

Ken Davidian
FAA Office of Commercial Space
Transportation (AST)
Room 331
800 Independence Ave SW
Washington, DC 20591

September 17, 2009

Welcome Letter

Dear Industry Visit Member,

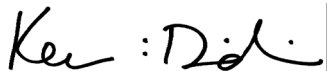
We would like to thank you for your interest in participating in the AIAA Commercial Space Group (CSG) Commercial Space Industry Visit to the Mojave Air & Space Port and the Dryden Flight Research Center.

Our goal is to make today's activities as informative and interesting as possible. Your active participation will help us meet your needs and, therefore, maximize the benefits to you.

If there is any way that we can help make your experience better and more worthwhile, please don't hesitate to let us know.

Thank you, again, and we look forward to spending the day with you!

Sincerely,



Ken Davidian
Chair, American Institute of
Aeronautics and Astronautics
Commercial Space Group, and
EFP Program Lead, FAA AST
Washington DC 20591
Tel: 202-267-7214
Fax: 202-267-5463
Email: ken.davidian@faa.gov

Eleanor Aldrich
Business Development
American Institute of
Aeronautics and Astronautics
1801 Alexander Bell Drive,
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AIAA Commercial Space Group

The purpose of the AIAA Commercial Space Group (CSG) is to communicate relevant and timely information regarding the emerging commercial space sector to target audiences. Specifically:

- To the public, communicate information about the emerging commercial space sector for educational purposes.
- To AIAA members and all aerospace professionals, provide them with timely and relevant information about the different aspects, sectors, and people of commercial space and provide volunteer opportunities in this new and dynamic aerospace sector.
- To the emerging commercial space sector, provide the wherewithal to obtain information about, and access to, all of AIAA's available resources and demonstrate the benefits of AIAA Commercial Space Group membership and support.

AIAA Commercial Space Group

Mojave Visit #2

Ken Davidian

**In preparation for the
17 September 2009 visit to
Mojave, California.**

Executive Summary

- AIAA Commercial Space Group is organizing a visit to established and emerging commercial space activities in the Mojave area.
- The purpose of this visit is to expose AIAA members about commercial space activities.
- This is the second visit to Mojave. The first was conducted on Tuesday, November 18, 2008.
- This visit is open to U.S. citizens only.
- Companies and organizations to be visited include stops at the Mojave Air and Space Port, XCOR Aerospace, and the NASA Dryden Flight Research Center.
- The cost of the visit is \$50 per person, payable in cash or check. Payment will be collected on the bus. Receipts will be provided. The cost will include the day's visits and briefings, informative handouts, snacks and drinks on the bus, and transportation.
- Since there is only one mid-sized bus being used for this visit, there is limited space. Reserve your place now!
- Dress code for the visit is "casual and comfortable". Flat-bottomed, closed-toe, walking shoes are highly recommended. Coats should be appropriate for the season based on weather forecasts.
- Tour attendees will begin to assemble at the Space 2009 Conference registration area at 07:30, and departure is scheduled for 08:00.
- The bus will return to the point of departure at approximately 18:30.

General Visit Information

- To sign-up for this visit, send an email to Ken Davidian (ken.davidian@faa.gov) or Eleanor Aldrich (eleanora@aiaa.org). Registration will close at the end of the business day on Wednesday, September 9, 2009.

Details of the itinerary for the September 17 visit are presented below.

General Visit Information

The following is general logistical and administrative information about the Mojave Visit #2.

AIAA COMMERCIAL SPACE GROUP

The American Institute of Aeronautics and Astronautics (AIAA) Commercial Space Group (CSG) was created in early 2008. The purpose of the CSG is to provide communication of relevant and timely information regarding the established and emerging commercial space sector to target audiences, specifically:

- To the public, communicate information about the emerging commercial space sector for educational purposes.
- To AIAA members and all aerospace professionals, provide them with timely and relevant information about the different aspects, sectors, and people of commercial space and provide volunteer opportunities in this new and dynamic aerospace sector.
- To the emerging commercial space sector, provide the wherewithal to obtain information about, and access to, all of AIAA's available resources and demonstrate the benefits of AIAA Commercial Space Group membership and support.

