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SPORT ROCKETRY

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2014 World Space Modeling Championships

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2014 World S
Modeling Champio

by Matt Steele and the 2014 U.S. Team

John Langford, Alyssa Stenberg, Allison Van Miligan, and Bill Stine pose with Alyssa's Gold-medal-winning Space Grant Scale Altitude model.
Photo by Jon Stenberg.

AUGUST 22-30, 2014 • KASPICHAN, BULGARIA

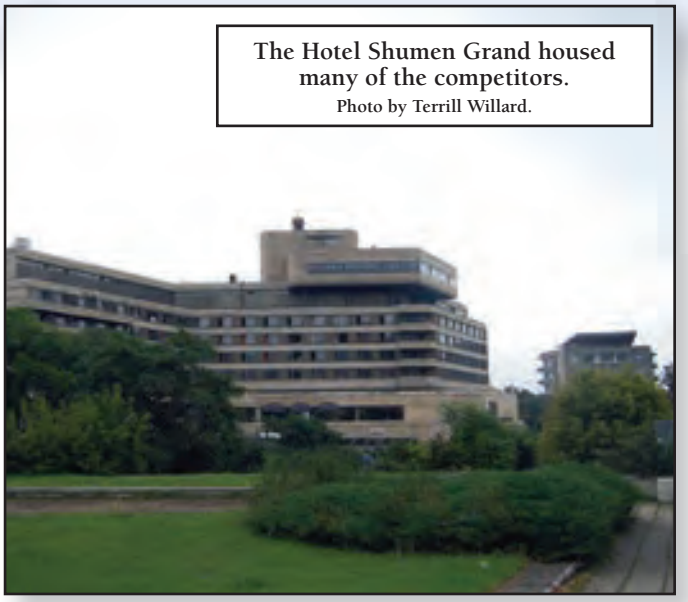
SPACE ONSHIPS

Introduction

Every two years, the best rocketry competitors in the world gather for the Olympics of the hobby, the World Spacemodeling Championships (WSMC). The 2014 Championships were held August 22-30, 2014, in Kaspichan, Bulgaria. This was the 20th meet for the Seniors (19 years old and up) and the 11th meet for the Juniors (18 years old and under). The WSMC consists of eight events, and it is always the same eight events.

Organized under the auspices of the Federation Aeronautique Internationale (FAI), the contest was hosted by the National Aero Club of Bulgaria. This was an important event for the Bulgarians, and they did a fine job of organizing it and making all the participants feel welcome. Teams from 23 nations competed in the event including the U.S., Russia, China, Great Britain, Germany, and many eastern European countries.

The contest was held near the town of Kaspichan, approximately 70 kilometers inland from the Black Sea port of Varna. The field was very large but had dense areas of corn and sunflowers in some potential recovery areas and a small village in another, so



The Hotel Shumen Grand housed many of the competitors.
Photo by Terrill Willard.

recovery was often challenging.

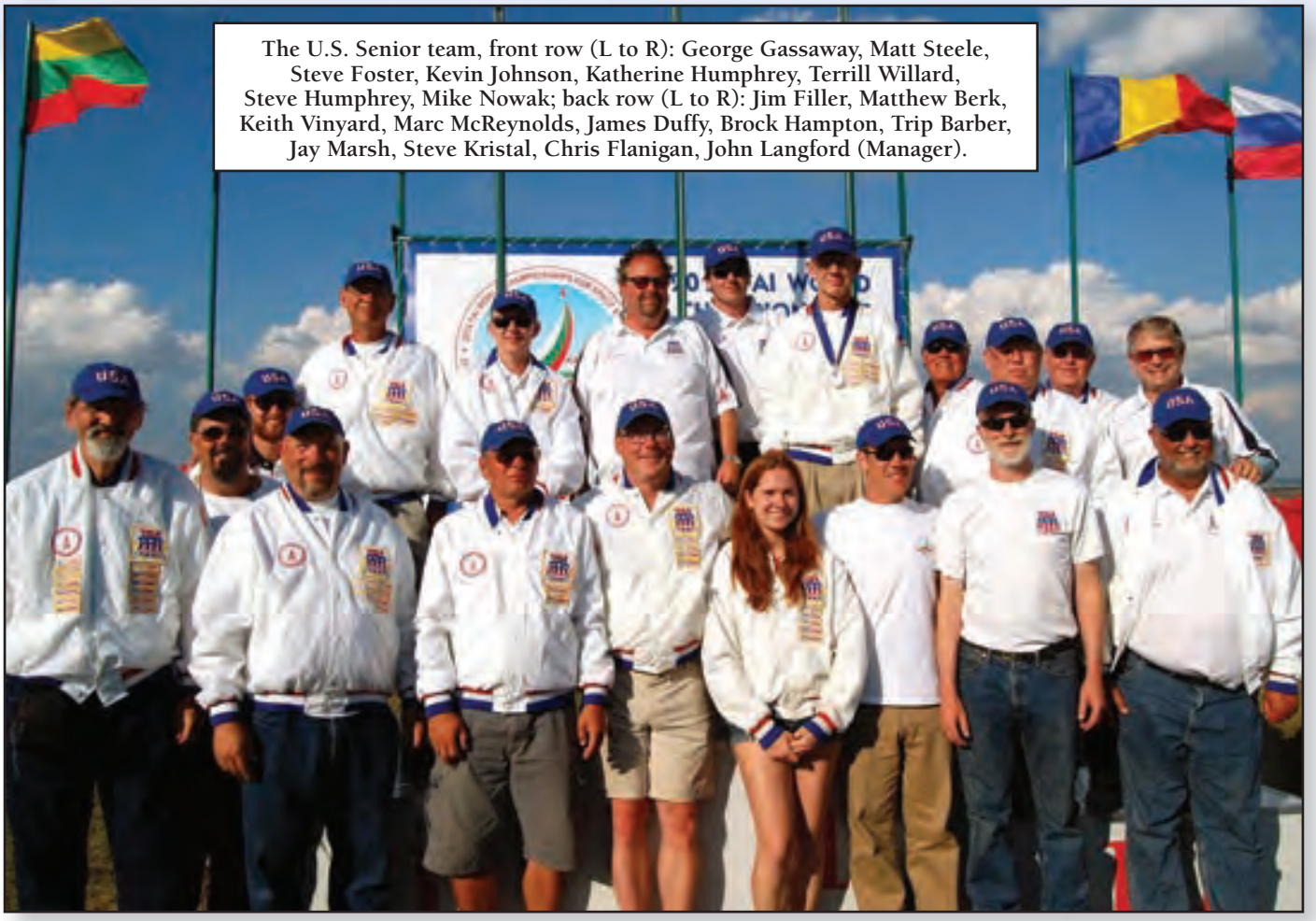
Lodging for contestants was in the city of Shumen, about a 30-minute drive from the flying field. Most contestants stayed at the Hotel Shumen, which dates from the Soviet era. Accommodations were austere but satisfactory, although getting the elevators to work at the end of a contest day was often an adventure!

The U.S. Team was selected by the National Association of Rocketry (NAR), in concert with the Academy of Model Aeronautics (AMA). The Junior team was sponsored by the NAR and by Aurora Flight Sciences Corporation. Team Manager of the U.S. Junior Team was Bill Stine, an executive with Utah-based RCS Rocket Motor Components. Eight of the Junior team's original twelve members were young women, the most of any of the Junior teams (though two were unable to attend at the last moment). Team Manager for the Senior team and manager of the overall U.S. FAI competition program was Dr. John Langford, CEO of Aurora and also a long-time NAR member who first began competing in World Championships in 1974. A total of 44 Americans went to Bulgaria as part of the U.S. Team: 10 Junior competitors, 18 Senior competitors, 2 team managers, a timer, and 13 family member supporters. These supporters were an important part of the team, helping in every aspect of the event from model recovery to medical response.

The U.S. team purchased 10mm diameter competition motors from vendors in several countries including Bulgaria, Ukraine, and Germany for delivery at the meet. These motors generally performed very well, although the difficulty of achieving ignition through their tiny nozzles and the small power of their ejection charges presented problems for some of the U.S. fliers until everyone got used to the motors.

