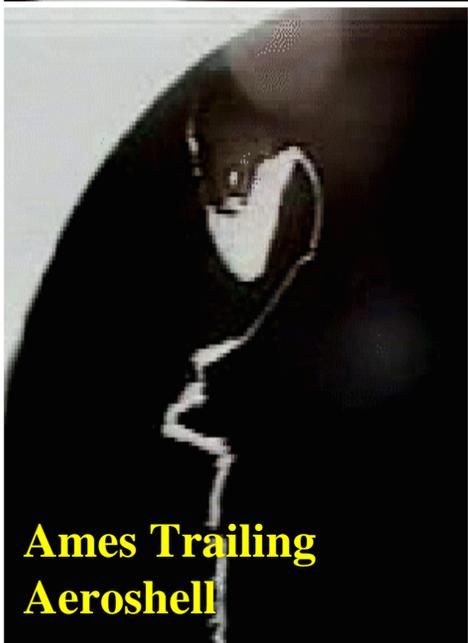
Earle



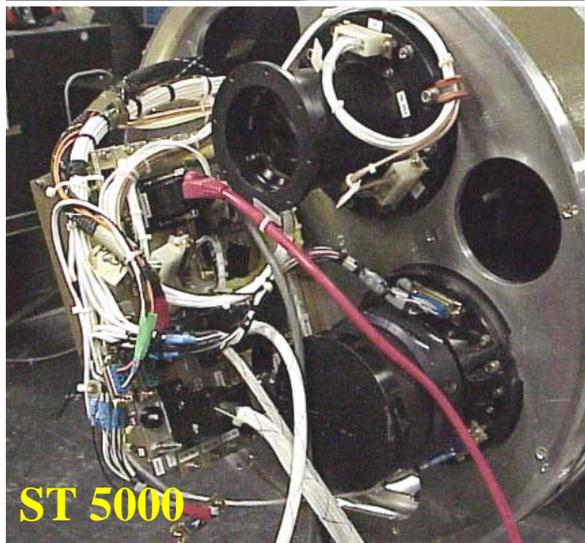
Loading rocket motors in C17 for emergency shipment to Svalbard



Mag ACS firing Jets



Ames Trailing Aeroshell



ST 5000

Photo Journal



FY03 Mission Results

- 27 Missions
 - 22 NASA
 - 5 Reimbursable
- 24 Successful Missions
 - 19 NASA
 - 5 Reimbursable
- 3 Mission Failures
 - Experiment focus/bending problem due to ascent heating
 - Terrier-Orion vehicle failure (interstage clamp system)
 - Experiment high voltage power supply problem



Recent Significant Accomplishments

- Flt Demo of NSROC Magnetic ACS (NMACS)
 - Two flights (low & high spin rates)
 - Verified system for Kwaj and Svalbard missions
- Development of NSROC Inertial ACS (NIACS)
- ST5000 Star Tracker airbearing tests
- GPS Event Module (GEM) flight tests
- GLNMAC Flight Test
- Low-Cost PCM Encoder test flight
- Kwajalein Preparations
- Svalbard Preparations



FY04 Launch Schedule



FY 2004			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
#	Vehicle Type	Mission												
WALLOPS ISLAND														
1	Terrier Orion	KANE/PENN STATE UNIVERSITY	▲											
2	Orion	LAUFER/UNIVERSITY OF VIRGINIA	▲											
3	Test Vehicle	KRAUSE/NASA-NSROC	▲											
4	Test Vehicle	KRAUSE/NASA-NSROC										△		
WSMR														
5	Black Brant IX	FELDMAN/JHU			▲									
6	Black Brant IX	MOSES/NRL			▲									
7	Black Brant IX	JUDGE/USC			▲									
8	Black Brant IX	STERN/SWRI				△								
9	Test Vehicle	KRAUSE/NASA-NSROC					△							
10	Test Vehicle	KRAUSE/NASA-NSROC									△			
11	Black Brant IX	RABIN/GSFC										△		
12	Black Brant IX	WILKINSON/UNIV. OF COLORADO										△		
13	Black Brant IX	KANKELBORG/MONTANA STATE UNIV.											△	
14	Black Brant IX	NORDSIECK/UNIV. OF WISCONSIN												△
NORWAY														
15	Black Brant X	KINTNER/CORNELL UNIVERSITY				△								



