

Ken Davidian  
FAA Office of Commercial Space  
Transportation (AST-100)  
Room 331  
800 Independence Ave SW  
Washington, DC 20591

November 13, 2008

## **Welcome Letter**

Dear Tour Member,

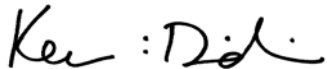
I would like to thank you for your interest in participating in the inaugural AIAA Commercial Space Group (CSG) NewSpace Tour to Mojave!

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  
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## AIAA Commercial Space Group

AIAA is actively engaged in expanding its outreach to the commercial and entrepreneurial space community.

The Institute's activities and resources have historically supported the traditional community for development and operations in space.

It now seeks to proactively reach out to the newest of the aerospace companies, operators, investors, insurers, and those who provide the essential engineering, testing, and myriad support services which are essential to the successful and profitable development of space as an enterprise for routine and recurring operations.

A review of AIAA's existing resources reveal assets rich in strategic value which could be made available to the newer, developing space community. Those who provide insurance, investments, legal, engineering and support services as well as payloads, applications and flying customers can all find elements of interest and support within AIAA.

The Institute serves as the national and international repository of technical information, hosts principal venues of technical exchange and represents these constituencies with international standards, Congressional and public policy advocacy.

AIAA is positioned to provide an umbrella of services and resources to individuals, companies, agencies, and to collegial associations in support of commercial and entrepreneurial space.

# AIAA Commercial Space Group Mojave Tour Overview

**Ken Davidian**

*EFP Program Lead*

*Office of Commercial Space Transportation*

November 18, 2008



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Administration



## Agenda

- **Tour Logistics**

- **Who?**

- Your Guide: Ken Davidian
- Your Host: AIAA Commercial Space Group
- Today's Topic: Commercial Space
  - Military Space
  - Civil Space
  - Commercial Space



## Tour Logistics

- 07h15-07h45: Assembly at AIAA West Coast Offices
- 08h00-10h00: Transit to Mojave, Intro Presentations
- 10h00-11h00: AirLaunch, Bldg 76
- 11h00-11h30: Mojave Air and Space Port, Bldg 58
- 11h30-12h30: Lunch at Voyager Restaurant
- 12h30-13h30: XCOR Aerospace, Bldg 61
- 13h30-14h30: Masten Space Systems, Bldg 25
- 14h30-16h30: Return to AIAA, “Black Sky” Viewing
- 16h30-17h00: End of Tour

## Who: Ken Davidian

- **Education**
  - BS in AAE at OSU; MS in ME 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

• **Activities: Tours, Paper Sessions, More...**

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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*



## Military & Civil Space

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• <b>Military Space</b><ul style="list-style-type: none"><li>– Defense-Related</li><li>– Intelligence Community</li></ul></li><li>• <b>Civil Space</b><ul style="list-style-type: none"><li>– NASA</li><li>– NOAA</li><li>– More...</li></ul></li></ul> | <ul style="list-style-type: none"><li>• <b>Commercial Space</b><ul style="list-style-type: none"><li>– Infrastructure</li><li>– Launch Vehicles</li><li>– Telecommunications</li><li>– Remote Sensing</li><li>– Position, Navigation, and Timing (GPS)</li><li>– Small Satellites</li><li>– “NewSpace”</li></ul></li></ul> |
|---|--|



## Government Roles

- **DoD, NASA, NOAA**

- Technology Developers
- Customers
- Encouragement

- **FAA AST**

- Regulate to Protect Public Health, Safety, etc...
- Encourage, Facilitate, and Promote



## Summary and Preview

- **Summary**

- AIAA CSG Organizing Tours To Expose Commercial Space To Membership
- Commercial Space and NewSpace

- **Preview**

- We're Going To Have A Great Tour
- Next Up: "NewSpace Definition and Status"
- Questions? Discussion?



# NewSpace Definition and Status

**Ken Davidian**

*EFP Program Lead*

*Office of Commercial Space Transportation*

November 18, 2008



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## Agenda

- **NewSpace Definition**
- **Overall Population**
- **Select Company Profiles**





## What Is NewSpace?

### • Possess Some, Many, All Characteristics

- Low Cost Focus
- Demand Elasticity
- Incremental Development
- Consumer Markets
- Operations Are Key
- Innovation
- Small Teams
- Fixed-Price Only
- Humans in Space

### • Not Necessarily Low TRL Technology Development



## 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.	t/Space
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	LiftPort Group	Space Channel	UP Aerospace
Caribbean Spaceport	Lunar Enterprise	SpaceCruiseNews	Virgin Galactic
Constellation Services International	Lunar Resources	SpaceDev	WonderWorld 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
Difinity, Inc.	Odyssey Moon Limited	Spacepartnerships	Zero-G Corporation
Digital Globe			