The contest days were very long. The team bus left the hotel at 6:45 AM each day to get to the field and start flying. In the words of Bill Stine, "Early is on time!" On a couple of days, the awards ceremonies on the field ended at 9:00 PM with car headlights providing the illumination, followed by a 30-minute ride to the hotel and then dinner. Most nights, it wasn't possible to get to bed earlier than 11:30 PM. That kind of schedule placed a premium on preparation prior to arrival at the contest.

The U.S. Junior team, front row (L to R): Brendan O'Bryan, Katherine Humphrey (Assistant Manager), Emma Kristal, Allison VanMilligan; back row (L to R):Stoil Avramov, Alyssa Stenberg, Rachel Clark, Ashley VanMilligan, Rachel Nowak, Zack Stenberg, Bill Stine (Manager), Daniel Kelton.
Photo by George Gassaway.



The U.S. Senior team, front row (L to R): George Gassaway, Matt Steele, Steve Foster, Kevin Johnson, Katherine Humphrey, Terrill Willard, Steve Humphrey, Mike Nowak; back row (L to R): Jim Filler, Matthew Berk, Keith Vinyard, Marc McReynolds, James Duffy, Brock Hampton, Trip Barber, Jay Marsh, Steve Kristal, Chris Flanigan, John Langford (Manager).

Getting There is Half the Fun

by Zackary Stenberg

This year was one of the greatest championships I've been to. From the time I flew in to Bulgaria to when I flew out of Bulgaria, it was a great experience. This year I was competing in S8 and S4. S8 requires lots of packing, so we always have to pack a lot of stuff like the glider wings, the fuselages, the tools, and the launcher. We always max out our luggage limit. Things started to go crazy when the flight from Minneapolis to Paris was delayed. When we arrived in Paris, we missed our flight to Sofia. We were supposed to drive to Athens, Greece, from Sofia for a mini vacation. We decided to fly straight to Athens because the next flight to Sofia was the next day. The people at the airport said it was OK to do that and our luggage would be on the flight with us. Unfortunately our luggage did not make it.

Athens was really cool! We got to try new foods and we visited historical places like the Acropolis and the Temple of Zeus, but we were also worried because our luggage was still missing. After two days we got two bags but they were just clothes. Our rocket stuff was still missing! The next day a box with a few of our gliders and rockets arrived. We were sort of relieved. At least we had something to fly. Then we found out the next day that our second box of gliders and rockets were at the Sofia airport. Matt Steele picked it up for us. The only thing that we were missing was our launcher. But we could borrow one at the world championships.

After five days in Greece, we flew back to Sofia and picked up a rental car. Our rental car wasn't that big and it was a challenge to fit everything in there. We drove to Shumen with me sitting on Alyssa's lap for six hours! We got there just in time for the opening ceremony.

I thought the opening was really awesome, especially with the fireworks at the end. When it was the first day of the contest flying, a lot of U.S. team members were flying. It was really intense and nerve wracking.

The day I flew S8 I was super nervous and afraid I would DQ, but I didn't, which was awesome. I had three qualified flights. On my first flight I didn't do very well because I didn't land in the zone. On my second flight I maxed *and* landed in the zone! I was really happy. On my third flight I got about four minutes and landed in the zone. I was really proud of myself. I came in 10th place overall. One of my teammates, Brendon, did really well too. He came in 12th place. I was really happy for Alyssa, my other teammate. She won an individual Silver medal! And we won a team Silver! That was awesome. One of my happiest memories was how much effort and support was put into the contest by the U.S. team.

When it was time for the banquet, boy, was it fun! One of my favorite parts of the World Championships was the banquet. The banquet was awesome, with all the dancing and the cool stuff we got from trading with other contestants from other countries. It was great! I think this was one of my favorite contests I've been to.

Oh—our launcher finally came back to us in Minnesota three weeks after we arrived home!

The U.S. S1B Altitude team: Matt Steele, Steve Kristal, and Trip Barber.
Photo by Barber.

S1A/B (FAI A/B Altitude)

In the "pure altitude" event, the Juniors fly S1A, and the Seniors fly S1B. The models are 500mm long, two-stage rockets with 40mm diameter lower stages and short 18mm diameter upper stages, powered by 1/2A (for Juniors) or A (for Seniors) motors in both stages. They are very tricky to fly, using gap staging of over 12 inches.

Emma Kristal, a veteran of this event at the past two world championships, did best among the U.S. Junior team. Flying a 1/2A2-0 to 1/2A1-6 combination, Emma's model soared to a very competitive 292 meters to place 12th overall. Her colorful models would have won the "best looking" award, if they had handed those out.

In this event, both Van Milligan girls were plagued by separation problems due to strong ejection charges in the upper stage motors. Allison finally got one good flight to 232 meters. Ashley got one good flight too, but her altimeter fell out of the model and was lost in the grass. The team was lucky to find the altimeter after her first flight DQ, but not the second time it happened, when her flight qualified.

The Russians dominated this event, winning both the individual silver and bronze medals, and the team gold.

In the senior event, U.S. Team members Trip Barber, Matt Steele and Steve Kristal were all veterans of this event. They had practice-flown this event many times in the U.S. with reliable success but always with Czech and Serbian motors. The motors that were delivered for use at the WSMC were new and different types from Bulgaria and the Ukraine. They were superior in total impulse, and the upper stage motors had the longer delay times that were needed to achieve the full altitude potential of the U.S. models. However, Trip's "flash tube" staging technique did not work with these engines. He lawn-darted three upper stages on practice flying day when they failed to ignite at staging. Steve Kristal asked the Ukrainians how they succeeded at staging, and they provided a few hints. Trip followed that advice and his final practice flight the next morning staged successfully. During the contest rounds, all three of Trip's flights achieved perfect piston launching, then staging. All three models were easily recovered after flight, too. Trip moved through a progression of upper stage motors across the three rounds, starting with Bulgarian "Jambol Jets" with 7-second delay, and finishing with Ukrainian motors with 9-second delays. Each flight went higher than the one before, and his final flight's altitude of 611 meters put him in 7th place.

Matt and Steve struggled during competition, as the RSO forced changes to the lower stage streamers on their models (that had flown with that style in both the 2012 WSMC and the 2013 European Championships—the explanation was "local rules"). Tracking the tiny upper stages of these models was problematic. Matt got his first flight upper stage returned late in the third round to get 531m to place 16th. His third round sustainer was never found.

Matt's second round flight DQ'd because of the booster streamer changes; Steve Kristal struggled all three rounds with the changes, never getting a qualified flight.

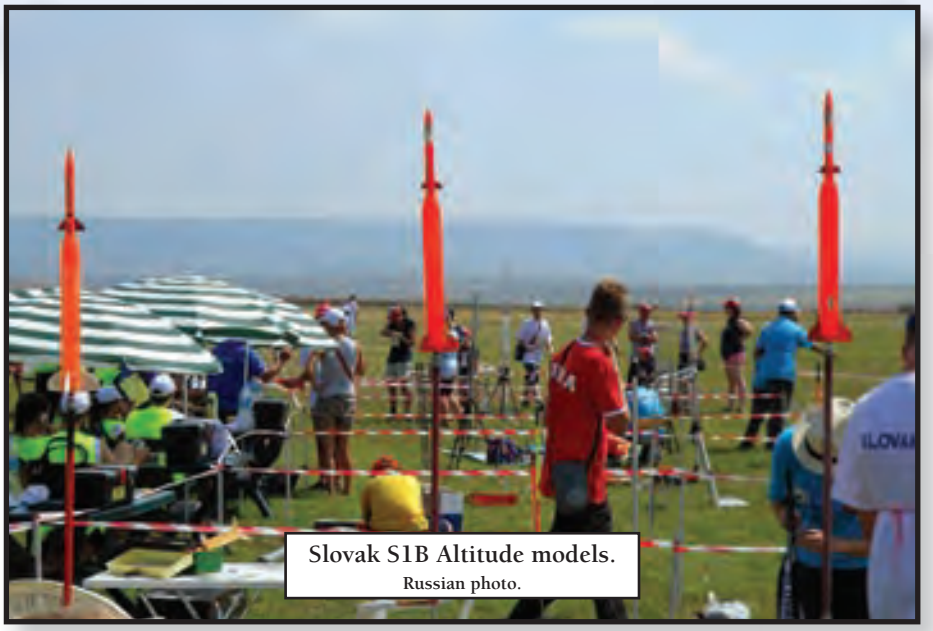
Italy's Antonio Mazzaracchio took the top spot with a 694m flight. The Russian team won the gold medal, while the U.S. team ended up 7th, even with all the problems encountered.

