

3rd Annual ATS - October 24th, 2014

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More information at the AIAA Rocky Mountain website: <u>http://www.aiaa-rm.org/</u>











Diamond Sponsor: Lockheed Martin Space Systems Company

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Space is a place without limits. A frontier where peacekeepers, explorers, weather watchers, and climate monitors use Lockheed Martin systems to learn more and do more. A proving ground where each mission expands our ability to achieve technical and scientific breakthroughs. On Earth. In orbit. And beyond.

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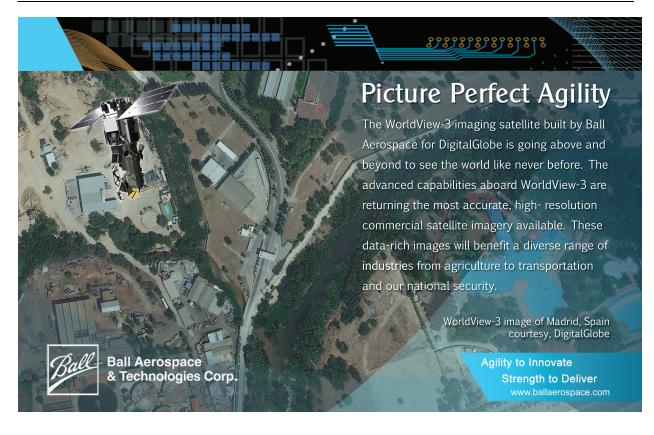








Platinum Sponsor: Ball Aerospace



Participating Organizations

http://www.usafa.edu/ College of Engineering



College of Engineering & Applied Science

http://eas.uccs.edu/



United States Air Force Academy STEM Club







Sponsors and Exhibitors

OCKHEED MARTIN

Lockheed Martin Space Systems Company



Ball Aerospace & Technologies Corp.

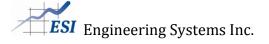
Ball Aerospace



Dept. of Mechanical and Aerospace Engineering, UCCS

Red Canyon Engineering & Software





TMC Design



Webster UNIVERSITY Webster University

EAS Online Graduate Programs, UCCS

College of Engineering and Applied Science

Colorado Space Business Roundtable

Surrey Satellite Technology US LLC





Design Solutions Beearch and Development Company Global Design Solutions Inc.

Dept. of Mechanical Engineering, UofW



ARES Corporation

United Launch Alliance







Message from the 2014 AIAA-RM ATS Chair

Ladies and Gentlemen,

Reflecting the mandate that professional societies should serve their communities, the AIAA Rocky Mountain Section is proud and very pleased to offer you, our membership, a section-wide event to call your own. The 2014 AIAA-RM Annual Technical Symposium, the third in hopefully a long line, is being hosted to highlight new ideas, methodologies, concepts, and technical innovations home grown here, in the local community. Sharing these concepts at a local level will create new and bolster existing partnerships to promote growth and national competitiveness in the Rocky Mountain Section. The purpose of this event is to establish flagship visibility for the creativity, resourcefulness, and competency of our local personnel, companies, and institutions and to sustain a dialog between these groups for mutual support and progress. Participants and attendees at this event will include neighbors and potential collaborators throughout the area whose proximity and availability make them as-of-yet unrealized solutions to tomorrow's challenges.

I would like to take this opportunity to thank those who have made this event possible, particularly a tireless and talented team of volunteers, to whom I am greatly indebted and without whom this event would not be possible. I would like to thank Dr. Jim Reilly for participating in this year's event. I would also like to thank our sponsors and affiliated organizations. Please take a moment to check this document for a list of these groups and remember to express your thanks in person on October 24th. Specifically, I would like to recognize Lockheed Martin Space Systems Company, Ball Aerospace, and the University of Colorado Colorado Springs. LMSSC has, for the third year, shown its dedication to investing in the community and developing valuable partnerships by substantial sponsorship of this event. Through LMSSC and Ball's leadership, the Section, as a whole, has a venue to exchange concepts, promote ideas, and network solutions. Similarly, I would like to thank UCCS for showing its established leadership in growing Colorado's technical expertise by opening its doors to this event and assisting in its planning and execution.