In support of this purpose, the CSG is organizing a series of visits to organizations operating in or around the Mojave, California area.

CSG LEADERSHIP

Ken Davidian - Ken Davidian is the “Encourage, Facilitate, and Promote” (EFP) Program Lead at the Federal Aviation Administration’s (FAA’s) Office of Commercial Space Transportation (AST), located in Washington, DC. Ken is also the head of the AIAA CSG and acts as the guide for the Mojave visit.

Below is Ken’s contact information:

- Work Address: FAA AST, 800 Independence Ave SW, Washington DC 20591

General Visit Information

- Tel: (o) 202-267-7214, (c) 202-834-0872
- Email: ken.davidian@faa.gov

Eleanor Aldrich - Eleanor Aldrich is the AIAA Executive Liaison to AIAA for CSG visit activities.

Below is Eleanor's contact information:

- Work Address: AIAA, 1801 Alexander Bell Dr, Ste 500, Reston, VA 20191-4344
- Tel: (c) 571-235-0528
- Email: eleanora@aiaa.org

COST AND PAYMENT The cost of the visit is \$50 per person, payable in cash or check. Payment will be collected on the bus. Receipts will be provided.

The cost will include the day's visits and briefings, informative handouts, snacks and drinks on the bus, and transportation.

The cost does not include the cost of lunch, which is the responsibility of each participant. The lunch location and approximate costs you can expect to pay are described below.

DRESS CODE The suggested dress code for this visit is informal to business casual. In any case, please make sure you wear comfortable, flat-bottomed, closed-toe, walking shoes, and bring appropriate protective wear and gear (i.e. coats, umbrellas) that match the weather forecast for the visit date.

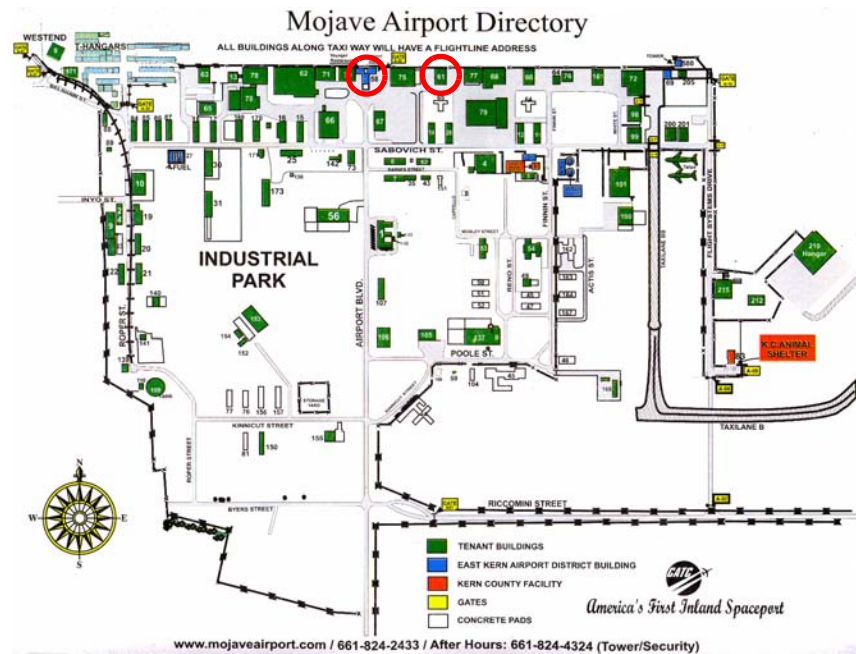
REQUIRED INFORMATION There are six pieces of information that are required from each attendee:

- Name
- Citizenship*
- Date of Birth
- Place of Birth
- Driver's License Number
- Driver's License State
- Last Six Digits of Your Social Security Number

*All visit attendees must be U.S. citizens.

HOW DO I SIGN UP? To sign-up for this visit, send an email to Ken Davidian (ken.davidian@faa.gov) or Eleanor Aldrich (eleanora@aiaa.org).

