Kodiak Star

A Success in Partnership

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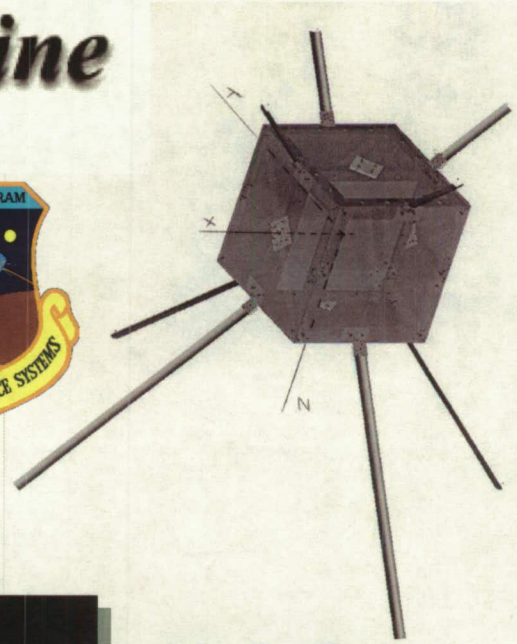
Launch Services Program

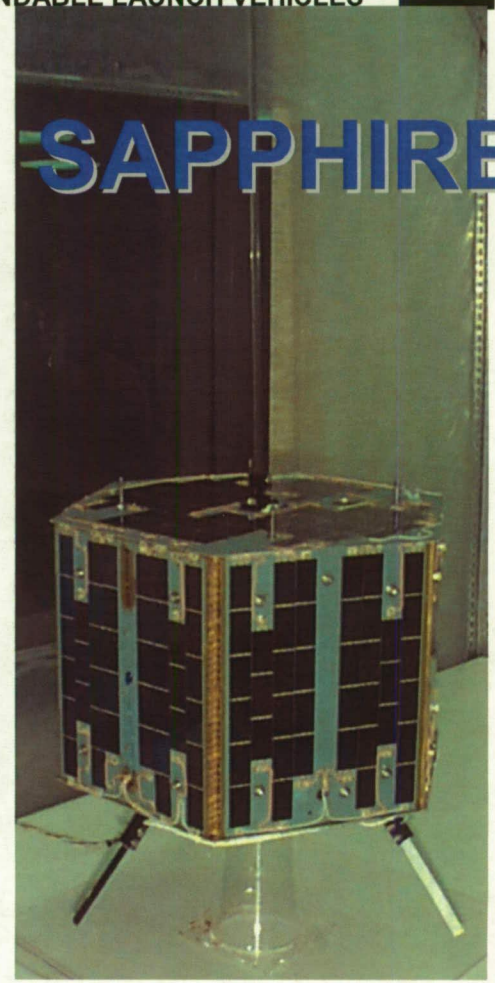
The Mission

John F. Kennedy Space Center

EXPENDABLE LAUNCH VEHICLES

Project Starshine





PCSat

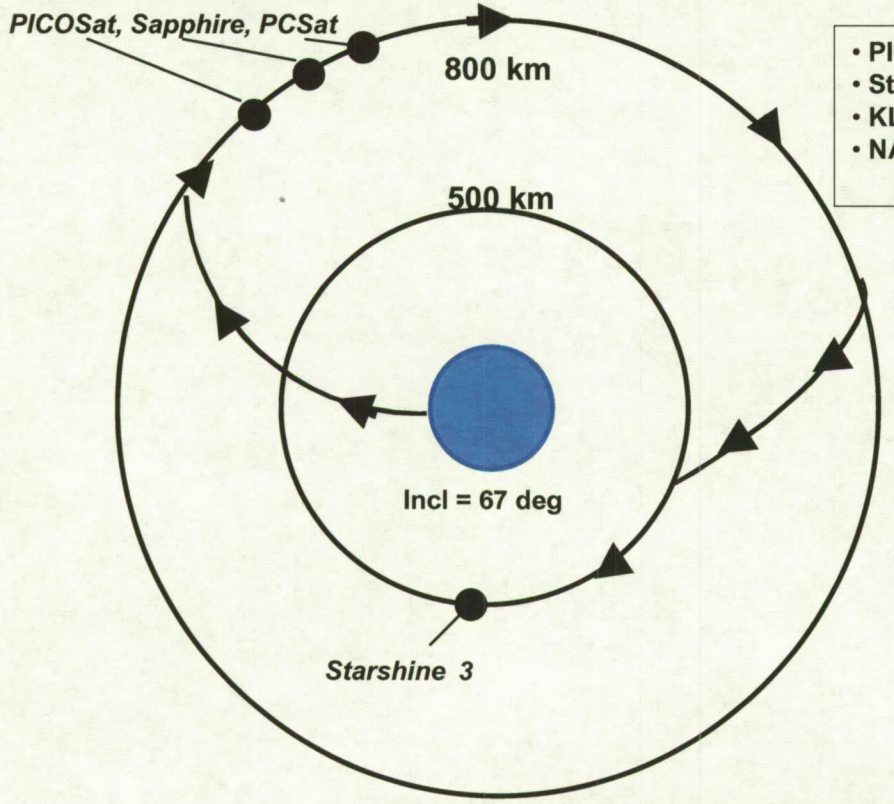
So, How did it all get start?