S1A JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Best Flight
1	Golovin, Olexandr	UKR	329	TL	367	367
2	Volokhov, Alexander	RUS	359	314	279	359
3	Pankratov, Denis	RUS	DQ	342	DQ	342
12	Kristal, Emma	USA	292			292
23	Van Milligan, Allison	USA	DQ	DQ	232	232
28	Van Milligan, Ashley	USA		DQ	TL	000

S1A JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	359	342	308	1009
2	Ukraine	367	336	296	999
3	Serbia	329	288	283	900
8	USA	292	232	000	524



Slovak S1B Altitude models.
Russian photo.

U.S. Junior S1A team members Allison and Ashley Van Milligan preparing Altitude models.

S1A SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Best Flight
1	Golovin, Olexandr	UKR	329	TL	367	367
2	Cuden, Joze	SLO		682	685	685
3	Strokov, Kirill	RUS	657	680	DQ	680
7	Barber, Trip	USA	582	586	611	611
16	Steele, Matt	USA	531	DQ	LT	531
36	Kristal, Steve	USA	DQ	DQ	DQ	000

S1A SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	635	664	680	1979
2	Ukraine	601	558	649	1808
3	Slovenia	685	563	512	1760
7	USA	611	531	000	1142
8	USA	292	232	000	524

U.S. Precision Eggloft team: Steve Humphrey, Trip Barber, and Chris Flanigan.
Photo by Barber.

S2P (Precision Eggloft Altitude and Duration)

S2P is a new event that was showcased at the WSMC at the request of the U.S., who invented the event. It is the FAI version of TARC, requiring three flights of an egg-carrying model to hit a target time and altitude. For S2P, the target time is 60 seconds and the target altitude is 300 meters. Only the Americans showed up with entries for this unofficial demonstration event, but they put on a good show.

Chris Flanigan's S2P model was based on BT-80 body tube and an AeroTech E20-7 motor. On his first flight, he was pretty close on altitude (295 meters) but somewhat long on duration. Chris's second flight was somewhat low and still a bit long on duration. His third flight altitude was closer to target, but the parachute tangled during ejection, resulting in a short duration. That was good enough to win, but only because Steve Humphrey's smaller and lighter model, which had less room for egg padding, hit a tent stake on recovery and broke the egg on his last flight.

Trip Barber's large and colorful red, white and blue model with onboard electronics for controlling parachute deployment exactly at apogee took second place, mostly due to a short duration on its second flight. Its AeroTech F50 motors definitely got the spectators' attention at each liftoff. The competitors from other nations who were examining the U.S. models were fascinated with the use of electronics.

There is interest within the FAI to move to these types events that do not rely on special motors or large fields. The sight and sound of these models flying got everyone's attention on the range. As the United Kingdom's Stuart Lodge said, "Another plus with these models is that there's no need for 'super lightness,' as there is no need to boost them as high as possible on a minimal motor impulse, contrasting with most existing Space Modeling classes. Consequently, the models are easy to make from basic materials—or even contemporary composites, take your pick—and painted in eye-catching colours."

All the competitors watched S2P flights with interest, so it is a good bet that this event will be more widely entered and closely contested in the future, if future WSMC organizers choose to hold it.

S2P SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Final Score
1	Flanigan, Chris	USA	62 sec/295m	62 sec/282m	40 sec/290m	107.01
2	Barber, Trip	USA	57 sec/286m	32 sec/295m	65 sec/289m	135.89
3	Humphrey, Steve	USA	59 sec/310m	64 sec/301m	59 sec/322m	Broken Egg (51.18)

Kevin Johnson ready to make his S3A flyoff flight.
Photo by John Langford.

S3A (FAI A Parachute Duration)

One of the most fun events to watch at the world championships is S3A. These models deploy 36-inch or larger Mylar parachutes and float for minutes. At any one time in good air, you can see six to twelve models in the same thermal.

The trick in this event is to get one model back after making the five-minute maximum time (max), as each modeler is allowed only two models for three flights. Usually there are multiple entries that get three maxes of 300 seconds, ensuring a flyoff. For the Juniors at the 2014 WSMC, there were three modelers in the final flyoffs. Vesilin Veselinnov of Bulgaria outdueled Martin Kosut of Slovakia in the final flyoff by 4 seconds, 420 to 416! Third place went to Bowen Gao of China, who DQ'd after having three perfect flights earlier in the day.

Both Daniel Kelton and Emma Kristal had two maxes and one flight short of a max, taking them out of the flyoff picture. Rachel Nowak struggled with DQs in the first two rounds before maxing in the final round. As a result, the U.S. team finished 8th overall.

The U.S. Senior Team consisted of Steve Kristal, Terrill Willard, and Kevin Johnson. The weather was great for Senior S3A, with booming thermals and clear skies.

Steve had two great flights to max the first two rounds. Unfortunately, his models kept riding the thermals all the way to the Black Sea, and he had nothing left to fly in the third round.

Terrill had even worse luck—his first flight model maxed, landed in a field, then was caught by the wind, picked up, and flew away! His second flight looped on boost, got DQ'd, then deployed its parachute—and flew away! Terrill was also left with nothing to fly in the third round.

Kevin Johnson's models were beefy and flew using Estes A3-4 with no piston. He wanted reliable, tested, "no drama" flights, so he stuck to what he had used at home in Maryland.

One thing the U.S. team excelled at was "picking air" (i.e., finding thermals). The glider guys, especially Herb Vinyard, were artists at seeing the invisible ocean of air above. Kevin managed to max on all three flights, even as he watched piston launched euro-motored birds boost high and get good times even if they didn't catch

S3A JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Veselinov, Veselin	BUL	300	300	300	420	1320
2	Kosut, Martin	SVK	300	300	300	416	1316
3	Gao, Bowen	CHN	263	300	300	DQ	900
12	Kelton, Daniel	USA	159	300	300		759
16	Kristal, Emma	USA	300	140	300		740
35	Nowak, Rachel	USA	DQ	DQ	300		300

S3A JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	China	863	813	900	2576
2	Poland	760	853	600	2213
3	Czech Republic	721	749	600	2070
8	USA	759	740	300	1799

Bill Stine with the U.S. Junior S8D team.

Stoil Avramov and family with his S4B Silver.
Photo by Jon Stenberg.

Cato of a Proton Scale model.
Photo by John Langford.

Above: One WAC Bumber successfully stages; another fails to stage.
Photos by John Langford.

Daniel Kelton's S7 liftoff.

U.S. Junior S8D team.
Photo by George Gassaway.

The awards, ready for presentation.
Photo by Jon Stenberg.

Scale Proton in flight.

U.S. Team motor supply.
Photo by Terrill Willard.

Marc McReynolds and his S7 Spartan. Above: Marc repairs the Spartan for a second flight.
Photo by John Stenberg.

a thermal. Kevin's models boosted 20-30 meters lower, but opened the chute, then found the lift that the team predicted.

Kevin was one of the first on the U.S. team to use tiny radio beacons to help the recovery team. The S5C team brought a radio tracking system for their scale altitude Bumper WAC model upper stages, so Kevin bought a micro transmitter (5mm x 13mm x 3mm with a mass of 0.5g) to give some recovery insurance in case of a long duration flight. His strategy proved to be a wise move; with fields of sunflowers and corn, there were plenty of recovery obstacles. Kevin's first round flight (with the tracker) flew over a ridge and descended into a dense patch of sunflowers. Jim Kelton and Dave O'Bryan used the tracking receiver to figure out an offset line to the model. It was found, and picked up much faster than if they were searching the field along the original line.

WSMC flight line.

With that model back, Kevin was able to fly his second model away in round two. He used the tracker again in round 3, but the model caught a boomer thermal and quickly flew high and downrange out of range of the receiver. Kevin had 3 maxes and was one of fifteen competitors in the flyoffs!