Locations on Visit



Registration will close at the end of the business day on Wednesday, September 9, 2009.

Locations on Visit

The following companies and organizations are the sites that will be featured on the upcoming industry visit.

MOJAVE AIR & SPACE PORT

The Mojave Air and Space Port is located in Mojave, California at the northern end of route 14, approximately 100 miles driving distance from Los Angeles International airport (LAX). A map of the Mojave Air and Space Port complex (with the buildings featured during the visit circled in red), are shown in the map on the next page.

NASA DRYDEN FLIGHT RESEARCH CENTER¹

Located at Edwards, California, in the western Mojave Desert, the Dryden Flight Research Center (DFRC) is NASA's primary center for atmospheric flight research and operations. NASA Dryden is critical in carrying out the agency's missions of space exploration, space operations, scientific discovery, and aeronautical research and development (R&D).

1. Quoted, excerpted, and based on material from the NASA DFRC webpage: www.nasa.gov/centers/dryden/about/overview.html

Locations on Visit

Dryden is the primary alternate landing site for the Space Shuttle and orbital support for the International Space Station.

In support of space exploration, DFRC is managing the launch abort systems testing and integration, in partnership with the Johnson Space Center and Lockheed-Martin, for the Crew Exploration Vehicle.

In support of aeronautical R&D, we are involved many aspects of the Fundamental Aeronautics and Aviation Safety programs, including the X-48 Blended Wing body and Ikhana (Predator B) in support of subsonics.

NASA's Dryden Flight Research Center is situated immediately adjacent to the compass rose on the bed of Rogers Dry Lake at Edwards Air Force Base, Calif. NASA's Dryden Flight Research Center is situated immediately adjacent to the compass rose on the bed of Rogers Dry Lake at Edwards Air Force Base, Calif.

Details about specific points of interest at NASA DFRC can be found at www.nasa.gov/centers/dryden/news/FactSheets.

TOUR ITINERARY The following is an overview description of the visit itinerary followed by a more detailed description of each visit stop.

ITINERARY OVERVIEW The table below provides an overview of the visit agenda. It is followed by a more detailed description of each agenda item.

Start Time	End Time	Event Description
07:30	08:00	Assembly at Space 2009 Registration Desk
08:00	10:00	Transit to Mojave, Introductory Presentations
10:00	11:00	Visit of XCOR Aerospace
11:00	12:00	Overview of Mojave Air and Space Port with Stu Witt
12:00	13:30	Lunch at Voyager Restaurant; Group Portrait
13:30	14:30	Transit to NASA DFRC
14:00	16:30	Visit of NASA DFRC
16:30	18:30	Return to Space 2009 Registration Desk. End of Visit

ITINERARY DETAILS Below is a more detailed description of what will take place at each stop on the visit.

07:30-08:00 Assembly at Space 2009 Registration Desk

Locations on Visit

- Visit attendees will be asked to meet at the Space 2009 registration desk between 07:30 and 07:45.
- The group will be directed to the bus departure location beginning at 07:45.
- The bus will leave at 08:00.

08:00-10:00 Transit to Mojave

- The total trip time from the Pasadena Convention Center in Pasadena, California to the Mojave Air and Space Port is approximately 2 hours, depending on traffic.
- En route, visit logistics, commercial space overview presentations, and group discussions will be facilitated by Ken Davidian.
- Water and other beverages will be available on the bus.



10:00-11:00 XCOR Aerospace, Building 61

- The group will go first to Building 61.
- The group will assemble in the XCOR conference room to receive a company overview presentation by Jeff Greason, XCOR CEO.
- Following the overview presentation, the group will Visit the rest of the facilities, including the machine shop and hangar, receiving a description of the different projects underway.

11:00-12:00 Mojave Air and Space Port, Building 58

- Upon arrival at Building 58, the Visit attendees will leave the bus and be guided into the administration conference room.
- Mojave Air and Space Port General Manager, Stu Witt, will deliver the Welcoming Remarks and give an overview of the facility.
- Approximately 10 minutes before lunch, there will be a break.