The AIAA-RM is happy to recognize UCCS' ongoing role in research, innovation, and education of Aerospace in the state of Colorado.

We look forward to your feedback on the event, its successes, and the areas where it may miss the mark. It is vital to our community, if we are to serve it faithfully, that we close the loop with our constituency and continue to evolve this event into what you need it to be. The Organizing Committee has worked diligently this year to assure relevance and interest in the technical program while maintaining broad applicability and minimal cost to attendees. This year's agenda includes approximately 60 technical presentations from local companies, students, and research groups. In addition to traditional presentations, four panel sessions will be held on career advancement, the direction of the industry, CO initiatives, and our responsibility to the next generation. The symposium will also include a keynote presentation on manned spaceflight, food, snacks, and an after-symposium event sponsored by Bristol Brewery.

This event has been designed to establish local connections and to promote local success. Please help us create an engaging opportunity for every facet of the community, from new professional to seasoned manager, from startups to Fortune 500s, and from educators to executers. I look forward to seeing you all at the 2014 Annual Technical Symposium.

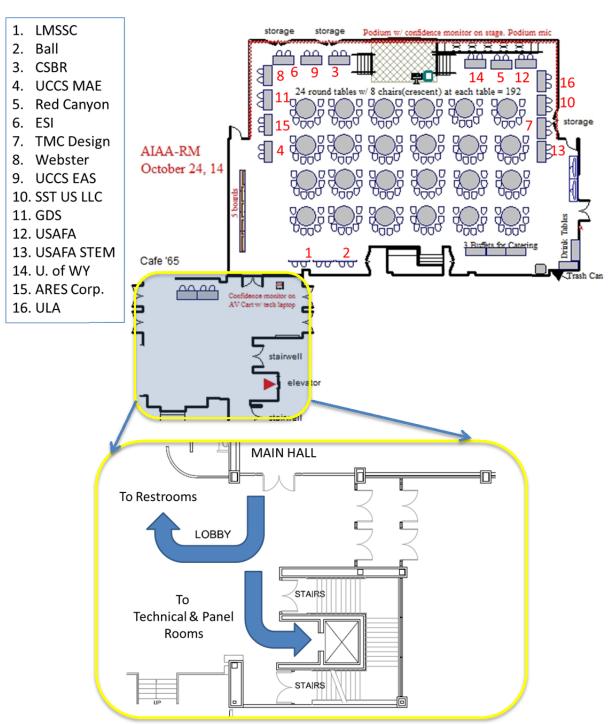
Taylor Lilly, PhD AIAA-RM Southern Vice Chair







Layout & Agenda







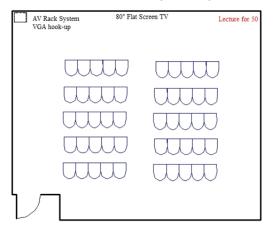




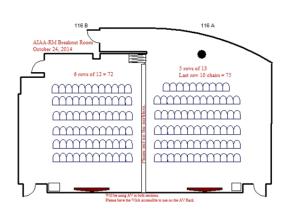
PANEL SESSIONS (UC302)

AIAA-RM October 24,14 projection room projection room

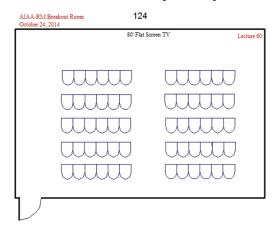
TECHNICAL C (UC122)



TECHNICAL A & B (UC116A&B)



TECHNICAL D (UC124)