The Mission

The concept for the Kodiak Star mission was developed at a *Munch & Mingle Luncheon* during the 2000 Small Satellite Conference in Logan UT.

The Mission

Kodiak Star Mission Design



- PICOSat considered primary by USAF
- StarShine 3 considered primary by NASA
- KLC Launch - first orbital space launch
- NASA provided Range – Wallops Island

Preliminary analysis completed
- 3–sigma performance reserve
- Mode sequencing and memory
- Schedule and Timelines
- Elect & Mech Interfaces

	PICOSat	PCSat	Sapphire	Starshine
Mass (kg)	67	15	22	91
Orbit Alt Range (km)	650-1100	200-1400	500-1100	?-500
Desired Orbit Alt (km)	800	1100	1100	500
Orbit Inclination (deg)	50-70	40-90	40-90	?
Desired Inclination (deg)	55	90	90	polar

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The Mission

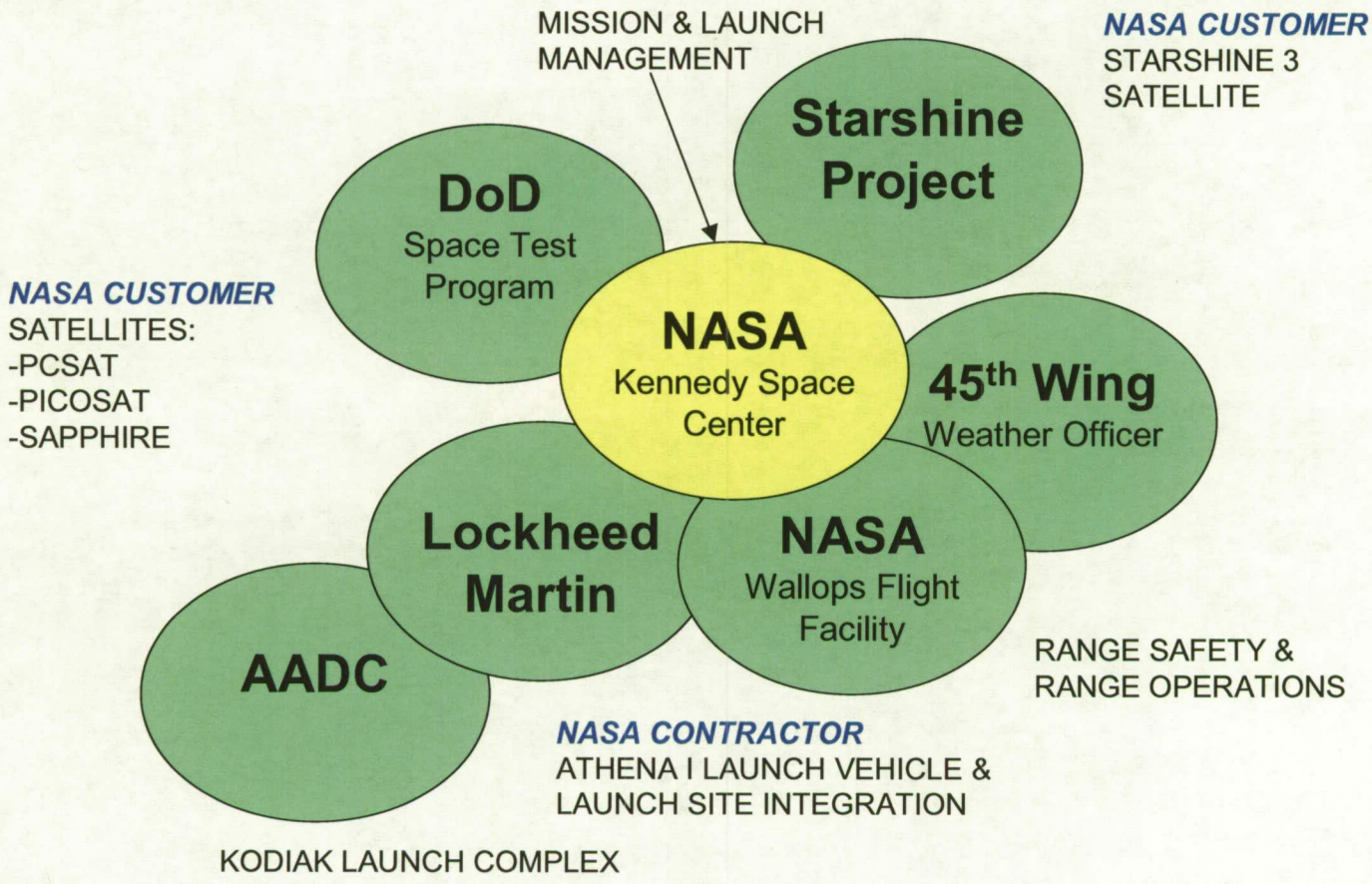
EXPENDABLE LAUNCH VEHICLES

Kodiak Star Integration

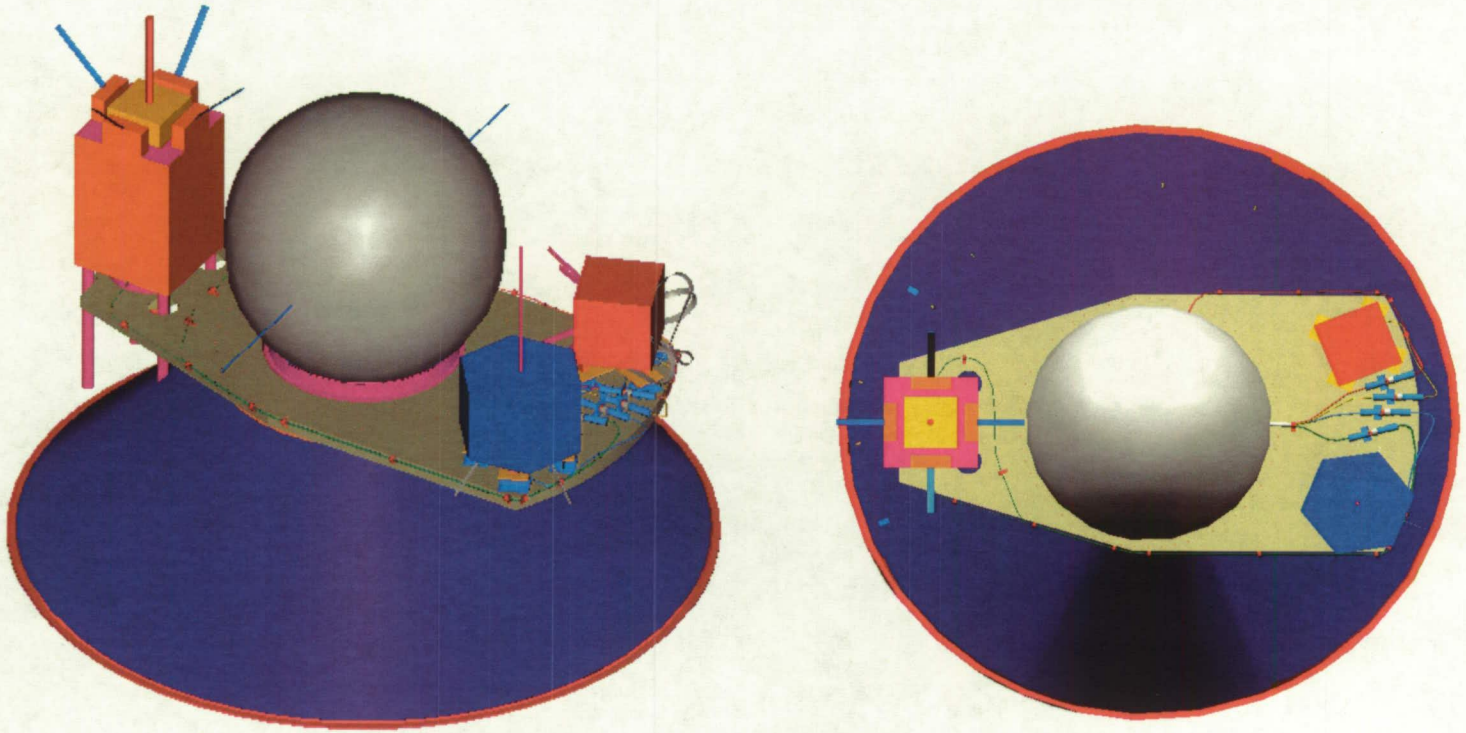
TASK	2000 Oct	Nov	Dec	2001 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Kickoff/ MIWG/GOWG	10/18		12/13	1/11		3/8		5/9		7/11	GORR		
Launch Site		11/2 KLC Site Visit						5/1	5/30	Mobile Range Equip on KLC			
System Analysis/Integration	10/19										7/30		
Spacecraft Fit Check						3/13	3/20						
Athena Stack ing								6/1	6/19				
Athena Processing									6/19			9/29	
Starshine Mate to PUD										7/30			
Sapphire Mate to PUD										8/8			
PCSat Mate to PUD										8/9			
PICOSat Mate to PUD										8/15			
Encapsulation											9/4		
Encap. Assembly Stack											9/5		
Peer Team Review							5/4	5/25					
Mission Dress Rehearsal										MDR I 8/3	MDR II 8/13		
KSC Center Director Review											8/30		
Flight Readness Review for ILC on 9/22												9/16	
Launch Readness Review for ILC on 9/22												9/19	
ILC - Intial											8/28		
ILC - Pre 9/11												9/17	
ILC - Post 9/11												9/22	
Solar Flares												9/24	
ILC - Launch												9/29	

