



ZERO
ROBOTICS
HS TOURNAMENT 2015



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Championship Tournament
January 25, 2016

Version 1.1



NORTHROP GRUMMAN
Foundation



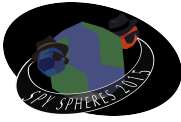


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Welcome

Dear Zero Robotics Teams,

Congrats on making it to the finals and Welcome to Boston! We are thrilled that you are here with us for the 2015 Zero Robotics championship event! We hope this trip will be exciting and educational.

During this event, you will have the opportunity to tour the various facilities at MIT and participate in a live test session with astronaut **Scott Kelly** and cosmonaut **Mikhail Borisovich Kornienko** as they run your algorithms on the SPHERES test bed on the ISS. You will also get to meet astronaut **Mike Fincke** (MIT alum) in person at MIT. To ensure that the entire trip runs smoothly, we ask that you adhere to the following code of conduct.

Code of Conduct

- Borrowing from the excellent credo of *FIRST* Robotics, please exhibit “Gracious Professionalism™” at all times.
- In that spirit, refrain from the use of profane, insulting, harassing or otherwise offensive language, especially during the competition.
- Students should make sure their chaperones and/or advisors know where they are, who is with them and when they will return when leaving the general area of the event.

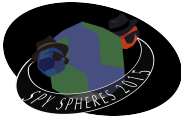
Contact Information

This event is being organized by the Zero Robotics team. Please don’t hesitate to contact the following members of the ZR team if you have any questions or comments during your stay here.

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Once again, we hope you enjoy your visit.

The SPHERES Zero Robotics Team



Schedule

All times are Eastern Time (MIT Local time) and 24 hour clock.

Sunday, 2016-Jan-24

Time	Event	Location
14:00-16:30	MIT Admissions Info-Session	10-250
	MIT Official Tours (immediately following MIT Admissions Info Session)	Leave from 10-250 (see map for entrance)
16:30-18:30	Casual Reception	Building 33 - first floor (Robert C Seamans Jr. Laboratory)
	SSL Tours -- sign up for 20 minute tour time slots	37-372
	Interviews with Zero Robotics External Program Evaluator (CASIS) available during this time.	33-116 – (adjacent the casual reception)

Monday, 2016-Jan-25

Time	Event	Location
03:00-04:30	Arrival – Coffee/Beverage service and light refreshments will be provided	Outside 10-250 (see map for entrance)
04:30-05:45	Welcome to ZR Finals (MIT, ESA, Australia) and special guests	10-250
05:45-08:40	ISS Finals live from station*	10-250
08:40-08:45	MIT /ESA/ Australia Closing Remarks	10-250
08:45-09:30	Team interviews (optional- champion and 2 nd place teams)	10-250
09:30-11:30	Brunch and Awards Ceremony	Lobby 13
-- End of Official Program --		
13:00-15:00	Interviews with Zero Robotics External Program Evaluator (CASIS) available during this time.	Lobby 13
MIT Museum is open until 17:00	Optional: MIT Museum free admission with pass (Pick up passes if desired upon arrival)	N51

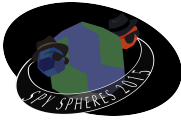
NOTES:

* Times for activities aboard the ISS are approximate.



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MIT Map

Buildings locations are shown on the map below.

Link to interactive map: <http://tinyurl.com/j45pjmn>

All rooms in MIT are numbered in the format Building-FloorRoom.

For example, 10-250 corresponds to Building 10, Floor 2, Room 250.