	Technical Presentations Pane				
Time	А	В	С	D	Sessions
9:00 AM	Welcome and Opening Remarks (Berger)				
9:30 AM	SE	Education	Aero	Space Exploration	
	Optimizing Strategic Technology Planning with system lifecycle design	Blasterbotica, the NASA Robotic Mining Competition Team from the Colorado School of Mines	Wind Tunnel Evaluation of Static Stability of SURG MAVs	Melanin as a Barrier Against Ionizing Radiation	
	30	43	25	47	
9:55 AM	Satellites	Dynamics	Aero	Space Exploration	
	Multidisciplinary Tracking and Discrimination Demonstration	USAF ACES II EJECTION HISTORY & INJURY RISK, 1978 to 2013	Aero-Optical Simulations of a Generic Turret Configuration	Students for Interplanetary Travel and Habitation: Mars	
	52	20	26	24	
10:20 AM	Satellites	Propulsion	Dynamics	Health monitoring	1
	Flying Underground	Applications of Droplet Stream Momentum Transfer in Space	Manipulating Natural Frequencies with Tunable Spring Masses	Locata Technology - A GPS Alternative in Civil and Commercial Environments	
	40	10	49	74	
10:45 AM	Satellites	Propulsion	Dynamics	Health monitoring	same
	Solar Panel Power Generation in a Tumbling 1U CubeSat	Design and Analysis Tools for Deployable Space-Based Structures	Analyzing PID Control of a Line-Following Robot	Global Visualization Information System – Terminal (GVIS-T)	
	13	21	14	75	
11:10 AM	Satellites Drag Measurements in a Simulated Low-Earth Orbit Environment	Propulsion Kinetic Energy Transfer of Near-Earth Objects for Interplanetary Manned Missions	Dynamics Characterization of Self- Excited, Asymmetric, Spinning, Rigid-Body motion as an Oblate Epicycloid	Health monitoring Orbital Satellite Relay Test Bed for Prognostics and Health Management Development	
	35	11	15	70	
11:35 AM	Keynote Address and Lunch (Berger)				
12:35 PM	Lockheed Sponsor Presentation (Berger)				







Time	٨	Technical Pr	esentations C	5	Panel
Time	A	B	-	D	Sessions
1:25 PM	Policy	Environment Front Range air quality:	Manufacturing	CFD	2
	Space Policy and Responsive Launch		the Oil & Gas and Aerospace	Using LES in a Discontinuous Galerkin method	
	Responsive Launch	to space	industries can benefit each	Galerkin method	
		to space	other.		
			other		
	76	31	1001	73	
1:50 PM	Policy	Environment	Manufacturing	CFD	same
	OEDIT - Advanced Industry	Predicting Large Solar	Additive Manufacturing in	Elliptic blending Reynolds	
	Initiatives	Flares: Are we ready for the	Aerospace	stress model for use in	
		big one?		hybrid RANS-LES methods	
	65	22	41	72	
2:15 PM	Policy	Lasers	Manufacturing	CFD	
	Freedom from Government	Development of	3-D Printing for Aerospace	High Performance	
	Oversight: Open standards	experiments to study the		Computing via a Web	
	and Compliance	interaction of exploration		Browser in Undergraduate	
	Assessment Impact on the	hardware with surfaces of		Computational	
	Front Range 16	airless bodies 42	9	Aerodynamics 39	
	10			59	
2:40 PM			n Snack (Berger)		
3:05 PM	Satellites	SW	Combustion	CFD	3
		Developing Complex Space	Development of the ISS	Comparison of	
	Cadet-built Satellite	Systems in Today's	Fine Water Mist Fire	Experimental and COMSOL®	
	Program	Shrinking Defense Budgets,	Extinguisher	Studies of Aeronautical	
		Testing Systems of Systems		Flow	
	63	68	23	53	
3:30 PM	Satellites	SW	Combustion	Combustion	same
	Robust, Agile Low Earth	Flying Quadcopter with	Thermophysical Properties	Thermal Stability of the	
	Orbit Space Debris	Google Glass	of Thermally Stressed RP-1	Kerosene Rocket Propellant	
	Disturbance Rejection		and RP-2	RP-2 as a Function of	
	Control: Modeling and			Composition	
	Simulation				
	62	67	38	51	
3:55 PM	Satellites	SW Autonomous Mission	Combustion	Risk	4
	Low-cost, Three-Axis, CubeSat Attitude	Operations Demonstrated	The effect of thermal stress on the combustion of	Failure is Not an Option: Using PRA to Drive Success	
	Determination Algorithms	Using the Integrated	endothermic fuels	Using Five to Drive Success	
	for the EyasSat3 Classroom	Scheduler-Planner And	endothermicrueis		
	Demonstrator	Reactive Executive (I-			
	61	59	46	50	
4:20 PM	Satellites	SE	Thermophysics	Risk	same
	Near Earth Asteroid	Continuous Improvement	Thermophoretic Force on a	: INTEGRATING RISK	-
	Mission: An Operations	Process	Particle in Transitional Flow		
	Management and			EXECUTION SUCCESS	
	Bioastronautics Perspective				
	50	10	EA.	AE	
	58	19	64	45	
4.45 0.4		OL			
4:45 PM 5:00 PM			emarks (Berger) nt Social (Berger)		