The Team

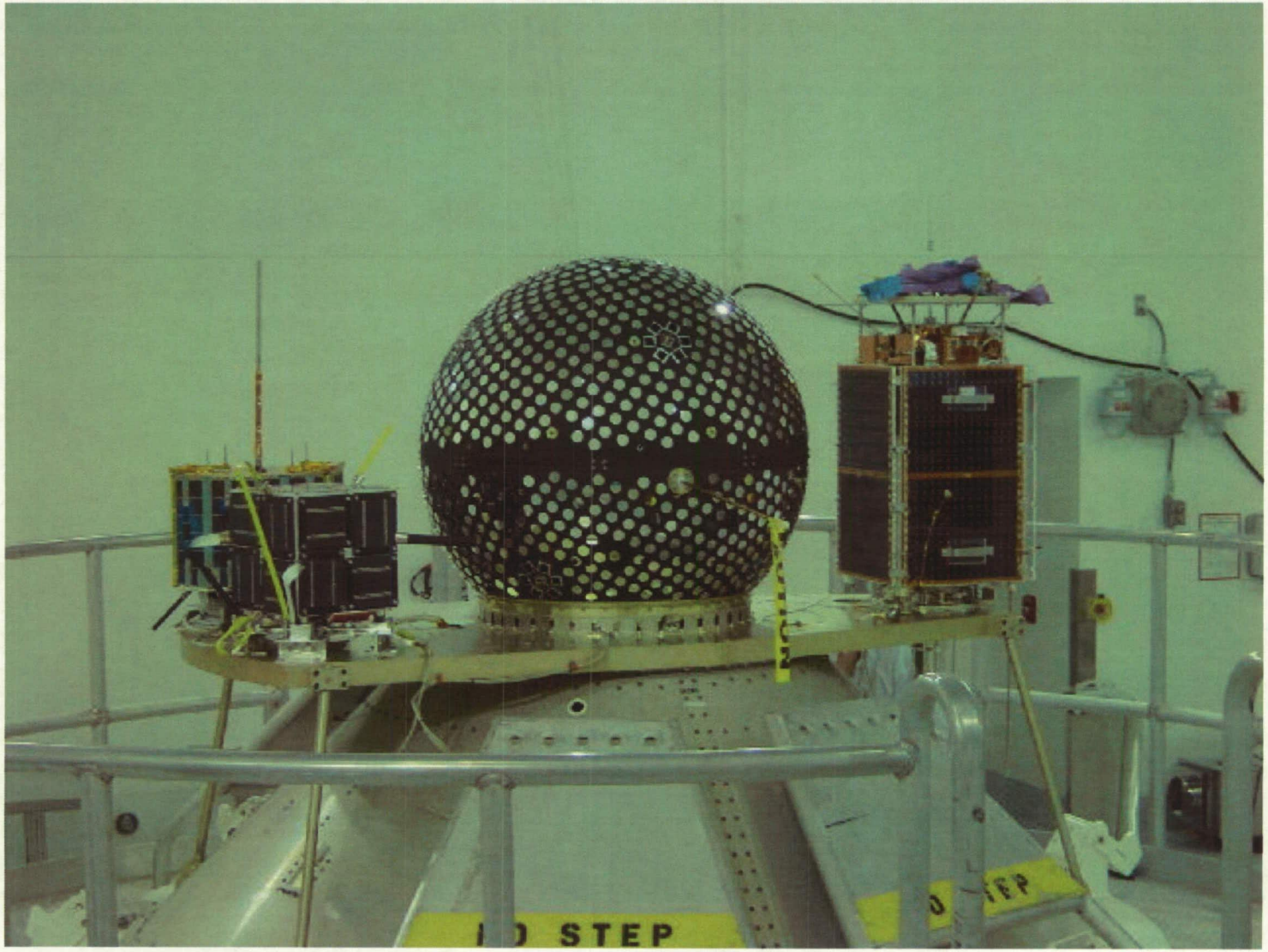
Kodiak Star Team Organizations



The Payload Upper Deck

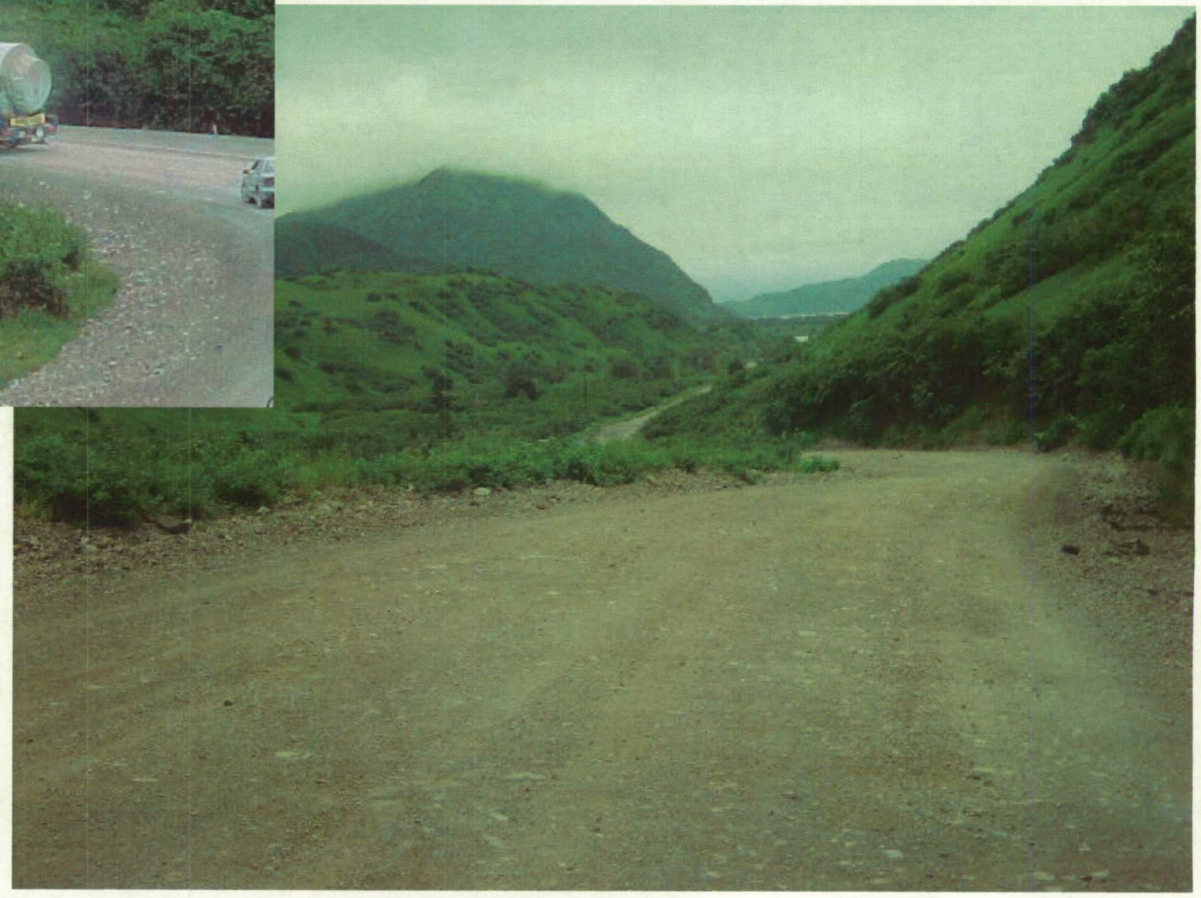


The Challenges



The Challenges

Travel to Launch Site



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The Challenges

EXPENDABLE LAUNCH VEHICLES

Launch Site

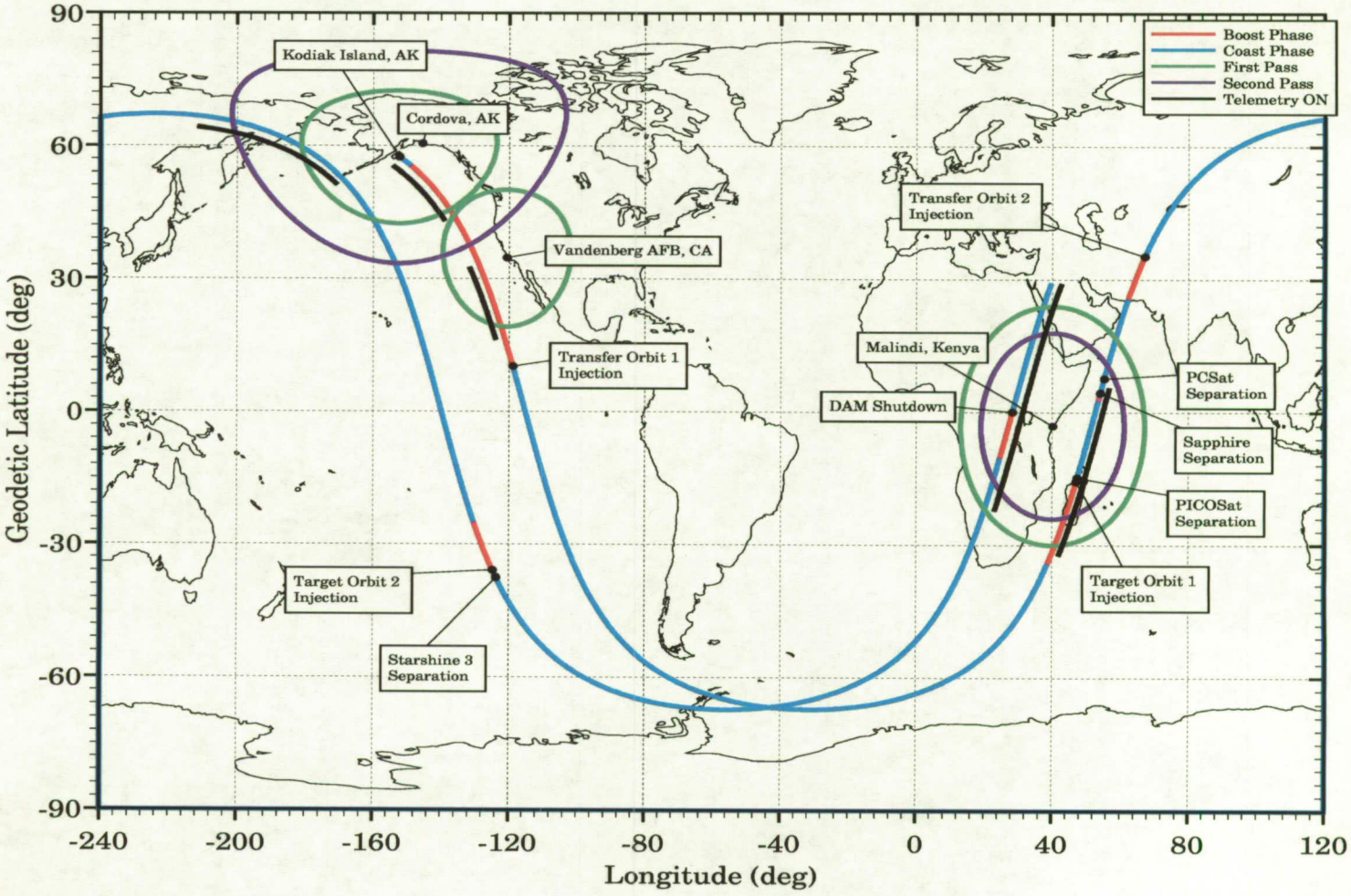
The Challenges

KLC Weather Constraint Status
September 2001

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2 **Fishing Day**	3	4 Cumulus Cloud Rule Ceiling < 5000 ft	5	6 **Fishing Day** Ceiling < 5000 ft Dist Wx Rule Thick Cloud Rule	7	8