For the flyoffs, contestants are allowed to use a third model. The flyoffs were held later in the early evening with a stiffening breeze and no thermal activity. Kevin borrowed a piston for this round, knowing that he needed all the altitude he could get. After two attempts at getting it set up, he decided to forgo the piston, and just fly as he had in the prior rounds. This time, the low boost altitude hurt his duration. His flights netted him 9th overall, though, and the U.S. Team finished 13th.

Antonio Mazzaracchio won the gold medal in an incredible manner. When the first flyoff round was complete, there were four fliers that maxed again. However, only Antonio had recovered enough models that he had one left to fly. This is especially remarkable since he *is* the Italian team and had no teammates to help him recover. He later said he had run over 20 kilometers (12 miles) that day to recover his models. His second flyoff flight took off with a big crowd watching. As the model's parachute deployed, the whole crowd gave him a round of applause as he won the gold. Even more incredibly, he did this on the same day he won the gold in S1B, so he stood on the medal stand twice in the same day!

My First World Championship for Space Modeling

by Stoil Avramov

This competition was a great experience for me. I had unforgettable moments, successful and unsuccessful runs, team work and work of my own, competing with Juniors from other countries, and being friends with the competitors from other countries.

I had to perform in two events, S9A (Gyrocopter duration model) on day two and S4A (Free-flight Boost Glider duration model) on the fourth day. I had problems with my S9 starts. Probably I was a little stressed out during the time when I set up the models for the starts.

The day for S4A RG started with nice thick air and calm wind in the morning. I had a nice straight boost in my first round, but just behind the thermal and the model did not get a max. I had to do my best without any mistakes on the next two rounds. And I did it—two max results, and Silver for Juniors. I was so happy.

It was awesome to be one of all the great competitors and to represent the United States. You see, both my parents grew up in Bulgaria, and both of them had competed on the Bulgarian national team. I was born there before our family came to the United States. So at this contest I was part of my old home and my new home.

Now, I am back home from this event motivated to work harder on my future models and perform well in the selection of U.S. Team 2016.

S3A SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff 1	Flyoff 2
1	Mazzaracchio, Antonio	ITA	300	300	300	420	290
2	Szulc, Sebastian	POL	300	300	300	420	0/300
3	Perc, Drago	SLO	300	300	300	420	0/296
9	Johnson, Kevin	USA	300	300	300	155	
42	Kristal, Steve	USA	300	300			
52	Willard, Terrill	USA	300	DQ			

S3A SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Serbia	900	900	866	2666
2	Slovenia	900	857	812	2569
3	Bulgaria	900	839	718	2457
13	USA	900	600	300	1800

S4A (FAI A Rocket Glide)

Most of the rocket glide models in S4A were scissors/flop wings. These models boost straight with the wing rotated/folded. At ejection, the wing rotates 90 degrees and the wing tips "flop" to turn into efficient gliders. For the U.S. junior team, Stoil Avramov, from Columbia, Maryland, used this design for his entry. His first flight was only 167 seconds, just short of a max. Usually, that would be enough to be out of medal contention, but on this day, lift was hard to find. Stoil had picture perfect maxes in rounds two and three, and when the results were tallied, his score was good enough for an individual Silver medal!

Some recoveries were hampered by sunflower fields.
Photo by John Langford.

Stoil's teammate Zack Stenberg had three good flights, but failed to find enough lift to max on any of them, ending up in 12th place. Brendan O'Bryan struggled, with two flights of less than 90 seconds and a DQ to wind up in 32nd place. The U.S. team ended up in fifth place.

Especially for the Seniors, S4A is an extremely challenging event with many excellent, highly experienced competitors. There is no room for error.

Chris Flanigan ran into problems right off the bat in the first round. He decided to swap out the pod on a swing/flop model that he had previously flown successfully

S4A JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Sadowski, Patryk	POL	180	180	180		540
2	Avramov, Stoil	USA	167	180	180		527
3	Voronin, Artem	RUS	151	180	180		511
12	Stenberg, Zackary	USA	167	108	126		401
32	O'Bryan, Brendan	USA	087	DQ	081		168

S4A JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	485	473	511	1469
2	Poland	476	540	270	1286
3	Slovakia	384	411	483	1278
5	USA	527	168	401	1096

using 13mm motors with a 10mm pod. After a few trim tosses, the model was ready for flight. At that point, he had over 30 minutes remaining in the first round, but he could not get the motor to ignite, resulting in multiple misfires. Igniter techniques that the team had developed and debugged at the 2013 European Spacemodeling Championships did not work with the Bulgarian JambolJet motors. This resulted in a zero score for the first round, eliminating Chris from contention. His second and third round flights were successful, but didn't catch good air.

S4A SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Yordanov, Plamen	BUL	180	180	180	300	840
2	Lipai, Aliaksandr	BLR	180	180	180	240	780
3	Mayboroda, Vitaliy	RUS	180	180	180	127	667
20	Hampton, Brock	USA	143	089	180		412
31	Foster, Steve	USA	123	180	000		303
39	Flanigan, Chris	USA	000	104	116		220

S4A SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	540	540	411	1491
2	Slovenia	516	525	441	1482
3	Bulgaria	481	433	540	1454
10	USA	220	303	412	935

Eating Sunflower Seeds and Other Memories of Bulgaria

by Ashley Van Milligan

My trip to the FAI World Championships was amazing. The World Championships is different from anything I have ever done. The FAI World Championships is in other countries and has people from all over the world. You get to see places that are in different countries and meet new people from all over the world. I got to see things I've never seen before. There is always a march-in for the contestants and their support team members. I even got to hold the flag for the United States during the opening ceremony. They had fireworks and lots to drink.

When you go to the rocket field you travel as a team on a bus. Traveling as a team is a good thing. One time we had to ride with the Chinese team, because our bus broke down. There are two events each day. There are three rounds which last 90 minutes each. I felt rushed at first, and a little scared. Then I realized I had enough time. I liked only competing in two events. I got a maximum time on one of my flights in the streamer duration event. This was so cool.

Another thing we had to do was track and recover other team members' rockets. This was fun sometimes because I was with other people. I had to track down rockets in sunflower fields, and it felt like a maze because they were so tall. I helped find two rockets in them. Then I ate some sunflower seeds (don't tell the farmers...). We were on the field all day from 7:30 AM, to sometimes 9:00 at night. I got to watch medal ceremonies, which was different.

Sometimes on the long days on the field we played cards with our team and hung out with people from other countries. I liked meeting new people who also did rocketry. At night we would eat dinner together. We never knew what we were going to eat, except there was sure to be some sort of tomatoes and cucumber salad. Sometimes we ate dinner really late, like 10:00 PM.

The banquet was a lot of fun too. I got to trade for items and stuff from other countries, like pens and stickers. I also got to dance. The music was great because they had a live singer.

I hope I get to go to the World Championships again because this is something I will never forget. It was so much fun. I liked being part of team.

Brock Hampton was a first-time flier at the World Space Modeling Championships. As a result, he focused on getting three qualified flights. When Brock got to Bulgaria, he found his models did not perform well when using European motors, throwing off the existing trim and inducing a corkscrew on boost. Steve Foster, the team's third member, lent Brock one of his spare models. Brock had three good flights and managed a max in his third round, to end up placing 20th.

Steve had a good first round flight and a max in the second round, but suffered a DQ in the third round to finish 31st. The U.S. team finished 10th.

S5B/C (FAI B/C Scale Altitude)

In S5B (B Scale Altitude) for Juniors, Alyssa Stenberg entered a 1/5 scale replica of the Aurora Flight Sciences' Space Grant 1 rocket. After judging, Alyssa's model was in first place in static judging with 398 points. Her entry was helped by the fact that it was a unique entry (worth 40 static points) and a third stage (worth another 40 points) and a near-perfect accuracy score. Teammates Daniel Kelton and Rachel Clark both entered Bumper WAC models, which were the favorite entry in both the Junior and Senior divisions. Daniel emerged from static judging with 347 points and Rachel not far behind with 343 points.