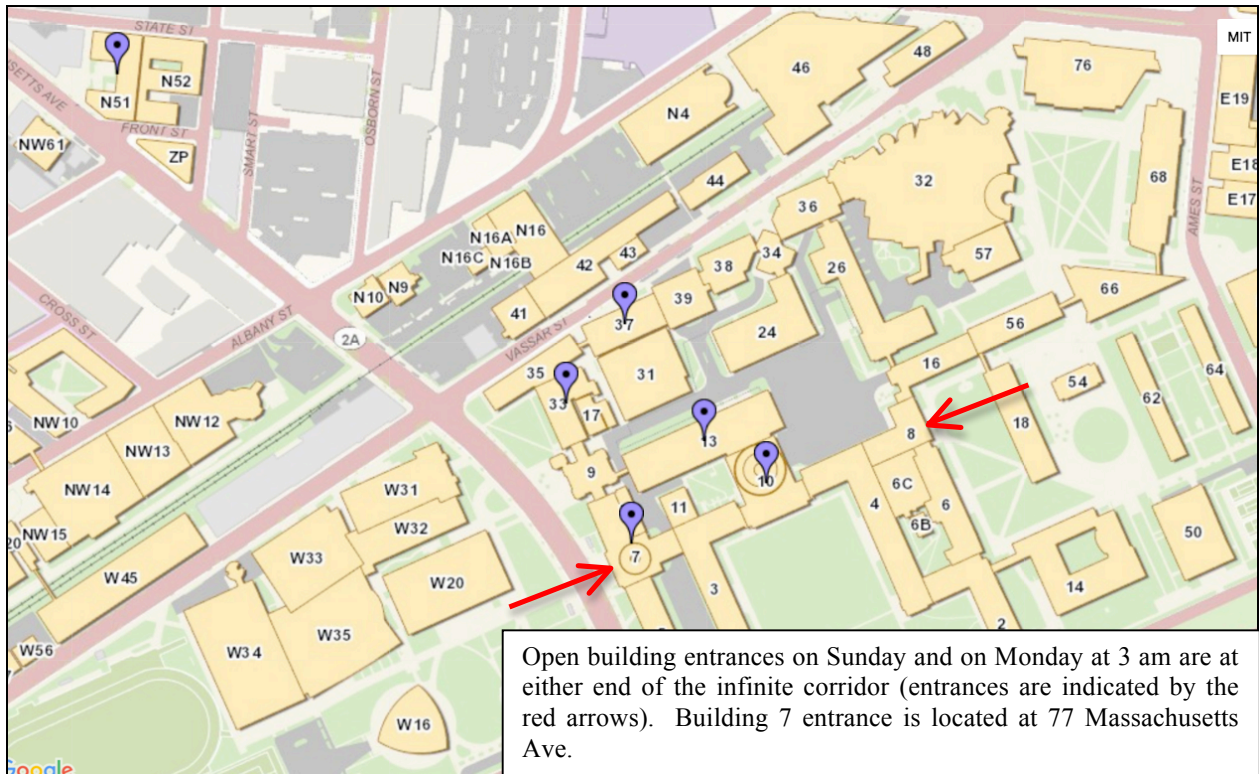
ISS Finals: 10-250

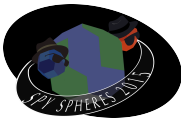
Brunch and Awards Ceremony: Lobby 13

SSL Tours: 37-372

Casual Reception: 33-First Floor

MIT Museum: N51





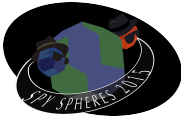
ISS Finalists (in seeding order)

Alliance / Teams	School/Organization	State	Country
Alliance 1: CrabNebulaMVZeroVADARS			
Crab Nebula	Liceo Cecioni	-	Italy
MV Zero	Monta Vista High School	CA	United States
VADARS	South Charleston High School	WV	United States
Alliance 2: Cookies Source Invaders			
Space Invaders	OSZ Lise-Meitner	-	Germany
Space Cookies	Girl Scouts of Northern California Troop 62868	CA	United States
Source Code;	Clarke County High School	VA	United States
Alliance 3: Kuhl-Wall-Hill			
Team Kuhlschrank	Pope John XXIII High School	NJ	United States
Wall-E 3.0	I.I.S. "Verona Trento"	-	Italy
Haverhill Robotics	Haverhill High School	MA	United States
Alliance 4: BACON Zanneio 2485			
BACON	Charlottesville High School	VA	United States
Zanneio Stardust	Zanneio Model Experimental Lyceum	-	Greece
Team 2485	Francis Parker School	CA	United States
Alliance 5: EphemeralWaterRocket			
Ephemeris	I.T.I.S. G. Ferraris	-	Italy
Team Rocket	River Hill High School	MD	United States
Waterbears	Forest Park High School	VA	United States
Alliance 6: Team Tesla			
USS Enterprise	I.I.S. Giulio Natta	-	Italy
OverExtendedProgramming(OEP)	Centennial High School	AZ	United States
LSA Robotics Team	Liceo Scientifico Avogadro	-	Italy
Alliance 7: Winning Alliance of Totally Excellent Robots			
Zero Work Ethic	Westlake High School	CA	United States
Sunday Programmers	Liceo Scientifico Statale "E.Fermi"	-	Italy
SetFermiForce	Liceo Scientifico Statale "E.Fermi"	-	Italy
Alliance 8: SHA-2468			
Stuy-Naught	Stuyvesant High School	NY	United States
Herder-Berlin	Herder-Gymnasium Berlin	-	Germany
2468 Team Appreciate	Westlake High School	TX	United States
Alliance 9: KeppleriansCora'sWHO			
The Mach Kepplerians	Mark Keppel High School	CA	United States
Corà's Eleven	Liceo G.B.Brocchi	-	Italy
White Hole 2	Gimnasium 1567	-	Russia
Alliance 10: TheFermiFloatingTeamTachyonsJuggler			
The Fermi Floating Team	Liceo Scientifico Statale "E.Fermi"	-	Italy
Tachyons	Saratoga High School	CA	United States
Juggler	I.I.S.G.B.Vaccarini Catania	-	Italy



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Alliance 11: Quasar			
SPHERES Tomsk	Children and Youth Center for creative activities	-	Russia
Da Vinci Boys	ITI L. Da Vinci	-	Italy
VSA	Tudor Vianu National High School of Computer Science	-	Romania
Alliance 12: Echelon			
Robodogs	Sweeny High School	TX	United States
ZRighi	ITI "Augusto Righi"	-	Italy
MSJ AP Coffee	Mount Saint Joseph High School	MD	United States
Alliance 13: Westiopeia v3			
Cassiopeia	Grigore Moisil Theoretical Highschool	-	Romania
Westwood Robotics	Westwood High School	AZ	United States
Awesome v3	Stedelijke Humaniora Dilsen	-	Belgium
Alliance 14: Apocaliss			
Apoapsis	Normanhurst Boys High School	-	Australia
Callisto	Nicolae Balcescu High School	-	Romania
KISS	Torhorst Gesamtschule	-	Germany

Virtual Finalists (in seeding order)

Alliance / Teams	School/Organization	State	Country
Alliance 1: ZiRconiuM_Paly_Eagles			
ZiRconiuM	IIS Pacinotti-Archimede	-	Italy
Paly Robotics	Palo Alto High School	CA	United States
Space Eagles	El Segundo High School	CA	United States
Alliance 2: Space::Yabadabad0rs!			
Code::Space	National College of Computers Science	-	Romania
Team y0b0tics!	Montclair Community	NJ	United States
Mira Loma Matadors	Mira Loma High School	CA	United States





SpySPHERES Game Parameters

The 2015 game has two main objectives: 1) to collect (virtual) pieces from a defunct satellite and 2) to collect intel on opponents by taking (virtual) pictures of the opponent and (virtually) uploading them back to Earth. This year's game field simulates orbiting earth by creating a sun-zone and an eclipse-zone.

The satellites start adjacent each other at one end of the game arena facing the pieces left by the defunct satellite at the opposite end of the arena. Each alliance will attempt to collect the pieces from the defunct satellite by moving over them.