## Company Profiles: ZeroG



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## Company Profiles: Bigelow




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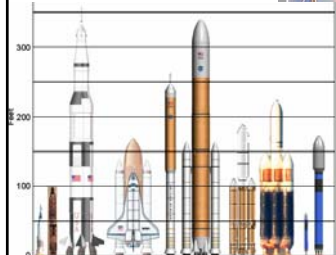
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## Company Profiles: SpaceX



SPACE EXPLORATION TECHNOLOGIES  
**Falcon 1 To Orbit!**  
28 September, 2008 (UTC)  
Click for Story and Video!  
FALCON


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## Company Profiles: Armadillo



ArmadilloAerospace™

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## Company Profiles: Orbital Outfitters

[Home](#) [Vision](#) [Who We Are](#) [Space Suits](#) [SpaceDiver](#) [Press](#) [Contact Us](#) [Links](#)



*"Have Space Suit – Will Travel."* – Robert A. Heinlein

New – [Orbital Outfitters Selected for NASA Space Suit Work](#)



The Mission of Orbital Outfitters is to provide affordable, industrial quality space suits and related services to commercial and government space travelers and explorers.

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## Summary and Preview

### •Summary

- NewSpace Companies Are Unique
- Many Examples Of Viable NewSpace Companies

### •Preview

- Next Up: "Mojave Tour Pre-Briefs"
- Questions? Discussion?

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# AIAA Commercial Space Group Mojave Tour Pre-Briefs

**Ken Davidian**

*EFP Program Lead*

*Office of Commercial Space Transportation*

November 18, 2008



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## Agenda

- Mojave Airport and Spaceport
- AirLaunch
- XCOR
- Masten Space Systems





## Mojave Airport and Spaceport



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## NewSpace Firsts at Mojave Spaceport

- July 26, 1998 - First flight of the Scaled Composites Proteus
- July 28-Oct 12, 1999 – Three flights of the Roton ATV.
- October 8, 2000 - First firing of an XCOR Aerospace LOX-powered rocket engine.
- July 21, 2001 - First flight of the XCOR EZ-Rocket, flown by Dick Rutan (single-engine configuration).
- October 6, 2001 - First flight of a twin engine rocket plane, again the XCOR EZ-rocket.
- July 24, 2002 - First touch-and-go of a rocket powered aircraft, the XCOR EZ-Rocket (world record).
- August 1, 2002 - First flight of Scaled Composites White Knight
- June 17, 2004 - Mojave designated a Spaceport by the FAA.
- June 21, 2004 - The first spaceflight of SS1.
- Sept 29 & Oct 4, 2004 – XP-winning flights of SS1.
- July 26, 2007 - Explosion with three fatalities at Scaled Composites facility.

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## Eric Blackwell, Todd Ivens, & Glen May



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Launch Anywhere ... Global Reach





- Developer of the QuickReach™ concept in response to the DARPA's FALCON program
  - Affordable Space Lift (<\$5M per flight)
  - Launch within 24 hours from notice

**Debra  
Faktor-Lepore**




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NEW TECHNOLOGY FOR SPACE

- VEHICLES
- ENGINES
- PUMPS
- VALVES
- CRYO COMPOSITES
- TURN KEY SYSTEMS

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#### Latest News



**October 6, 2008:**  
XCOR flights help Mojave log over half of this century's manned rocket flights



**September 09, 2008:**  
Former Banker Andrew Nelson Joins XCOR as Chief Operating Officer



**August 20, 2008:**  
Desert Sky Holdings Makes First Institutional Investment in XCOR



**LYNX SUBORBITAL VEHICLE**

**Latest Press Coverage:**

NASA Turns to the Private Sector  
William Pomerantz, VentureBeat, 21 Oct 2008

Space Tourism to Soar, Official Says  
Frank Morring Jr., AVWeek, 16 Aug 2008

The Stealth Rocketeers  
Alan Boyle, MSNBC, 08 Aug 2008

Economy Fare (\$100,000) Lifts Space Tourism Race  
Andy Pasztor, The Wall Street Journal, 26 Mar 2008

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## XCOR PERSONNEL

- **Founders:**

- Jeff Greason, President
- Dan DeLong, Vice President, Chief Engineer
- Doug Jones, Co-Founder, Chief Test Engineer
- Aleta Jackson, Co-Founder, Manager

- **Additional Company Principals:**

- Randy Baker, Controller
- Andrew Nelson, Chief Operating Officer
- Rich Pournelle, Director of Business Development