NASA Philosophy Trends

- All NASA projects must comply w/ new Program Project Guidelines (ISO)
 - Impact
 - Development of Project Plans (GPG 7120.1)
 - Failure/Anomaly Reporting (GPG 8621)
 - More formal risk management
- Independent Technical Authority (ITA)
 - One of the outcomes of the Columbia Accident Investigation Board (CAIB) report
 - Increased NASA contract oversight
 - Tendency for NASA to have more participation in experiment development (from SRPO perspective)



NASA Philosophy Trends (cont)

- Code 800 (Suborbital and Special Orbital Projects Directorate)
 - Less tolerant of failures on \$1M+ missions
- Code 810 (SRPO)
 - Will tailor new documentation requirements to NSRP philosophy
 - Do not anticipate change in payload testing approach
 - Will apply more scrutiny into problems that are discovered
 - More investigation in to “cause and effect”
 - More engineering analysis & less “seat of the pants”
 - Will advocate more upfront design collaboration between NSROC, NASA, and PI’s



Budget





Budget Issues

- Kwajalein costs
- NSROC cost overrun
- Rocket motor purchase
- Mobile/Foreign campaigns and missions
- Technology Funding
- Effects of Full-cost Accounting



Kwajalein Campaign Costs

- Operations cost currently at ~\$4.5M
- Cost reduction strategies include:
 - Drop plans for Illeginni launch site
 - Find lower cost method for shipping
 - Provide technical support to Kwaj with payment in terms of reduced costs
- Impact to SRPO:
 - Consumed all FY04 contingency
 - Less carry-over into FY05
 - Could not accommodate requests for additional flights from WSMR in FY04
 - Pushed program to the edge financially



NSROC Cost Overruns

- **Causes**
 - Heavy mission load in FY02
 - 30 NASA missions conducted (includes 3 met rockets)
 - Consumed hardware that had to be replaced in FY03
 - FY03 mission load
 - 27 total missions conducted (22 NASA and 5 reimbursable missions)
 - Budget may only be able to support 20 missions (or less?)
 - Transition to in-house ACS
 - SVC and Aerojet contracts were still required as back-up
 - In-house development effort drove up labor costs



NSROC Cost Overruns (cont)

- **Resolution**

- Covering FY03 overruns

- Apply reimbursable funds tagged for Oriole motor purchase
 - Drawdown carryover (even more...)
 - Rely on reimbursable benefits to cover costs rather than support new efforts
 - Borrow remainder of overrun balance against FY05 budget

- Avoiding the overruns in FY04 and outyears

- Eliminate SVC subcontract
 - Eliminate Aerojet subcontract (ASAP in FY04?)
 - Scale back to affordable mission model
 - No longer run an annual hardware deficit
 - More strategic manifest planning



Rocket Motor Purchase

- Kwajalein and FY03 cost overruns require the SRPO and NSROC to be creative with rocket motor procurements
 - Oriole vehicle demonstration flights will be conducted with motors borrowed from NSWC
 - Allows the demos to be completed earlier
 - Allows motor performance verification before delivery of NASA motors
 - Northrop Grumman is working to purchase first batch of 6 Oriole motors with deferred billing to NSRP
 - Allows order to be placed earlier
 - Shifts costs into FY05 where they can be better absorbed
 - May try to combine NASA, NSWC, and Australian orders to reduce costs by \$92K - \$136K per unit
 - Looking at placing order in March 2004