In the first two rounds, Alyssa's model was plagued by DQs on the booster stage. This was especially frustrating, as the altimeter readings showed that a gold medal was within reach. With the help of Allison Van Milligan, Alyssa's model got a qualified flight and an altitude of 558 meters on its third flight—the lowest of her three flights but still the highest flight of the event. With both the highest static score and the highest flight score, Alyssa had a firm lock on the Gold medal.

Rachel Clark had a great first flight of 383 meters on her Bumper WAC. Her second attempt suffered a "track lost" (i.e., a bad altimeter reading), but she still placed 9th overall.

Daniel Kelton suffered a first round DQ due to his lower stage motor sliding up upon ignition. This resulted in his lower stage barely clearing the tower, and the recovery system failed to deploy before landing. In the second round, Daniel suffered an upper stage ignition failure, and the flight, while safe, went very low. In the

Jim Filler Prepping his S5B model.
Photo by Filler.

Eleven Out of Ten for Fun

by Allison Van Milligan

I had such an amazing time competing at the World Space Modeling Championships in Bulgaria this past August. I had so many experiences that I would have never had anywhere else.

One of my favorite parts was that it is a team experience. In NAR competitions you are trying to do good for yourself, all by yourself. But, being on a team everybody was trying to help you do well, and you are helping them. Even off the field you are still a team. I thought this was so cool. We all rode the team bus to the field and back everyday, we all stayed in the same hotel, and we all had dinner together. Some of us even were on the same flights back to the USA.

In the scale event, after static judging my rocket was in 23rd place out of 24 entries. All the other countries models were *amazing*! On my first flight, the wind conditions made my Saturn 1B go unstable, which caused it to get a DQ. I didn't think it was fixable. But there were about seven or eight people gathered around a little table all helping me fix my rocket. Different groups of us were working on different parts. Finally we got it done with like 15 minutes left in the round. I checked it in, then put it out on the pad, then I launched it. We were all watching and it worked!! Everybody was so happy! It was truly unbelievable and breathtaking! Everybody from our team was coming up and giving me hugs. I ended up finishing up 15th in the world!

Even though the whole trip was just incredible, I would say my favorite part was becoming friends with so many new people. I became 'best' friends with some of my American teammates in just a week; we text each other almost every day. I even became friends with people from other countries. I also learned more about other countries in one week there than I learn in a whole school year. The British rocketeers, I think, were the funniest by far. It would've helped a lot more to speak another language so I could have talked to even more people. Some of the American kids around my age would go play Durak (a Russian card game) with the Russian kids after dinner every night. Even though we couldn't speak Russian, and they couldn't speak English very well, we still became very good friends. I even text them and follow them on Instagram (thanks to Google Translate). I had so many social experiences in one week with other people, that over here in America, it would've taken years to have.

I'm not gonna lie, this is the hardest most tiring week I've ever had. But it was also the most *amazing* week I have ever had. When I was going into this I thought that this week would be really long and boring but it was the total opposite. It was not at all what I was expecting. This week went by so fast it was hard to believe. You were up at like 5:00 in the morning and you wouldn't get back until like 8:00 at night from the field, then you would go to dinner, and then I would go play cards and not get to bed until like 11:30. Everybody was pooped by the end of the week.

On the "funness" scale: NARAM is about a 5 out of 10. Internats is an 11 out of 10! I am definitely going to try out for the team again. I really hope I make it and can go because I can't even explain how astounding this trip was. Even though I missed the first two weeks of high school I would say that the trip was well worth it.

third round, the upper stage on his model ignited, but the lower stage motor did not, for a DQ.

When Daniel went to get his altimeter score from the second round, he was understandably feeling disappointed. When he heard the judge say "Well done. Is beautiful flight," he didn't quite understand what was going on. He then looked at his flight sheet that read 680 meters, and it made even less sense. After thinking about the situation, Daniel went back and at length convinced the officials to change the score to a track lost. As a result, he got his static points to count towards the final score, but no flight altitude added to it. (It is likely that the altimeter was not properly reset from a previous flight by another competitor prior to Daniel's flight.) The erroneous reading would have resulted in a gold medal for Daniel, and first place for the Junior team, but with Daniel's correct score, Daniel placed 24th and the Juniors placed fifth.

The U.S. S5C team with supporters.
Photo by Filler.

As a result of his good sportsmanship and honesty, Daniel won a special FAI award for "Fair Play" at the Awards Banquet. Well done, Daniel!

S5B JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Prototype	Static	Flt 1	Flt 2	Flt 3	Total
1	Stenberg, Alyssa	USA	Space Grant 1	398	DQ	DQ	558	956
2	Zaytsev, Oleh	UKR	Taurus Tomahawk	372	517		-	889
3	Vishinakov, Anastasiia	RUS	Bumper WAC B-7	360	DQ	511	412	871
9	Clark, Rachel	USA	Bumper WAC B-7	343	383		TL	726
24	Kelton, Daniel	USA	Bumper WAC B-7	348	DQ	TL	DQ	348

S5B JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Slovenia	764	768	683	2215
2	Ukraine	650	889	659	2198
3	Russia	871	616	652	2139
5	USA	726	348	956	2030

S5C SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Prototype	Static	Flt 1	Flt 2	Flt 3	Total
1	Tarasov, Vladimir	RUS	Bumper WAC B-7	384	987			1371
2	Kot'uha, Jan	SVK	Bumper WAC B-7	407	857		DQ	1264
3	Cuden, Joze	SLO	Bumper WAC B-7	392		800		1192
10	Filler, Jim	USA	Bumper WAC B-7	355	666		DQ	1021
11	Duffy, James	USA	Bumper WAC B-7	347	DQ	671	DQ	1018
24	Steele, Matt	USA	Bumper WAC B-7	348	59		DQ	407

S5C SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Slovakia	1129	1059	1264	3452
2	Romania	1080	991	827	2898
3	Slovenia	1192	742	696	2630
4	USA	1018	1021	407	2446

The Senior S5C team of James Duffy, Jim Filler, and Matt Steele were veterans of the 2012 WSMC, where they placed 4th. All of the U.S. team flew Bumper WAC, Round B-7, the de facto design for this event. After static judging, the U.S. entries were clustered in the middle of the pack.

Jim Filler's first flight hit an altitude of 666 meters, using a Ukrainian Zenit B2-6 in the upper stage. His second flight was not nearly as good because his piston stop became unseated, causing the booster and the sustainer to tip off from vertical. His total was good enough to place 10th overall.

James Duffy suffered a DQ on his first flight, then came back with a good second flight to 671 meters. That score was good enough to place James in 11th place, right behind Jim.

Matt Steele's first flight didn't ignite the upper stage WAC due to a prepping error. His 59 meter flight was qualified, but the upper stage was badly damaged and required the entire second round to repair. Matt's third flight boosted straight up to 497 meters, but the booster was DQ'd for unsafe recovery. Had Matt's score counted, the U.S. team would've placed third; as it was, the team ended up fourth.

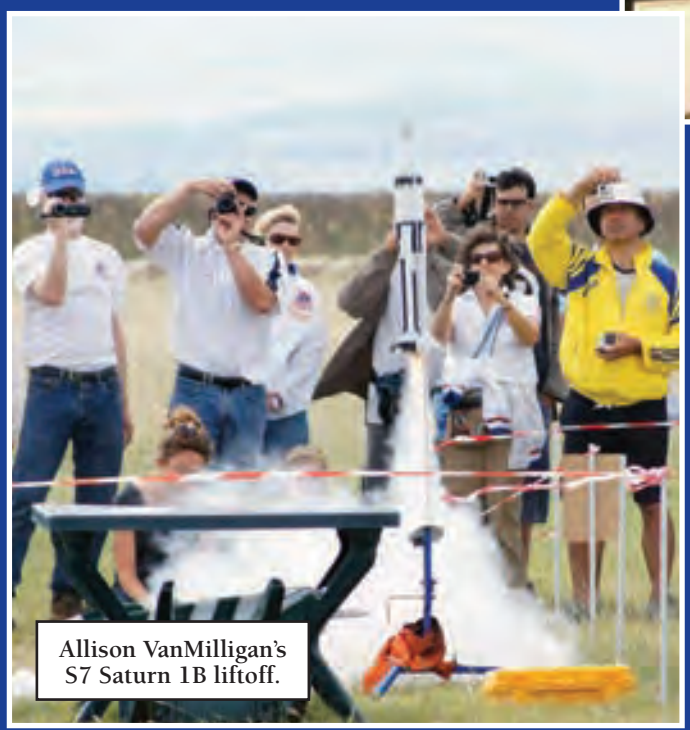
Matt Steele loads his S5C model into the tower.

