Commercial Space Transportation

QUARTERLY LAUNCH REPORT

Featuring the launch results from the 1st quarter 2000 and forecasts for the 2nd quarter 2000 and the 3rd quarter 2000

Special Report:
FAA's Third Annual Commercial Space Transportation Forecast Conference

2nd Quarter 2000

United States Department of Transportation • Federal Aviation Administration
Associate Administrator for Commercial Space Transportation
800 Independence Ave. SW Room 331
Washington, D.C. 20591

Introduction

This report features the launch results from the first quarter of 2000 (January-March 2000) and launch forecasts for the second quarter of 2000 (April-June 2000) and the third quarter of 2000 (July-September 2000). This report contains information on worldwide commercial, civil, and military orbital space launch events. Projected launches have been identified from open sources, including industry references, company manifests, periodicals, and government sources. Note that projected launches are subject to change.

This report highlights commercial launch activities, classifying commercial launches as one or more of the following:

- *Internationally competed launch events (i.e., launch opportunities considered available in principle to competitors in the international launch services market),*
- *Any launches licensed by the Office of the Associate Administrator for Commercial Space Transportation of the Federal Aviation Administration under U.S. Code Title 49, Section 701, Subsection 9 (previously known as the Commercial Space Launch Act), and*
- *Certain European launches of post, telegraph and telecommunications payloads on Ariane vehicles.*

Contents

Photo credit: An Atlas 2AS, designated AC-158, successfully launched HISPASAT 1C, a Spanish communications satellite, on February 3, 2000, from Cape Canaveral Air Station, FL. This was the 48th consecutive successful Atlas launch.

Highlights From First Quarter 2000

One Launch Failure Investigation Closed, Another Opened

The Proton launch vehicle returned to service on February 12 when it successfully lofted Indonesia's Garuda 1 into geosynchronous orbit. Prior to this launch, the Proton had been effectively grounded following the October 27, 1999 launch failure when the government of Kazakhstan banned Proton launches from Baikonur until a thorough investigation of the failure was completed.

After an investigation, Russian authorities concluded that the failure had been caused by the presence of foreign matter in one of the vehicle's second stage engines. To prevent such failures in the future, the Proton's manufacturer will install special filters in these engines. Satisfied by the conclusions of the investigation, Kazakhstan lifted its ban on Proton launches in time for the scheduled February launch of Garuda 1.

International Launch Services (ILS) is the commercial launch service provider of the Proton and Atlas vehicles. In 1999, ILS experienced the Proton ban and also a lengthy delay in launches of its Atlas vehicle. For the year 2000, ILS should experience not only the Proton's return, but also the introduction of a new Atlas vehicle, the Atlas 3.

Exactly one month after the Proton successfully returned to service, Sea Launch's Zenit 3SL suffered its first launch failure. On March 12, the third Zenit 3SL mission failed to deploy the first ICO satellite when it flew off course during its second stage burn. The mishap followed the successful launches of Sea Launch's first two vehicles in 1999. Sea Launch has formed a board to investigate the failure. Although not completed, the latest reports of the investigation point to a software error in the ground system.

ICO Global Communications, the owner of the satellite lost in the failure, experienced several financial woes in the last half of 1999 that eventually led to bankruptcy. ICO was subsequently buoyed by a substantial investment by Craig McCaw and his Eagle River company, the same company that is spearheading the ambitious Teledesic project. ICO was originally designed to be an independent constellation of ten satellites offering voice and paging communications services. Recent statements by Eagle River indicate that the ICO system may be modified to offer data services as well.

Fortunately, given the loss of the first ICO satellite, ICO had already contracted with Hughes to build two spare satellites in addition to the ten that will make up their constellation. To further mitigate risks, ICO signed launch contracts with four different companies so that their system would not be hostage to the setbacks and delays of one vehicle. Currently the next ICO satellite is scheduled to be launched in fall 2000 on a Delta 3, Atlas 2, or Proton.

First Quarter 2000 Launch Events Summary

(January 2000 – March 2000)