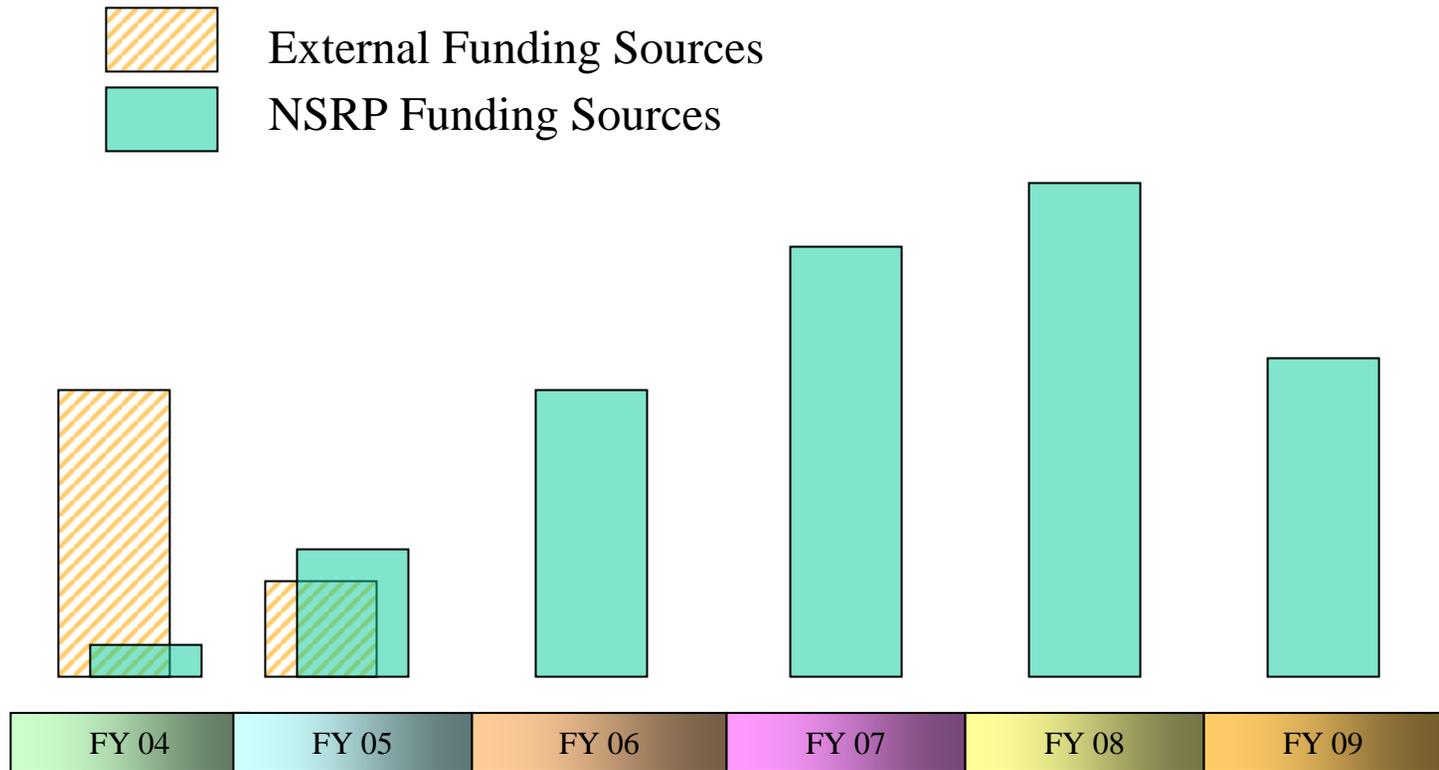


Mobile/Foreign Campaigns

- Need to conduct more analyses on existing mobile and foreign missions
 - Cost Phasing
 - Cost Effectiveness
- May need to shift more costs into FY05



Anticipated Technology Funding Profile



- *Impact of full-cost accounting makes data uncertain*
- *Funding is phased later than desired*



Full-Cost Accounting

- True budget is not known at this time
- Need to ensure we do not lose out during the switch over
 - Ensure CS and Contractor labor costs are adequately funded by HQ
 - Ensure Code Y funding is not eliminated



Technology Development





Vehicle Development Funding

- Existing SRPO internal funds being used to support Oriole vehicle development
- Augmenting the budget:
 - Leveraging Terrier-Oriole work being done by Naval Surface Weapons Center
 - Leveraging Next Generation Launch Technology (NGLT) funding for higher-performance Oriole development
 - Flying Ames experiments on test rounds in exchange for vehicle development funding
 - Tapping into JPL New Millennium funds to help support development

Oriole Vehicle Development



• Terrier-Oriole

- First flight scheduled for July 2004
- Development effort being conducted by the Naval Surface Weapons Center (WSMR)
- NSROC is participating in the development effort along with other contractors

• Talos-Oriole

- Flight demo will be conducted in July/Aug 2004
- Primary funding is from SRPO budget
- Additional funding to be provided by JPL and Ames
 - May be used to support JPL New Millennium Proposal
 - 1st flight will carry Ames lifting wedge