Simultaneously, the alliances will try to take pictures of their opponents, while preventing their opponent from taking pictures of them. The total points is a combination of pieces picked up and pictures taken. Points are received only after (virtually) uploading valid pictures back to Earth. A (virtual) mirror can be collected and used to deflect opponent pictures.

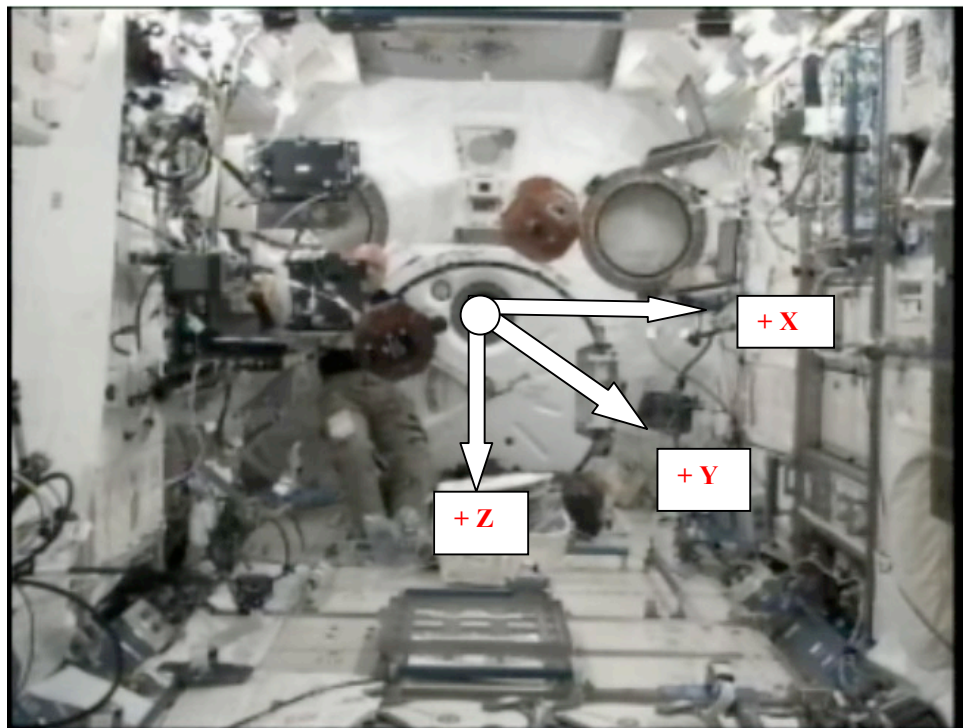
In order to have the energy needed for satellite control and for picture taking the satellites must recharge from the sun while in (virtual) light zones or by collecting (virtual) batteries from the defunct satellite. The light and dark zones are dynamic and cycle throughout the game representing how a satellite in Low Earth Orbit is half of the time illuminated by the sun and the other half in the Earth's shadow.

In order to be victorious over the opposing alliance each satellite must make use of the virtual items and their camera in order to take pictures of the opponent and gain points, all while managing energy, fuel, memory, and their position in light or darkness.

Matches are played between two SPHERES satellites, controlled by code written by two different alliances (each alliance consists of three teams).

Coordinate System

This view shows the Japanese Experiment Module (JEM) looking along the +Y axis of the game. The +X, +Y, +Z axis.



ISS Test Session & Rules

Running a live competition with robots in space presents a number of real-world challenges that factor into the rules of the competition. Among many items, the satellites use battery packs and CO₂ tanks that can be exhausted in the middle of a match and the competition must fit in the allocated time. This section establishes several guidelines the Zero Robotics team intends to follow during the competition. Keep in mind, as in any refereed competition, additional real-time judgments may be required. Please respect these decisions and consider them final.

Above all, the final competition is a demonstration all the hard work teams have put forward to make it to the ISS. The ZR staff's highest priority will be making sure every alliance has a chance to run on the satellites. It is also expected that the competition will have several "Loss of Signal" (LOS) periods where the live feed will be unavailable. We will attempt to make sure all teams get to see a live match of their player, but finishing the competition will take priority.

To summarize, time priority will be allocated to:

- 1) Running all submissions aboard the ISS at least once
- 2) Completing the tournament bracket
- 3) Running all submissions during live video

We also hope to complete the tournament using only results from matches run aboard the ISS, but situations may arise that will force us to rely on other measures such as simulated matches.

Competition Format

The alliances will be divided into 2 conferences for the ISS competition. Matches have been seeded based on the ranking from the final alliance competition. All teams ranked with odd numbers will participate in Conference A; all teams ranked with even numbers will participate in Conference B, as shown in Figure 1.

Conference A Alliance ranks	Conference B Alliance ranks
1,3,5,7,9,11,13	2,4,6,8,10,12,14

Figure 1: Division of Teams between Conferences

Each conference will include one "bye" team (alliances ranked #1 and #2 automatically advance to the conference semi-finals) and 2 brackets of 3 alliances each (as shown in Figure 2). Each bracket will play 3 matches in round-robin style: alliance A vs. B, B vs. C, and C vs. A.

After the round-robins are complete, there will be a winner of each bracket (shown as A-1, A-2, B-1, B-2 in Figure 2.) The following rules determine the winner:

1. The alliance with the most wins advances
2. If alliances are tied for wins, the alliance with the highest total score advances
3. If scores are tied, simulation results will be used to break the tie

The semi-final match between the top 2 bracket winners and the "bye" team will also be played in round-robin style. The winner of this match is determined in the same way as the bracket winners:

1. The top 2 alliances with the most wins in their bracket, advance
2. If there is a tie for wins, the alliance(s) with the highest total score in their bracket advance
3. If scores are tied, simulation results will be used to break the tie

The winning alliance from each conference will play a single match to determine the Zero Robotics ISS Champion. The losing alliance will be awarded 2nd place.