Figure 1: Launch Vehicle Use

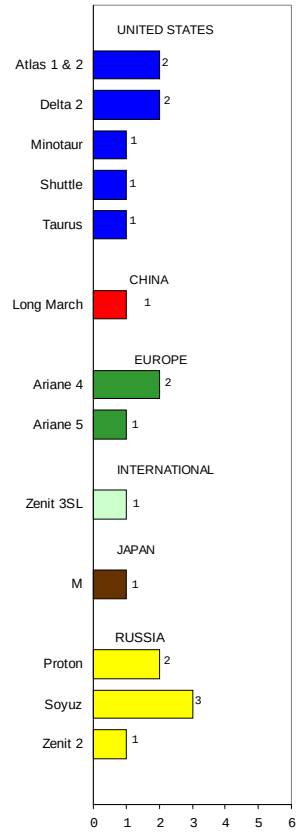

Figure 2: Launch Events by Country

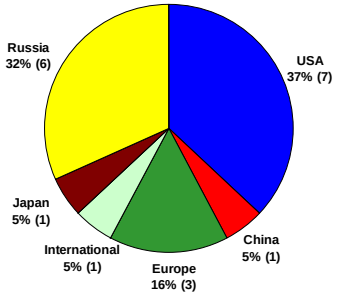

Figure 3: Commercial Launch Events by Country

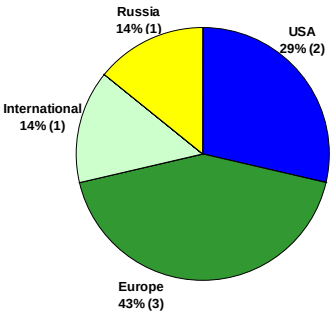

Figure 4: Payload Use Summary

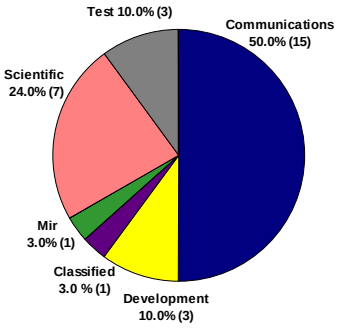

Figure 5: Launch Success vs. Failures

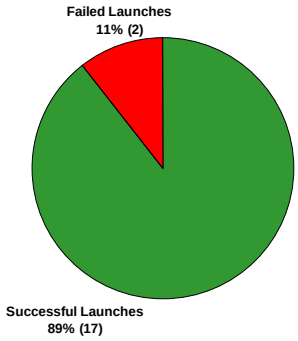

Figure 1 shows the number of launches of each launch vehicle that occurred in the first quarter of 2000. The launches are grouped by the country in which the primary vehicle manufacturer is based. Exceptions to this grouping are launches preformed by Sea Launch, which are designated as "International."

Figure 2 shows all orbital launch events that occurred in the first quarter of 2000 by country.

Figure 3 shows all *commercial* orbital launch events that occurred in the first quarter of 2000 by country. The definition of "commercial" can be found on Page 1.

Figure 4 shows the payloads launched into orbit in the first quarter of 2000 by the mission of the payload. Note: the total number of payloads launched may not equal the total number of launches. This is due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Figure 5 shows launch outcome for all orbital launch events that occurred in the first quarter of 2000 by country.

Second Quarter 2000 Launch Events Summary
(April – June 2000)

Figure 6: Projected Launch Vehicle Use

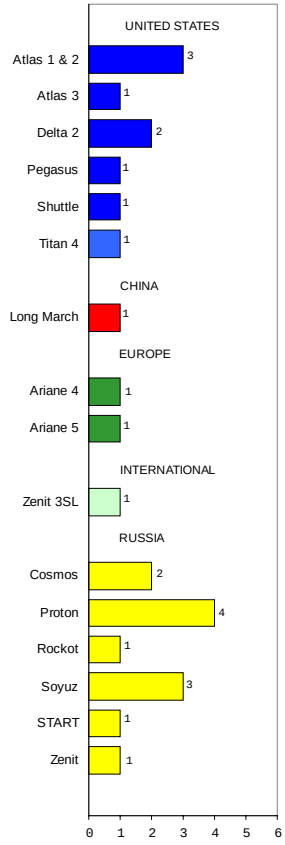

Figure 7: Projected Launch Events by Country

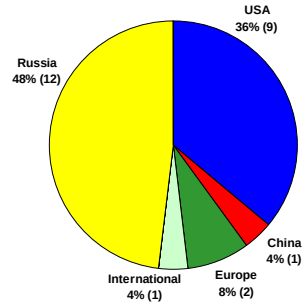

Figure 8: Projected Commercial Launch Events by Country

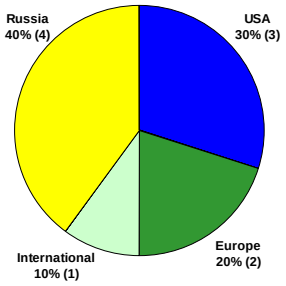

Figure 9: Projected Payload Use Summary

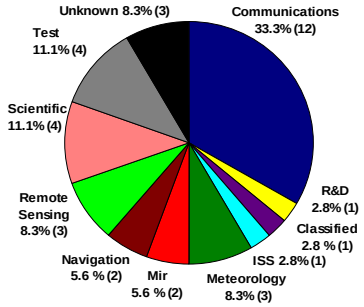

Figure 10: Projected Payload Mass Class Summary

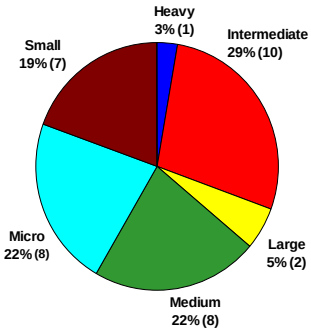

Figure 6 shows the number of launches projected to occur in the second quarter of 2000 by launch vehicle, by country.

Figure 7 shows all orbital launch events projected to occur in the second quarter of 2000 by country.

Figure 8 shows all *commercial* orbital launch events projected to occur in the second quarter of 2000 by country.