12:00-13:30 Lunch at Voyager Restaurant, Building 58; Group Portrait

- The group will be assembled at 11:30 in the Voyage Restaurant and we will be seated together.

Locations on Visit

- The restaurant is located in the same building where the Mojave overview presentation will be given.
- There is a full-service menu available with sandwiches and salads costing between \$5-\$10, from which the attendees will be able to order their lunch.
- The restaurant can be found on the web at www.mojaveairport.com/voyager.htm.
- Tour attendees will be able to walk around Legacy Park (picture below) after lunch where will take a group photo in front of the model of SpaceShipOne.



13:30-14:30 Transit from MA&SP to the NASA Dryden Flight Research Center

- The duration of this leg of the trip will depend on which NASA DFRC gate in which we are allowed to enter.

14:30-16:30 NASA Dryden Flight Research Center

- There are many operational aspects of the shuttle program and other historic programs that are available for our visit to DFRC, including the Shuttle Carrier Aircraft (747), the Shuttle mate/demate facility, the original M2-F1 Lifting Body piloted prototype aircraft, and the Lunar Landing Research Vehicle.
- The visit to DFRC will last approximately two hours, with a period for Q&A.

16:30-18:30 Return to Pasadena Convention Center

- The group will board the bus at approximately 16:30 to return to the Pasadena Convention Center.
- Estimated arrival at the Pasadena Convention Center will be at 18:30.

AIAA Commercial Space Group

Mojave Industry Visit #2

Ken Davidian

EFP Program Lead

Office of Commercial Space Transportation

September 17, 2009



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Administration



Agenda

- **Tour Logistics**
- **Presentation Agenda**
 1. The Three U.S. Space Sectors
 2. Definitions of “NewSpace”
 3. Emerging Commercial Space Company Profiles

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September 17, 2009



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Tour Logistics

07:30 Assembly at Space 2009 Registration Desk

08:00 Transit to Mojave, Intro Presentations

10:00 Visit of XCOR Aerospace

11:00 Overview of Mojave Air & Space Port

12:00 Lunch at Voyager Restaurant; Group Picture

13:30 Transit to NASA DFRC

14:00 Visit of NASA DFRC

16:30 Return to Space 2009 Registration Desk.

18:30 End of Visit

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September 17, 2009



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Who: Ken Davidian

• Education

- BS in Aero Eng at OSU
- MS in Mech Eng at CWRU

• Work

- 83-96: Liquid Rocket Design/Analysis, NASA LeRC
- 97-99: SSP Asst. Director, ISU (on-loan from NASA)
- 00-01: Plans & Programs Office, NASA GRC
- 01-02: Operations Director, PSDC (CargoLifter)
- 02-03: Operations Director, X PRIZE Foundation
- 03-04: Program Director, PSDC
- 04-08: Centennial Challenges/ESMD, NASA HQ
- 08-Now: EFP Program Lead, FAA AST

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Who: Eleanor Aldrich



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Who: AIAA Commercial Space Group

- The purpose is to communicate relevant and timely information regarding the established and emerging commercial space sector to target audiences.
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The Three U.S. Space Sectors

Ken Davidian
EFP Program Lead
Office of Commercial Space Transportation
September 17, 2009



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Agenda

- U.S. Space Policies
- The U.S. Space “Big Picture”
- Three Space Sectors
- Roles of Government Agencies

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U.S. Space Policies

- **NSPD 27, 25 April 2003**
 - U.S. Commercial Remote Sensing Space Policy
- **NSPD 31, 14 January 2004**
 - U.S. Space Exploration Policy
- **NSPD 39, 08 December 2004**
 - U.S. Space-Based Position, Navigation, and Timing Policy
- **NSPD 40, 21 December 2004**
 - U.S. Space Transportation Policy
- **NSPD 49, 31 August 2006**
 - U.S. National Space Policy