S9A Senior award ceremony, with Trip Barber taking Bronze.
Photo by Jim Filler.

Chinese S7 Scale model liftoff.

Scale judging room.

Stoil Avramov receives Silver in S4A.



Allison VanMilligan's S7 Saturn 1B liftoff.

Junior S8D medalists, with Alyssa Stenberg taking Silver.
Photo by Jon Stenberg.

Bulgarian monuments.

Shepherd with flock.
Right: Local transportatio
Photo by Dave O'Bryan.

Downtown Shumen.
Photo by Trip Barber.

Statue of Asparuh,
first king of Bulgaria.
Photo by Trip Barber.

Flying S8 for Silver

by Alyssa Stenberg

This year's world championships were in Kaspichan, Bulgaria. This would be my third world championships and it was one of my favorite competitions. I always enjoy it when I see my friends, teammates, and the competitors there.

This year I flew in three events: S9, which was first, then S5 and S8, which were on the same day.

My teammates and I did our best in S9 but our rockets did not perform very well and we got low times. It was quite disappointing.

I tried to shake that disappointment away the day of competing in S5 and S8. I was extremely nervous and stressed because I had to prepare for two events. S5 was in the morning and it took up all my time so I didn't get to spend as much time as I would have liked on my gliders in S8.

S8 was the event I feel most nervous in. I felt like the first round was always the worst in terms of stress. I was so nervous because anything and everything can go wrong, from the glider flying off-vertical on boost and getting a DQ, to not getting a max or not landing in the landing zone. My hands were sweaty and I felt my knees getting a little shaky when the countdown to the first boost began. The boost went well, and I felt some of my stress drain away. Now all I had to do was keep the glider up in the air for six minutes, weave the glider through the sky, and try to grab as much lift as possible. Unfortunately, there wasn't enough lift in the air that I could get to, and as the glider got lower and lower I realized I wasn't going to get a max. Talk about getting a sinking feeling! However, the practice I had with landing paid off and I landed the glider in the landing box, gaining a bonus minute of time. Despite that, I ended in 10th place.

Alyssa Stenberg with her Silver-winning S8D glider.
Photo by Jon Stenberg.

The second round was a little easier because I had a qualified first round. That didn't help with the stress of the boost though. I think I will never get over the stress of boosting! I still felt a little weak in the knees but the boost went really well, going straight up. There was lift in the air, so my glider went up, and I managed to get it to stay up for a max, which was awesome. I landed the glider in the landing zone, and that added to my joy. A max with a landing is a great thing to have! I breathed a sigh of relief, but I still had one more round to go.

That last round, I was still nervous, waiting with my transmitter in hand and the glider on the pad. I wanted the best lift possible, so I waited a long time for signs of a big thermal. Then at one point, I saw a bunch of gliders in the air that were in one spot, and they were rising. I launched, the boost not as nerve-wracking this time but still just as straight, and flew right into a massive thermal that took my glider up and up. My happiness rose as my glider did, and I got a max flight with altitude to spare. Then, I had to get it down so I could land it. I put the glider in a slight dive and lost altitude. The time the glider was sitting on the launch pad and the six minutes or so that it was in the air added up. The battery inside my glider was small and twenty seconds before landing, the battery died, and I could only watch as it spiraled down to the ground, outside of the landing zone. I felt awful, despite my max. I was sure I was out of medal contention. I remember not wanting to see the final results. I was third in the standings before my third and final flight, and I thought that without the bonus landing points, I would be bumped back to 10th place.

Imagine my shock when I finally looked at the rankings and saw my name in the 2nd place spot! Better yet, the S8 team got a Silver medal as well! I was so surprised and happy. I couldn't take the smile off of my face for a long time. That night, as I stood on the podium with two silver medals around my neck surrounded by my teammates, I felt like I was on top of the world.

The closing ceremony that year was one of my favorites, and it washed away any feelings of stress or nervousness from the competition.

S6A (FAI A Streamer Duration)

FAI Streamer Duration appears to be simple, but is an extremely challenging event to fly competitively. Rarely are there three maxes of 180 seconds from any modeler. The event puts a premium on light weight, reliability, and the voodoo science of streamer material and folding.

The Junior S6A team ran into problems right from the start, as they encountered ignition problems and weak ejection charges. All three girls (Ashley Van Milligan, Rachel Clark, and Rachel Nowak) had no deployments on their first flights for DQs. They fixed the problem for subsequent flights, but the damage was done. Ashley's second flight was decent, but didn't catch any air—only 56 seconds. On her third and final flight, she finally got a little bit of lift and got a max and finished 26th. Ashley was the only one of the three girls to fly using a piston launcher. Rachel Clark got decent second and third flights, but Rachel Nowak had stability problems with her rocket and DQ'd her third flight.

One Bulgarian Junior, Kaloyn Dimitrov, managed to max all three rounds and took home the gold medal. The Bulgarian Juniors also took home the team gold, while the U.S. team finished in 12th place.

For Senior S6A, the thermals were not as easy to find as when the Juniors flew. Leszek Malmyga of Poland won the gold with two maxes of 180 seconds and a third flight of 155 seconds.

The best U.S. flier was Terrill Willard, who was drafted to fill in for Pat Butler at the last minute. With airframes from Keith (Herb) Vinyard, streamers from Jay Marsh, nose cones from Matt Steele, and Trip Barber's fin jig, Terrill was able to get models together and flew them successfully. Terrill had fairly good flights, ending up placing 24th, with Steve Humphrey close behind in 28th. Jay Marsh's ultra-light Kapton models proved to be too fragile during boost. He DQ'd his first two flights before reinforcing the structure enough to get a good final flight.

S8D (FAI D Rocket Glide)

The members of the U.S. S8D junior team were Brendan O'Bryan (son of long-time U.S. Team member Dave O'Bryan), Zackary Stenberg, and Alyssa Stenberg. They all flew Raven-10 models designed by Bob Parks. S8D Rocket Glide is flown in three flight rounds where each flight is timed to a max of six minutes, plus an extra 60 seconds if any part of the glider lands inside of a 20 meter square box.

The day of the contest had a constant wind of about 10 mph. In the first round, Alyssa seemed to be in good enough air to max, but in the last two minutes it went away and her bird got low. She just did manage to land it inside the 20-meter square, 22 seconds short of a max. Brendan flew in lift and maxed, and landed inside the zone, to be one of twelve tied for

S6A JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Dimitrov, Kaloyn	BUL	180	180	180		540
2	Lasocha, Pawet	POL	180	108	180		468
3	Dejan, Cancarevic	SRB	180	180	090		450
26	Van Milligan, Ashley	USA	DQ	070	180		250
36	Clark, Rachel	USA	DQ	072	050		122
37	Nowak, Rachel	USA	DQ	042	DQ		042

S6A JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Bulgaria	382	379	540	1301
2	Serbia	417	450	360	1227
3	Poland	288	345	468	1101
12	USA	122	042	250	414

S6A SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Malmyga, Leszek	POL	180	180	155		515
2	Vasilev, Stefan	BUL	180	180	123		483
3	Zoran, Katanic	SRB	180	161	123		464
24	Willard, Terrill	USA	067	137	125		329
28	Humphrey, Steve	USA	077	083	144		304
51	Marsh, John	USA	000	000	095		095

S6A SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	437	449	347	1233
2	Bulgaria	457	482	254	1194
3	Serbia	406	321	464	1191
13	USA	304	095	329	728

first in round one. Zackary did not get any lift, tried flying upwind to find lift. Finally had to come back, but it was too low to properly set up to land and landed outside the box, 24 seconds short of a max.