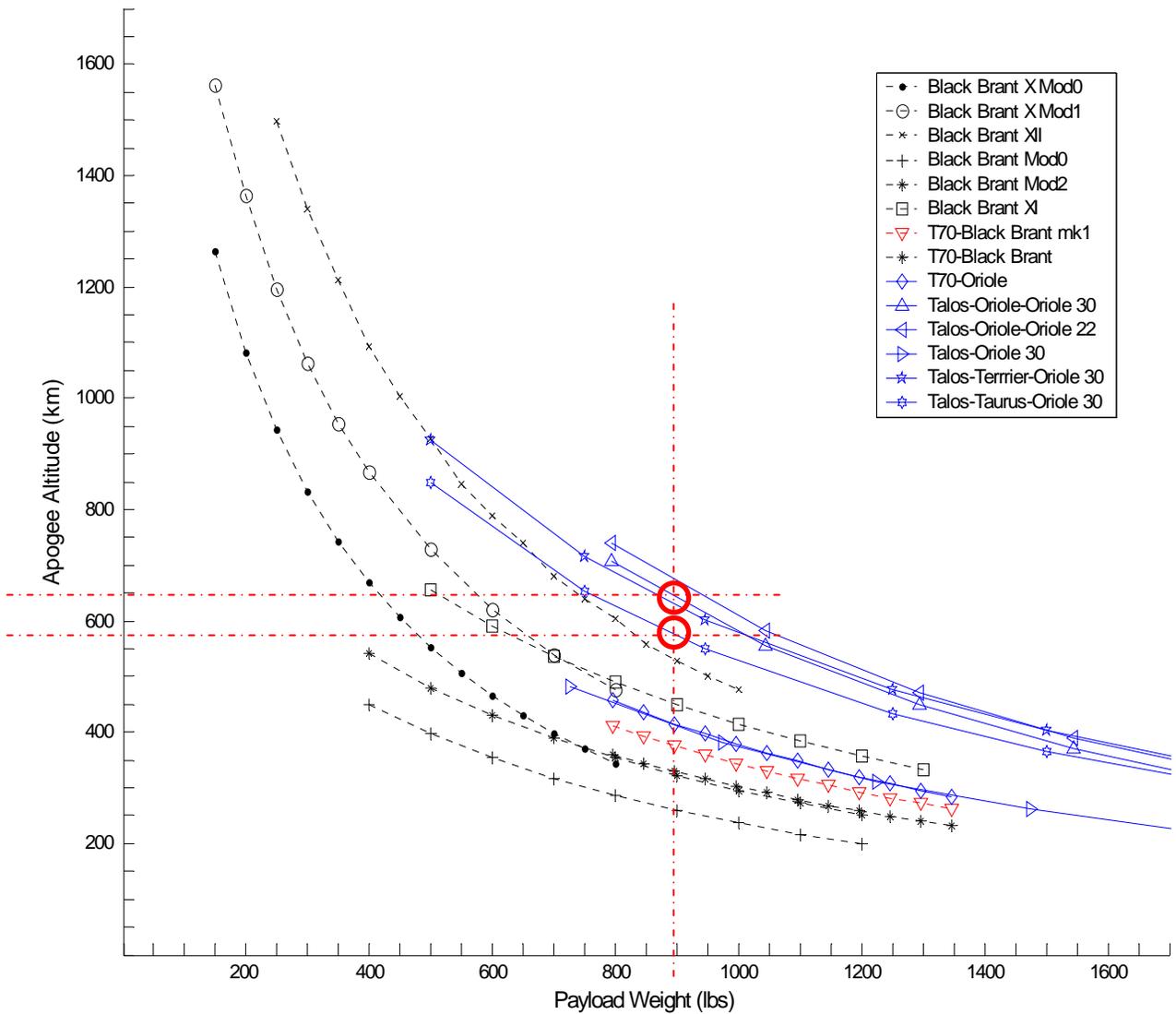


Oriole Vehicle Development

- **Talos-Oriole-Oriole (TOO)**
 - Flight Demo will be conducted Sept 2004
 - Supporting Next Generation Launch Technology (NGLT) effort
 - SRPO is assuming limited application to NSRP due to vehicle cost
 - ~600K more expensive than proposed TTO
 - Provides ~13% better performance over proposed TTO
 - Tapping into NGLT and Ames funding
 - Some design elements to be applied to TTO & Talos-Oriole
- **Talos-Taurus-Oriole (TTO)**
 - Will rely on BBXI 1st and 2nd stage configuration
 - Will leverage third stage TOO design
 - First flight anticipated in late FY05



