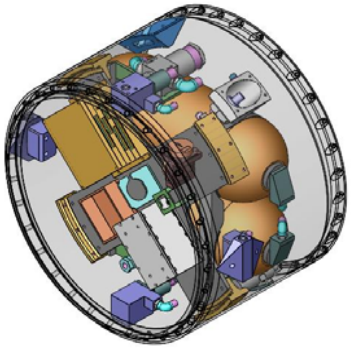
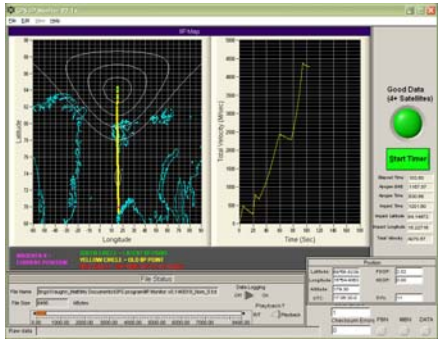


Sounding Rocket Working Group
June 18, 2009

NASA Sounding Rocket Operations Contract (NSROC)



NASA Goddard Space Flight Center

SRWG Agenda - NSROC

NSROC State of Affairs	Rob Maddox
Operations	Jay Scott
Engineering Director	Ricky Stanfield
Chief Engineer	Dave Krause
Electrical Engineering	Shelby Elborn
Mechanical Engineering	Brian Creighton
Vehicle Engineering	Catherine Hesh
ACS/Sensors	Ron Kiefer
SPARCS	Carlos Martinez
Conclusions	Rob Maddox

Program Manager

Rob Maddox

NSROC Programmatic

- Contract Status
  - Current extension expires June 30, 2009
    - Anticipating 1 year extension
  - Received funding relief to increase staff and replenish inventories

- Financial Accounting Status
  - Most issues are resolved concerning transition to One Source SAP
  - NASA Cost reports are now delivered on time
  - Significant budget tracking this period to meet SRPO budget guidance

- ITAR Status
  - Most TAA's are progressing well
  - Some provisos have restrictions on foreign national grad student interaction with Universities. This is being addressed between NASA HQ and Dept of State.

NSROC Programmatic

Subcontract Status

- Significant hardware orders in place. Evergreen clause allows delivery of hardware up to one year beyond contract extension end date.
- Bristol
  - 18 Black Brant motor buy – 90% complete
  - 15 Black Brants & 9 Nihka motors buy – beginning production
  - Technical concerns developed with last 3 Black Brant motors produced
- Saab – Recently acquired by RUAG Holdings, Switzerland
  - New name is RUAG Aerospace Sweden AB
  - S-19 Conversions are on track
  - Considering (3) S-19D to S-19L conversions
- Univ of Wisconsin – On going support for ST 5000
- PSL – On going support for instrumentation and WSMR ground stations
- Anderson Metals – Significant orders for nosecones and ancillary hardware
- Troy 7 – Woman Owned Small Business from Huntsville. Provides post flight data analysis. Approx 2 FTE's per year

NSROC Programmatic

- Reimbursable Business
  - US Navy Aegis targets– Terrier Orion & Terrier Oriole from PMRF
  - ASAF Airborne Laser – 10 BBIX Missions from San Nic, CA
  - Max Launch Abort System (MLAS) – Significant fabrication and integration effort
  - MDA Next Generation Sensor Program (NGSP) – Another BBXI from WFF
- New business marketing has slowed due to end of contract. Most reimbursable work is now from returning customers.
- Several Technical Spinoffs from reimbursable customers.
- Hardware economies of scale being realized.

Operations

Jay Scott

NSROC Operations

- Finding #6 from December 2008 SRWG
  - Close out reports
    - FTP site set up in late 2005 as a result of Jan 2005 finding #5
    - Not much traffic
    - Will e-mail close out reports
    - What other requirements?
  - Mission web site
    - What are desires/requirements?
      - Pictures
      - Dialog
      - Static documents

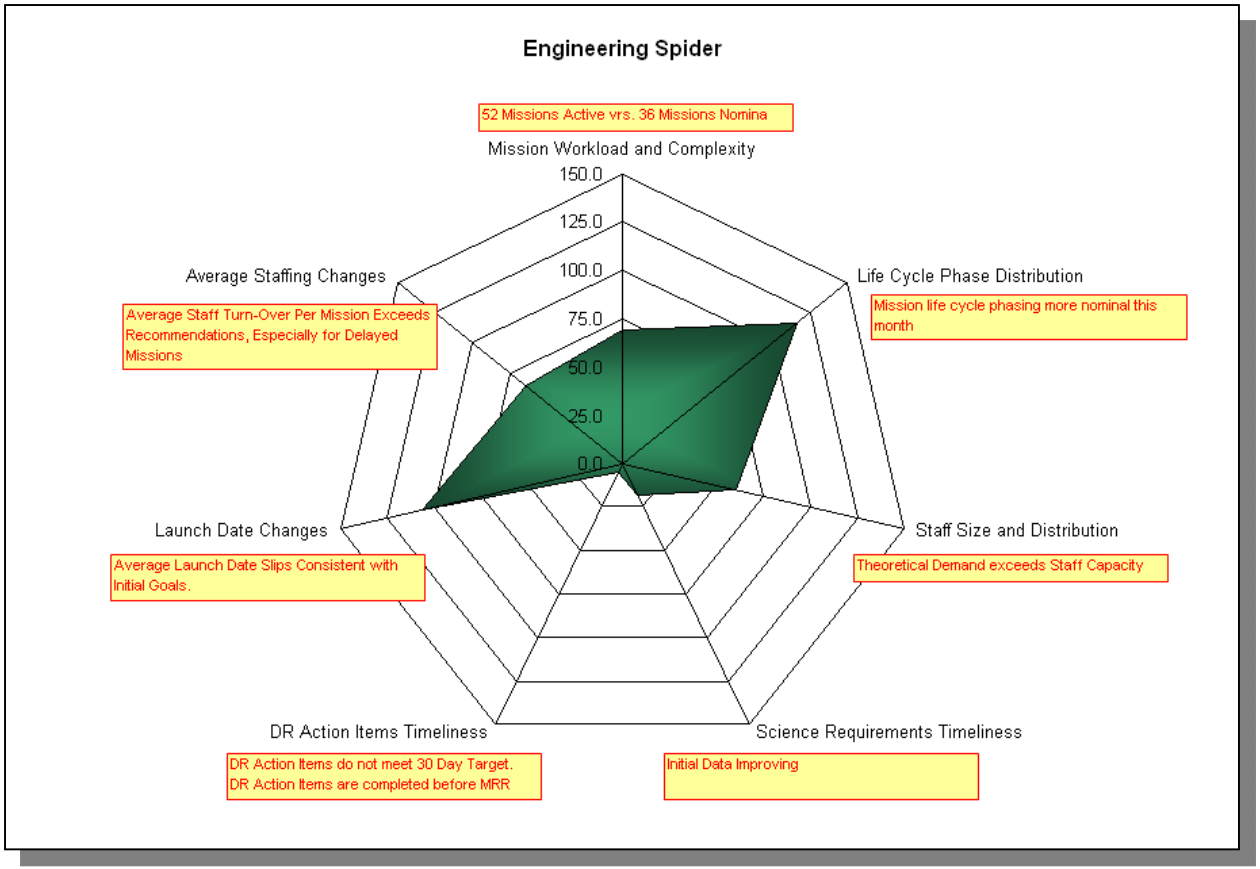
Engineering Director

Ricky Stanfield

NSROC Engineering Management

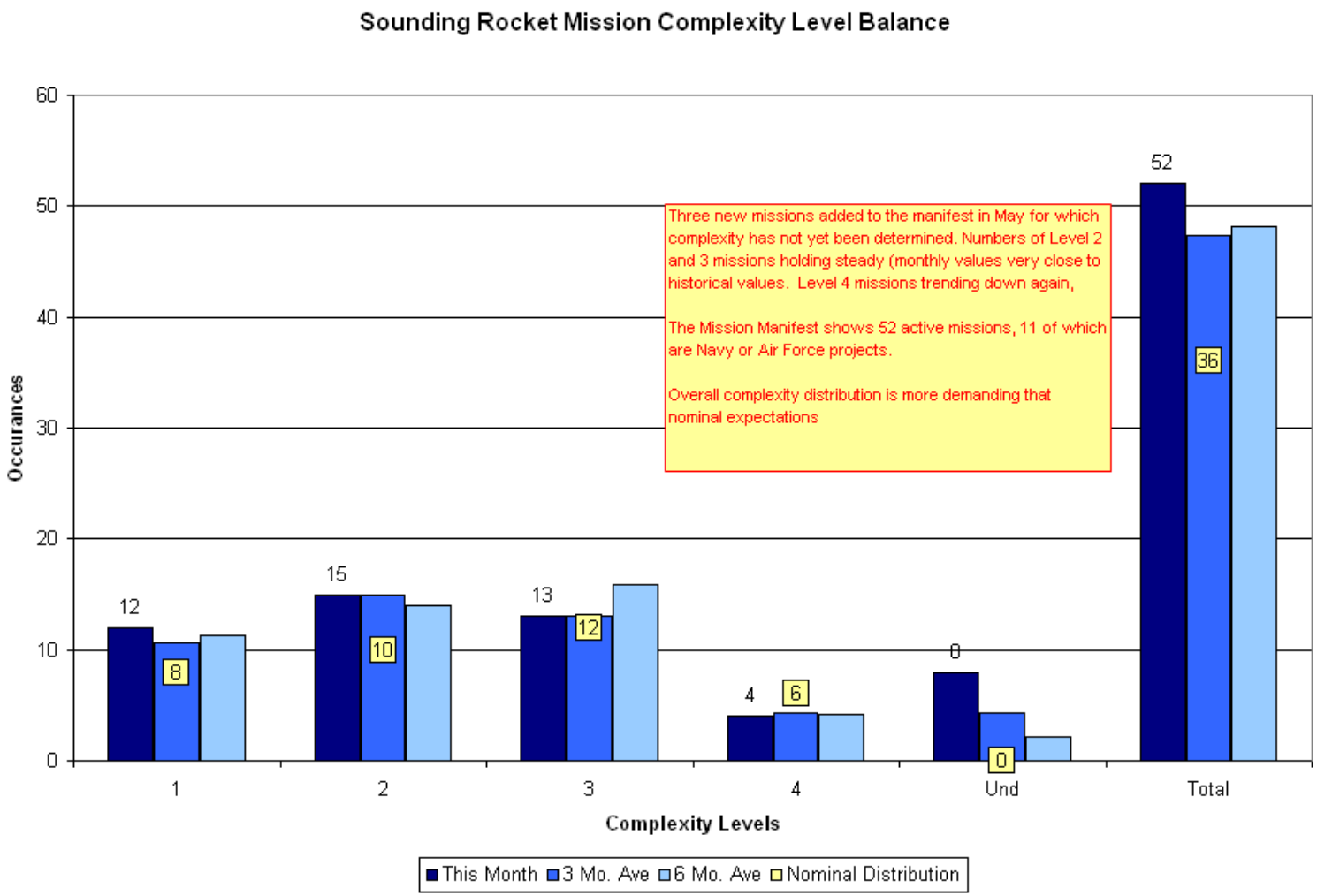
- NSROC Engineering Objectives
  - Flexible support of NASA Sounding Rocket Program PI's
  - Responsiveness to changes
  - Preservation of SRPO cost targets
- NSROC Engineering Leading Indicators
  - Tracking of six parameters that are indicators of engineering performance
- NSROC Risk Management Activities
  - Update on risk management efforts across the NSROC program
- Configuration Management
  - Configuration Control Board activities
  - Change Request process update
- Engineering Staffing
  - Overview of engineering staffing

Engineering Leading Indicators

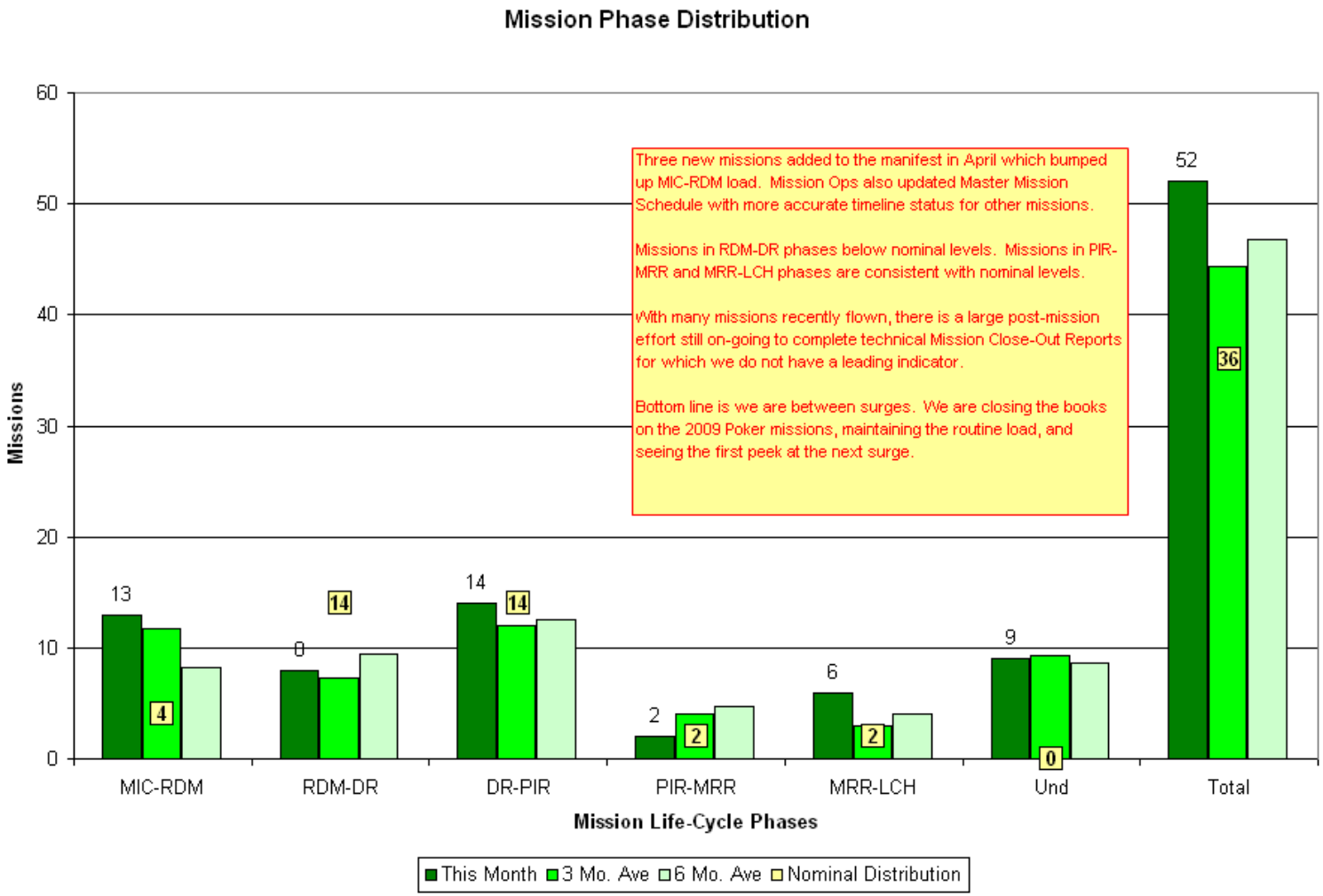


- NSROC has studied the contributing factors to mission success from an engineering process point of view
- We've modeled a monitoring process after the NGTS Leading Indicators example
- Engineering has defined six leading indicators that we are monitoring
- These Indicators will help us balance responsiveness (flexibility) with quality (reliability) and with cost