Opening Remarks (9:00 am)



Major General Terrence A. "Terry" Feehan

Maj. Gen. Terrence Feehan is Director of Requirements, Headquarters Air Force Space Command, Peterson Air Force Base, Colorado. He is responsible for defining the future of space and cyberspace systems through requirements definition, mission area architecting and science and technology in support of the joint warfighter, Department of Defense, civil and national users. Mission areas include missile warning/defense, military satellite communications, responsive space, cyber warfare network operations, global positioning system, space control, space protection, launch and range operations and requirements generation.

General Feehan received his commission as a distinguished graduate of the U.S. Air Force Academy in 1984. He has previously commanded at the squadron, group, wing and numbered air force levels, and has served as an engineer, acquisition program manager and inspector general. The general has also held assignments at the major command and headquarters Air Force levels, and he was a Secretary of Defense Fellow, Accenture Corporation, Northbrook, Ill.

Please see the "Extended Biographies" section for a full biography on Maj. Gen. Feehan.







Keynote Speaker (11:35 am)



Dr. James "Jim" Reilly

Why do we go to space? What benefits do we as a society receive by being a spacefaring nation? How does space affect your life every day?

Dr. Jim Reilly will present his experiences as a 3-time Space Shuttle astronaut and talk about what it means to *engineer the capability* to fly in space and stay there. He will relate personal and programmatic experience on how building the International Space Station offered spectacular views of our planet and continues to offer a different perspective on how we interact with our home world. More critically, since it is truly an international endeavor, the ISS program is a landmark project where the largest spacecraft ever built was, for the first time, constructed and continues to operate through the efforts of citizens of 14 countries and space programs. When we as a human species decide to move past low earth orbit and return to the Moon, or travel on to Mars, it will likely be on the shoulders of lessons learned from this international endeavor and not the program of any single country. Jim will examine some of the "whys" in going back to the Moon and in pursuing the first human footprints in the red dust of Mars. As engineers and scientists, we will be charged with not only deciding how we will travel to and live on the Moon and Mars but will also help shape the opinion, policy, an national will driving why we want to go and what type of people we will be when we get there.

Please see the "Extended Biographies" section for a full biography on Dr. Reilly.







AIAA Membership

CONNECT When you join AIAA, you gain countless **OPPORTUNITIES TO CONNECT WITH MORE THAN 30,000 OTHERS** in the field of aerospace science, engineering, technology, management, education, and policy.

AIAA connections and educational programs provide a LIFETIME OF OPPORTUNITIES for you to ADVANCE PERSONALLY AND PROFESSIONALLY and TO BE RECOGNIZED FOR YOUR ACHIEVEMENTS.