In the second round, Alyssa's model was not in lift. It was down to 100 feet with 2 minutes to go. Then "bump," it rose a little. And a few seconds later, "bump," it rose more, and it wasn't due to stalls or gusts. She finally had flown into oncoming lift, and got high enough to max and to set up properly to land right in the middle of the zone. Brendan did not get lift, flying for 176 seconds, and then landing in the zone. Zackary had the same kind of flight as Alyssa, no lift, getting low, then "bump," and "bump," and finally rising high enough to max and to set up to successfully land in the zone.

In the third round, Brendan didn't get any lift and flew for 237 seconds, with a landing in the zone. That performance, though, was good enough to place Brendan in 12th place.

Zackary flew last, and being late in the day, there was no lift, just a bit of sink. He landed at 239 seconds, inside the landing zone, good enough to finish 10th.

Alyssa flew first in round 3 but waited on the pad for other models to launch, to find lift. It was a long wait, as no one flew for about 25 minutes after the round started. Finally, a few models launched, and found lift, so then Alyssa launched into massive lift. She easily maxed, but the model was pretty high up when she hit the six-minute mark. Alyssa didn't want to come down too quickly, and there was no apparent need to do so, except to leave more time for her teammates. She gently brought the model down to under 100 feet, but then the model started acting up. It eventually lost control, and hit about 50 feet outside the landing zone. The battery had gone dead. So, she maxed but did not get the 60-second bonus for landing inside the box (which she almost surely would have done in those conditions). Without the landing points, it seemed certain she'd drop from 3rd (her place where she entered the round) to some lower place.

The results were printed and posted a few minutes after each round. Alyssa and Zackary's father, Jon Stenberg, was waiting at the results board after the event ended. Those inside the U.S. Team tent heard him yell "Silver!" Alyssa had won the Silver medal, again, her second S8D silver medal in the last three WSMC's. Both of the top fliers in Round 2 had not maxed, one dropped down in the bad air of most of Round 3, but Mladen Totev of Bulgaria held on for gold. So the dead battery did not cost Alyssa a medal, but it did cost her a gold medal, as the landing points would have given her first place. Had she won the S8 gold, she would have become the first American ever to win two FAI gold medals in a single day, since she had won the S5 gold only a few hours earlier.

As a result of a solid effort, the Junior U.S. Team also won the silver medal, behind the Bulgarian Team.

S8D JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Totev, Mladen	BUL	420	420	388		1228
2	Stenberg, Alyssa	USA	398	420	360		1178
3	Wang, Yunhao	CHN	420	282	420		1132
10	Stenberg, Zachary	USA	336	420	299		1055
12	O'Bryan, Brendan	USA	420	236	297		953

S8D JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Bulgaria	1228	1108	1101	3437
2	USA	1178	1055	953	3186
3	China	1132	980	817	2929

S8E/P SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Lu, Zheng	CHN	1000	1000	993	1000	3993
2	Synielytsyi, Oleksandr	UKR	993	998	1000	998	3989
3	Malmyga, Leszek	POL	993	976	1000	974	3943
11	Berk, Matthew	USA	835	961	844		2640
24	Vinyard, Keith	USA	503	885	791		2179
31	Gassaway, George	USA	707	000	977		1684

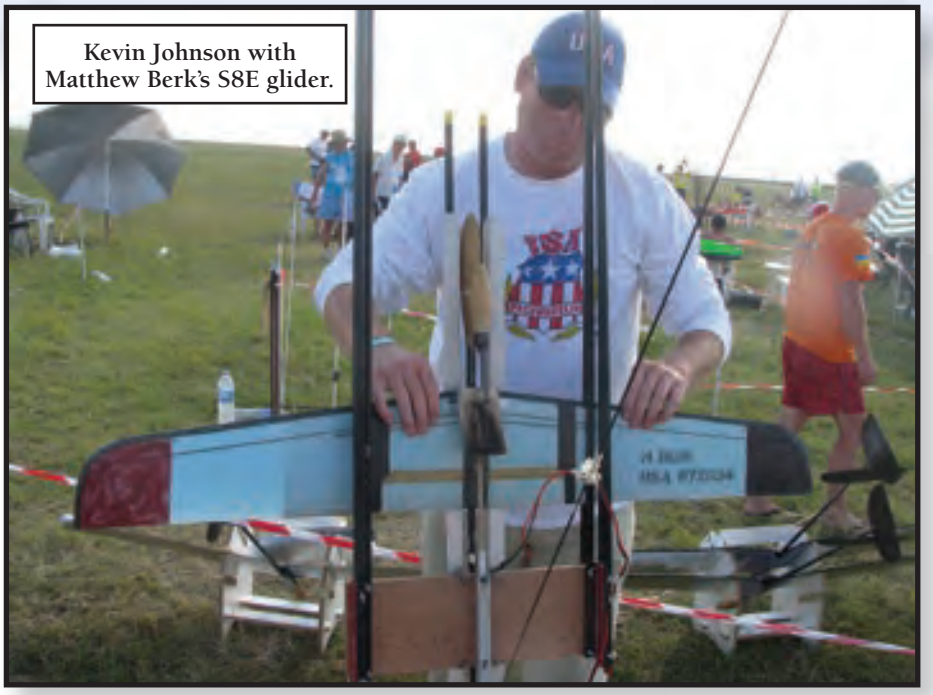
S8E/P SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	China	2993	2978	2898	8869
2	Ukraine	2765	2493	2991	8249
3	Poland	2969	2503	2549	8021
9	USA	2640	1684	2179	6503

S8D (FAI D Rocket Glide)

S8E/P has a fight duration target time of six minutes, and every second above or below is deducted from 360 as the point score. There is also a landing bonus of 100 points for landing within one meter of the target, with 10 points deducted for every meter away from the target. The flights must be flown during an assigned short period of time, with six to seven fliers per flight group (there were 38 pilots, 6 assigned flight groups per round). The scores among each group are normalized such that the highest score of the group gets 1000 points and the rest of the fliers' scores are adjusted in proportion. There are three rounds, then a fourth round for the top five pilots from the first three.

Matthew Berk, Keith Vinyard, and George Gassaway were the members of the U.S. S8E/P team. They all flew models based on Bob Parks's Raven-11 design, with their own variations and size tweaks from 270 to 330 square inches of wing



Kevin Johnson with Matthew Berk's S8E glider.

One of the Chinese S8E fliers.
Photo by Jon Stenberg.

area. Matthew and Keith used models with a center flap to act either as a spoiler (moving up) or flap (moving down) to aid with glide path control. George's model used "crow" for glide path control, center flap down, tip panel control surfaces moving up.

The weather was good, blue sky with wind of about 10 mph. It was a typical "energetic" afternoon, with big, distinct thermal cycles coming through about every 10 minutes. Either everyone made their time or everyone fought the sink depending on when in the cycle the group's launch window occurred. The landing area was on the downwind side of a sloping hillside, so pilots needed to approach it with enough altitude to come down through a mucky air layer in the last 10 feet above the ground on a fairly steep approach. Glide path control was a must.

On Keith's first and third flights, he hit the sink/neutral phase of the thermal cycles and had to stretch the time all he

could, at the expense of two zero landing scores. His second round flight was in lift, but he was a little over the target time and only made a 50 landing score. He finished in 24th place.

Matthew had a good first round, fighting lousy air with everyone else in his group and scored an 80 or 90 on landing. He also hit lift on the second round, but bad air on his last round and finished 11th.

George had trouble seeing his model during the last part of the boosts, with the sky conditions and sun nearby when facing into the wind. His first flight was only for about 5 minutes and he waited too long to set up to land, getting a zero landing score. In the second flight, the model got off course when he lost sight of it, and the flight was DQ'd. The third flight went very well, just short of 6 minutes and a tricky landing a bit over two meters away from the target for 80 points. He ended up 31st.

So, all three U.S. Team members had an "off" day in one way or another. Also, many other countries had upped their game. The Chinese team was again flying their 6-channel models with wings that had inboard flaps and outboard ailerons for "crow." Many countries had 4-channel models that used full span flaperons, flap and aileron control mixed. The Ukrainians and Bulgarians used actual Discus Launch Glider (F3K) models, professionally built "Snipe" sailplanes with a rocket engine pod added to the fuselage. The Bulgarians went as far as to actually recruit Hand Launch R/C Sailplane pilots to join the country's rocket team, which was a great strategy.