Engineering Leading Indicators



Engineering Leading Indicators



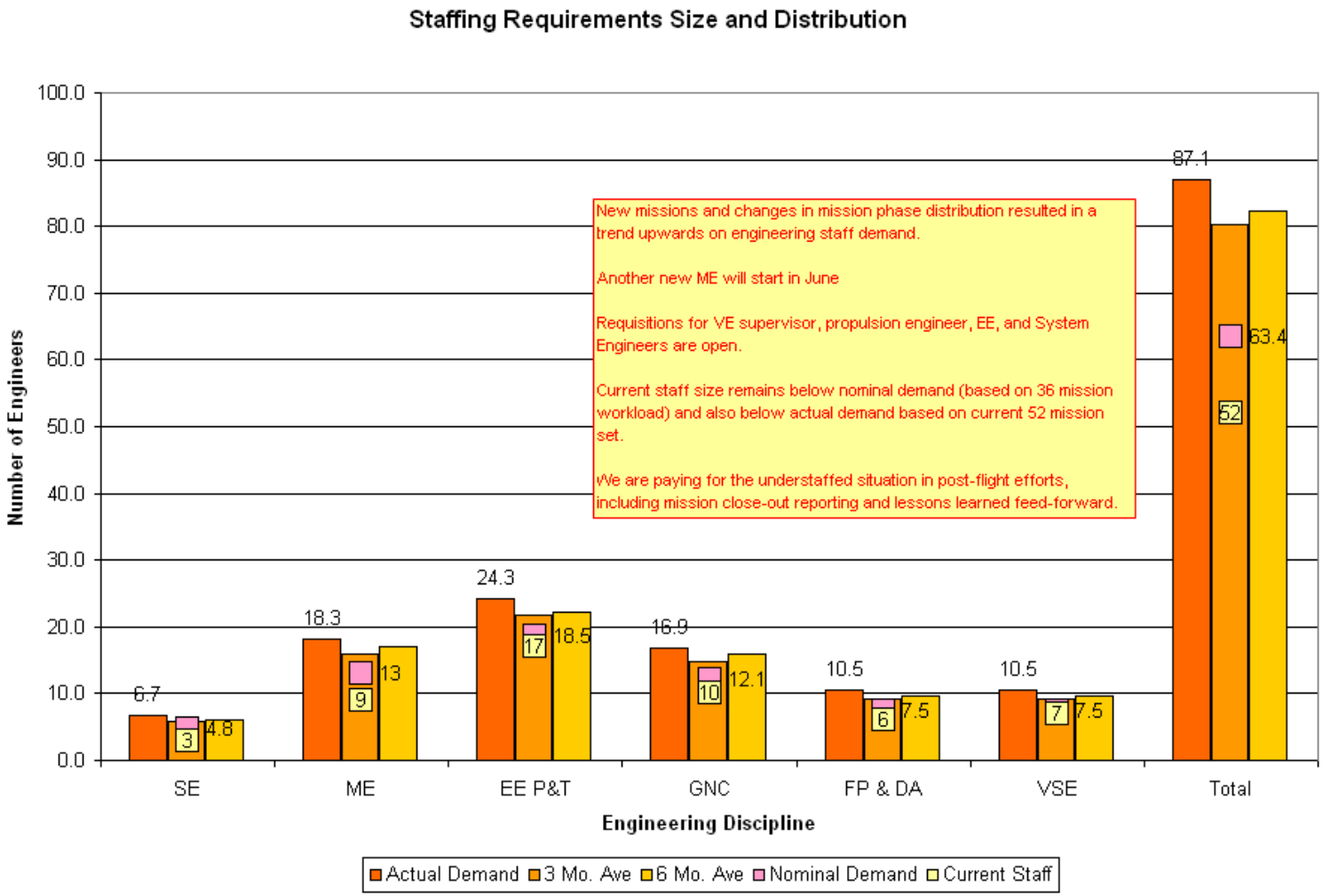
Three new missions added to the manifest in April which bumped up MIC-RDM load. Mission Ops also updated Master Mission Schedule with more accurate timeline status for other missions.

Missions in RDM-DR phases below nominal levels. Missions in PIR-MRR and MRR-LCH phases are consistent with nominal levels.

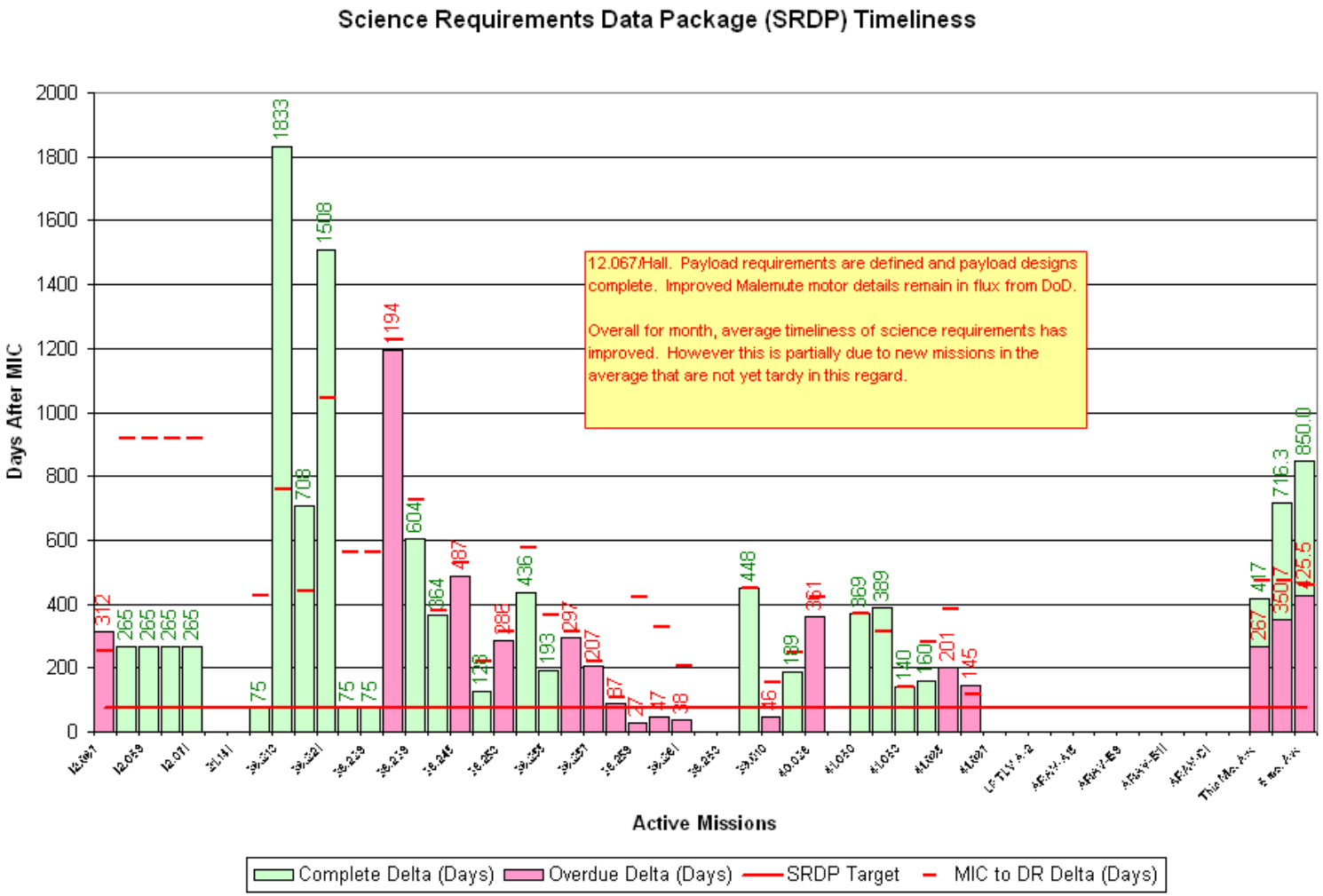
With many missions recently flown, there is a large post-mission effort still on-going to complete technical Mission Close-Out Reports for which we do not have a leading indicator.

Bottom line is we are between surges. We are closing the books on the 2009 Poker missions, maintaining the routine load, and seeing the first peek at the next surge.