AIAA membership helps you SHARE IDEAS, SPARK

AIAA membership helps you SHARE IDEAS, SPARK INSIGHTS, MEET YOUR HEROES, AND BUILD ENTHUSIASM FOR AEROSPACE WITH THE NEXT GENERATION. When you join, you become part of AIAA's mission to ADVANCE THE STATE OF AEROSPACE SCIENCE, ENGINEERING, AND TECHNOLOGICAL LEADERSHIP.

<u>www.aiaa.org/join</u>

AIAA PROFESSIONAL MEMBERSHIP

Your annual \$110 investment in AIAA membership provides the professional development resources and contacts to advance your career ... expand your potential impact on the future of aerospace ... and keep you at the forefront of aerospace technology.









CONNECT ENDLESS OPPORTUNITIES TO NETWORK!

ENDERSO OPPORTUNITIES TO NETWORK! STUDENT BRANCHES – Where the Action Is LOCAL SECTION MEETINGS – Network Close to Home TECHNICAL AND PROGRAM COMMITTEES – Discover your Passion NATIONAL CONFERENCES – Who Will You Meet? AIAA'S SOCIAL NETWORKING CHANNELS – Networking at Your Fingertips

ACHIEVE

RESOURCES TO SUPPORT YOUR EDUCATION AND CAREER! SCHOLARSHIPS – Awarded Through the AIAA Foundation STUDENT CONFERENCES AND DESIGN COMPETITIONS – Gain Practical Experience AIAA CAREER CENTER – Your Ideal Job Awaits AIAA MEMBER DISCOUNTS – Save While You Learn HONORS AND AWARDS – Gain Recognition for Your Accomplishments ONLINE NEWS AND RESEARCH – Your One-Stop Resource

INSPIRE MAKE YOUR MARK!

CONGRESSIONAL VISITS DAY – Make Your Voice Heard in Congress AUGUST IS FOR AEROSPACE – A Grassroots Program Close to Home ENGINEERS AS EDUCATORS – Learn How to Engage K–12 Students in Hands-on Activities





AIAA STUDENT MEMBERSHIP

At \$25 a year, AIAA Student Membership offers a great return on investment.

~ 15 ~











- 1. Direction of the Industry (10:20 am)
- 2. STEM Education & Outreach (1:25 pm)
- 3. Job Market / Career Advancement (3:05 pm)
- 4. Colorado Initiatives (3:55 pm)

Please see the "Extended Biographies" section for a full biography on the panelists.

Panel Sessions, Next Page.

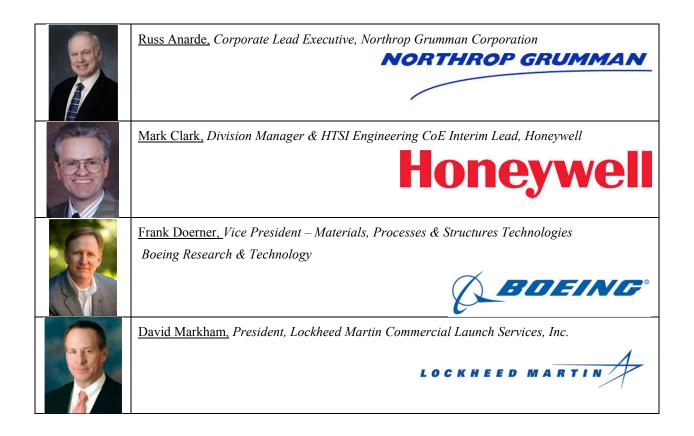






Direction of the Industry (10:20 am)

This panel aims to formulate an outlook for the direction of aerospace and related industries in the Rocky Mountain section. Major themes in this panel may include technology indicators, national and regional trends, strategies for growing Colorado industry, and emerging markets. This panel seeks involvement from Air Force users, space asset manufacturers, aircraft companies, aeronautical and space operators, and the smaller firms which supply these groups.