NSPD = National Security Presidential Directives

Office of Commercial Space Transportation

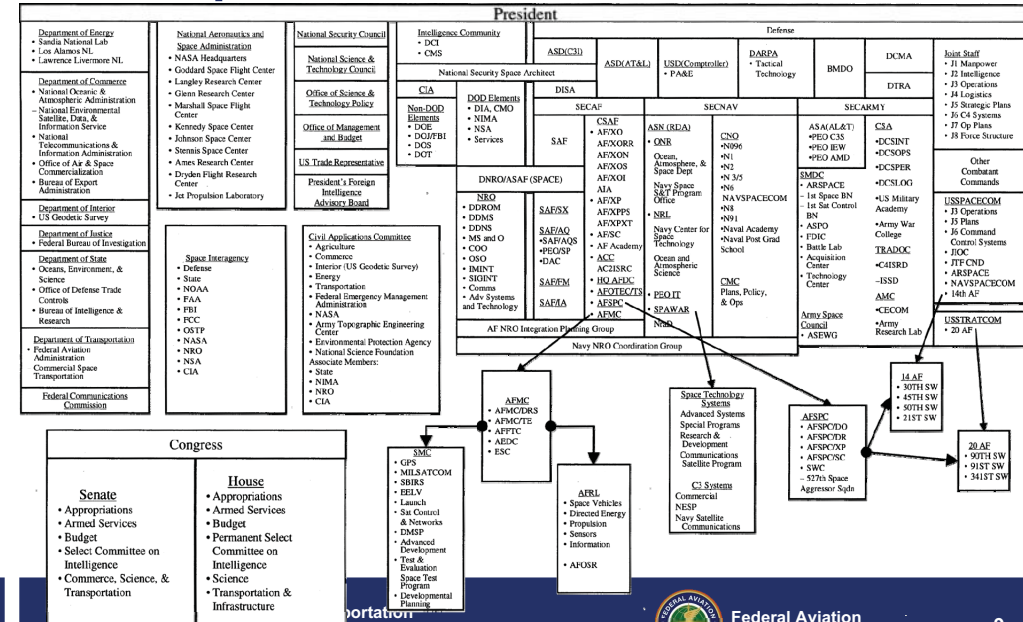
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USG Space: The BIG Picture



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Military & Civil Space

- **Military Space**
 - Defense-Related
 - Intelligence Community (IC)
- **Civil Space**
 - NASA
 - NOAA
 - More...
- **Commercial Space**
 - Infrastructure
 - Launch Vehicles
 - Telecommunications
 - Remote Sensing
 - Position, Navigation, and Timing (GPS)
 - Small Satellites
 - “NewSpace”

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Government Roles

- **DoD, NASA, NOAA**
 - Technology Developers
 - Customers
 - Encouragement
- **FAA AST**
 - Ensure Public Safety Through Judicious Regulation of, and ...
 - Encourage, Facilitate, and Promote...
 - a Safe and Successful Commercial Space Transportation Industry

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September 17, 2009



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Summary and Preview of Part 2

• Summary

- AIAA CSG Organizing Industry Visits To Inform Audiences About Commercial Space
- Three Sectors of U.S. Space

• Preview

- Next Up: “Commercial and NewSpace Definitions”
- Questions? Discussion?



Definitions of “NewSpace”

Ken Davidian
EFP Program Lead
Office of Commercial Space Transportation
September 17, 2009



Agenda

- NewSpace Definitions
- Definition of Emerging Industries



List of NewSpace Companies

92 NewSpace Companies and Organizations

Note: this is an informal list, meaning the only requirement to be here is an active website. If you see an error, or wish to add a company or organization, please inform us by using our Comments page. Ultimately, the power of the marketplace will determine who remains listed.