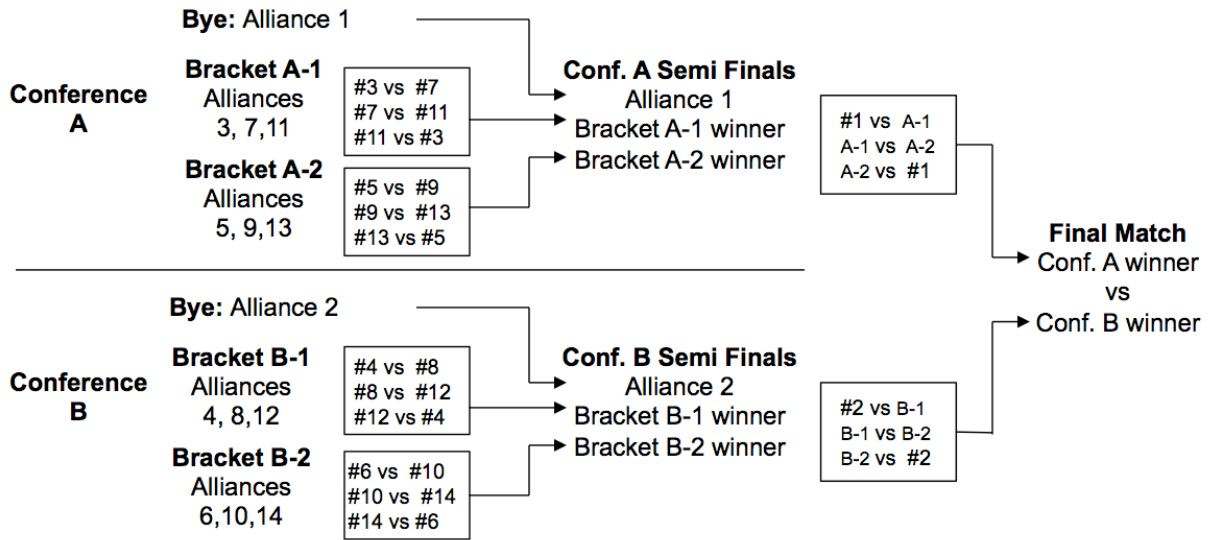
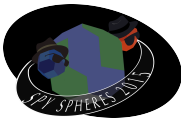


Figure 2: ISS Competition Bracket

Definition: Successful Match

- Both satellites move correctly to initial positions
- Both satellites have normal motion throughout the test
- Both satellites return a valid score
- Neither satellite expends its CO₂ tank during a test run

Definition: Simulated Match

In advance of the competition, the ZR Team will run a simulated round robin competition between all participating teams. The results from matches in this competition will be used in place of ISS tests if necessary (see below.) The results of a simulated match will only be announced if they are used in the live competition.

Scoring Matches

Scores in the scoring matches will be determined according to these rules:

Case 1: Successful Match, Both Satellites Return Unique Score (e.g. 130, 151)

- The scores will be recorded as the official score for the match

Case 2: Either Satellite Returns an Invalid Score (e.g. 255)

- If the first run of a match is not successful, the match will be re-run (time permitting)
- If the second run of a match is not successful, the results from a simulated match will be used

Test Result Guide and Brackets

Each satellite will return a test result number at the completion of each test. As in the simulation, these numbers will indicate the result of each race. The crew will use the communications loops to call down these values during the session.

Test Result #	Test Outcome	Action
11-239	Valid score values	
254	Second Player not selected	Rerun race
255	Satellite reset	Rerun race

When a score of a match is read from the ISS the score encodes the team number as well as the score for the match.

Team number = (Test Result Number % 10)

Score = (Test Result Number / 10)

(i.e if the score read from the ISS is 123 then Team number is =3 and the Score is = 12)

Winning team of each match is awarded an extra point. All scores less than 1 will be recorded as 1 and all scores greater than 22 will be recorded as 22 except when the team earns an extra point for winning a match. For example if a team earns a score greater than 22 and is also the match winner the score read from ISS will be 23.

A blank bracket listing has been provided in the pages below to fill in during the event. You may also view the bracket on one of the projector screens in the auditorium.

Competition Brackets

Conference A

Bye: CrabNebulaMVZeroVADARS

Bracket A-1

Team 1	Team 2	Team 1 Points	Team 2 Points
Kuhl-Wall-Hill	Winning Alliance of Totally Excellent Robots		
Winning Alliance of Totally Excellent Robots	Quasar		
Quasar	Kuhl-Wall-Hill		

Winner of Bracket A-1: _____

Bracket A-2

Team 1	Team 2	Team 1 Points	Team 2 Points
EphemeralWaterRocket	KeppleriansCora'sWHO		
KeppleriansCora'sWHO	Westiopeia v3		
Westiopeia v3	EphemeralWaterRocket		

Winner of Bracket A-2: _____

Conference A Semi Finals

Team 1	Team 2	Team 1 Points	Team 2 Points
CrabNebulaMVZeroVADARS	(A-1)		
(A-1)	(A-2)		
(A-2)	CrabNebulaMVZeroVADARS		

Winner of Conference A Semi Finals: _____

Conference B

Bye: (2) Cookies Source Invaders

Bracket B-1

Team 1	Team 2	Team 1 Points	Team 2 Points
BACON Zanneio 2485	SHA-2468		
SHA-2468	Echelon		
Echelon	BACON Zanneio 2485		

Winner of Bracket B-1: _____

Bracket B-2

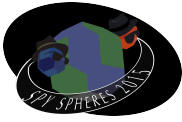
Team 1	Team 2	Team 1 Points	Team 2 Points
Team Tesla	TheFermiFloatingTeamTachy onsJuggler		
TheFermiFloatingTeamTachy onsJuggler	Apocalis		
Apocalis	Team Tesla		

Winner of Bracket B-2: _____

Conference B Semi Finals

Team 1	Team 2	Team 1 Points	Team 2 Points
Cookies Source Invaders	(B-1)		
(B-1)	(B-2)		
(B-2)	Cookies Source Invaders		

Winner of Conference B Semi Finals: _____



Virtual Finals Championship Match

Team 1	Team 2	Team 1 Points	Team 2 Points
ZiRconiuM_Paly_Eagles	Space::Yabadabad0rs!		