Sounding Rocket Vehicle Performance



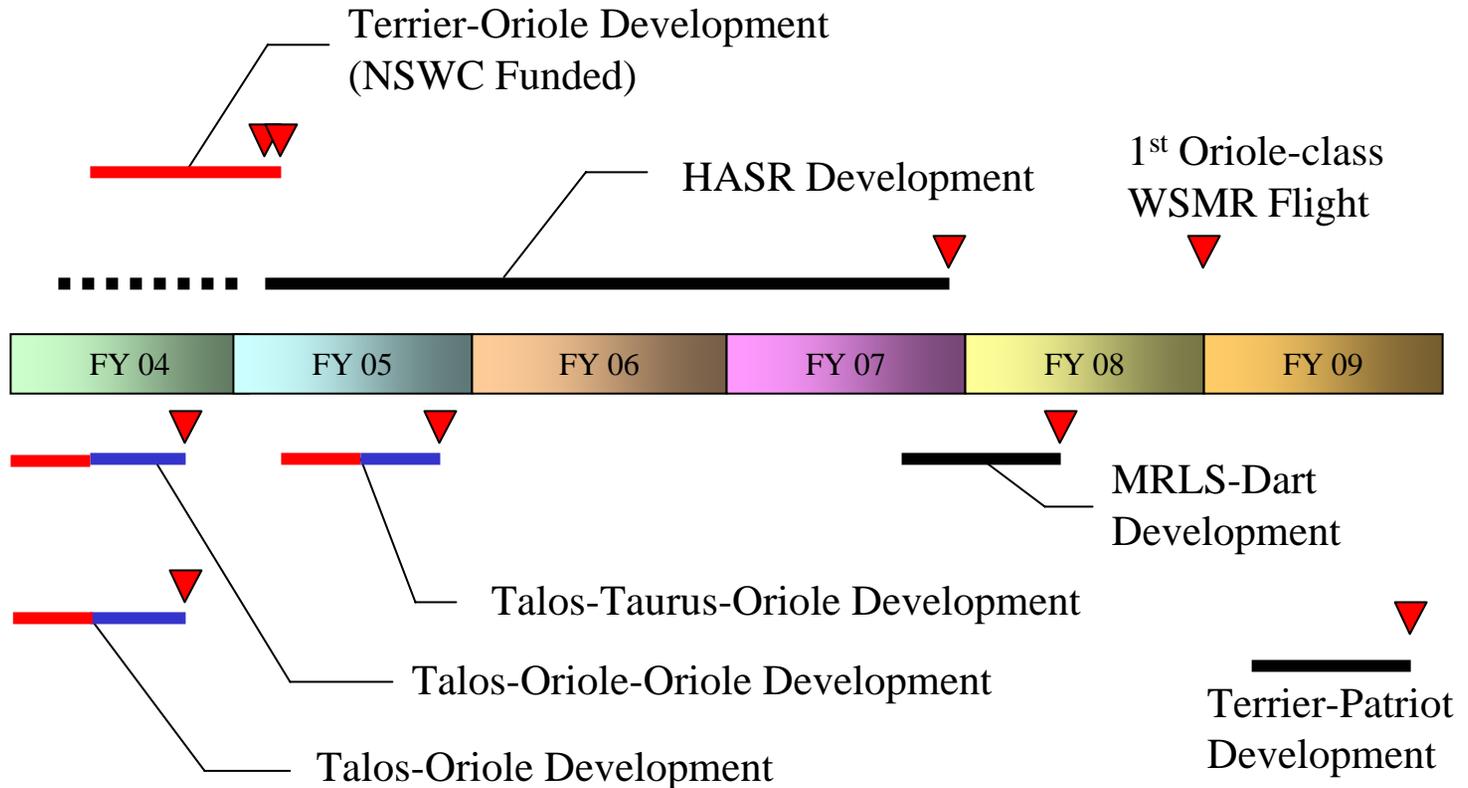


High Altitude Sounding Rocket

- Established Detailed Formulation Team
- Conducting performance analyses to satisfy the range safety requirements
- Performing link analyses for flight termination system, PL telemetry, radar tracking
- Assessing infrastructure needs to support HASR missions
- Project Plan nearing completion



Vehicle Technology Development Timeline



Phasing is based on current anticipated funding profile and is subject to change.