9 **Fishing Day** Ceiling < 5000 ft	10 **Fishing Day** Ceiling < 5000 ft Vis < 2 Miles Dist Wx Rule Thick Cloud Rule	11 **Fishing Day** Ceiling < 5000 ft Vis < 2 Miles Dist Wx Rule Thick Cloud Rule	12	13 **Fishing Day** Ceiling < 5000 ft Possible Thick Cloud Rule	14 **Fishing Day** Ceiling < 5000 ft	15 **Fishing Day** Ceiling < 5000 ft Thick Cloud Rule
16 **Fishing Day** Ceiling < 5000 ft Thick Cloud Rule	17 Cumulus Cloud Rule Ceiling < 5000 ft	18	19 **Fishing Day** Ceiling < 5000 ft	20	21 **Fishing Day** Winds > 35 kts Ceiling < 5000 ft Vis < 2 Miles Dist Wx Rule Thick Cloud Rule	22
23 30 **Fishing Days** Ceiling < 5000 ft	2 4 **Fishing Day** Solar Constraint	25 **Fishing Day** Solar Constraint	26 **Fishing Day** Solar Constraint	27 **Fishing Day** Solar Constraint	28 **Fishing Day** Solar Constraint	29 Launch Solar

The Success

Mission Performance



The Success

Orbit Injection Accuracy			
Orbital Element	**Required Orbit**	**IMU Derived**	**NORAD**
TARGET ORBIT 1			
Perigee Radius (km)	7178.1 $\pm$ 20	**7177.5 (-0.6)**	**7175.9 (-2.2)**
Apogee Radius (km)	7178.1 $\pm$ 20	**7178.2 (+0.1)**	**7178.4 (+0.3)**
Inclination (deg)	67 $\pm$ 0.3	**67.01(+0.01)**	**67.04 (+0.04)**
TARGET ORBIT 2			
Perigee Radius (km)	6848.1 +30 –NA	**6845.6 (-2.5)**	**6839.2 (-8.9)**
Apogee Radius (km)	6848.1 +30 –NA	**6850.7 (+2.6)**	**6852.5 (+4.4)**
Inclination (deg)	67 $\pm$ NA	**67.05**	**67.06**

Summary

- The Kodiak Star Mission was very challenging and offers significant lesson for future missions. A multinational fully integrated team had the opportunity to perform a truly first of a kind mission from a new launch complex with a unique manifest of experimental spacecraft. The integration goal of 10-months was met utilizing quick identification of the issues, and determining innovative ways to solve the problems