Champion : _____

ISS Finals Championship Match

Team 1	Team 2	Team 1 Points	Team 2 Points
A	B		

Champion: _____

SpySPHERES 2015 Referees



Astronauts Scott Kelly, Mikhail Kornienko Leave on Yearlong Space Mission

(Associated Press - MARCH 27, 2015) An American astronaut and Russian cosmonaut blasted off into space today, on their way to the International Space Station, where they will live for an entire year.

The trip is NASA's first attempt at a one-year spaceflight, anticipating Mars expeditions that would last two to three years.

Their Soyuz space capsule set off from Russia's manned space launch facility on the steppes of Kazakhstan at 3:42 p.m. ET Friday (early Saturday local time) and is scheduled to dock with the International Space Station about six hours later after making four orbits of the planet.

Cosmonaut Gennady Padalka of Russia was also aboard their Soyuz capsule. He is scheduled for the standard six-month tour of duty aboard the space station.

At a news conference Thursday at the Russian manned-space facility in Baikonur, Kazakhstan, Kornienko said "we will be missing nature, we will be missing landscapes, woods." He admitted that on his previous trip into space in 2010 "I even asked our psychological support folks to send me a calendar with photographs of nature, of rivers, of woods, of lakes."

Kelly was asked if he'd miss his twin brother Mark, who also was an astronaut.

"We're used to this kind of thing," he said. "I've gone longer without seeing him and it was great."

The mission won't be the longest time that a human has spent in space — four Russians spent a year or more aboard the Soviet-built Mir space station in the 1990s.

"The last time we had such a long duration flight was almost 20 years and of course all ... scientific techniques are more advanced than 20 years ago and right now we need to test the capability of a human being to perform such long-duration flights. So this is the main objective of our flight, to test ourselves," said Kornienko."

"One of the differences here is that we're doing it as an international partnership, and if we're going to go beyond low-Earth orbit again, perhaps to Mars, because of the cost and the complexity it will most likely be an international mission so we see this as a stepping stone to that," Kelly said.

"If you're ever going to go to Mars, going from a place like this would be, you know, a step in the right direction," Kelly said of Baikonur, set amid the vast and barren steppes of central Asia.

It will be NASA's first stab at a one-year spaceflight, a predecessor for Mars expeditions that would last two to three times as long.

Five things to know about the duo's extraordinary endeavour:

1. The crew

Both Scott Kelly and Mikhail Kornienko have lived on the space station before. No-nonsense former military men, they were selected as an astronaut and cosmonaut in the 1990s. Kelly, 51, is a retired navy captain and former space shuttle commander. Kornienko, 54, is a former paratrooper. The pair blasted off with Russian Gennady Padalka, a veteran spaceman who will spend six months at the orbiting lab.



2. The mission

Kelly and Kornienko will remain on board until March 2016. During that time, they will undergo extensive medical experiments, and prepare the station for the anticipated 2017 arrival of new U.S. commercial crew capsules. That means a series of spacewalks for Kelly. They also will oversee the comings and goings of numerous cargo ships, as well as other Russian-launched crews.

3. The science

Doctors are eager to learn what happens to Kelly and Kornienko once they surpass the usual six-month stay for space station residents. Bones and muscles weaken in weightlessness, as does the immune system. Body fluids also shift into the head when gravity is absent, and that puts pressure on the brain and the eyes, impairing vision for some astronauts in space. Might these afflictions peter out after six months, hold steady or ramp up? That's what researchers want to find out so they can protect Mars-bound crews in the decades ahead.

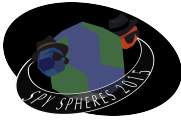
4. The twins

NASA's scientists couldn't resist when Kelly's identical twin brother, Mark, a retired astronaut, agreed to take part in many of the same medical experiments as his orbiting sibling. Researchers are eager to see how the space body compares with its genetic double on the ground. They won't follow the same diet or exercise regime, however. Mark said he has no intentions of consuming bland space-type food or working out and running two hours a day on a treadmill, as his brother will be doing.



5. The history

NASA and the Russian Space Agency announced Kelly and Kornienko as the one-year crew in late 2012. This will be new territory for NASA, which has never flown anyone longer than seven consecutive months. The Russians hold the world record of 14 months, set by a physician-cosmonaut aboard the former Mir station in 1994-1995. Several other Russians spent between eight and 12 months at Mir. All but one of those long-timers are still alive.



Astronaut Bio: Scott J. Kelly (Captain, USN, Ret.)¹

@StationCDRKelly

PERSONAL DATA: Born February 21, 1964 in Orange, New Jersey. He has two children.

EDUCATION: Graduated from Mountain High School, West Orange, New Jersey, in 1982; received a Bachelor of Science degree in Electrical Engineering from the State University of New York Maritime College in 1987 and a Master of Science degree in Aviation Systems from the University of Tennessee, Knoxville, in 1996.

ORGANIZATIONS: Associate Fellow, Society of Experimental Test Pilots; Member, Association of Space Explorers.

SPECIAL HONORS: Two Defense Superior Service Medals, Distinguished Flying Cross, Navy Commendation Medal, Navy Achievement Medal, two Navy Unit Commendations, National Defense Service Medal, Southwest Asia Service Medal, Kuwait Liberation Medal, Sea Service Deployment Ribbon, NASA Distinguished Service Medal, NASA Exceptional Service Medal, NASA Outstanding Leadership Medal, two NASA Space Flight Medals, Russian Federation Medal for merit in Space Exploration. Korolev Diploma from the Federation Aeronautique Internationale, 1999. Honorary Doctorate of Science degree from the State University of New York, 2008.