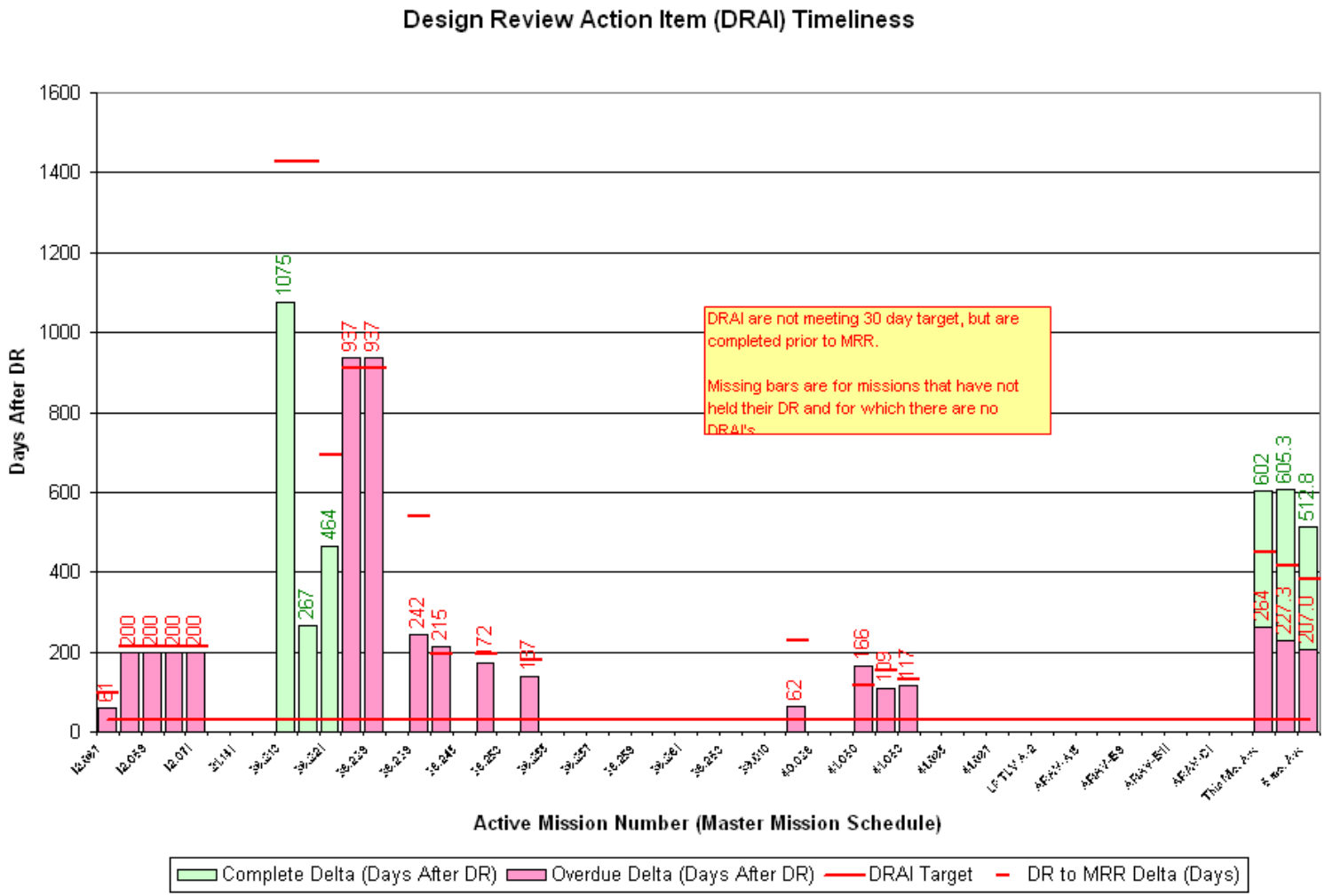
Engineering Leading Indicators



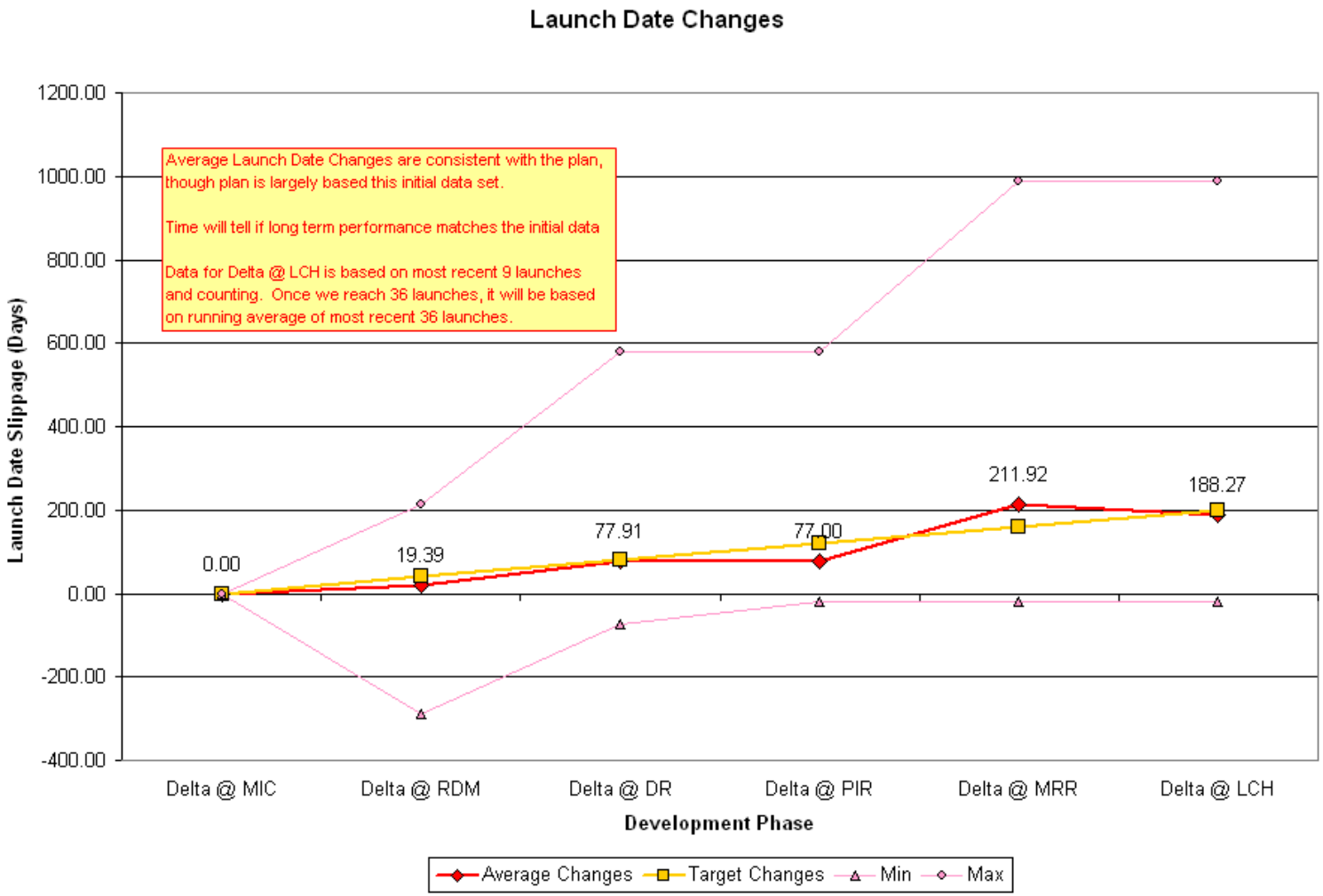
Engineering Leading Indicators



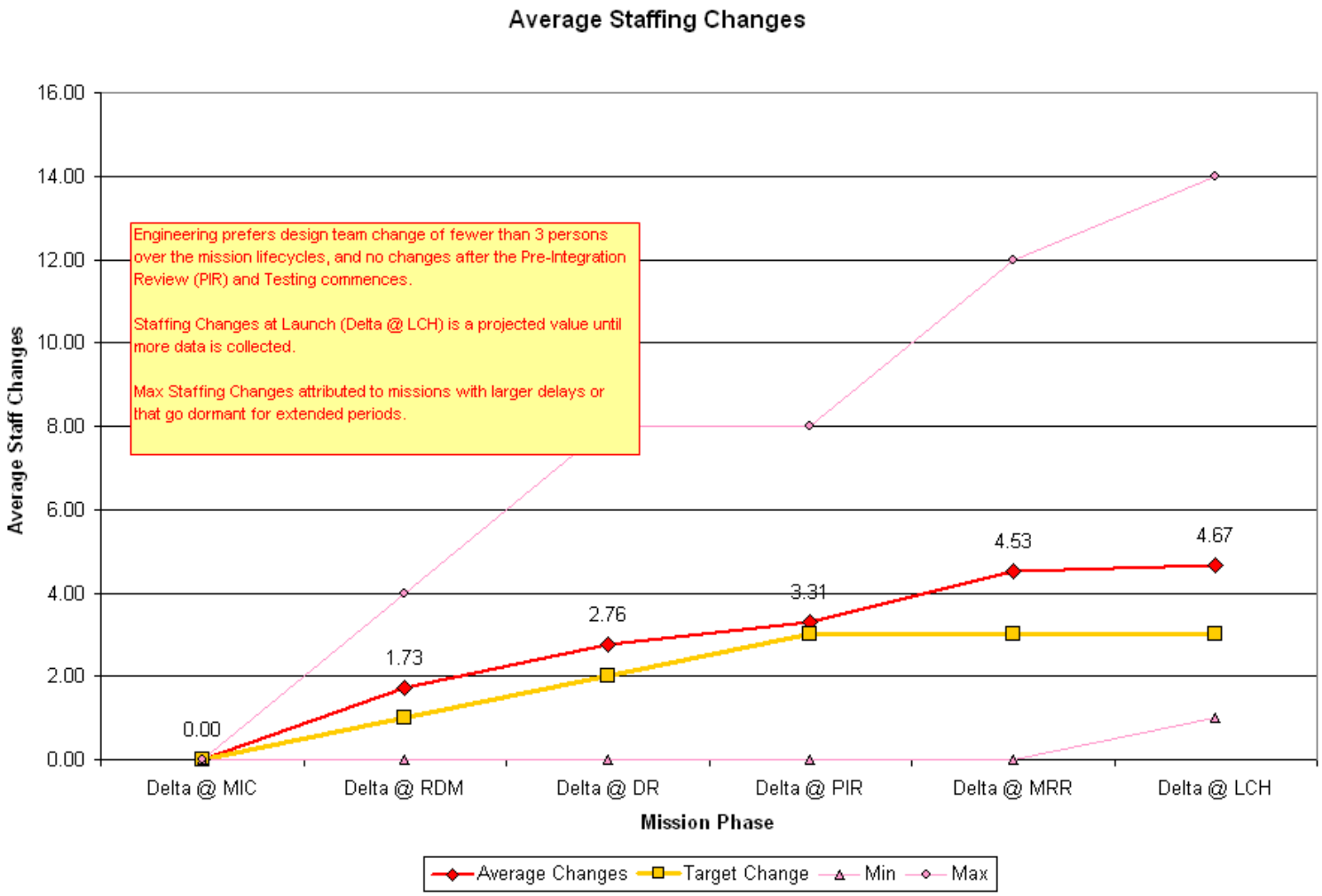
Engineering Leading Indicators



Engineering Leading Indicators



Engineering Leading Indicators



Risk Identification and Tracking

- The Integrated Risk Summary (formerly known as the Engineering Risk Summary) continues to be our main risk identification and tracking tool
  - Identifies risks by mission and engineering discipline
  - Tracks issues to closure with severity and mitigation notes
  - Tracks trends by department across all missions
  - Expanded to include programmatic and mission operations risks
- Matrix is updated each week
  - Reviewed with engineering leads monthly
  - Provided to SRPO as reference
  - Will be maintained by Systems Engineering with SQA Support
- Implemented Improvements
  - Revised color code to reflect NASA Risk Management Guidelines
  - Expanded legend of symbols
  - Defined in new ISO Process
- Future plans include a migration to a MS Access version

Integrated Risk Summary

NSROC Integrated Risk Summary 6/8/2009

Likelihood / Consequence	1	2	3	4	5
5					
4					
3					
2					
1					

(N): Note, General
(R): Resolved Item
(W): Watch Item
(LC): Risk Item Ratio
(M):Mitigation
(Inc):Innovation
(LL):Lesson Learned
(CR): Change Request
(NCR): Non-Criminice
(CATS): Cmctv Action
(/): Risk Increasing
(-): Risk Holding
(\): Risk Decreasing
(AR) Accepted Risk

NSROC Integrated Risk Summary

Mission		Engineering Risks: Systems	Flight	Mechanical	Power	Telemetry	Guidance	Boost	Vehicle	Launcher & GSE	Operations and Business Risks: Schedule	Cost	Science	Range Ops/Safety	Staff Name [Changes]	Procurement
LPTLV2	Rodriguez										MIC RGM DR PR MRR LCH L@M DSF MCR				MM Name [0] FP Name [0] ME Name [0] PWR Name [0] TM Name [0] GNC Name [0] DP Name [0] VSE Name [0]	
36.244 (S711) [LVL 2]	Green	HV not in Vac Section (R) INT at WFF (R) Overlap Dock Team (R) WSMR Conflicts Cash and ARAV (R) Internal Exp Heaters (R) (LL) Full WFF Testing to avoid DRL Testing @ WSMR	Stability Marg's (W) M: Trade Light/Ballast M: Watch Roll/Pitch Respns MDA/FP on Mass Props (R)	Experiment Bumpers (W) M: Contingency Plans ME DWG Submit (R) M: Josh Up to Date Burn Air Ballast Ring (R) M: End Gap and Flow Size Waiver (W) M: Robust PI Parts	Bad Pack Bad Cells (R) M: Relate to IRVE Cells M: Replace Pack Pre-Engt M: Alert MLAS Users Results: Batt Margins (R) M: Use Measured Loads	Eliminator Data (TM) M: Active LPF Drop Vehicle for Fiber TCs Special Grd PSL Counter Deck (R)	CACS - No Issues M: Linear Thrust Models New PIL Alignment (W) M: ACS Scan Forced. Airbase Star Field Test (W) M: Verify Test is Suffic. Re-Zero Algn in Scan (W) M: Exp to verify if need to re-zero at scan steps	S-19 L (R) W: Verify Autopilot Missing Grd to TM (R) N: Not a Risk, but goes noisy data	1230 Ib Parachute (W) M: Rive Chute X-Rays Reentry Margins (W) Need New TTS (R) M: Stock Bolted Sys. TTS Ring (R) M: In Stock Flex Flight Test 2 (W) W: Flex Delivery W: Acquire vehicles Dal NAR Decision ASAP post-fit for Production		MIC RGM DR PR MRR LCH L@M DSF MCR	10/1/07 4/30/09 10/29/09 3/30/09 5/13/09 est 6/21/09 3/21/09			New PIL ITAR Exp Vib Issues (W) M: Excessive Motion		MM Payne [0] FP Kilcoyne [0] ME Wroblewski [0] PWR Amey [1] TM Amey [1] GNC Kapellan [1] DP X [0] VSE Wroblewski [1]	
36.228 (S510) [LVL 2]	MARTI		Low GS (60°) San Nicolas Ops	All Trans V-Band (S/G) M: Fitting in Groove M: Inspect and Report					Large Motor Tech Demand Motor Painting Process		MIC RGM DR PR MRR LCH L@M DSF MCR	4/2/09 1/11/08 1/17/08 4/5/09 5/5/09 est 6/30/09 1/2/08					MM Gass [0] FP Kilcoyne [0] ME Yaccobucci [1] PWR Murray [1] TM Murray [1] GNC None [0] DP X [0] VSE Hesh, C. [3]	
36.229 (S511) [LVL 2]	MARTI	Work Hour Limits (R) N: Issue #2 Launches M: SPO to rev Schedule PIL Bracket Removal (R) N: When and how to remv. Spark Arrester on Bucket Truck (W) M: MM to Investigate	Low GS (70°) (R) M: Egress Analysis Done San Nicolas Ops Longest Bulbous Section Ever (R) Use of Aero Preps for Both Missions (W) M: Rb Delta to Actuals M: Monte Carlo + RMS		Zero Switch Tolerns (S/S) M: SK Zero 4.16 Ign Alt M: Murray to Compare Fiber Use Allocate (R) M: Murray to Confirm M: Terminals, Margins	MIT Data to NSROC (W) M: Health/Status Data			Motor Tech Demand (R) M: Teams assigned M170-B8 Mkt Mod 2 1st Painted B8 (Grey) 1st Gard Blast Structures Launcher Load Test (W) M: Data from Navy???		MIC RGM DR PR MRR LCH L@M DSF MCR	4/2/09 1/11/08 1/17/08 4/5/09 5/5/09 est 6/30/09 1/2/08			At MRR one DRAI Open N: TR Overlaidon Data M:		MM Gass [0] FP Kilcoyne [0] ME Yaccobucci [1] PWR Murray [1] TM Murray [1] GNC None [1] DP X [0] VSE Hesh, C. [3]	
41.083 (S815) [LVL 2]	Koehler [Kay-Lef] (Rock-On II)	Vib "Customer" Cons (W)	Stability and P/L Legth (R)	Need Add'tional Parts (R) Two Exp Sections (R) Rem-Air Pressure (W) Burst Pressure or Section Will Do Check Balance Force Cons to be 20lbs? N/C Heat Analysis (1/5)	Strut Plug for Exp (R) Must add Beacon & Antenna post D.R. (R) Alt-To add Beacon	Beacon or Skin Track (W) M: Beacon added @ DR.			M512 Testbrep (R) Bayonet Margin (R) M: At 24% Good RBAN Loads a 10% Lines	Move from MRL to 50K	MIC RGM DR PR MRR LCH L@M DSF MCR	MIC 6/17/2009 RGM 11/3/09 DR 2/4/09 PR MRR LCH est 6/3/09 LCH @ MIC MCO			Launch week stay time (W) Need Success Criteria (R) Details on Mega-win P/L		MM Weaver [0] FP Edwards [0] ME Mandigo [0] PWR Gaell, J. [0] TM None [0] GNC None [0] DP X [0] VSE Serabian [0]	
12.068 (G8___)	Hickman (MESQUITO)	Slide to MM Delay By TecSet II (W) Same as First Flight Pinned at Hardstage				Avionics Readiness (R) M: Qual Unit is Test Now			Cart Fin Design (S/O) M: Yaccobucci Working		MIC RGM DR PR MRR LCH L@M DSF MCR	MIC RGM DR PR MRR LCH est 1/__/09 LCH @ MIC MCO			Need Mission Sched (R) M: Kissee to Determine		MM Name [0] FP Name [0] ME Name [0] PWR Name [0] TM Name [0] GNC Name [0] DP Name [0] VSE Name [0]	Gun Drill Bay (S/S) *Heating up Proposals*
12.069 (G____)	Hickman (MESQUITO)	Slide to MM Delay By TecSet II (W) Same as First Flight Not Pinned at Hardstage				Avionics Readiness (R) M: Qual Unit is Test Now			Cart Fin Design (S/O) M: Yaccobucci Working M: Mar on Fin Attachment		MIC RGM DR PR MRR LCH L@M DSF MCR	MIC RGM DR PR MRR LCH est 1/__/09 LCH @ MIC MCO			Need Mission Sched (R) M: Kissee to Determine		MM Name [0] FP Name [0] ME Name [0] PWR Name [0] TM Name [0] GNC Name [0] DP Name [0] VSE Name [0]	Gun Drill Bay (S/S)
36.252 (S806) [LVL 1]	Cash	Clean Tent is High Bay (W) Radio Active Appnt (R) M: SRPO set w/WSMR M: WFF Got Gity Working Delicate GSM Dist (W) Vacuum on Rail (R) M: Exos Leak into P/L M: Delay HV On M: Pull-Away Pump PI GSE issues w/ Gesar	B8 MK1 Under-Part (R) M: Use Approd Multiplier Long & Heavy (R) M: Watch Wt Growth M: Hard Rolly More Hvy Data Products (R)	Shutter Door to PI (R) Exp Bdrkt to PI (R) Vibrometrs Tri-Lot Str (R) TM Skin Redesign (R) High Pressure Tank (R) Vac Pump on Locher (W) W: Material Buy Delays M: Standard Platform Gate Valve Cvr Design (W)		TM Rain Damage (R) M: TM Checks Success M: NCR closed Active LPF for Vibrat (R) M: Retrofit Per Lows Eplnk for HV On (R) TM Rate (R) M: Constant Next 3 Fts PSL Counter Deck (R) M: Special Order Rind	CACS (R) M: Accel Limits Good M: Truncate Star Cat M: Fixed Sens Cyc Time M: Watch Gas Budget	S-19 L - No Issues (R) W: Reverify Autopilot M: sin 030 Assigned M: Dash 14 Autopilot	1250 ORSA (W) M: Chute at Supplaire M: Repack w New Cutbs Interim TTS 1st Use (R) M: Use STD Bolted TTS ORSA Circuit Test Fit (R) M: Moved to Other Mass Use Around Fins (R) Athena Readiness (R)		MIC RGM DR PR MRR LCH L@M DSF MCR	MIC 5/7/09 RGM 9/12/09 DR 12/11/09 PR 5/14/09 MRR LCH est 6/26/09 LCH @ MIC MCO			Resource Conflict with Green Team (R) M: No Remaining Crafts		MM Payne [0] FP Edwards [0] ME Thompson [0] PWR Banks [0] TM None [0] GNC Kapellan [0] DP X [0] VSE Hesh, C. [2]	