4Frontiers Corporation	E' Prime Aerospace	Optech	Space Propulsion Systems
62 Mile Club	Ecliptic Enterprises Corporation	Orbital Commerce Project	Space Resources, Inc.
AeroAstro	Epsori Space Systems	Orbital Expeditions	Spaceport Systems
Alien Landscapes	eSpaceTickets.com	Orbital Outfitters	Space Settlement Institute
ARCASpace	Flometrics	Orbital Recovery	Space Studies Institute
Airlaunch LLC	Forever Bound	Orion Propulsion	The Spaceship Company
Andrews Space	Garvey Spacecraft	Paragon Space Development Corp.	Space Tourism Society
Armadillo Aerospace	GeoEye	PlanetSpace	Sprague Astronautics
Apogee Books	High Altitude Research	ProSpace	Tethers Unlimited
AstroVision	HMX Inc.	Rocket Lab Ltd.	TGV Rockets
Aurora Aerospace	Interorbital Systems	Rocketplane Ltd.	tSpace
Benson Space Company	Institute for Space Law and Policy	Scaled Composites	TransLunar Research
Beyond-Earth	IPX Entertainment	Space Access Society	TransOrbital
Bigelow Aerospace	JP Aerospace	Space Adventures	Universal Space Lines
Blue Origin	Kelly Space	Space Angels Network, LLC	Universal Space Network
Canadian Arrow	LHRPort Group	Space Channel	UP Aerospace
Caribbean Spaceport	Lunar Enterprise	SpaceCruiseNews	Virgin Galactic
Constellation Services International	Lunar Resources	SpaceDev	WonderWorks Inc.
Copenhagen Suborbitals	Lunar Transportation	SpaceX	XCOR Aerospace
Da Vinci Project	ManSat	Space Frontier Foundation	X Prize Foundation
DestinySpace	Masten Space Systems	SPACEHAB	X-Rocket, LLC
Enterprises	Microcosm, Inc.	Space Island Group	XtraOrdinaryAdventures
Dfinity, Inc.	Odyssey Moon Limited	Spacepartnerships	Zero-G Corporation
Digital Globe			



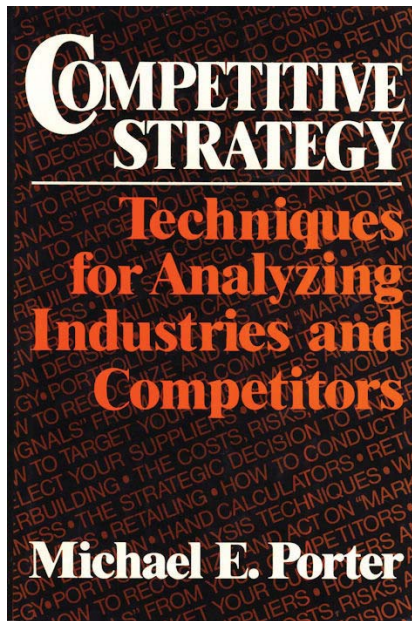
HobbySpace Definition of NewSpace

- Possess Some, Many, All Characteristics
 - Low Cost Focus
 - Incremental Development
 - Operations Are Key
 - Small Teams
 - Humans in Space
 - Demand Elasticity
 - Consumer Markets
 - Innovation
 - Fixed-Price Only
- Not Necessarily Low TRL Technology Development
 - KD addition, not from HobbySpace



Tauri Group Definition of NewSpace

- “New Space includes companies that are likely to be flatter, flexible organizations that are consumer-focused, innovative, willing to take risks, and focused on new technology solutions.”
 - “Global Space Industry: Refining the Definition of New Space”, by Jason Hay, Paul Guthrie, Carie Mullins, Elaine Gresham, and Carrisa Christensen. Presented on 14 September at AIAA Space 2009, Pasadena, CA.



Chapter 10. Competitive Strategy in Emerging Industries

That's Porter



Common Structural Characteristics

- Technological Uncertainty
- Strategic Uncertainty
- High Initial Costs but Steep Cost Reduction
- Embryonic Companies and Spin-Offs
- First-Time Buyers
- Short Time Horizon
- Subsidy



Early Mobility Barriers

- **Common Early Barriers**
 - Proprietary Technology
 - Access to Distribution Channels
 - Access to Raw Materials & Other Inputs of Appropriate Cost and Quality
 - Cost Advantages Due to Experience
 - Enhanced by Uncertainties
 - Risk (Raises Effective Capital Barriers)
- **Usually Not Capital, Economies of Scale, Brand ID**



EMs: Strategic Choices - Externalities

“The overriding problem for the industry is inducing substitution and attracting first-time buyers, and it is usually in the firm’s interest during this phase to help promote standardization, police substandard quality and fly-by-night producers, and present a consistent front to suppliers, customers, government, and the financial community. Industry conferences and associations can be a useful device, as can the avoidance of strategies that degrade competitors.”