EXPERIENCE: Kelly received his commission from the State University of New York Maritime College in May 1987 and was designated a naval aviator in July 1989 at Naval Air Station (NAS) in Beeville, Texas. He then reported to Fighter Squadron 101 at NAS Oceana, Virginia Beach, Virginia, for initial F-14 Tomcat training. Upon completion of this training, he was assigned to Fighter Squadron 143 and made overseas deployments to the North Atlantic, Mediterranean Sea, Red Sea and Persian Gulf aboard the USS Dwight D. Eisenhower (CVN-69). Kelly was selected to attend the U.S. Naval Test Pilot School in January 1993 and completed training in June 1994. After graduation, he worked as a test pilot at the Strike Aircraft Test Squadron, Naval Air Warfare Center, Aircraft Division, Patuxent River, Maryland, flying the F-14 Tomcat and F/A-18 Hornet. Kelly was the first pilot to fly an F-14 with an experimental digital flight control system installed and performed subsequent high angle of attack and departure testing. He has logged over 8,000 hours in more than 40 different aircraft and spacecraft and has over 250 carrier landings. Kelly holds a United States Coast Guard Third Mate's license. Kelly retired from the U.S. Navy in June of 2012.

NASA EXPERIENCE: Selected by NASA in April 1996, Kelly reported to the Johnson Space Center in August 1996. Following completion of training, he was assigned technical duties in the Astronaut Office Spacecraft Systems/Operations branch. A veteran of three space flights, Kelly has logged more than 180 days in space. He served as pilot on STS-103 in 1999 and was the Mission Commander on STS-118 in 2007. Following STS-103, Kelly served as NASA's Director of Operations in Star City, Russia. He served as a backup crewmember for ISS Expedition 5 and as the Astronaut Office Space Station Branch Chief. Kelly also served as a Flight Engineer for ISS Expedition 25 and as the Commander of ISS Expedition 26. He currently serves as the International Space Station Operations Branch Chief within the Astronaut Office. Kelly and cosmonaut Mikhail Kornienko have been selected to serve a one-year mission aboard the International Space Station in 2015. The goal of the mission is to understand how the human body reacts and adapts to the harsh environment of space. Data from the expedition will be used to reduce risks to the health of crewmembers as NASA prepares to advance space travel beyond low Earth orbit.



¹ <http://www.jsc.nasa.gov/Bios/htmlbios/kellysj.pdf>

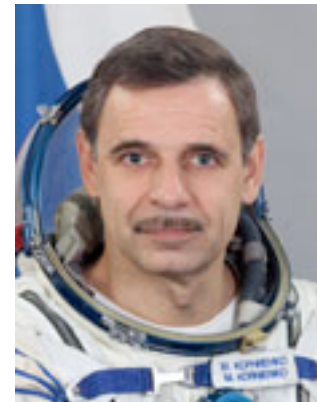
SPACEFLIGHT EXPERIENCE: STS-103 (December 19 to December 27, 1999) was an 8-day mission, during which the crew successfully installed new instruments and upgraded systems on the Hubble Space Telescope (HST). Enhancing HST scientific capabilities required three spacewalks (EVAs). The STS-103 mission was accomplished in 120 Earth orbits, traveling 3.2 million miles in 191 hours and 11 minutes.

STS-118 (August 8 to August 21, 2007) was the 119th space shuttle flight, the 22nd flight to the International Space Station (ISS), and the 20th flight for Endeavour. During the mission, Endeavour's crew successfully added another truss segment, a new gyroscope and an external spare parts platform to the ISS. A new system that enables docked shuttles to draw electrical power from the station to extend visits to the outpost was successfully activated. A total of four EVAs were performed by three crewmembers. Endeavour carried approximately 5,000 pounds of equipment and supplies to the station and returned to Earth with approximately 4,000 pounds of hardware and equipment. Traveling 5.3 million miles in space, the STS-118 mission was completed in 12 days, 17 hours, 55 minutes and 34 seconds.

On October 7, 2010, Kelly launched aboard the Soyuz TMA-M spacecraft to serve a tour of duty on the ISS. He assumed command of Expedition 26 once the Soyuz TMA-19 undocked on November 24, 2010. After a 159 day stay aboard the ISS, Commander Kelly and Russian Flight Engineers Alexander Kaleri and Oleg Skripochka safely landed their Soyuz spacecraft on the Kazakhstan Steppe on March 16, 2011. On March 27, Kelly, Kornienko and cosmonaut Padalka launched from the Baikonur Cosmodrome in Kazakhstan to stay aboard the ISS for one year, which is twice as long as typical U.S. missions. This one year mission is critical to understanding how the human body reacts to long duration of spaceflight. The science gathered will be used to determine ways to reduce risks on future deep space missions such as the journey to Mars.

Cosmonaut Bio: Mikhail Borisovich Scott J. Kornienko²

ROSCOSMOS Test-Cosmonaut
514th Cosmonaut of the world
104TH Cosmonaut of the Russian Federation



BIRTHPLACE AND DATE: Born 15 April, 1960, in Syzran, Kuibyshev region, Russia.

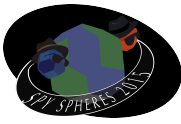
PERSONAL DATA: Married to Irina Anatolievna Kornienko (Savostina); daughter Natalia.

EDUCATION: Graduated from a secondary school in Chelyabinsk, Russia, in 1977; served in paratroops in 1978 – 1980; in 1981 to 1987 he studied at the Moscow Aviation Institute and graduated with an engineering degree (aircraft engine mechanical engineer).

EXPERIENCE: In 1980 Kornienko completed his military service and worked for the Moscow law enforcement agencies from 1980 to 1986. In 1986 started working for a mechanical engineering design bureau as a test engineer. In 1991-1995 he worked for commercial companies. In April 1995 Kornienko started working at the Energia Rocket/Space Corporation (RSC) as an engineer. He was responsible for technical documentation and software for testing and crew EVA training.