- **Board of Directors**

- Jeff Greason
- Dan DeLong
- Stephen Fleming
- Aneel M. Pandey
- Lee Valentine

- **Test Pilots**

- Richard Searfoss
- Dick Rutan



**Andrew Nelson**



**Jeff Greason**



**Randall Clague**



**Rich Pournelle**

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## XCOR

- **Products**

- Rocket Powered Flight Vehicles
- Complete Rocket Propulsion Systems, Engines
- Rocket Engine Electrical Igniters
- Rocket Propellant Piston Pumps
- Custom and Modified Propellant Valves
- Cryogen Compatible Composite Materials and Integral Airframe Composite Tanks



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## XCOR Propulsion Systems

- **XR-2P1 15lb<sub>f</sub> N2O-Ethane**
  - R&D and educational, variable propellants and third fluid injections
- **XR-3E17 56lb<sub>f</sub> N2O-Ethane**
  - Stationkeeping - storable
- **XR-3B4 50lb<sub>f</sub> N2O-Isopropyl**
  - Stationkeeping - storable
- **XR-3M9 50lb<sub>f</sub> LOX-Methane**
  - Stationkeeping – storable
- **XR-4A3 400lb<sub>f</sub> LOX-Alcohol**
  - Auxilliary or primary propulsion
- **XR-4K14 1,500lb<sub>f</sub> LOX-Kerosene**
  - Primary propulsion, 'Rocket Racer' engine
- **XR-4K5 1,800lb<sub>f</sub> LOX-Kerosene**
  - Primary propulsion
- **XR-5M15 7,500lb<sub>f</sub> LOX-Methane**
  - Primary propulsion, space storable





**What do you want to fly into space?**

Masten Space Systems will fly anything you want into space and back for \$250/kg.

Increase your TRL level for NASA

Build your own mini-Hubble telescope

Customize your own earth imaging platform

Test affects of zero gravity on biological systems

Teach innovative STEM curriculum

Create winning science fair projects

Fly *daily* heliospheric survey flights

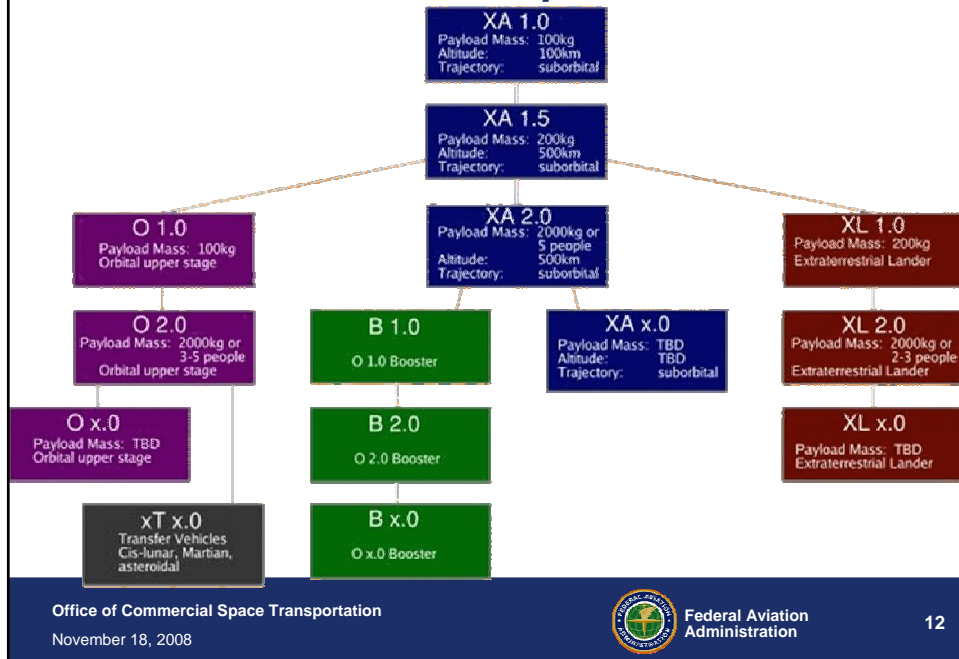
Find out what happens to ... in space

**Get Started Now!**

- **Launch Services**
- **Aerospace Hardware and Subsystems**
- **Aerospace Consulting and R&D**



## Masten Product Roadmap



## Masten People

- David Masten  
President/CEO
- Michael Mealling  
CFO & VP Business Development
- Sean R. Lynch  
CIO
- Jonathan A. Goff  
Propulsion Engineer
- Ian Garcia  
GN&C Engineer



## Conclusion

- **Today's Tour Will Highlight Some of Mojave's Most Exciting NewSpace Companies**
  - But Not All...
- **Future Tours Will Include Other Commercial Space Companies And Organizations In Other Locations**
- **Questions? Discussion?**



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## **Feedback Form**

Dear Tour Member,

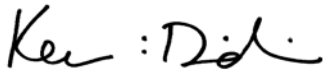
It is our goal is to make today's activities as informative and interesting as possible.

If you have any comments 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 this information 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 the back of this piece of paper 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, AST-100 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](mailto: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.