POC: Ricky Stanfield
(757) 824-2197

3 of 10

Configuration Control Matrix

- NSROC continues to populate the Configuration Control Matrix
  - Applies to all NSROC standard systems, processes, assets
  - Now includes Systems Engineering processes
  - Captures top level documents and cognizant engineer
  - Top level documents reference subordinate documents
  - CCB Panel meets once each month to update one engineering discipline
  - Shared with SRPO as a reference
- CCB serves as a forum for focused systems engineering discussion of every standard system
- CCB Matrix is now Adept controlled itself as EN75759
- *CCB is now the review authority for Level II Change Requests (CR)*

NSROC Engineering Configuration Control Matrix - Vehicle Systems Engineering (VSE)

Systems	Cog Eng	Alt Eng	Drawings	Schematics	Procedures	Reports	Other Ref's
Recovery							
ORSA 750	Serabian	Hesh			E5501.49		ER96909 (Bristol),
ORSA 750 - w/ACS Pneumatics	Serabian	Hesh			E5501.49		Process flow (WIP)
ORSA 750 - w/SPARCS mag	Serabian	Hesh		680-12611 (Bristol)	E5501.49		Process flow (WIP)
ORSA 750 - Refurb kit	Serabian						Bill of Materials
ORSA 1000	Serabian	Hesh			E5501.49		Process flow (WIP)
ORSA 1000 - w/ACS Pneumatics	Serabian	Hesh			E5501.49		Process flow (WIP)
ORSA 1000 - w/SPARCS mag	Serabian	Hesh		680-12611 (Bristol)	E5501.49		Process flow (WIP)
ORSA 1000 - Refurb Kit	Serabian						Bill of Materials
ORSA 1250	Serabian	Hesh		680-12600 (Bristol)	ER94817 (Bristol)		Process flow (WIP)
ORSA 1250 - w/ACS Pneumatics	Serabian	Hesh			ER94817 (Bristol)		Process flow (WIP)
ORSA 1250 - w/SPARCS mag	Serabian	Hesh			ER94817 (Bristol)		Process flow (WIP)
ORSA 1250 - Refurb Kit	Serabian						Bill of Materials
Bristol 750 lb Aft Recovery	Serabian	Hesh			VS77831		ER80704 (Bristol), Process flow (WIP)
Bristol 1000 lb Aft Recovery	Serabian	Hesh			VS77831		Process flow (WIP)
Big RMA Aft Recovery	Serabian	Hesh			30-33-1		Process flow (WIP)
RMA 14" Aft Recovery	Serabian	Wrobleswki			ME60371		30-39-2, Process flow (WIP)
Wallops 14" Aft Recovery	Serabian	Wrobleswki					Process flow (WIP)
RMA refurbishment process	Serabian	Wrobleswki					Process flow (WIP)
ORSA refurbishment process	Serabian	Hesh					Process flow (WIP)
Parachutes							
PARANETICS 1000# CROSS CHUTE 2034-100	Serabian	Hesh			VS77249	Flores, Axel. "Paraform Recovery System Design Analysis with 1,100 Pounds Total Weight."	Parachute Packing Records
PARANETICS, 63.5 FT CSS CHUTE 2064-300	Serabian	Hesh			VS77249		
PARANETICS, 750# FLAT CIRCULAR CHUTE 2065-100	Serabian	Hesh			VS77249		
PARANETICS, 750# CROSS CHUTE 2093-300	Serabian	Hesh			VS77249	Alamat, Rakan. "Design Analysis P/N 2093-300 Parachute Recovery System 750 lbs Black Brant Sounding Rocket." 1/8/1999	
PARANETICS, 1500# CROSS CHUTE 2093-200	Serabian	Hesh			VS77249		Parachute Packing Records
RAVEN, 1000# CROSS CHUTE C-52551	Serabian	Hesh	C52551 Rev D		VS77249	Stewart, Allan. Raven Report R-9403004-A. "Design Analysis Report for C-52551 Recovery System for 1000 Pound Payload." 3/11/1994	Parachute Packing Records
RAVEN, 750# FLAT CIRCULAR CHUTE C-52552	Serabian	Hesh			VS77249	Thies, Patrick. Raven Report R1289301. "Decelerator System 750 lb Capacity." 12/23/1989	Parachute Packing Records
RAVEN, 1250# CROSS CHUTE C-52574	Serabian	Hesh			VS77249		Parachute Packing Records
SANDIA, 24 FT FLAT CIRCULAR CHUTE (14" ORION LAND RECOVERY) MOD I-L	Serabian	Hesh			VS77249		Parachute Packing Records
SANDIA, 35-FT FLAT CIRCULAR CHUTE (14" ORION LAND RECOVERY) MOD II-750	Serabian	Hesh	Working New Production DWGs		VS77249		Parachute Packing Records
Parachute Procurement Process	Serabian	Hesh			VS77249		Statement of Work in progress
Ignition							
Bristol BB Ignition Housing	Burkhead	Wrobleswki		680-03606 (Bristol)	ER96740 (Bristol)		VS77037 config definition sheet
NSROC BB Ignition Housing	Burkhead	Wrobleswki	ME56900	See Electrical Sys.			Process flow (WIP)
NSROC BB Ignition/Nihka Crossbar bep Assy.	Burkhead	Wrobleswki	ME51144	See Electrical Sys.			Process flow (WIP)
Bristol Taurus Ignition Housing	Burkhead	Wrobleswki		680-04800 (Bristol)	ER98623 (Bristol)		Process flow (WIP)
NSROC Taurus Ignition Deck	Burkhead	Wrobleswki	ME69352	See Electrical Sys.			Process flow (WIP)
Bristol Nihka Ignition Housing	Burkhead	Wrobleswki			ER83695 (Bristol)		Process flow (WIP)
NSROC Nihka Ignition Housing	Burkhead	Wrobleswki	ME69317(Deck), or ME48954 (Deck)	See Electrical Sys.			Process flow (WIP)
NSROC Imp. Orion Ignition Housing	Burkhead	Wrobleswki	ME44939	See Electrical Sys.			Process flow (WIP)
NSROC Lynx Ignition Housing	Burkhead	Wrobleswki	Adept record 36596	See Electrical Sys.			Process flow (WIP)
Terrier Spin motor/clamp release Deck	Burkhead	Wrobleswki	D35415	See Electrical Sys.			Process flow (WIP)
Talos Spin Motor Deck	Burkhead	Wrobleswki	D33267	See Electrical Sys.			Process flow (WIP)
Improved Malmute	Burkhead	Wrobleswki		See Electrical Sys.			Process flow (WIP)
NSROC Onole VSM	Burkhead	Bradley (EE)					
Thrust Termination							
Bristol TTS Kit	Burkhead	Wrobleswki			VS46737		
Lynx FTS Assembly	Burkhead	Wrobleswki	D43014, D43015				
Bristol Hybrid TTS (Under development)	Burkhead	Wrobleswki		EE76346			
NSROC FTS (Under development)	Burkhead	Wrobleswki					
Tailcans, Motor Adapters, and Interstages							
BB 4-fin Tailcan Assembly	Hesh	Owens					
BB 3-fin Tailcan Assembly	Hesh	Owens					
BB Mod0/Mod1 Interstage	Hesh	Owens					
BB Mod2/Mod3 Interstage fwd half	Hesh	Owens					
BB Mod2/Mod3 Interstage aft half	Hesh	Owens					
Imp. Orion 4-fin Tailcan for single stage	Wrobleswki	Owens	D34471 or ME54293				
Imp. Orion 3-fin Tailcan for single stage	Wrobleswki	Owens					
Imp. Orion Drag Sep Tailcan Assy.	Wrobleswki	Owens	ME44932				
Terrier Clamp Ring for IO drag sep.	Wrobleswki	Owens	ME44954				
Imp. Orion Clamp Rail Tailcan Assy.	Wrobleswki	Owens	D36200				
Imp. Orion motor adapter for RMA	Wrobleswki	Owens	D31750				
Imp. Orion motor adapter for Wallops 14" AR	Wrobleswki	Owens					
Lynx Drag Sep Tailcan Assy.	Wrobleswki	Owens	D34411				
Terrier Clamp Ring for Lynx drag sep.	Wrobleswki	Owens	D34903				
Talos/Taurus Interstage	Wrobleswki	Owens	Adept record 30580				
Nihka Tailcan	Hesh	Owens					
Malemute Tailcan	Wrobleswki	Owens					
Mosquito interstage	Owens	Wrobleswki					
Improved Malemute Tail Can (Under development)	Wrobleswki	Owens	ME71789				

Staffing and Retention

NSROC Engineering Staffing Plan

Engineering Staff		
Stanfield	NG	Director
Krause	OSC	Chief Eng.
Blake	NG	Admin

Location	Guidance				Flight Performance				Vehicle Systems				Systems Engineering			
Wallops Flight Facility	Kiefer	OSC	Eng		Simko	OSC	Eng		Vacancy 1	NG VurV			Vacancy 1	NG VurV		
	Crippen	RSS		Ad	Onions	NG		Ad	Weidner	RSS		Ad	------	------		
	Jennings	ARC	Eng		Disbrow	OSC	Eng		Burkhead	NG	Eng		Cruddace	NG	Eng	
	Kupelian	NG	Eng		Edwards	NG	Eng		Hesh	NG	Eng		Vacancy 2	Not Posted		
	Ozanne	NG	Eng		Kilcoyne	NG	Eng		Owens	NG	Eng		Vacancy 3	Not Posted		
	Tibbetts	OSC	Eng		Power	NG	Mth		Wrobl' Nick	NG	Eng		Vacancy 4	Not Posted		
	Shoemaker	OSC	Eng		Melvin P/T	NG	Eng		Serabian	NG	Eng		Krause	Acting	Eng	
	Benton	OCS	Eng		Vacancy 1	Posted			Scott P/T	NG	Eng		Stanfield	Acting	Eng	
	Gsell P/T	OSC	Eng		Contingent 1	Not Posted			Vacancy 3	NG VurV						
	McPhail	NG		Tek					Vacancy 4	Not Posted						
	Lang	NG		Tek					Contingent 1	Not Posted						
	Doyon	OSC		Tek												
	Scott, Mike	NG		Tek												
	Corson	NG		Tek												
	Snyder P/T	NG		Tek												
	Miller P/T	NG		Tek												
	Bowden	NG 6/8/09														
	Vacancy 2	Not Posted														
	Contingent 1	Not Posted														
WSMR	Martinez, C	OSC	Eng						Christensen	OSC	Eng					
	Grzelachows	NG		Ad					Evans	OSC		Tek				
	Martinez, J.	OSC	Eng						Evavold	OSC		Tek				
	Harmon	OSC		Tek					Vacancy 2	NG/wsmr						
	Starr	OSC		Tek												
Totals	Engineers		10				6				7				3	
	Non-Engineers			11				1				3				0

Location	Electrical				Mechanical				Information Technology		
Wallops Flight Facility	Elborn	OSC	Eng		Creighton	OSC	Eng		Donovan	NG	Mgr
	Nock	OSC		Ad	------	------			-----	-----	
	Lankford	OSC	Eng		Mandigo	NG	Eng		Holmer	NG	Tek
	Diehl	NG	Eng		Yacobucci	NG	Eng		Watkinson	NG	Tek
	Cranor	ARC	Eng		Thompson	OSC	Eng		Vacancy 1	Not Posted	
	Hesh	NG	Eng		Widmyer	OSC	Eng				
	Gsell	OSC	Eng		Reese	NG	Eng				
	Murray	OSC	Eng		Foster	NG	Eng				
	Brooks	OSC	Eng		Hylbert	NG		Drft			
	Malaby	OSC	Eng		Walthall	OSC		Drft			
	Bradley	NG	Eng		Paschak	ARC		Drft			
	Johnson	OSC	Eng		Daughton	ARC		Drft			
	Banks	NG	Eng		Wrobl', Nate	NG	Eng				
	Bowden	NG	Eng		Babcock	NG	Eng				
	Amey	NG	Eng		Oberste	NG 6/18/09					
	Gabbard	NG	Eng		Vacancy 1	Not Posted					
	Blake P/T	NG	Eng		Vacancy 2	Not Posted					
	Vacancy 1	Not Posted									
	Contingency	Not Posted									
WSMR	Bower	ARC		Tek							
	Hoxworth	OSC	Eng								
Totals			17				9				0
				2				4			3

- NSROC continues to recruit for engineers and turn-over continues to be light
  - Hired 1 ME, 1 GNC, and Lost 1 VSE (Rosanova) since December 2008
  - Brian Creighton now leads ME. Cathy Hesh is acting lead of the VSE Group.
- Average years of experience holding steady, with new employees pulling averages down slightly
  - ACS: 10 (+1) FP: 15 (+0) EE: 12 (+1) VSE: 7 (+1) ME: 3 (+1)
- NSROC is continuing to encourage engineers to take on more project engineering responsibility
  - Improves Systems Engineering Skills and Project Execution
  - Grooms Future Leaders and Mission Managers
- NSROC continues to develop its approach for staffing Systems Engineer for the program

Engineering Resources

- Engineering Leading Indicators
  - Helps us optimize work force to match pressures of overall mission set
  - Helps us anticipate surges (though surges are usually pretty obvious)
- Engineering Risk Summary
  - Keeps attention on all risks
  - Identifies emerging risks early when they can be resolved with least impact
  - Maintains open awareness and dialog on risks and challenges
- Configuration Control Board process
  - Focusing on standardized systems, their specifications, and ***ownership***
  - Minimizes effort needed to use these systems on all missions
- Staffing and Recruiting
  - Focused and persistent recruiting is filling our strategic engineering needs
  - Building a staff base to meet engineering and mission management needs