SPACEFLIGHT TRAINING: In February, 1998 Kornienko was selected as an Energia test cosmonaut candidate, and in 1999, following basic training at the Yu. Gagarin Cosmonaut Training Center, was qualified as a test cosmonaut.

² <http://www.jsc.nasa.gov/Bios/htmlbios/kornienko.html>



From August 2001 to February 2003 Kornienko was assigned to the ISS 8 backup crew as an ISS flight engineer and Soyuz TM commander (for a launch on the Shuttle). Due to the Columbia tragedy the crew was reassigned.

SPACEFLIGHT TRAINING (cont.):

- From March 2003 to August 2005 participated in RS ISS advanced training.
- From September 2005 to January 2006 participated in ISS advanced training.
- From February 2006 trained as ISS 15 bu engineer and Soyuz TMA bu flight engineer.
- From March 2007 to August 2008 participated in RS ISS advanced training.
- From August 2008 to April 2010 trained as an ISS 23/24 flight engineer and Soyuz TMA flight engineer.

SPACEFLIGHT EXPERIENCE: From April 2, 2010 to September 25, 2010 completed his first spaceflight as a Soyuz TMA-18 and ISS-23 flight engineer with cosmonaut A. Skvortsov and astronaut T. Caldwell-Dyson (NASA). Performed a spacewalk that lasted for 6 hours and 43 minutes. Kornienko has logged 176 days 1 hour and 18 minutes in space.

AWARDS: Golden Star of the Hero of the Russian Federation (April 12, 2011), Gagarin medal, Honorary citizen of Syzran (2010).

DECEMBER 2012

Astronaut Bio: Edward Michael “Mike” Fincke (Colonel, U.S. Air Force, Retired)³

@AstroIronMike

PERSONAL DATA: PERSONAL DATA: Born March 14, 1967, in Pittsburgh, Pennsylvania, but considers Emsworth, Pennsylvania, to be his hometown. Married to the former Renita Saikia of Houston, Texas. They have three children. In addition to time with his family, Col. Fincke enjoys travel, geology, astronomy, learning new languages and reading. He is conversant in Japanese and Russian. His parents, Edward and Alma Fincke, reside in Emsworth, Pennsylvania. Renita’s parents, Rupesh and Probha Saikia, formerly of Assam, India, reside in Houston, Texas.

EDUCATION: Graduated from Sewickley Academy, Sewickley, Pennsylvania, in 1985. He attended the Massachusetts Institute of Technology (MIT) on an Air Force Reserve Officers’ Training Corps (ROTC) scholarship and graduated in 1989 with a Bachelor of Science in Aeronautics and Astronautics as well as a Bachelor of Science in Earth, Atmospheric and Planetary Sciences. This was followed by a Master of Science in Aeronautics and Astronautics from Stanford University in 1990. He was awarded an Associate of Science Degree in Earth Sciences (geology) from El Camino College in Torrance, California, in 1993 and a second Master of Science in Physical Sciences (planetary geology) from the University of Houston - Clear Lake in 2001.

SPECIAL HONORS: In addition to two NASA Distinguished Service Medals and three NASA Spaceflight Medals, Colonel Fincke is a recipient of the first International Space Station Leadership Award as well as the Defense Superior Service Medal, Legion of Merit, and Meritorious Service Medals, among others for his military service. He is a Distinguished Graduate from the U.S. Air Force ROTC, Squadron Officer School and Test Pilot



³ <http://www.jsc.nasa.gov/Bios/htmlbios/fincke.pdf>



School Programs and the recipient of the U.S. Air Force Test Pilot School Col. Ray Jones Award as the Top Flight Test Engineer/Flight Test Navigator in class 93B.

EXPERIENCE: Col. Fincke graduated from MIT in 1989 and immediately attended a summer exchange program with the Moscow Aviation Institute in the former Soviet Union where he studied cosmonautics. Upon graduation from Stanford University in 1990, he entered the United States Air Force where he “washed out” of the Euro-NATO Joint Jet Pilot Training program and then was reassigned as a Space Systems Engineer and a Space Test Engineer at Los Angeles Air Force Base. As a Flight Test Engineer at Edwards and Eglin Air Force Bases, he flew in F-16 and F-15 aircraft. In January 1996, he reported to the Gifu Test Center, Gifu Air Base, Japan, where he was the United States Flight Test Liaison to the Japanese/United States XF-2 fighter program. Col. Fincke has over 1,100 flight hours in more than 30 different aircraft types.

NASA EXPERIENCE: Selected by NASA in April 1996, Col. Fincke reported to the Johnson Space Center where he completed two years of training and evaluation. He was assigned technical duties in the Astronaut Office Station Operations Branch, serving as an International Space Station Capsule Communicator (CAPCOM), a member of the Crew Test Support Team in Russia and as the space station Crew Procedures Team Lead. He also served as a backup crewmember for Expeditions 4 and 6 as well as backup commander for Expeditions 13 and 16. He is qualified to fly as a left-seat flight engineer (co-pilot) on the Russian Soyuz TM and TMA spacecraft. He was the commander of the second NASA Extreme Environment Mission Operations (NEEMO 2) mission, living and working underwater for 7 days in May of 2002, and was on the CAVES 2012 crew, living underground and exploring for six days, sponsored by the European Space Agency in September 2012.

Col. Fincke was previously in the Exploration Branch of the Astronaut Office where he supported NASA’s Commercial Crew Program and served as a space station CAPCOM. Currently, he serves as Branch Chief for the Commercial Crew Branch.