Figure 9 shows the payloads projected to launch into orbit in the second quarter of 2000 by the mission of the payload. Note: the total number of payloads launched may not equal the total number of launches. This is due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Figure 10 shows payloads projected to launch in the second quarter of 2000 by mass class. Micro (0 to 200 lbs.), Small (201 to 2,000 lbs.), Medium (2,001 to 5,000 lbs.), Intermediate (5,001 lbs. to 10,000 lbs.), Large (10,001 lbs. to 20,000 lbs.), and Heavy (Over 20,000 lbs.)

Third Quarter 2000 Launch Events Summary
(July – September 2000)

Figure 11: Projected Launch Vehicle Use

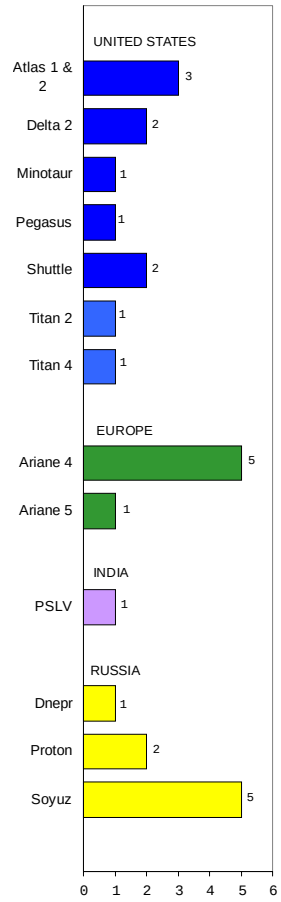

Figure 12: Projected Launch Events by Country

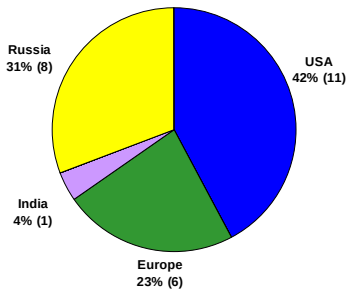

Figure 13: Projected Commercial Launch Events by Country

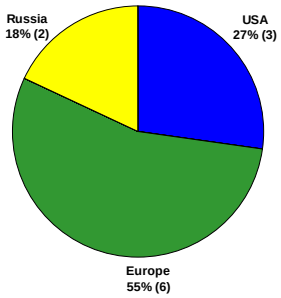

Figure 14: Projected Payload Use Summary

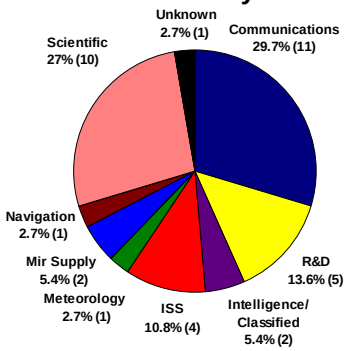

Figure 15: Projected Payload Mass Class Summary

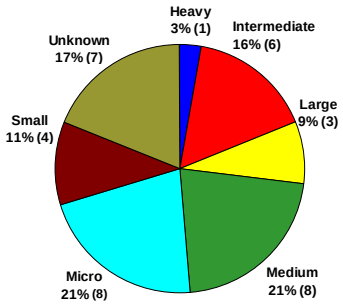

Figure 11 shows the number of launches projected to occur in the third quarter of 2000 by launch vehicle, by country.

Figure 12 shows all orbital launch events projected to occur in the third quarter of 2000 by country.

Figure 13 shows all *commercial* orbital launch events projected to occur in the third quarter of 2000 by country.

Figure 14 shows the payloads projected to launch into orbit in the third quarter of 2000 by the mission of the payload. Note: the total number of payloads launched may not equal the total number of launches. This is due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Figure 15 shows payloads projected to launch in the third quarter of 2000 by mass class. Micro (0 to 200 lbs.), Small (201 to 2,000 lbs.), Medium (2,001 to 5,000 lbs.), Intermediate (5,001 lbs. to 10,000 lbs.), Large (10,001 lbs. to 20,000 lbs.), and Heavy (Over 20,000 lbs.)