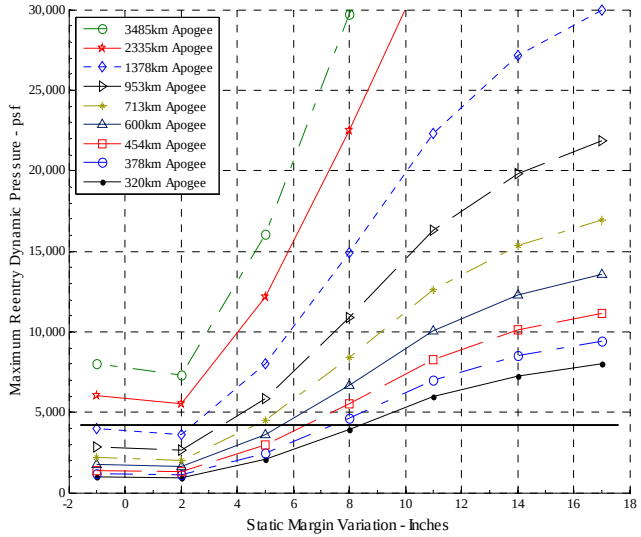
NSROC Engineering

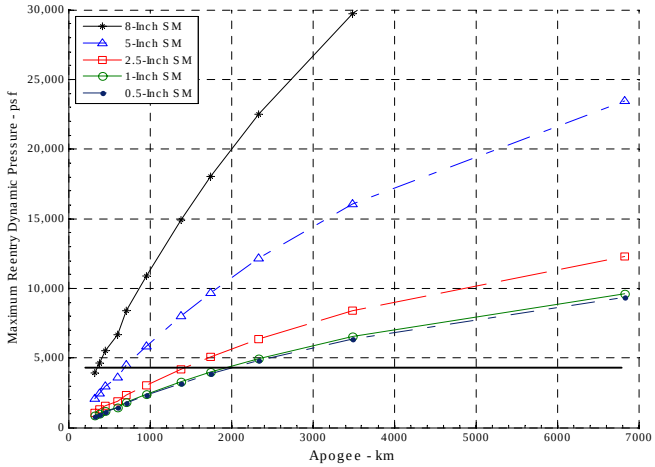
Dave Krause

DEC 2008 SRWG Panel Finding #4

Technical challenges of recovering a payload from > 320 km

- The reasonable limit for a successful payload recovery (high l/d body) is ~4200 psf
  - Apogee dependent
  - Payload orientation critical (static margin and resulting q)
- Reentry orientation & spin required to dissipate thermal input
  - q below 4200 psf
  - Adequate acs gas to reorient for reentry
- Payload layout critical
  - Balanced payload
  - Telescope payload are a challenge due to the long hollow tube
  - Extra acs gas required for both long duration pointing and reentry consideration
- The HASR Study assumed that there was no payload recovery in exchange for ~40 minutes data obtained





Electrical Engineering

Charles Lankford

20 M Bit Per Second PCM
DEC 2008 SRWG Panel Finding #5

- PSL developed the “MV” PCM encoder about 8 years ago and has used it on several of their non-NSROC efforts. It has a 3” x 2” footprint and presently has 4 modules that can support data rates up to 20 M BPS
  - Control deck with single RS232 input deck
  - Strain gauge / bridge completion deck
  - 4 Channel programmable input voltage range analog deck
  - 8 Channel 0 – 5 Volt input voltage range analog deck
- NSROC has submitted requirements for PSL’s development of the following data modules
  - 32 Channel 0-5 Volt input voltage range analog deck
  - 12 Channel thermocouple deck
  - 4 Channel asynchronous deck
  - 2 Channel time event / buffer deck
- PSL is in the process of enhancing existing 16 bit parallel digital deck to work at bit rates up to 20 M BPS (Planned for use on Figueroa / 36.245)

20 M BPS Data Issues & Resolutions

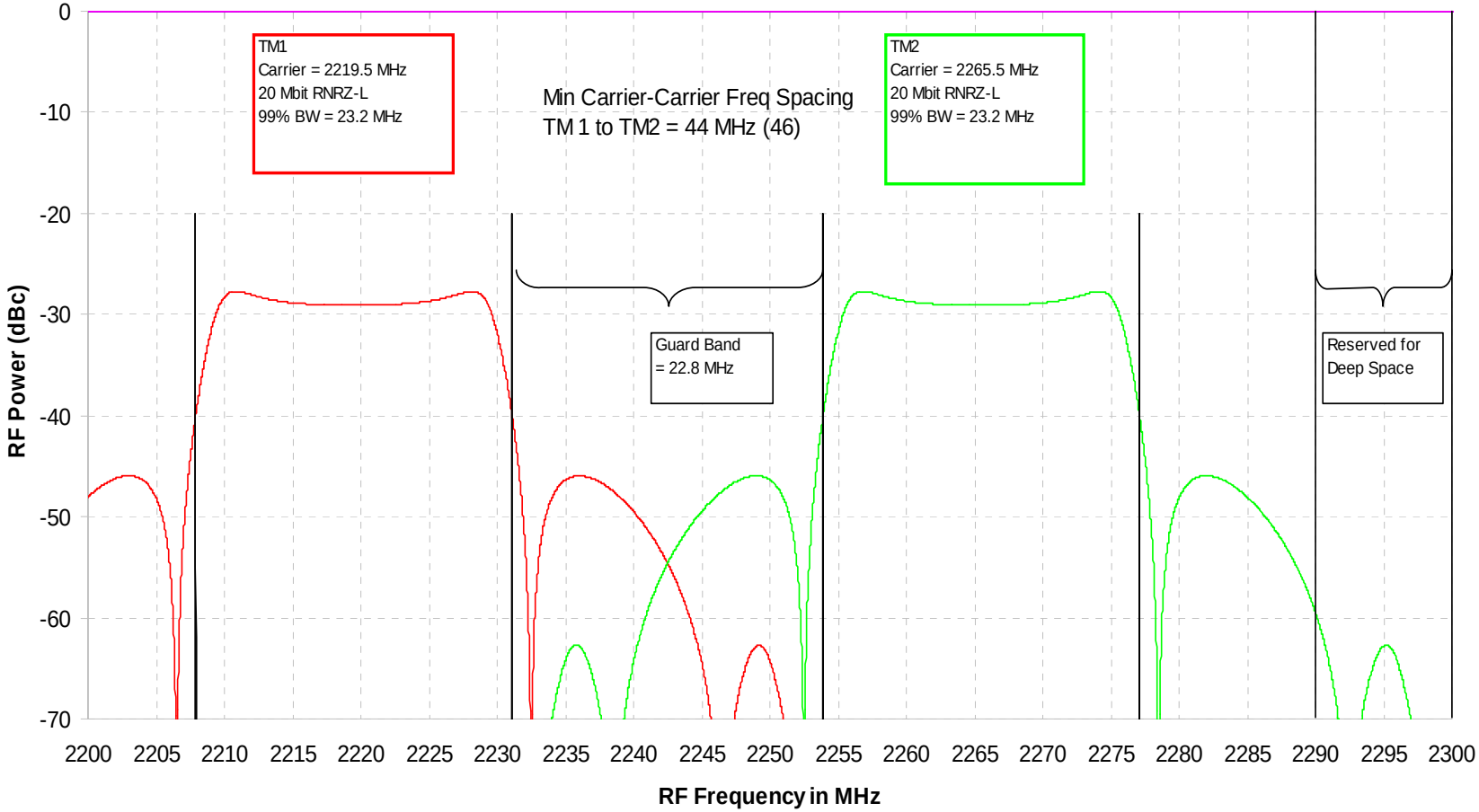
- 2-20 M BPS PCM/FM RF links completely fill allowable 90 MHz bandwidth allotment
- WSMR launches are limited to 20 MHz RF Bandwidth
- 20 M BPS PCM/FM spectrum extends to 23.2 MHz
- PSL MV PCM encoders will not have enough data channels to support downlinking of ACS, S-19, vehicle and TM housekeeping data. Anticipate MV encoder being used just for Experiment data.
- If 2-20 M BPS PCM/FM RF links are used a third housekeeping data downlink will be required which will require using upper S-Band.
- Upper S-Band is currently unproven at WSMR.
- NSROC has (or will have after August) 6 receivers capable of supporting 20 M BPS and or Upper S-Band.
- No backup TM tracking antenna for 20 M BPS data rates (Redstone is only viable antenna) unless RF transmitter power is doubled to 20 Watts

20 M BPS Data Issues & Resolutions

- QPSK (Quadrature Phase Shift Keying) is a much more bandwidth efficient modulation method.
- QPSK transmitters are currently available but from data to date are much more expensive than FM units
- QPSK is an unproven technology with hardware currently in VAB and N-200 ground stations at WSMR and may require additional equipment as well as effort to bring on-line
- Two 20 M BPS data streams can be down linked via one 10 Watt QPSK transmitter (I & Q Channels)

20 M Bit Per Second Data Issues

Calculated RF Spectrum
for Mission 36.245 Figueroa (Using 30 KHz Resolution Bandwidth)



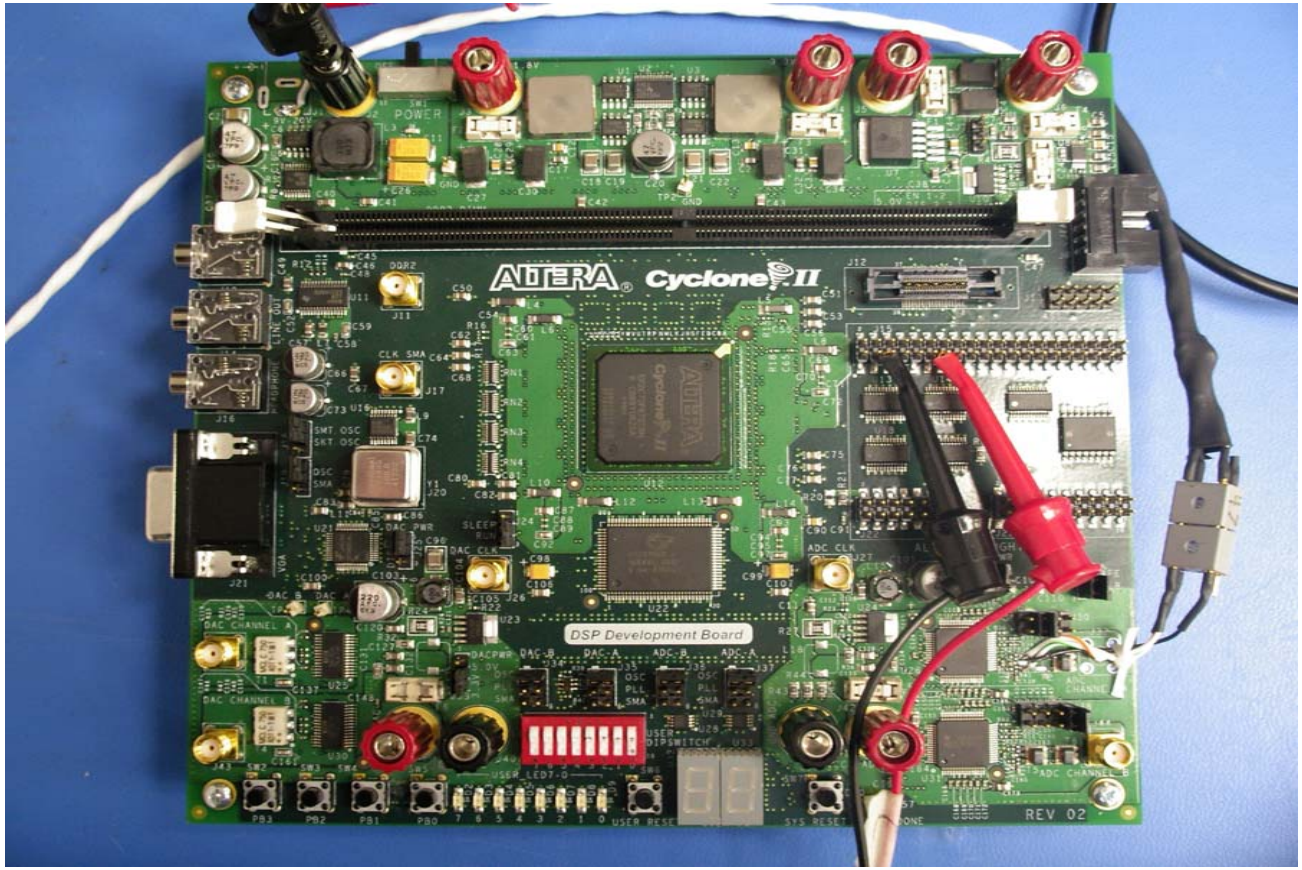
150 M BPS Data Downlink

- LaBelle 40.025 will include an X-Band TM system as an opportunity to test new technology for providing Experimenters with very high rate Science data.
- Buffered and amplitude limited Baseband data will be provided to NSROC to digitize and format into a composite 150 M bits per second data link.
- NSROC EE has chosen the Altera Cyclone II EP2C70 DSP Development Board which has 2 TI ADS5500 14 bit 125 M SPS Analog to Digital converters, over 64 K logic elements, 1.152 M bits of RAM, 4 Phase Lock Loops and a host of other features.
- The data digitization system will utilize buffered GPS rM and 1 PPS signals to develop microseconds of the week timing that will be embedded into each PCM minor frame.
- Experiment baseband analog data will be quantized to 14 bit resolution at 37.5 M SPS, minus frame sync and time words.