Subsystem Development Funding

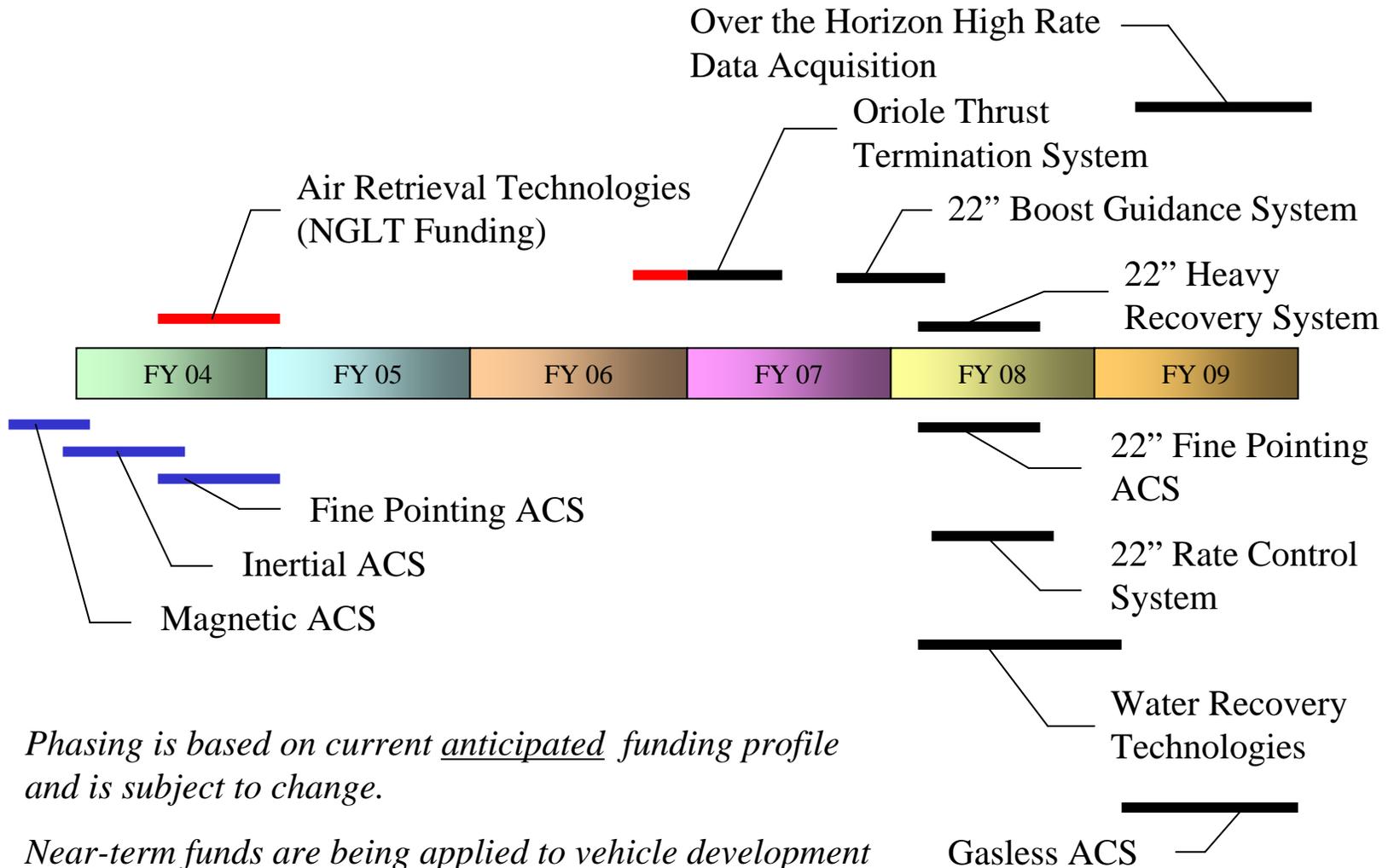
- Budget reflects increased funding for subsystem technology development starting in FY07
- Current funding projection has a lot of uncertainty
- Current phasing results in development efforts starting later than desired



Subsystem Development

- Standard 17.26” diameter subsystems
 - Used for initial Oriole missions at ranges that do not require guidance and thrust termination systems (TTS)
- 22” diameter subsystems
 - Will be more versatile than 30” systems
 - Can be used to support both Oriole and Brant missions
 - Work on 22” subsystems is planned to begin in FY07
- Thrust Termination System
 - SRPO will leverage FTS work being conducted by the Naval Surface Weapons Center
- Subsystem Development plan will accommodate 1st WSMR Oriole flight in FY08/09 time frame

Subsystem Technology Development Timeline



Phasing is based on current anticipated funding profile and is subject to change.