Historical Commercial Launch Trends

Figure 16: Commercial Launch Events, Last 12 Months

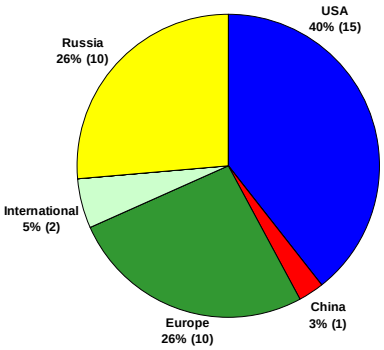

Figure 17: Commercial Launch Revenue, Last 12 Months

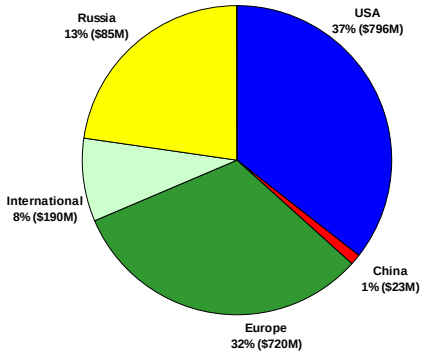

Figure 18: Commercial Launches by Country, Last Five Years

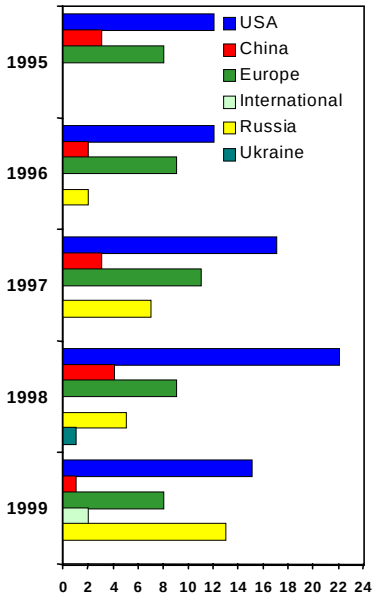

Figure 19: Commercial Launch Revenue by Country, Last Five Years

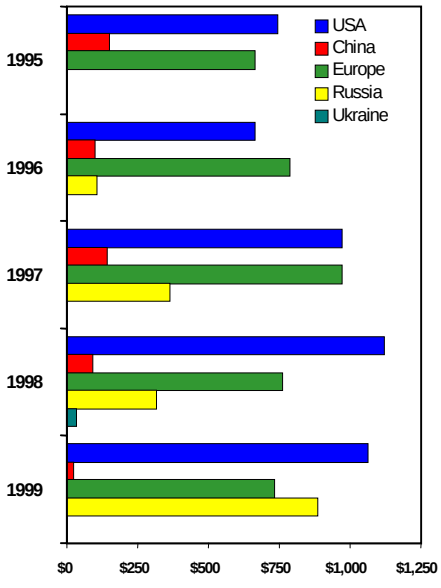

Figure 16 shows commercial launch events for the period April 1999 to March 2000 by country.

Figure 17 shows commercial launch revenue for the period April 1999 to March 2000 by country.

Figure 18 shows the trend in commercial launch events for the last five full years by country, by year.

Figure 19 shows the trend in commercial launch revenue for the last five full years by country, by year.

FAA'S THIRD ANNUAL COMMERCIAL SPACE TRANSPORTATION FORECAST CONFERENCE (FEBRUARY 8-9 2000)

INTRODUCTION

The Third Annual Federal Aviation Administration (FAA) Commercial Space Transportation Forecast Conference took place in Arlington, Virginia at the Sheraton National Hotel. The year 2000 conference featured seven panels and several special presentations by top-level government and industry guests, including the Honorable Rodney E. Slater, Secretary, U.S. Department of Transportation, Dr. Neal Lane, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy (OSTP), and Representative Dana Rohrabacher, Chairman, Subcommittee on Space and Aeronautics, House Committee on Science.

The first day kicked off with opening remarks by FAA Associate Administrator for Commercial Space Transportation, Patricia G. Smith. Ms. Smith highlighted three strategic projects for the FAA in commercial space transportation: 1) Space Transportation Vehicle Safety, a project which will establish an FAA process to address all aspects of space flight operations; 2) the continuation of work on the Space and Air Traffic Management System (SATMS), the program for the future integration of commercial space launch operations into the existing air traffic management system; and 3) the continuation of work with the Air Force on the development of national safety standards for commercial launch operations.

Ms. Smith expressed appreciation for the work and accomplishments of the U.S. commercial launch and commercial spaceport industries for the past year. She also expressed confidence that commercial launch operations would be stronger and more successful for 2000 and beyond.

Featured Speakers

On Tuesday, February 8, Former Chairman of the House Science Committee, Robert Walker, delivered the conference luncheon address. Mr. Walker is currently the Chairman and Chief Executive Officer for the Wexler Group. He discussed the "Three Es" for the future of the U.S. space sector—exploration, the opportunity to develop new knowledge through space travel and applications; exploitation, the utilization of space to meet specific commercial and military needs; and entrepreneurship, innovative ideas and activities that would create more investment in space operations.

Also on Tuesday, there was a special presentation by Dr. Neal Lane, who reported on the findings from the OSTP/National Security Council (NSC) *Interagency Review on the Future Management and Use of U.S. Space Launch Bases and Ranges.* Dr. Lane outlined key recommendations from the review including, alternative management processes to allow U.S. commercial and government users to have a greater voice in improving operational flexibility and efficiency of the ranges; use of non-Federal funding where appropriate for the maintenance and modernization of launch

bases and ranges to meet national needs; and options for replacing excess capacity construct in current law to allow a more complete Federal-state-industry partnership to develop. Lt. Col. Vic Villhard, Assistant Director for Space and Aeronautics in OSTP, provided details on the OSTP/NSC Review and answered questions from the conference audience.