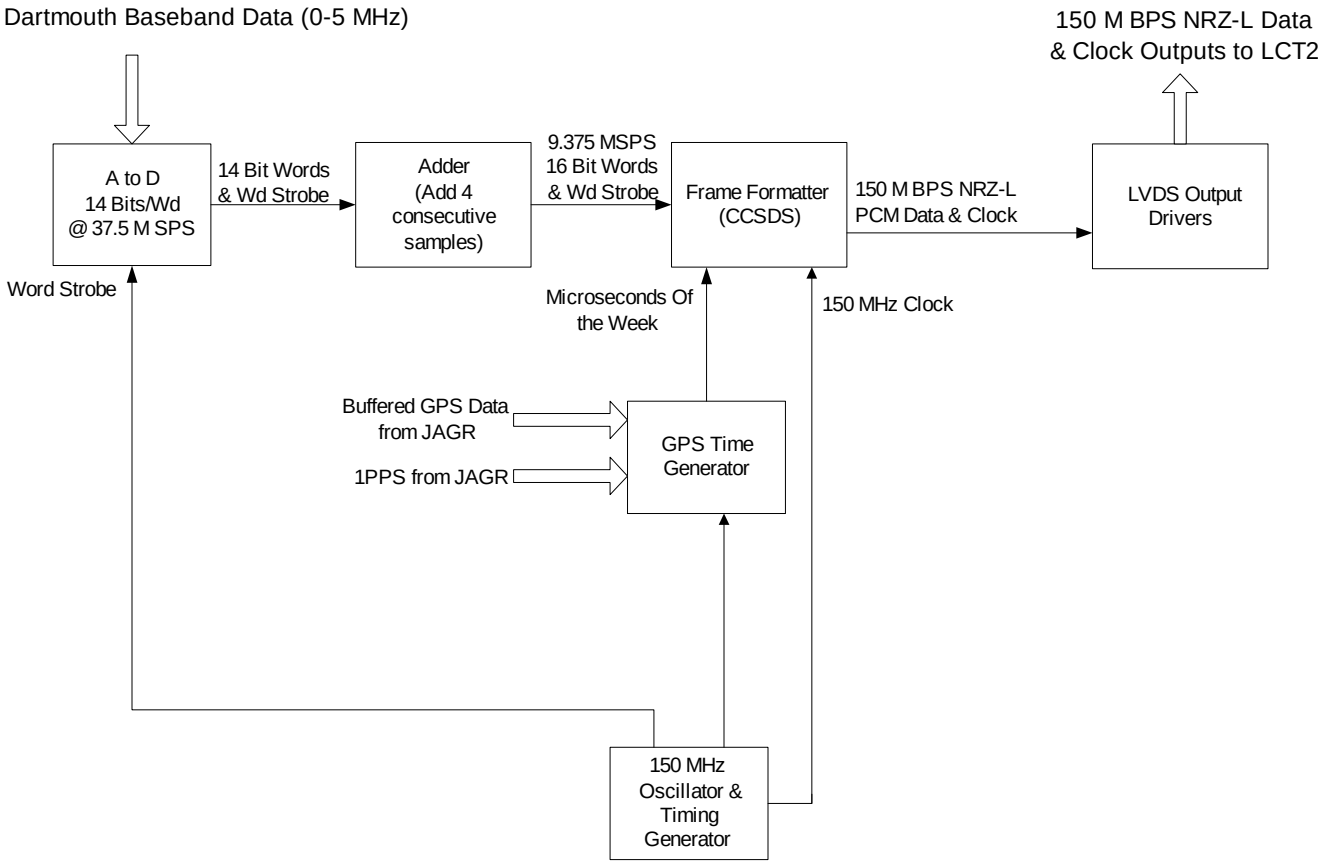
150 M BPS Data Downlink

- Four sequential 14 bit words will be added resulting in one 16 bit word at 9.375 M SPS, minus frame sync and time words
- The composite 150 M BPS PCM signal will be formatted as CCSDS and output as NRZ-L code with associated clock as LVDS signals to the LCT2 modulator.
- The LCT2 modulator will convolutionally encode the 150 M BPS LVDS signal, separate the rate ½ encoded signal into an I and a Q channel and up-convert the QPSK signal to ~1 milliWatt X-Band RF.
- The 1 milliWatt LCT2 X-Band signal output will be fed to a 30 Watt Solid State Power Amplifier whose RF output will be fed to a 17.25” diameter X-Band wraparound antenna.

150 M BPS Data Downlink

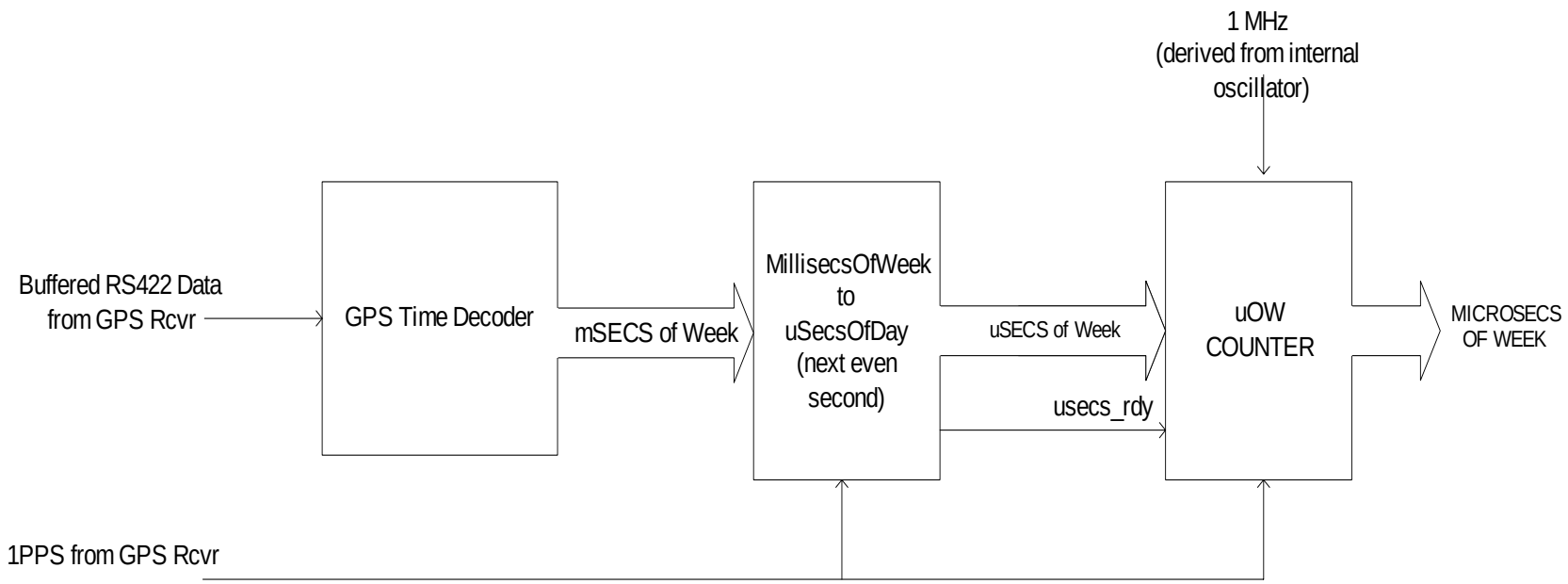


150 M BPS Analog to Digital Data Processing



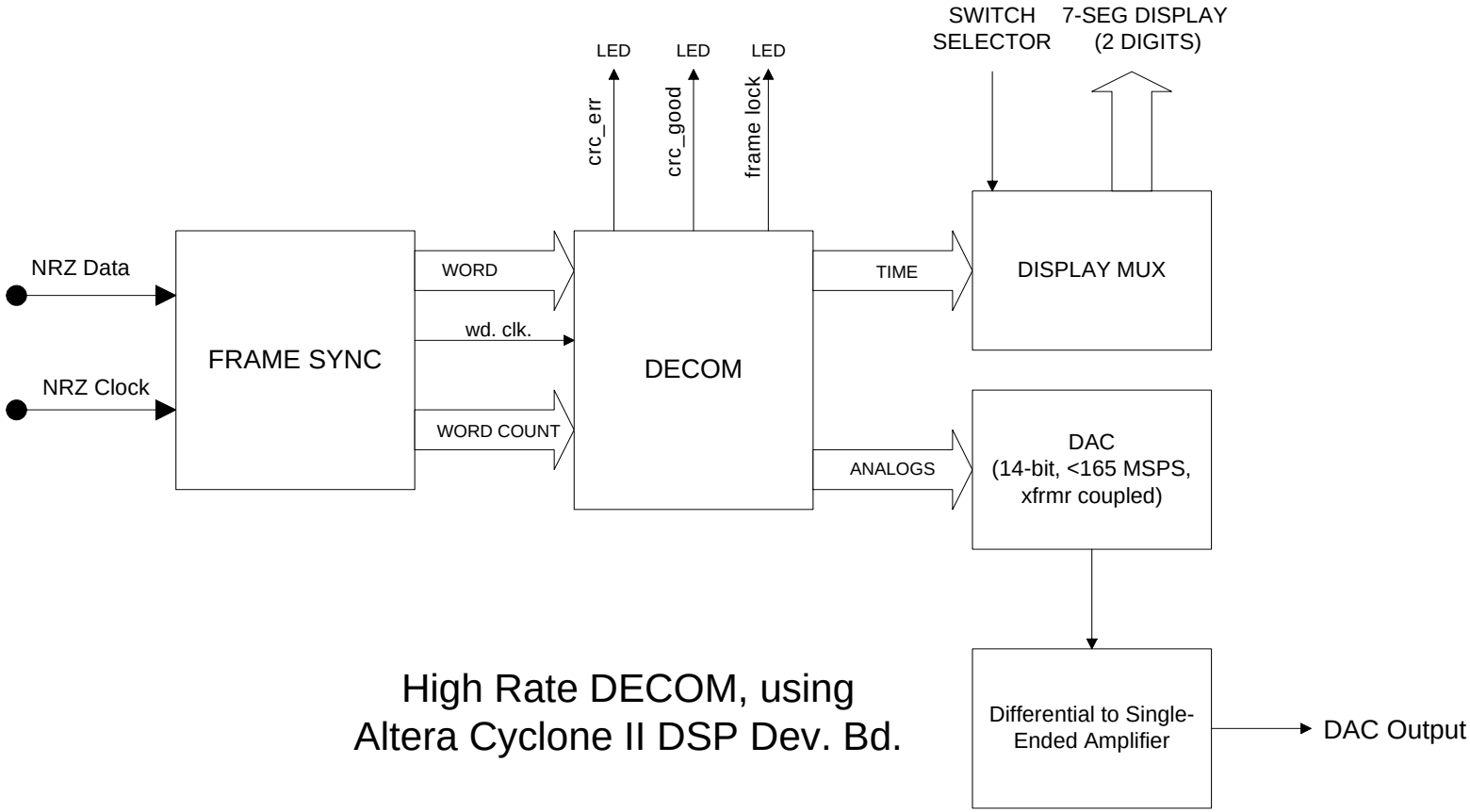
40.025 LaBelle / Dartmouth
Baseband High Frequency Digital Data Composite System Design

150 M BPS Microseconds of Week Generation



PCM TIME CODE
GENERATOR

150 M BPS Data Decommutation and Output



High Rate DECOM, using
Altera Cyclone II DSP Dev. Bd.

150 M BPS RF Link Analysis

Preliminary X-Band Link Calculation (11.3 Meter Class Antenna)			
Vehicle Transmitter (Watts)	30	14.77121	dBW
Antenna Gain		-8	dB
Vehicle EIRP		**6.771213**	**dBW**
User Frequency		8500	MHz
Range		900	Km
Free Space Loss		170.11	dB
Polarization Loss		3	dB
Antenna Pointing Loss		0.1	dB
Atmospheric Loss		0.43	dB
Rain Loss		0	dB
Power Received at Antenna		**-166.872**	**dBW**
Ground Terminal G/T		34.5	dB/K
Information Rate		150	Mbps
Information Rate Noise Density		81.76	dB bps
Modulation Loss		0.5	dB
Available Eb/No		13.97	dBHz
Implementation Loss		2	dB
Coding Gain		5	dB
Required Eb/No for QPSK for 1E-9 BER		12.8	dBHz
Margin		**4.17**	**dB**

150 M BPS PCM System Parameters

• PCM Encoder	-	Altera Cyclone II EP2C70
• Bit Rate	-	150 Mbits/second
• Format Size	-	1024 Words
• Word Size	-	16 bits per word
• PCM Output Code	-	NRZ-L
• PCM Synch Pattern	-	FE6B2840 Hex
• Bit Alignment	-	MSB first

150 M BPS PCM System Status

Completed:

- Altera Cyclone II EP2C70 DSP development board ordered and delivered.
- Development board was programmed and tested to output 16 bits per word digitized data at 2 M, 10 M and 150 M BPS
- Analog input single ended to differential buffering circuit development work completed
- CCSDS formatting implementation completed (recommendation from NASA WFF AETD).
- Developed plan and successfully implemented for generating µSW from GPS signal for time tagging PCM frames
- Located X-Band antenna vendor, received cost quote and ordered 2 units
- Because data decommutation hardware will not arrive until just before payload I & T NSROC developed capability to decommutate and convert analog digitized data in 150 M BPS stream back to analog signal using additional capability of Altera Cyclone II DSP development board

150 M BPS PCM System Status

In Process / To Be Completed:

- Two additional Altera Cyclone II EP2C70 DSP development board have been ordered and received. One will be a spare for the flight unit and the other will be used as the data decommutation and DAC output unit.
- Capability for logging decommutated data to on-board memory to allow post test download and analysis is in progress
- LVDS receivers and drivers have been ordered and received but need to be installed on airborne and ground DSP development boards
- Ground GSE case has been ordered and received. Additional DSP development board will need to be packaged, wired and checked out for GSE.

Future 150 M BPS PCM Encoder Requirements

NSROC needs to know what Experimenters want/need for high speed data to allow development of appropriate encoder data Input types and capability

- Numerous 10 to 20 M BPS PCM systems multiplexed together in high rate encoder?
- Several analog data channels sampled by encoder at M SPS rates?
- Multiple channels digitized by Experimenters and shifted to encoder synchronously?
- Combination of M SPS analog data and digital data?