STEM Education & Outreach (1:25 pm)

This panel aims to connect both ends of the STEM pipeline from student education to eventual employment. This panel will discuss skills and qualities important to the industry, techniques and challenges associated with STEM education, and how better to promote communications all along a student's progression. An example topic would be the opportunities available to the professional community for promoting interest, education, and involvement in fields necessary to a long lasting, sustainable, and competitive future for the industry. This panel seeks involvement from K12 through post-secondary educators, education professionals (district, government, & legislative), industry technical and management representatives, and outreach and philanthropic contacts.

Violeta García, PhD, STEM Education Coordinator, Colorado Department of Education COLORADO Department of Education
Dianne Kingsland, Executive Director, STEMsCO
<u>Rex Kiziah, Colonel, USAF,</u> Permanent Professor and Head, Department of Physics USAF Academy
Marcos Stephens, Northrop Grumman Corporation







Job Market / Career Advancement (3:05 pm)

This panel aims to highlight the current Rocky Mountain job market and atmosphere for career advancement in the section. This discussion will include how local university resources prepare the work force, highlight opportunities for ongoing career enhancement such as professional societies, and the tools and techniques necessary for an upwardly mobile career. This panel seeks involvement from collegiate student groups, university educators, professional societies, industry management executives, and human relations representatives.

Douglas Atkinson, Sr. Director of Engineering, HGST Inc. – a Western Digital company HGST a Western Digital company
Sabra Bennet, Director – Human Resources, Bal Seal Engineering Inc.
Lauren C. Johnson, Senior Systems Engineer, a. i. solutions a.i. solutions
Nina Maggio, Recruiter, Northrop Grumman Corporation
Sean D. McClung, Executive Director for Space Innovation, Millennium Engineering and Integration Company







Colorado Initiatives (3:55 pm)

This panel aims to highlight opportunities for collaboration between large and small privateindustry firms, government and public sector users and buyers, university and private research firms, and legislative entities in the current Rocky Mountain section. In particular, this panel will discuss initiatives and collaborative ventures associated with the state of Colorado such as the establishment of the Aerospace Champion position and Advanced Industries Accelerator program. This panel seeks involvement from small and large industry executives and regulatory and legislative bodies.

Casey Howard, Military Legislative Assistant - Senator Udall's Office
Vicky Lea, Senior Manager – Aerospace and Aviation, Colorado Space Coalition
Jay Lindell, Major General (Ret), USAF, Aerospace and Defense Industry Champion, Colorado Office of Economic Development & International Trade
Andy Merritt, Chief Defense Industry Officer, Colorado Springs Regional Business Alliance







After Symposium Event (5:00 pm)

Wait out the traffic and relax at the symposium's on-site after-event sponsored by **Bristol Brewery!**



Red Rocket Pale Ale complimentary to attendees w/ cash bar for further refreshment.









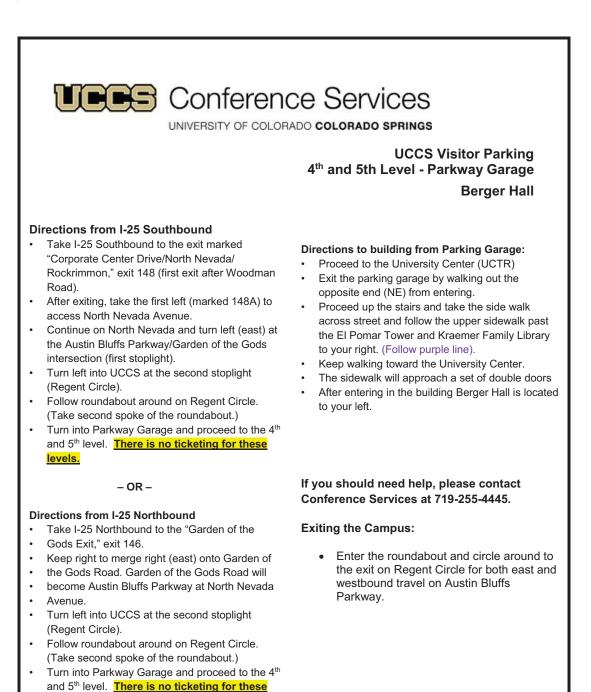
Symposium Menu, Parking, & Internet Access