Art Stephenson, Director, NASA Marshall Space Flight Center, provided an in-depth presentation on the NASA Space Launch Initiative, Space Shuttle upgrades, and third-generation technologies. He pointed out that in addition to NASA's goal for safe, reliable and affordable space transportation, there is the goal to transition NASA's space transportation needs to commercial launch vehicles.

Mr. Stephenson outlined the three-point strategy to support NASA's goals: 1) investment in technical and programmatic risk reduction activities driven by industry need to enable full scale development of commercially competitive, privately-owned and operated earth-to-orbit RLVs by 2005; 2) development of an integrated architecture with systems that build on commercial earth-to-orbit launch vehicles to meet NASA unique requirements that cannot be economically served by commercial vehicles alone; and 3) enabling procurements of near-term, path-finding launch services for select space station needs on commercial launch vehicles.

On Wednesday, February 9, Representative Dana Rohrabacher discussed a wide range of issues including, the President's budget proposal for 2001; NASA's strategic plans for replacing the Shuttle with commercial launch vehicles in 2005 and plans for buying alternative access to the international space station; and results of the OSTP/NSC Review. Congressman Rohrabacher expressed his desires that NASA increase its promotion of new industries in space, especially space tourism; that the private sector increase its investments in new and innovative ways which would foster more opportunity in space operations; and that the private sector and government work cooperatively to reduce the high costs of access to space.

The highlight of the year 2000 conference was the address by Transportation Secretary Rodney Slater. Secretary Slater also discussed the results of the OSTP/NSC Review and reiterated some of the recommendations discussed the previous day by Dr. Lane. He noted that the Department of Transportation and the FAA were committed to supporting the recommendations and working with industry to develop common range safety requirements for all space sectors for Federal and non-Federal launch sites.

Secretary Slater reported that DOT is requesting a doubling of resources (from $6.2 million to $12.6 million) to ensure that FAA resources will be adequate to meet current and future work for commercial space transportation and commercial spaceports. He also announced the upcoming International Transportation Symposium that will take place in October 2000 and urged participation from the commercial space transportation industry.

Secretary Slater emphasized the Administration's commitment to the growth, both technologically and economically, of the U.S. commercial space transportation. He told conference participants "…that there is no part of the transportation enterprise that forces us to cast our sights to higher

heights any more than this sector; without your role and without your vision…we cannot have a transportation system that is truly a transportation system of the 21st century."

Conference Panels

PANEL 1: THE SPACE EXPERIENCE: WHO, WHEN, AND HOW?

The first panel focused on the various types of human experience in space. Marguerite Broadwell, Commercial Development Manager of Operations and Services, International Space Station for NASA, discussed the development of the Space Station and its current status. Roger Crouch, NASA Shuttle Astronaut, provided personal accounts of the space experience as a Payload Specialist aboard the NASA Shuttle. He focused on the physiological effects of extended stays in space, as well as efforts by NASA to try to alleviate some of the negative physiological side effects.

Tom Rogers, Chief Scientist, Space Transportation Association, provided an overview of the human space flight experience, starting with a historical context from 1957 with the launch of the former Soviet Union's Sputnik through his vision of the future wherein space will be opened to the general public.

PANEL 2: SO YOU WANT TO LAUNCH ROCKETS?: THE EVOLVING LAUNCH SITES

This panel explored the various stages of evolution for U.S. launch sites, including non-Federal or commercial spaceports for launch and reentry and existing sites. Pat Ladner, Executive Director, Alaska Aerospace Development Corporation, discussed the challenges of operating and facility construction for the Kodiak Launch Complex, one of four FAA-licensed commercial spaceports. Robert Triplett, Chairman of the Oklahoma Aeronautics & Space Commission and Tom Moser, Executive Director for the Texas Aerospace Commission, discussed their efforts to development non-Federal sites in their states. Loren Shriver, Deptuy Director, Kennedy Space Center, Florida, discussed the operation of the traditional Federal launch site and the changing environment for Federal sites.

PANEL 3: ENVIRONMENTAL CASE STUDIES: OVERCOMING THE OBSTACLES

This was the first panel for the annual Commercial Space Transportation Forecast Conference to focus on environmental issues for commercial launch operations and commercial spaceport development. Panelists included Will Ernst, Environmental Specialist for the Boeing Company, Hanson Scott, Executive Director, Southwest Regional Spaceport, New Mexico Office of Space Commercialization, Sal V. Cuccarese, Director, Environment & Natural Resource Institute, University of Alaska, and Daphne Fuller, Manager, Environment Law Branch for the FAA.

PANEL 4: OF RISKS AND RIGHTS: RISK ASSESSMENT AND MANAGEMENT

The fourth panel examined the types of information needed to assess risks in order to make informed decisions, the types of decisions about risk that should be left to personal choice, what the government's role should be in assessing and managing personal and societal risk, and whether risk management is a business or a marketplace-driven decision. Panelists included John

Ross, Senior Editor of Smithsonian Magazine, who discussed the overall nature of risk and how individuals evaluate and deal with risk on a daily basis; Peter Diamandis, Chairman of the X-Prize Foundation, who discussed his views on risk acceptance and its relationship to progress; and John Vinter, President, International Space Brokers, Inc., who provided an overview of the state of the space insurance market and space risk.