SPACEFLIGHT EXPERIENCE: Expedition 9 (April 18 to October 23, 2004). Expedition 9 launched from the Baikonur Cosmodrome, Kazakhstan, aboard the Soyuz TMA-4 spacecraft. As the NASA space station science officer and flight engineer, Col. Fincke spent six months aboard the station, continuing science operations, maintaining station systems and performing four spacewalks. The Expedition 9 mission concluded with undocking from the station and safe landing back in Kazakhstan on October 23, 2004. Expedition 18 (October 12, 2008 to April 8, 2009).

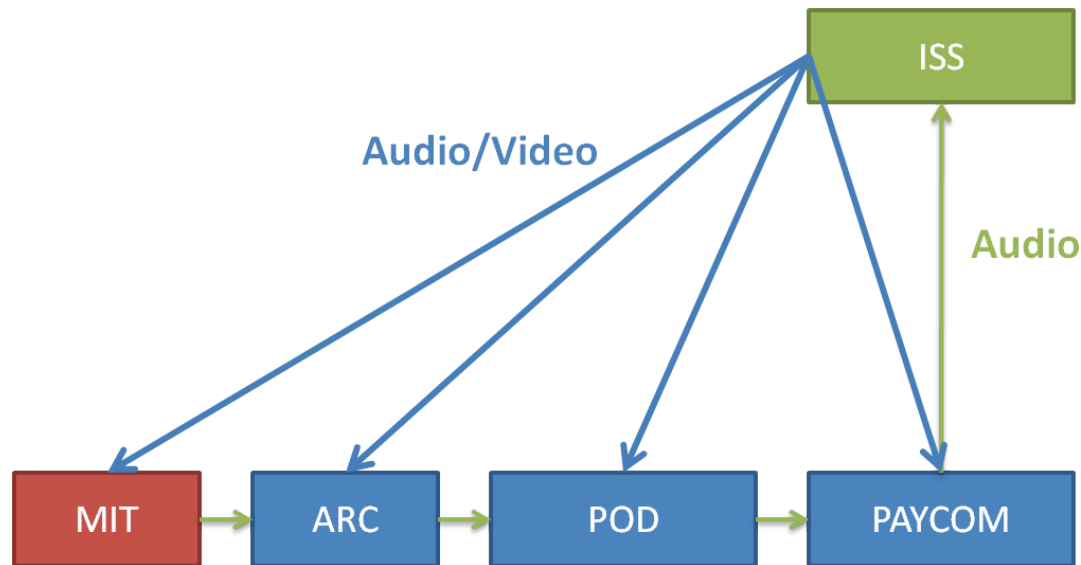
Expedition 18 launched from the Baikonur Cosmodrome, Kazakhstan, aboard the Soyuz TMA-13 spacecraft. As the commander, Fincke and his three-person crew helped prepare the station for future six-person crews and hosted the space shuttle crews of STS-126 and STS-119. The Expedition 18 mission concluded with undocking from the station and safe landing back in Kazakhstan on April 8, 2009. STS-134 (May 16 to June 1, 2011).

The STS-134 mission marked the final flight of Space Shuttle Endeavour. Fincke served as mission specialist 1 on the flight deck and as one of the spacewalkers and robotic arm operators. The STS-134 crew delivered the Alpha Magnetic Spectrometer (AMS), a state-of-the-art cosmic ray particle physics detector, to the International Space Station.

Col. Fincke has a total of 381 days, 15 hours and 11 minutes in orbit and has logged 48 hours and 37 minutes of EVA time on nine spacewalks.

MIT/NASA Communications During Test Sessions

The communications flow during a SPHERES test session involves several NASA-affiliated groups all over the country. Each can see and hear the crew through audio and video downlink. PAYCOM at NASA Marshall Space Flight Center in Huntsville, AL speaks directly to the crew. PAYCOM is managed by the Payload Operations Director (POD), also at Marshall. POD approves everything before it is relayed to the crew. MIT's connection to POD is through NASA Ames Research Center (ARC) in Moffett Field, CA. MIT speaks to ARC, who speaks to POD and PAYCOM, and PAYCOM speaks to the crew. Sound confusing? It is sometimes, but the chain of communications is a filter to make sure only the most concise and important information from the MIT team reaches the crew.



Acronym & Common Phrases Guide

POD	Payload Operations Director
PAYCOM	Payload Communications Officer
“SPHERES”	Call sign of the SPHERES research team at Ames
“MIT”	Call sign of the SPHERES research team at MIT
GUI	Graphical User Interface
Huntsville	Location of Payload Operations, at NASA Marshall Space Flight Center
Space to Ground	Communication loop that NASA uses to talk to ISS
SSC	Standard Station Computer (laptop)
LOS	Loss of Signal
AOS	Acquisition of Signal
JEM	Japanese Experiment Module, a.k.a Kibo

Things to see in Boston/Cambridge

Tours

Historic Freedom Trail <http://www.thefreedomtrail.org/>
 Boston Trolley Tours <http://www.trolleytours.com/boston/>

Museums

MIT Museum <http://web.mit.edu/museum/>
 Museum of Science <http://www.mos.org/>
 Museum of Fine Arts <http://www.mfa.org/>
 Skywalk Observatory <http://skywalkboston.com/>
 Isabella Stewart Gardner Museum <http://www.gardnermuseum.org/>
 New England Aquarium <http://www.neaq.org>

Areas

Harvard Square Red Line, Harvard Sq T-stop
 Boston Commons Red/Green Line, Park Street T-stop
 Newbury Street Green Line, Hynes ICA T-stop
 Faneuil Hall Market Place Red/Orange Line, Downtown Crossing

Public Transportation

Mass Bay Transportation Authority <http://www.mbta.com/>

Universities (other than MIT)

Harvard University <http://www.harvard.edu/>
 Boston University <http://www.bu.edu/>
 Berkley College of Music <https://www.berklee.edu/>
 Tufts University <http://www.tufts.edu/>
 Wellesley College <http://www.wellesley.edu/>
 Northeastern University <http://www.northeastern.edu/>