Breakfast: The Classical Continental	Lunch: Deli Buffet
Fresh Baked Muffins Whole Fresh Fruit Orange Juice Coffee Decaf and Hot Tea.	Sliced Turkey, Roast Beef & Ham, Cheddar, Muenster & Swiss Cheese with Tomatoes, Cucumbers, Onions, Lettuce, Pickles, Banana Peppers, Sandwich Bread Selection & Condiments Dijon Vinaigrette Potato Salad Tricolor Pasta Salad Decadent Dessert Bars Iced Tea, Iced Water, Coffee
Afternoon Break:	Reception:
Cubed Cheese & Cracker Tray Walnut Mountain Pesto Tray Fresh Vegetable Tray Veggies (Carrots, cucumbers, broccoli, cauliflower & celery) served with Ranch dip Cheddar, Swiss and Dill Havarti served with cracker medley Mixed Nuts, Potato Chips with French Onion Dip Tortilla Chips w/ House Salsa Iced Water w/ Lemons & Oranges, Coffee	Munchies Tray with Large Cubed Cheese & Fruit Tray: Cheddar, Swiss and Dill Havarti served with cracker Medley Seasonal fresh fruit Mixed Nuts, Potato Chips w/ French Onion Dip Tortilla Chips w/ House Salsa The Official Beer of Spaceport Colorado (Red Rocket Ale from Bristol Brewery) Iced Water w/ Lemons & Oranges







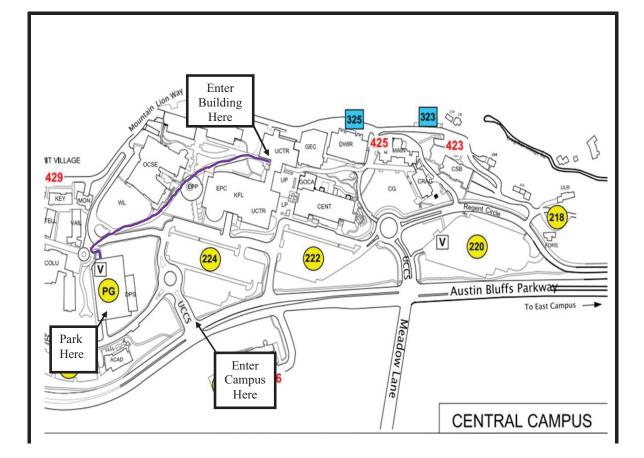




levels.







Google Maps Overview from I-25 to UCCS









UCCS WIRELESS NETWORK INFORMATION

- Wireless Network: UCCS-Wireless
- Username: g-c8620
- Password: 2838

iPhone/iPad instructions

When prompted to connect to a wireless network select UCCS-Wireless

If you are not prompted to select a network, Tap on Settings then Tap on Wi-Fi, then Tap UCCS-Wireless

Pad		2:40 PM	
Settings		Wi-Fi	
Airplane Mode	OFF		
🔂 WI-FI	Not Connected	Wi-Fi	
Bluetooth	On	Choose a Network	
VPN VPN	OFF	UCCS-Cable	۵ 🕈 🙆
Do Not Disturb	OFF	UCCS-Info	÷ 🕑
-	() UFF)	UCCS-Wireless	≅ 🗢 🕑
Notifications		Other	>
Contract (

Enter the username and password listed at the top of this page, then tap **Join** in the top right corner.



If prompted with the below message tap Accept.