Panel 5: Kicking the Tires and Getting Under the Hood: RLV Operation and Maintenance

Panelists Robert Davis, Chief Executive Officer, Kelly Space & Technology, Inc., Carl Meade, X-33 Deputy Program Manager, Lockheed Martin Skunk Works, and Hugo Delgado, Chief Engineer for Advanced Development and Shuttle Upgrades, Kennedy Space Center, discussed the challenges of RLV operation and maintenance. Perspectives ranged from the new concepts for RLV development, including Kelly's proposal for a two-stage launch vehicle and Venture Star operations, to the processing and upgrades for the Space Shuttle.

Panel 6: In the Footsteps of Walter Cronkite: Space Journalism

Panel six included two distinguished space journalists from the Washington, DC area, who discussed the state of coverage of space programs and commercial space transportation. Rick Barnard, Vice President and Executive Editor for *Space News*, provided a historical discussion of space coverage from the beginning of the manned program to the present, and a look at the future prospects for coverage of space activities. Paul Hoversten, Washington Bureau Chief for Space.com, presented information on space media coverage using the vastness of electronic media.

Panel 7: Customized and the Right Price: Optimizing Payloads for RLVs

The final panel presented representatives from three companies developing new RLV concepts to explore the benefits that fully reusable launch vehicles can bring when they become operational and available to a wide range of customers in various markets, whether customers will gain flexibility through RLV utilization, how the RLV will help to improve the business case of its customers. Panelists were Michael Kelly, Chairman, Kelly Space & Technology, Inc., Gary Hudson, President, Rotary Rocket Company, and Charles Lauer, Vice president of Business Development, Pioneer Rocketplane.

First Quarter 2000 Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price	L	M
1/20/00		Atlas 2A	CCAS		DSCS III 3-11	DoD	Lockheed Martin Corp.	Communications	$75-85M	S	S
1/24/00	√	Ariane 42L	Kourou	*	Galaxy 10R	Pan American Satellite Corp.	Hughes	Communications	$80-100M	S	S
1/26/00		Long March 3A	Xichang	*	DFH 3	Chinese Broadcasting Satellite Corp.	Chinese Academy of Space Technology	Communications	$45-55M	S	S
1/26/00		Minotaur	California Spaceport		Jawsat	Air Force Academy & Weber State Univ	Air Force Academy	Scientific	$10-15M	S	S
					Artemis Picosat	Santa Clara University	Santa Clara University	Scientific			
					ASUSat 1	Arizona State University	Arizona State University	Scientific			
					DARPA Picosat	DARPA	DARPA	Scientific			
					FalconSat	USAF	USAF	Development			
					MASAT	Unknown	Unknown	Communications			
					OPAL	Space Systems Development Laboratory	Space Systems Development Laboratory	Development			
					STENSAT	Radio Amateurs	Radio Amateurs	Scientific			
2/1/00		Soyuz	Baikonur		Progress M1-1	RKK Energia	RKK Energia	Supply	$35-40M	S	S
2/3/00	√	+ Atlas 2AS	CCAS	*	Hispasat 1C	Hispasat	Aerospatiale	Communications	$90-105M	S	S
2/3/00		Zenit 2	Baikonur		Kosmos 2369	Russian MoD	KB Yuzhnoe	Intelligence	$35-40M	S	S
2/8/00	√	+ Delta 2 7420	CCAS	*	Globalstars 60, 62-64	Globalstar, Inc.	Space Systems/Loral	Communications	$45-55M	S	S
2/9/00		Soyuz	Baikonur		Dummy	Unknown	Unknown	Test	$35-40M	S	S
					IRDT	Starsem	DaimlerChrysler Aerospace	Test			
2/10/00		M 5	Kagoshima		Astro E	ISAS	ISAS	Scientific	$35-45M	F	F
2/11/00		Shuttle Endeavour	KSC		STS 99	NASA	Rockwell International	Crewed	$300M	S	S
2/12/00	√	Proton	Baikonur	*	Garuda 1	Asia Cellular Satellite (ACeS)	Lockheed Martin Corp.	Communications	$75-95M	S	S
2/17/00	√	Ariane 44LP	Kourou	*	Superbird 4	Space Communications Corp.	Hughes	Communications	$90-110M	S	S
3/12/00	√	+ Zenit 3SL	Sea Launch Platform	*	ICO Z-1	ICO	Hughes	Communications	$75-95M	F	F
3/12/00		Taurus 1	VAFB		MTI	DoD	Ball Aerospace	Development	$18-20M	S	S

√ Denotes commercial launch, defined as a launch that is internationally competed or whose primary payload is commercial in nature.

+ Denotes FAA-licensed launch.

* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is opperated by a commercial entity.