Summary and Preview

- **Summary**
 - “NewSpace” Companies Are Not New
 - “NewSpace” is part of an “Emerging Commercial Space Industry”
- **Preview**
 - Next Up: “Emerging Commercial Space Company Profiles”
 - Questions? Discussion?



Emerging Commercial Space Company Profiles

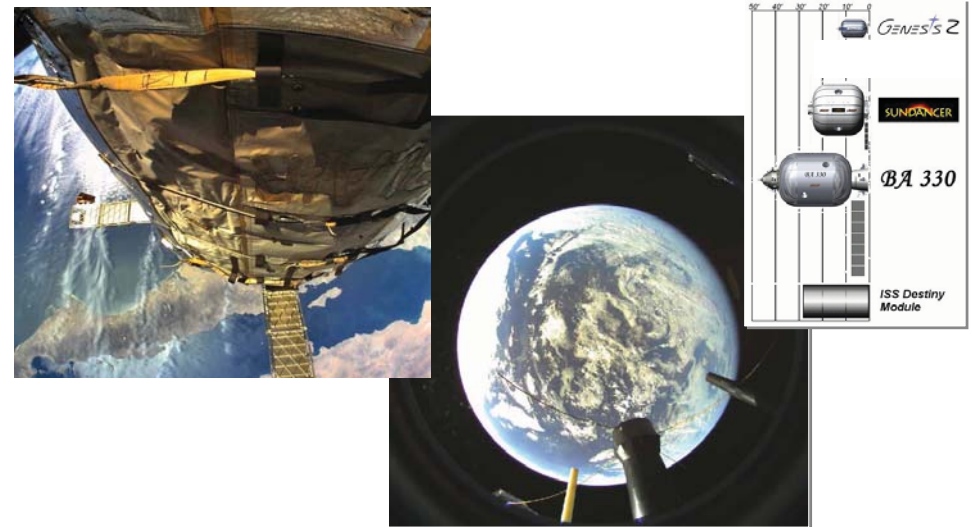
Ken Davidian
EFP Program Lead
Office of Commercial Space Transportation
September 17, 2009



Company Profiles: ZeroG



Company Profiles:



Company Profiles: **SPACEX**



Company Profiles: Armadillo



Company Profiles: Orbital Outfitters/Flagsuit



Conclusion

- **Summary**
 - Many Examples Of Viable Emerging Commercial Space Companies
- **Questions? Discussion?**



These charts will be available on the web at the following URL:
commercialspace.pbworks.com/AIAA-Commercial-Space-Group

Ken Davidian
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Washington, DC 20591

September 17, 2009

Feedback Form

Dear Industry Visit Member,

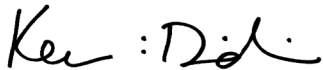
It was our goal is to make today's activities as informative and interesting to you as possible.

If you have any comments about this experience from which we could benefit, please don't hesitate to tell us.

To make it as easy as possible for you, we would be happy to accept your comments in any one (or more) of the multiple ways described below.

Your input is appreciated and always welcome!

Sincerely,



Ken Davidian

Ways To Submit Your Feedback

1. Right Now! You can write your comments on this piece of paper or your business card and hand it to me at any time.
2. By US Postal Service: Please send your written comments to the following address: Ken Davidian, FAA Office of Commercial Space Transportation, Space Systems Development Division, Room 331, 800 Independence Ave SW, Washington DC 20591.
3. By Email: Please send your written comments to the following email address: ken.davidian@faa.gov.
4. By Fax: Please send your written comments to the following fax number: 202-267-5463.
5. By Phone: Please give me a call and speak with me directly at the following phone number: 202-267-7214. If I'm not there, you can leave your suggestions and ideas in my voicemail if you want. If not, I'll call you back as soon as I can.
6. In Person: This isn't the ideal way to provide information, just because I might forget it or I might not remember it correctly. Although written communication is preferred, if this is the way you'd prefer to provide the information, then I'll be happy to accommodate you as best I can.