Next Generation GPS

GPS Receiver Status

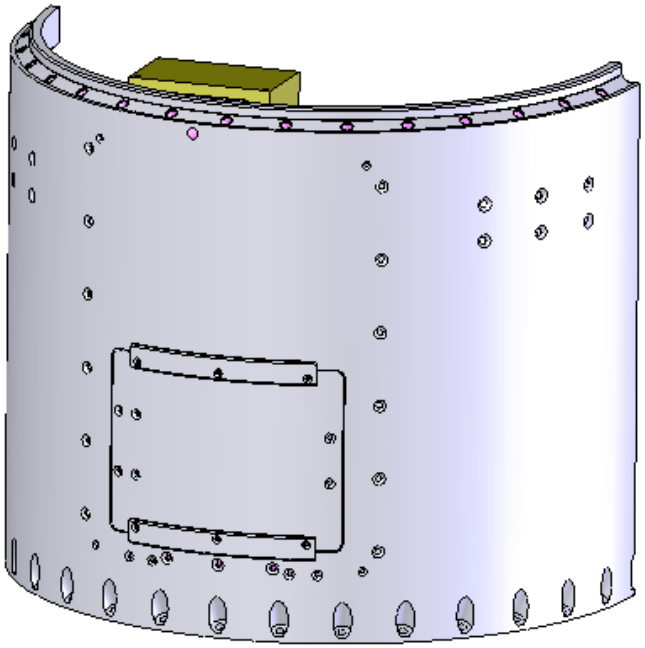
- Javad model JNS100 was chosen as a candidate for Next Generation GPS receiver.
- First JNS100 receiver and associated interface circuitry was successfully flown on 41.075 Smith Sub-TEC II
- Second JNS100 receiver assembly successfully flew on 40.023 Lynch mission
- NSROC has 12 JNS100 receivers ready for assembly
- NSROC has completed evaluation of a Javad TR-G2 miniature GPS receiver.
- The TR-G2 receiver is less than 50% of the size of the JNS100 unit.
- The TR-G2 receiver has some additional flexibility in operation programmability
- NSROC has ordered 10 of the new TR-G2 and plans to fly one as a mission of opportunity on 39.009 Bernhardt in September

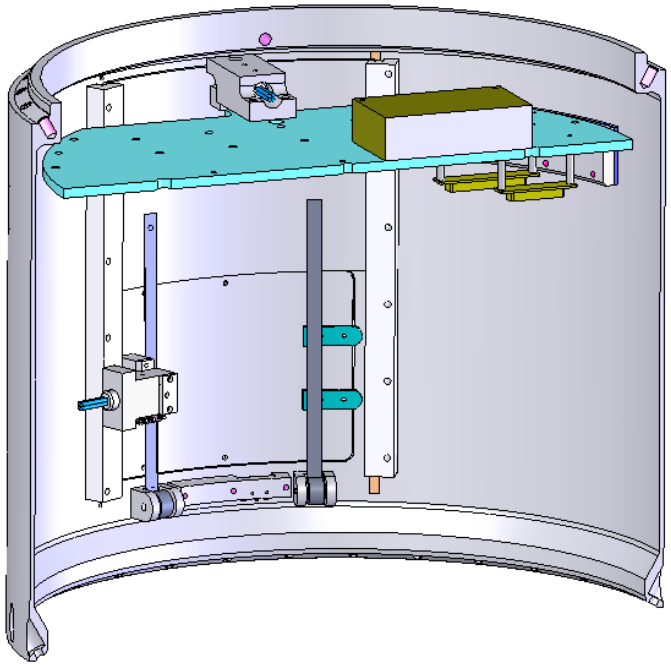
Mechanical Engineering

Brian Creighton

Mechanical Engineering

- **Blow-off/Slammer Door Design**
  - Successfully flown on 36.226/Bock mission
  - Blow-off door exposed side looking ST5000 after launch
  - Slammer door covered the opening in the skin during re-entry
  - Door hung up slightly on re-entry…working on a fix to this anomaly





T&E Lab

- **Spin Balance Controller Updated**
  - Balanstar Model SBX
  - Directly replaces the controller installed in 1982.
  - PC based running DOS

- **New Thermal Chamber**
  - 1 chamber at both WFF and WSMR
  - ESPEC Model ESZ-4CA
  - Temperature Range: -70°C to 150°C
  - Volume: 32 cubic feet
  - Capable of autonomous operation
  - 3 levels of overheating protection

Machine Shop

- **New Additions**
  - HAAS slant bed lathe
    - Capable of performing milling operations as well
  - Larger water jet
    - Capable of plates up to 4’ x 8’

- **Upgrades**
  - New controller on the Binns lathe
  - New controls on the Lucas Mill
  - Moving the smaller water jet machine to the welding shop along side the new one

Vehicle Engineering

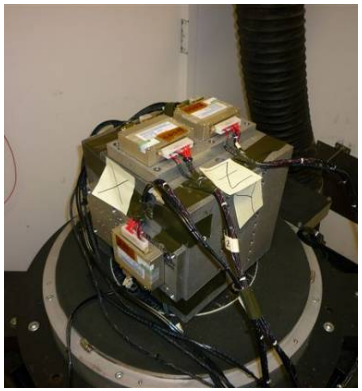
Catherine Hesh

Flight Termination System

- Status

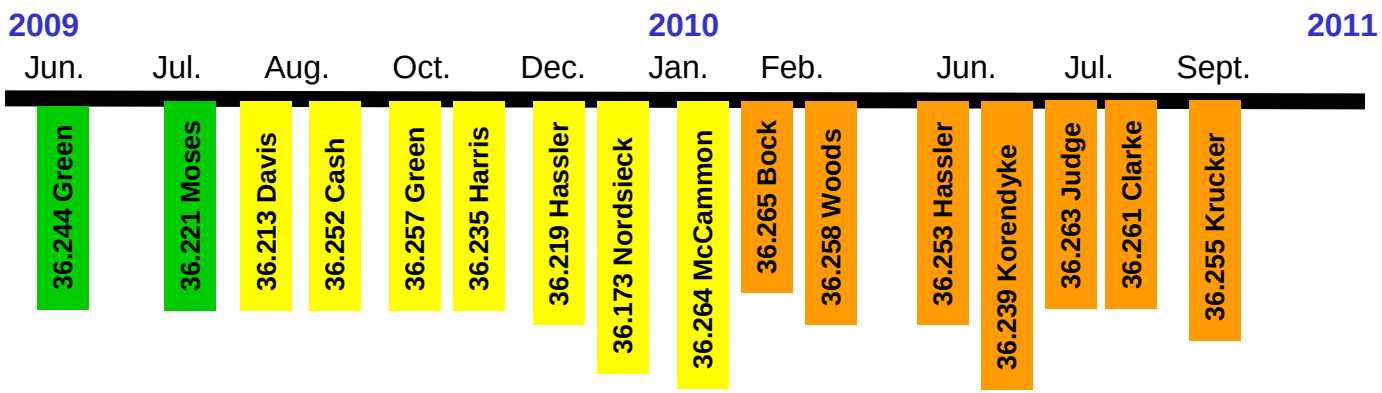
System	Status	Changes	Components to be Qualified
Legacy	2 systems left	None	None
Hybrid I	6 to 7 systems possible First flight in Aug. 2009	Receiver, Circuit Card Assembly (CCA)	Receiver, CCA, cables
Hybrid II	First flight in early 2010	Fully redundant, adds NSROC circuitry	Antenna system, wiring harnesses
Final	First flight in 2011	New ordnance package	S&A, FCDC, ordnance paddles

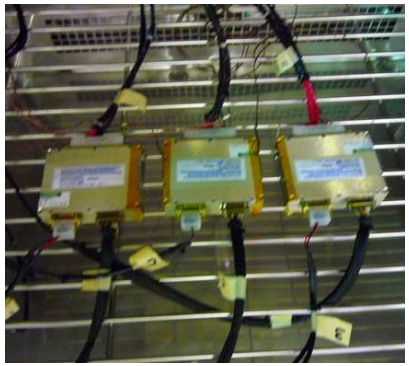
HFTR60 Receiver



CCA Vibration Test

- Timeline

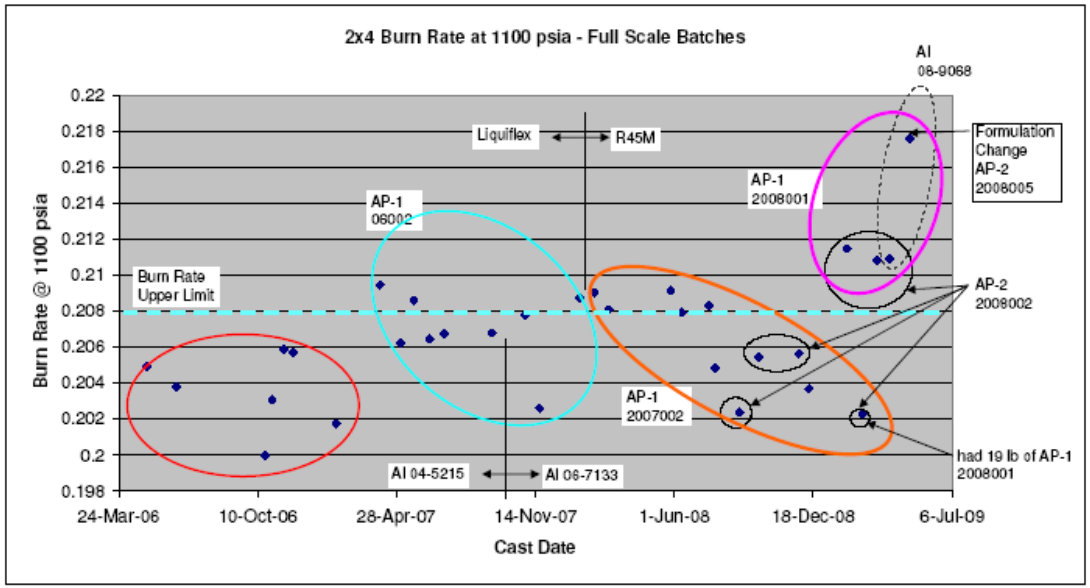




CCA Thermal Test

Black Brant Mk1 Contracts

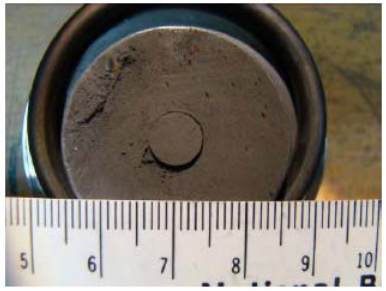
- Status
  - 2 open contracts – 18 motor buy and 15 motor buy
  - 17 of 18 motors delivered for 18 motor buy
    - Issue on last motor concerning high propellant burn rate
    - 81ºF temperature restriction
  - 0 of 15 motors delivered for 15 motor buy
    - Production on hold until resolution of propellant burn rates
  - Motor deliveries are expected to be complete in early 2010
  - Expected to run out of motors in mid to late 2010



Black Brant Mk1 Production Burn Rate Trend

Motor Procurement Status

- Sustainer Motor Procurement
  - Procurement will be for a Black Brant class vehicle
  - Competitive procurement for a flight-proven solid propellant rocket motor
  - Motor must be compatible or require minimal modification to existing payload designs, vehicle systems, surplus motors, launchers, and ground support equipment
  - Evaluation criteria will include technical, cost, past performance, and programmatic
  - Schedule
    - RFP Release — June 29, 2009
    - Proposals Due — August 21, 2009
    - Downselect Notification — September 4, 2009
    - Oral Presentations — September 14-18, 2009
    - Sub-Contract Award — October 9, 2009
    - First Delivery — June 1, 2010
- New Nihka Buy
  - Static fire planned in September 2009 at Bristol
  - Performed propellant ignitability testing at China Lake, results fell in line with old Nihka propellant
  - Igniter testing is ongoing at Bristol
  - Deliveries begin in late 2009 or early 2010



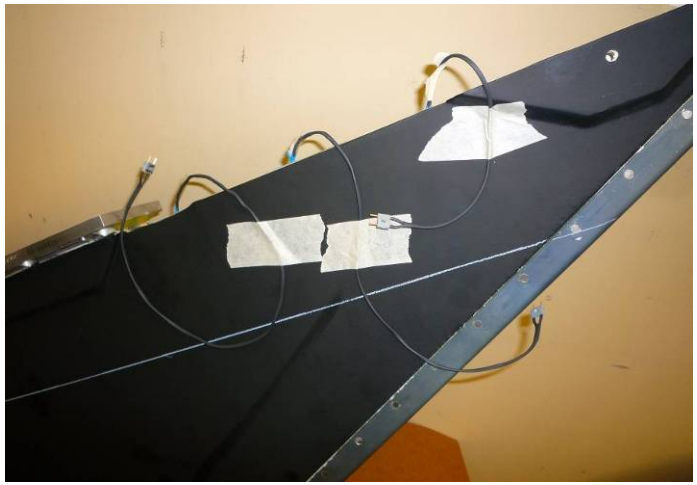
Nihka Propellant Sample

Black Brant Mk1 Fin Thermal Coating Transition

- Materials
  - Previous thermal coating was Avcoat
  - New thermal coating is Firex

- Qualification Process
  - 2 test Firex fins flown on 36.207 Kowalski in Oct. 2008
    - Firex ablative were blistered after flight
    - Firex did protect the metal fin from heating damage
    - Bristol changed application process and type of Firex
  - 2 test Firex fins will fly on 36.244 Green in June 2009
    - Instrument with thermistors
    - Assess flight temperature data and perform post-flight visual inspection
  - Continue production if second test flight goes well

Firex Fin from 36.207 Kowalski



Instrumented Firex Fin

Surplus Motors

- Talos Refurbishment
  - Indian Head completing first motor refurbishment this week.
  - Old grains are still flight worthy
  - Minor refurbishment glitches, but overall went well
- Terrier Mk 12
  - Indian Head discovered that the grains are shrinking due to age
  - Motors have had problems passing the pressure test, but Indian Head developed an alternate pressure test mechanism
  - Have enough Terrier Mk 12 motors that passed inspection to get us through this year
  - Planning to static fire a motor with a short grain at Wallops in Fall 2009
- Improved Malemute
  - Received results on altitude ignition and spin rate from ATK
    - High altitude ignition is marginal, but less marginal than Improved Orion
    - Recommend to limit the spin rate to 4 Hz
  - Static Fire
    - Instrument with pressure transducer and thermistors
    - Fire with flight CDI/AFD, and pump down bore prior to ignition
    - Static fire scheduled for July 2009
  - Flight Test
    - Instrument with pressure transducer, strain gauges, thermistors, and aft-looking cameras
    - Test flight scheduled for August 2009

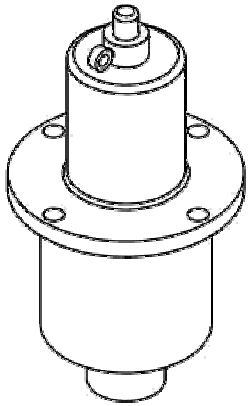
Talos propellant cartridge

Improved Malemute Motor

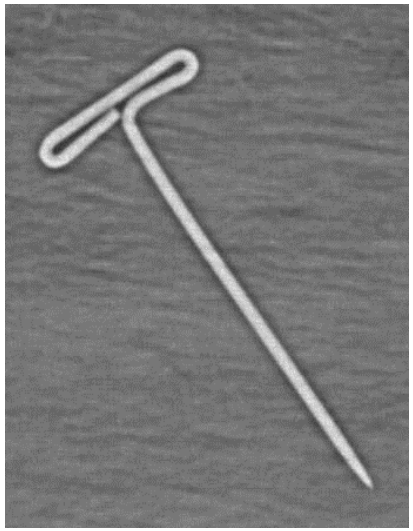
Recovery Systems

- New ORSA Avionics Development
  - Heritage System
    - Mechanical timer inventory diminishing and reliability problems
    - New mechanical timers cost prohibitive
  - New System
    - Introducing electronic timer, new g-switch, and circuit consistent with other NSROC systems
    - Component level testing and design finalizing by late July 2009
    - Design Review expected mid August 2009
    - Test flight of deck Spring 2010, target first operational flight Fall 2010

- Parachute System Corrective Action
    - X-ray inspection revealed foreign objects in (2) systems
  - Preventative Action
    - NSROC reemphasized critical nature of inspection to packer
    - Inspection check list created
    - Parachute systems X-rayed prior to packing
    - Metal detector inspection aid



G-Switch - Inertia Switch Inc.