Near-term funds are being applied to vehicle development while far-term funds are being applied to subsystems needed to expand the capability of the vehicles.



Upcoming Tech Demo Flights

- Talos-Oriole
 - 12.055 WFF/July-Aug '04
- Talos-Oriole-Oriole
 - 12.XXX WFF/Sep '04
- NIACS
 - 12.054 WSMR/Feb '04
 - 12.056 WSMR/May '04
- ST5000
 - 12.054 WSMR/Feb '04
 - 12.056 WSMR/May '04
 - Nordsieck WSMR/Sept '04



Far-Out Concepts

- Glide-back Payloads
 - Ames has proposed that WFF join team to demonstrate glide-back rocket motor concept
 - May have applications for payload recovery
- Inflatable Aeroshell Decelerator
 - LaRC wants WFF to collaborate on low-cost demo
 - May have applications for high-energy reentry (BBXII or HASR)



Findings

June 26, 2003 Meeting





I. Oriole Launch Vehicle Development

- *The SRWG would like to understand better the Oriole development plan and how it interacts with other programs such as HASR*
 - *Funding for support subsystems*
 - *Funding for initial motor buy*
 - *Potential impact on flight rate of existing configurations*
 - *Schedule*
- Oriole capabilities are being developed with internal funding and outside funding sources
- Oriole vehicles could be used at WFF, Poker & Norway as early as FY05/06
- Technology funding profile pushes Oriole flights at WSMR out to FY08/09 timeframe



II. Nihka Motor Availability

- *The SRWG is alarmed to learn that Nihka motors are no longer being manufactured.*
- Plan
 - DTI has “Cardinal” rocket motor on the drawing board
 - ATK (Elkton) may be interested in developing a similar system based on its ASAS technology
 - Bristol has expressed interested in developing a Nihka replacement
 - Proposed Process
 - Establish forward looking requirements (ASAP)
 - Issue RFI (ASAP)
 - Estimate funding needs and required schedule
 - Hold design competition
 - Build motors



III. Mesospheric Sounding Rocket

- *The SRWG strongly encourages Wallops to continue development of the Mesospheric Sounder*
- MRLS motors were shipped to WFF on Jan 9th
- Dart mechanical design will be based on exiting 4” dart concept
- Current plan calls for system development in the FY07-08 time frame

IV. Water and Air Recovery from Wallops



- *The SRWG underscores the clear and pressing need to develop as quickly as possible the technologies required to support the recovery of heavy, high flying payloads launched from Wallops*
- Air retrieval technologies are being developed under an ongoing NGLT effort
 - Parafoil w/ helicopter air snatch
 - Currently looking at 800 lbs weight class
 - Demo of capability set for late FY04
 - Funded by NGLT
- Advanced water recovery technology development can not be funded until FY09 time frame



V. Launches from Wallops

- *The SRWG continues to be concerned about the difficulties of launching out of Wallops due to conflicts with various naval, commercial and recreational ships and boats*
 - *How is the range controlled*
 - *Mission planning obstacles*
 - *General range policies*
- Discussion points:
 - Challenges to launching at WFF
 - Scheduling w/ External agencies (Navy, FAA, fishing tournaments, pony penning)
 - Fishing/pleasure boats
 - Surveillance technique
 - Mitigating the challenges
 - Agreements with VACAPS
 - Night Launches
 - Time of year
 - Use higher performance rockets to avoid fishing/pleasure boat issue



Kwajalein Status

- Illigenni launch site eliminated to reduce costs
- Revised Program Requirements Document submitted to the test range Dec. 19th
- Awaiting official cost estimate from Kwaj
 - Expected in late January
 - Budget situation will be better understood once estimate is in hand
- Operations cost currently estimated to be ~\$4.5M
 - Anticipating a reduction as the result of dropping the Illeginni site
 - Investigating lower cost shipping methods
 - Bartering tech support in exchange for reduced range costs
- Technically, we appear to be in good shape; no major WFF ops issues