L/M refers to the outcome of the launch and mission: S = success, P = partial success, F = failure

First Quarter 2000 Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price	L	M
3/12/00		Proton	Baikonur	*	Express 6A	Intersputnik	NPO Prikladnoi Mekhaniki	Communications	$75-95M	S	S
3/20/00		Soyuz	Baikonur		Dumsat	Starsem	Unknown	Test	$35-40M	S	S
3/21/00	√	Ariane 5	Kourou	*	AsiaStar 1	WorldSpace, Inc.	Alcatel Espace	Communications	$150-180M	S	S
				*	Insat 3B	ISRO	ISRO	Communications		S	S
3/25/00		Delta 2 7326	VAFB		IMAGE	NASA	Lockheed Martin Corp.	Scientific	$45-55M	S	S

√ Denotes commercial launch, defined as a launch that is internationally competed or whose primary payload is commercial in nature.

+ Denotes FAA-licensed launch.

* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is opperated by a commercial entity.

L/M refers to the outcome of the launch and mission: S = success, P = partial success, F = failure

Second Quarter 2000 Projected Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price
4/3/00		Soyuz	Baikonur		Soyuz TM-30	RKK Energia	RKK Energia	Crewed	$35-40M
4/17/00		Proton	Baikonur		Sesat	Eutelsat	NPO Prikladnoi Mekhaniki	Communications	$75-95M
4/18/00	√	Ariane 42L	Kourou	*	Galaxy 4R	Pan American Satellite Corp.	Hughes	Communications	$80-100M
4/21/00		Delta 2 7925	CCAS		Navstar GPS 2R- 4	DoD	Lockheed Martin Corp.	Navigation	$50-60M
4/21/00		Rockot	Plesetsk		Rockot Demo 1	Unknown	Unknown	Test	$12-15M
					Rockot Demo 2	Unknown	Unknown	Test	
4/24/00		Shuttle Atlantis	KSC		STS 101	NASA	Rockwell International	Crewed	$300M
					ISS Cargo	NASA	NASA	Space Station	
4/XX/00		Proton	Baikonur	*	Gorizont TBA	PO Kosmicheskaya Sviaz	NPO Prikladnoi Mekhaniki	Communications	$75-95M
4/XX/00		Zenit 2	Baikonur		Meteor 3M-1	Russia	VNII	Meteorological	$35-40M
					Maroc-Tubsat	TBA	TBA	Development	
					Badr 2	SUPARCO	SUPARCO	Remote Sensing	
					Reflector	TBA	TBA	TBA	
					Tiungsat 1	TBA	TBA	Development	
5/3/00		Atlas 2A	CCAS		GOES L	NOAA	Space Systems/Loral	Meteorological	$75-85M
5/8/00		Titan 4B/IUS	CCAS		DSP 20	DoD	TRW	Intelligence	$350-450M
5/15/00	√	+ Atlas 3A	CCAS	*	Eutelsat W4	Eutelsat	Alcatel Espace		$90-105M
5/23/00	√	Ariane 5	Kourou	*	Astra 2B	Societe Europeenne des Satellites (SES)	Matra Marconi Space	Communications	$150-180M
			Kourou	*	GE 7	GE Americom	Lockheed Martin Corp.	Communications	
5/31/00	√	Cosmos	Plesetsk		BIRD	DLR	DLR	Test	$12-14M
					Champ	DARA	Jena-Optronik GmbH	Scientific	
					Mita	Italian Space Agency (ASI)	Carlo Gavazzi Space	Communications	
5/XX/00		Soyuz	Baikonur		Progress M1-2	RKK Energia	RKK Energia	Supply	$35-40M
5/XX/00	√	START 1	Svobodny		Odin	Swedish National Space Board	Swedish Space Corp.	Scientific	$5-10M
6/11/00	√	+ Atlas 2AS	CCAS	*	Echostar 6	EchoStar Satellite Corp.	Space Systems/Loral	Communications	$90-105M
6/15/00		Soyuz	Baikonur		Cluster II 1	ESA	Dornier	Scientific	$35-40M
					Cluster II 2	ESA	Dornier	Scientific	
6/15/00		Delta 2 7925	CCAS		Navstar GPS 2R- 5	DoD	Lockheed Martin Corp.	Navigation	$50-60M
6/20/00		Proton	Baikonur		Express 3A	Intersputnik	NPO Prikladnoi Mekhaniki	Communication	$75-95M
6/29/00		Atlas 2A	CCAS		TDRS F8	NASA	Hughes	Communications	$75-85M

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Second Quarter 2000 Projected Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price
6/XX/00	√	Cosmos	Plesetsk	*	QuickBird 1	Earthwatch, Inc.	Ball Aerospace	Remote Sensing	$12-14M
				*	SNAP 1	Surrey Satellite Technology Ltd.	Surrey Satellite Technology Ltd.	Test	
				*	Tsinghua 1	Tsinghua University	Surrey Satellite Technology Ltd.	Remote Sensing	
6/XX/00		Proton	Baikonur		Luch 1-2	Tas-Luch	NPO Prikladnoi Mekhaniki	Communications	$75-95M
2nd Quarter	√	+ Zenit 3SL	Sea Launch Platform		PAS 9	Pan American Satellite Corp.	Hughes	Communications	$75-95M
2nd Quarter	√	+ Pegasus XL	VAFB		TSX 5	DoD	Orbital Sciences Corp.	Development	$12-15M
2nd Quarter		Long March 3	Xichang		FY 2B (2000)	China Meteorological Administration	Shanghai Institute of Satellite Engineering	Meteorological	$35-40M