Radiograph - Pin packed into a SR parachute system

Parachutes

- Parachute Status
  - Current

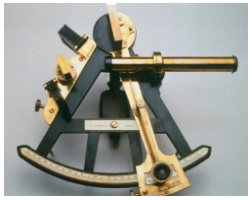
Capacity	Existing	Exhaustion Date
325#, 14”	4	TBD
750#, 14”	4	Through Aug 2010
750#, 17” Kevlar	9	TBD
750#, 17” Standard	9	Through 2013
1000#, 17”	25	Through 2011
1250#, 17”	11	Through 2010

  - RFP for 14” 750# parachute systems
    - Procured by 2011
    - RFP issued to the best parachute developers/manufactures, as well as historic sources
    - Not limited to recreating the current system
  - Possible Improvements
    - Advances in aerodynamic decelerator technology since the current parachute system was placed into service
    - Eliminate some or all of the pyrotechnic cutters
    - Reduce weight and pack volume while maintaining reliability and impact velocity

ACS/Sensors

Ron Kiefer

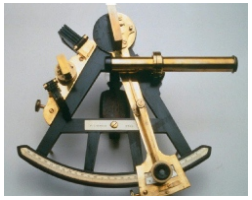
GNC – ACS/Sensors



Contents of GNC Presentation

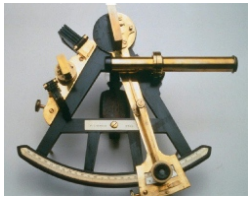
- Sensor Hardware
  - Standard
  - New
- GSE Hardware
  - New
- ACS Hardware
  - Standard
  - New
  - Innovative
- Data Products
  - Attitude Determination
- ACS Missions
  - Recent Past
  - Present
  - Near Future
- WSMR Highlights – Carlos Martinez
  - Digital SPARCS VII – Upgrades, test flight
  - GSE Upgrades

Sensor Hardware - Standard



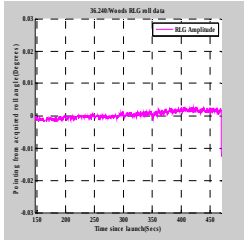
- GLNMAC
  - Contains LN-200 FOG
  - S/N 058 is at Sandia for calibration
  - S/N 066 to be complete by October
- Solar Sensors
  - SLIT (sets of 4, up to 10 sensors)
  - CSS - Coarse Solar Sensor (SPARCS)
  - MASS (SPARCS)
  - LISS (SPARCS)
- Magnetometers
  - TM Bartington (0-5V)
  - NMACS Bartington (± 10V)
- Star Tracker (Celestial ACS)
  - ST5000 by UW
  - Flathead and Cylindrical Sensors
- Rate Sensor
  - Gyro chip sensor, QRS11, triad
- Horizon Crossing Indicator
  - HCI by Servo, nadir
- Fiber Optic Gyro (Celestial ACS)
  - LN-251 by NG

Sensor Hardware - New

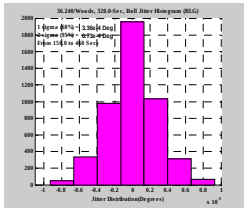


- Micro-IMU
  - Robust, by MEMSense
  - Size of a hockey puck

- Digital Magnetometer
  - HRM2300 by Honeywell
  - Better performance



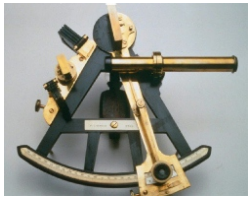
- Ring Laser Gyro - SPARCS
  - 1 lb unit by Honeywell
  - Improvement 4-8X RIG control



- Rate Sensor
  - Gyro chip sensor, QRS116
  - Robust - withstand higher vibration levels

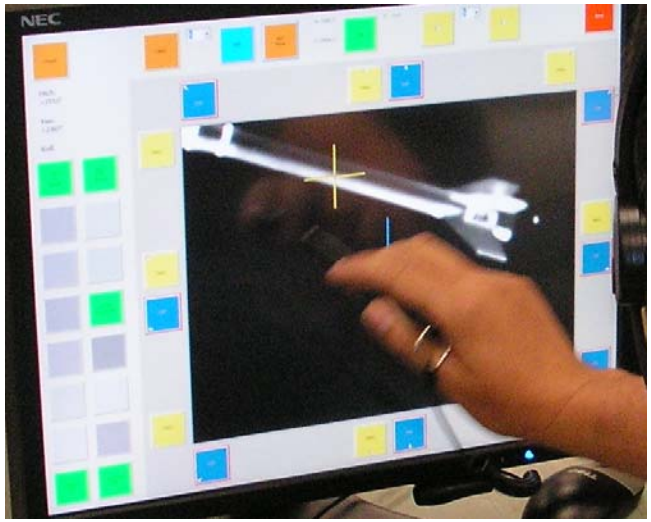
- ST5000 Mk III
  - Repackaging, eliminating Ball circuitry
  - Smaller, lighter, more robust

GSE Hardware - New



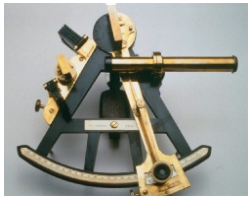
Command Uplink System

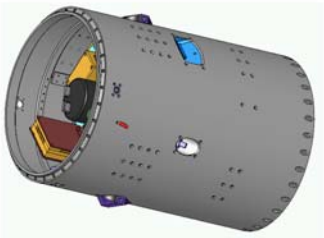
- Latest state-of-the-art technology
- Touch Screen Control
- New 9-position scan feature - Green



Shown is the real time display for the LeClair MDA payload, June 26, 2008

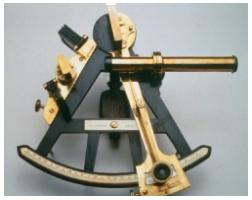
ACS Hardware - Standard

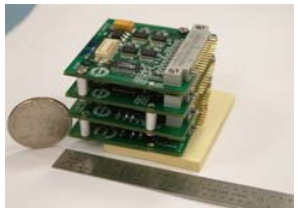


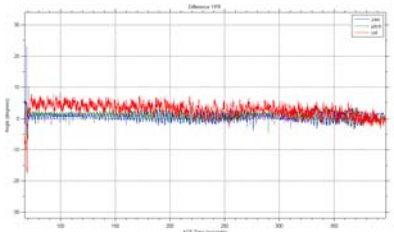


- NIACS
  - Inertial, or spinning to 2 Hz
- NMACS
  - Magnetic spinners, 0.25 to 5 Hz
- CACS
  - Fine pointing <0.5 arcsec.
  - ST5000 tracker (saves time - no guide stars required)
- SPARCS
  - Solar missions, 4 units available
  - Stored and serviced at White Sands
- NSROC(a)
  - Miniature unit, used with 4 SLIT solar sensors
- S19 BGS by RUAG, formerly Saab
  - S19L contains LN200 - 4 units
  - 4 new S19L units to be received by end of 2009
  - 3 S19D units contains DMARS (future conversion)

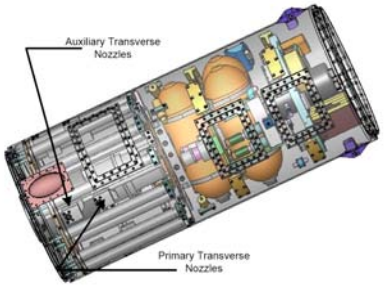
ACS Hardware - New

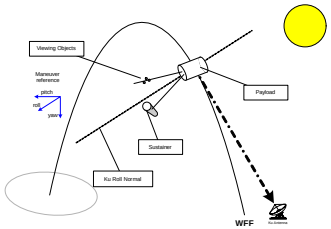




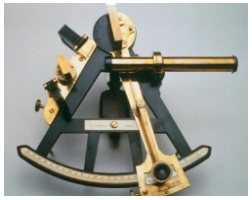


- RTAS - Real Time Attitude Solution
  - Provides payload attitude real-time
  - Uses the micro-IMU and a GumStix computer
  - Also uses 4 solar sensors, the HCI and a digital magnetometer
  - Maiden flight was Smith 41.075 on July 14, 2008
  - Determined attitude to within 3.5 degrees
  - Next flight to be Bull 41.082 - summer
- NIACS – New Features
  - Dual pointing scheme
  - Auxiliary Kicker thrusters

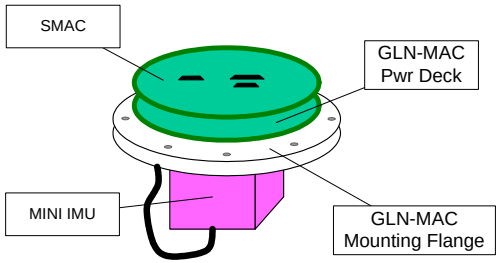




ACS Hardware - Innovation

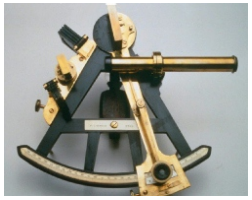


- TM Gyro II
  - Provide an alternate for TM GLNMAC
  - Lighter and more economical
  - Maiden flight to be Bull 41.082 - summer



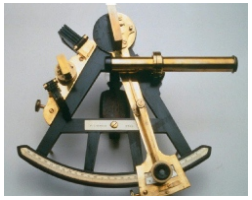
Sketch showing major components housed inside an enclosure.

Data Products – Attitude Determination



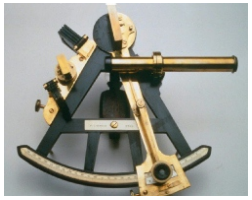
- Sensor Map
  - location and orientation of each sensor is now shown on the Payload Assembly and Mass Property drawing.
- Data Products
  - Each Design and Mission Review data package now contains a list of Data Products with a brief description of each. The list also states who and when each data product is provided.
- Post-flight Data Reduction
  - The Sounding Rocket Attitude Data Reduction Manual is being revised again. The revision to be released in the coming year will be used as a training aid for other analysts as well as a reference for the science community.
- Personnel
  - Hiring more staff to meet obligations and soon-to-retire Dennis Melvin

ACS Missions – Recent Past



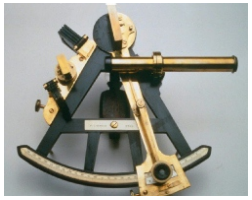
- Bounds 36.242 and 21.139, PFRR January 29, 2009
  - NMACS
  - TM GLNMAC
  - 21.139 experienced a valve problem
- Lehmacher 41.078 and 41.079, PFRR February 18, 2009
  - TM Magnetometer
  - Micro-IMU
  - Horizon Crossing Indicator (HCI)
- Bock 36.226, WSMR February 25, 2009
  - Celestial ACS
  - S19D
- Lynch 40.023, PFRR March 20, 2009
  - NIACS (special dual thrust for PFF deploy)
  - Solar Sensors (5 sets)
  - HCI (3)
- Murbach 41.080, WFF May 28, 2009
  - TM Magnetometer
  - Micro-IMU

ACS Missions – Present



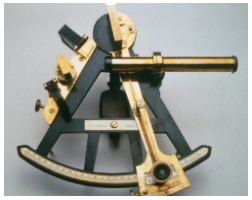
- MLAS (WFF June 2009)
  - GLNMAC, 3 units
- Green 36.244 (WSMR June 2009)
  - CACS (w/CUS)
  - S19L
- Hall 12.067 (WFF July 2009)
  - Solar Sensors – 8 devices
  - Micro-IMU
- Moses 36.221 (WSMR July 2009)
  - SPARCS
  - S19L
- Davis 36.213 (WSMR July 2009)
  - SPARCS
  - S19D
- Bull 41.082 (WFF July 2009)
  - GLNMAC
  - RTAS
  - TM Gyro II
- Cheatwood 36.254 (WFF July 2009)
  - NSROC(a) with Solar Sensors
  - Rate Sensors – QRS116

ACS Missions – Near Future



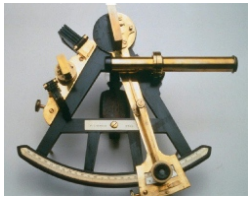
- Cash 36.252 (WSMR August 2009)
  - CACS (w/CUS)
  - S19D
- Erdman 41.086 (WSMR August 2009)
  - TM Magnetometer
  - HCI
  - Micro-IMU
- Bernhardt 39.009 (WFF September 2009)
  - TM Magnetometer
  - NSROC(a) WAASP version, with solar sensors
- Green 36.257 (WSMR October 2009)
  - CACS (w/CUS)
  - S19L
- Harris 36.235 (WSMR October 2009)
  - CACS (w/CUS)
  - S19L
- Woods 36.258 (WSMR November 2009)
  - SPARCS - RLG
  - S19D
- Hassler 36.219 (WSMR December 2009)
  - SPARCS - RLG
  - S19D

ACS Missions – Near Future



- Nordsieck 36.173 (PFRR January 2010)
  - CACS (w/CUS)
  - S19L
- LeBelle 40.025 (PFRR January 2010)
  - NMACS
  - HCI
  - TM GLNMAC
- Conde 41.084 (PFRR January 2010)
  - Micro-IMU
  - TM Magnetometer
- Lessard 40.026 (**ARR** January 2010)
  - NMACS
  - HCI
  - TM GLNMAC
- Bailey 36.256 (PFRR January 2010)
  - CACS (w/CUS) 1st time at this location
  - S19L ??
- McCammon 36.264 (WSMR January 2010)
  - NIACS
  - S19D
- Bock 36.265 (WSMR February 2010)
  - CACS (w/CUS)
  - S19L

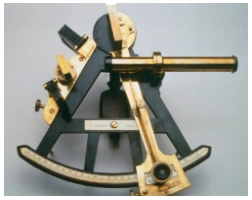
Test Flight Proposal for Digital SPARCS VII



Proposed upgrades to Digital Solar Pointing ACS SPARCS VII:

- New SPARCS LISS Electronic Board. The new board with upgraded electronics to lower noise and improved characteristics.
- The new board will be used to refurbish current LISS.
- The new LISS electronics board has two gain control input bit:
  - Low gain to allow SPARCS to acquire the sun in intermediate mode without rate gyros.
  - High Gain set for 0.02 arc-seconds/step to improve pointing stability.
- Intermediate mode to use the LISS output and an estimator algorithm to derived the rate. Eliminating a rate gyro in intermediate mode.
- Test MEMS rate sensors or solid state such as the SDI QRS116 to replace mechanical Humphrey rate gyros.
- Tests other minor software changes such as Telemetry ISR, firmware version number in the RS232 data for the Flash memory controller board, improved RLG interface.

WSMR Ground Support Equipment Upgrades



- Heliostat (sun tracker) mirror was re-coated.
- New Varian Vacuum pump purchased to back-up experiment vacuum pumps.
- New Temperature Chamber for testing electronic components.
- Acquisition of new portable vibration table for environmental testing smaller components.
- Several Integration carts fully refurbished with solid aluminum top.
- Optics lab automatic test equipment for sun sensor testing

Conclusions

- NSROC is committed to continuing the SRPO mission and program successes. 2009 has been a good year for Sounding Rockets.

- NSROC's Primary Goal is unchanged:
  - to satisfy the NASA PI mission requirements.

- NSROC is committed in expanding the technical innovations while
  - Meeting the requirements of the PIs
  - Maintaining a cost effective environment
  - Making effective use of the in-house talent, experience and hardware.

- NSROC's early receipt of the SRWG findings is important for future growth planning.
  - Thank you to the SRWG for providing these important findings