UCCS-Wireless should now have a **blue check**. Press your **home button**.

Tap on **Safari** (Web Browser) and try to access the Internet (www.google.com). Once Google loads you have full Internet access. If necessary wait 10 – 15 seconds and try to access Google again.



Laptop Instructions

Select **UCCS-Wireless** from the list of available wireless networks on your laptop.

When prompted for a username and password, please enter the information at the top of the page. Then click on **Connect.**

UCCS-Wireless should now show a connected status.

Open any web browser. You will be automatically redirected to the page below. Select "Limited Access" option, then click I would like to be granted Limited Access.

VICCS Wireless Network Information Technology Department UNVERSITY OF COLORADO SPRINGS

UCCS Wireless Network Overview

You are connected to to **UCCS-Wireless**, the primary wireless access network at UCCS. UCCS-Wireless provides two different levels of access: Full Access, and Limited Access. Details about both can be found below.

Full Access - Unrestricted Network Usage

· Limited Access - Typical Web Usage

If you are unable to install SafeConnect, a limited form of Internet access is available. No additional client installation is required. Basic web access is available using this method, though many specialized ports are blocked while on limited access.

In order to use limited access, click the link below. Your current device will be enrolled in the limited access group for a period of time of several hours, and you will be granted basic Internet access. After the period of time applies, you will once again be brought to this page. You may then either choose to install SafeCornect to gain full access, or request limited access again. I would like to be cranted Limited access

I would like to be granted Limited Acces

The below page will automatically load.



After 10 seconds the main UCCS web page will load and you will have Internet Access.







Accommodation: Embassy Suites

Persons requiring reservations should call 719-599-9100 and ask for the negotiated rate for the "AIAA ATS" event.

We have a room block set aside for your 3rd Annual Technical Symposium at Embassy Suites.

- We provide a welcome note for each guest booked within the block and amenity in speaker's room.
- All our guestrooms are large 2 room suites with wet bar, microwave and mini refrigerator.
- All double rooms have larger queen size beds for additional comfort vs. full size beds.
- We have an indoor pool with outdoor sun deck, hot tub, and state of the art fitness center.
- We are conveniently located off of I-25 only 4 miles away from UCCS.
- We have a full service restaurant, room service, catering and meeting facilities plus we are walking distance from 5 other restaurants.

Each guest suite includes a full cooked to order breakfast with eggs, bacon, sausage, potatoes, pancakes, cooked to order omelets, fresh fruit, breads, pastries, oatmeal with fixings, assorted beverages and more! We provide our evening reception 7 days a week from 5:30 pm - 7:30 pm with alcoholic and non-alcoholic beverages as well as light snacks. Below is an awesome picture of the west atrium where the group would enjoy the complimentary breakfast each morning as well as the evening reception.



Our group rate for you is \$89.00 per night. To access more information about the hotel and to view all of the awesome pictures of the hotel, click on our website link: <u>http://embassysuitescoloradosprings.com</u>

Elle Christensen

Sales Manager Embassy Suites Colorado Springs 7290 Commerce Center Drive Colorado Springs, CO 80919 Hotel- 719-599-9100 Direct- 719-955-6807 Fax- 719-599-4644

Room rates do not include applicable taxes and fees. The above rooms will be available for your guests until 09/24/2014, which is 30 days prior to the first scheduled arrival date. After 09/24/2014, this agreement is void. All reservation requests after this date will be subject to Embassy Suites Colorado Springs prevailing rates and availability. Please understand during periods of limited availability, your negotiated rate will not be available. Persons requiring reservations should call 719-599-9100 and ask for the negotiated rate for the University of Colorado at Colorado Springs (UCCS) event.











Shaping the Future of Aerospace



http://www.aiaa-rm.org/



College of Engineering and Applied Science

UNIVERSITY OF COLORADO COLORADO SPRINGS

http://eas.uccs.edu/