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Third Quarter 2000 Projected Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price
7/1/00		Minotaur	VAFB		MightySat 2-1	DoD	Spectrum Astro, Inc.	Development	$10-15M
7/6/00	√	Ariane 44LP	Kourou	*	Europe Star 1	Europe Star	Space Systems/Loral	Communications	$90-110M
7/8/00		Proton	Baikonur		Zvezda	Russia	RKK Energia	Space Station	$75-95M
7/13/00		Soyuz	Baikonur		Cluster II 3	ESA	Dornier	Scientific	$35-40M
					Cluster II 4	ESA	Dornier	Scientific	
7/17/00		Titan 4B	VAFB		NRO 2000-2	NRO	TBA	Classified	$350-450M
7/28/00	√	Proton	Baikonur	*	Sirius Radio 1	Sirius Satellite Radio Inc.	Space Systems/Loral	Communications	$75-95M
7/31/00		Soyuz	Baikonur		Progress M-ISS-01	RKK Energia	RKK Energia	Supply	$35-40M
7/XX/00	√	Ariane 5	Kourou	*	PAS 1R	Pan American Satellite Corp.	Hughes	Communications	$150-180M
					STRV 1C	British Defense Ministry	Defense Research Agency	Development	
					STRV 1D	British Defense Ministry	Defense Research Agency	Development	
7/XX/00	√	Ariane 44L	Kourou	*	Anik F1	Telesat Canada	Hughes	Communications	$100-125M
7/XX/00		PSLV	Sriharikota Range		PROBA	ESA	TBA	Scientific	$15-25M
7/XX/00	√	Ariane 4 TBA	Kourou	*	Eurasiasat 1	Eurasiasat SM	Aerospatiale	Communications	
8/7/00		Delta 2 7320	VAFB		Earth Observing 1	NASA	Swales & Associates Inc., MIT/Lincoln Labs	Development	$45-55M
					Citizen Explorer	Colorado Space Grant Consortium	Colorado Space Grant Consortium	Scientific	
					Munin	TBA	Swedish Institute of Space Physics	Scientific	
					SAC C	Argentina	Bariloche Company Invap.	Scientific	
8/18/00		Titan 2	VAFB		NOAA L	NOAA	Lockheed Martin Corp.	Meteorological	$30-40M
8/19/00		Shuttle Atlantis	KSC		STS 106	NASA	Rockwell International	Crewed	$300M
					ISS 2A.2b	NASA	NASA	Space Station	
8/XX/00		Soyuz	Baikonur		ISS 2S	NASA	NASA	Crewed	$35-40M
8/XX/00	√	Ariane 44LP	Kourou	*	Brazilsat B4	Embratel	Hughes	Communications	
				*	Nilesat 102	Egyptian Radio and TV Union (ERTU)	Matra Marconi Space	Communications	$90-110M
8/XX/00	√	+ Atlas 2AS	CCAS	*	ICO A-1	ICO	Hughes	Communications	$90-105M
8/XX/00	√	+ Atlas 2AS	CCAS	*	Tempo 1	DirecTV, Inc.	Space Systems/Loral	Communications	$90-105M

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Third Quarter 2000 Projected Orbital Launch Events

Date		Vehicle	Site		Payload	Operator	Manufacturer	Use	Vehicle Price
8/XX/00	√	Dnepr 1	Baikonur	*	MegSat 1	MegSat S.P.A		Communications	$10-20M
					Saudisat 1-1	Space Research Institute (S.A.)	TBA	Scientific	
					Saudisat 1-2	Space Research Institute (S.A.)	TBA	Scientific	
					Unisat	University of Rome	TBA		
9/8/00		Delta 2 7925	CCAS		Navstar GPS 2R-6	DoD	Lockheed Martin Corp.	Navigation	$50-60M
					ProSEDS	NASA	University of Michigan	Development	
9/14/00		Soyuz	Baikonur		Progress M-ISS-02	RKK Energia	RKK Energia	Supply	$35-40M
9/21/00		Shuttle Discovery	KSC		STS 92	NASA	Rockwell International	Crewed	$300M
					ISS 3A	NASA	NASA	Space Station	
9/30/00		Atlas 2AS	VAFB		NRO 2000-3	NRO	TBA	Classified	$90-105M
9/XX/00	√	Ariane 4 TBA	Kourou	*	Measat 3	Bina Riang Pte. Ltd.	TBA	Communications	
3rd Quarter		Soyuz	Plesetsk		Bion 12	Russia	Russia	Scientific	$35-40M
3rd Quarter	√	+ Pegasus XL	Kwajalein		HETE-2	Massachusetts Institute of Technology	Massachusetts Institute of Technology	Scientific	$12-15M

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