S9A JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Shirobokov, Aleksandr	RUS	180	180	180	193	733
2	Ivanov, Ivelin	BUL	180	180	180	170	710
3	Trzilova, Viktorie	CZE	180	180	180	DQ	540
15	Stenberg, Alyssa	USA	128	121	180		429
31	Van Milligan, Allison	USA	138	098	DQ		236
33	Avramov, Stoil	USA	068	120	DQ		188

S9A JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Bulgaria	522	438	540	1500
2	Russia	540	462	482	1484
3	China	519	508	401	1428
10	USA	188	429	236	853

S9A SENIOR INDIVIDUAL RESULTS

Place	Name	Country	Flight 1	Flight 2	Flight 3	Flyoff	Total
1	Stoyanov, Toshko	BUL	180	180	180	300	840
2	Malmyga, Lesek	POL	180	180	180	214	754
3	Barber, Trip	USA	180	180	180	207	747
42	Humphrey, Katherine	USA	136	000	103		239
44	Humphrey, Steve	USA	000	138	090		228

S9A SENIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Bulgaria	540	531	417	1488
2	Poland	540	518	327	1385
3	Lithuania	445	514	419	1378
13	USA	540	239	228	1007

S9A (FAI A Gyrocopter Duration)

S9A Gyrocopter (we inaccurately call it Helicopter in the U.S.) is one of the more popular events on the FAI contest list.

For S9A (Junior), Alyssa Stenberg flew a flop-rotor design. It flew well but did not catch any lift for the first two flights for times of about 2 minutes each, and then thermaled away her third flight. Alyssa finished 15th.

Allison Van Milligan had two good flights, but she didn't find any real lift. In the first round she was up for 138 seconds, but her model hit down air for only 98 seconds in the second round. Her third flight deployed everything, but one blade hung up a little bit and didn't fully deploy. The rocket rotated slowly and came down at around 58 seconds, but was DQ'd for no rotation.

Stoil Avramov had two good flights in light lift, but DQ'd in the third round due to rotor problems. The U.S. team finished 10th in the event.

Two Juniors managed three maxes, and the flyoff saw Russia's Aleksandr Shirobkov out duel Bulgaria's Ivelin Ivanov by 23 seconds for the gold medal.

Trip Barber's S9A models were the best among the American models, capable of doing over two-minute durations with the Bulgarian Jambol Jet A2-4 motors and a piston launcher. He had three perfectly straight flights during the event in the morning and fortunately, with the help of the U.S. thermal picking team teammates, was able to pick enough lift during the event that he got three maxes, each just barely—with a 10 to 15 second margin. The U.S. recovery team returned his model each time, so Trip flew the same model in each round.

At the end of the first three rounds, there were five competitors left for the flyoff to be held at the end of the day. By late afternoon, there was more wind and little thermal activity. Trip had noticed that there was still some lift coming from the houses and pavement of a village that was downwind of the launch site. In the flyoff, while the other competitors waited until lulls in the wind to fly hoping for lift in the launch area, Trip deliberately chose a gust of wind for flying, hoping that it would blow his model downwind far enough to catch lift over the village. That worked, and (with some significant help) the timers were able

Trip Barber launching his S9A model in the flyoff.
Photo by Jon Stenberg.

Space Modeling: Bringing the World a Little Closer Together

by John Langford NAR 13672

This was the twentieth world championship for space modeling, and it came as a shock to realize that I had been to more than half of them (11, to be exact). This was the second time I had been to Bulgaria, the previous trip being in 1978 for the third world championships. That team was led by Howard Kuhn and Jerry Gregorek, and it saw Guppy Youngren win the first-ever American Gold Medal.

The creation of a Junior category in the 1990s was one of the best things that ever happened to the Internats. Over the past decade, the American delegation has become a true family affair. People from other countries are constantly commenting on how much fun the U.S. team seems to have together.

For me, the highlight of this year was unquestionably having the U.S. receive a Special Award for "Fair Play" after Daniel Kelton turned down a Gold medal in S5 Scale Altitude. Daniel describes this beautifully elsewhere in this issue. The other countries literally were stunned—I do not believe this had ever happened before. We are all extremely proud of Daniel.

A second great memory of this trip was meeting Stan Stanev and his grandson. When you are out on the range, in your "lane," you often have people come by to watch or talk. On several contest days, for example, a young American family (a father and his young son and daughter) came by to visit. They were American missionaries from the Baptist Church, and lived in the village nearby. The dad explained that they had lived here eight years, and covered seven local villages. They worked to make sure that the local children were fed, as the social net is still developing. They especially enjoyed the rocket-boost-glide event.

On Scale day, a local gentleman came up and began a conversation in excellent English. He was especially interested in which parts of the U.S. the various team members came from. It turned out that he was a professor at the local university, and that his special passion had been researching the POW camp that held Americans during World War II. It turns out that all of the American fliers shot down over Bulgaria were sent to Shumen, where they were housed in a succession of camps. Along with one of the former fliers, the professor had written a book on the subject, documenting the stories of as many fliers as possible.

The last day of the contest was a weather reserve day, which turned into a touring day. The professor, Stanimir Stanev, offered to take a group of us to the site of the former POW camp, located adjacent to the current site of a UNESCO cultural monument atop the hill overlooking the town. Eight of us spent several hours learning about the history of the town, its role in World War II, the Americans who were captured and held there, and the amazing cultural monument atop the hill. Truly, international space modeling helps to bring the world closer together.

Scale judge at work.

to keep sight of his rapidly-disappearing model long enough to lock down a third place.

Katherine and Steve Humphrey were plagued by non-deployments, Steve in the first round, and Katherine in the second. Flying the heavier, low total impulse Estes A3-4Ts put them at a disadvantage compared to the 10mm powered models even when the models worked as planned.

S7 (FAI Scale)

S7 Scale is the most difficult and prestigious event in FAI competition. The rules and judging in the event are very different from NAR scale competition. Much more attention is paid to the amount of fine details on models, and to the number of special effects (clustering, staging, etc.) that models successfully perform in flight.

The U.S. had two Juniors enter the event, Allison Van Milligan and Daniel Kelton.

Allison's static points put her third from the bottom out of 26 competitors with her Saturn 1B. Allison's model had a cluster of eight motors in the bottom stage, with four C6-0s and four A10-3Ts, a single C11-0 in the 2nd stage, and a single A10-3T in the upper stage. Because of the howling winds on the morning of the event, the rocket went unstable and crashed. A lot of the other competitors suffered the same fate of having models that might have flown properly on a calm day fly poorly in the wind.

The U.S. team banded together and repaired her model for a second flight. This time, everything worked! This was probably the highlight of Allison's Bulgaria experience. With all the crashes, she ended up in 15th place because of the complexity of her flight points.

Daniel Kelton entered his backup Bumper WAC from S5 in S7. While the model was relatively simple, it flew well in the high winds, and placed 20th overall. The U.S. Junior team placed a respectable 7th overall.

On the U.S. Senior team, the top model in static judging was Chris Flanigan's 1/48 scale Saturn IB SA-205 model. Like

Allison's model, Chris's used eight motors in the first stage, one in the second stage, and one in the third stage.

As one of the largest S7 Saturn models, Chris's flight was popular with the crowd. Chris's special effect of counting down and launching to the actual Apollo countdown (played through the PA) made sure everyone was watching when it lifted off. At liftoff, only seven of eight motors ignited. Even with reduced thrust, liftoff was reasonably good. After stage 1 burnout, the stage 2 ignition timer functioned nominally and ignited the second stage.

That's when the flight got "interesting." The pop-out fins on Stage 2 functioned, but it appeared that the fin preload was insufficient to keep the fins deployed/locked if the vehicle was at large angle of attack. This caused the stage 2 vehicle to wallow instead of flying nominally. By stage 2 burnout, the vehicle was essentially horizontal. If stage 3 had ignited, the flight would have DQ'd.

Mike Nowak and his S7 Little Joe II.
Photo by Terrill Willard.

This is where some luck for Chris came in. Stage 3 didn't ignite! Stage 3 remained with the stage 2. When the stage 2 ejection charge occurred, this deployed the parachutes for stage 2 and the spacecraft adapter. The ejection was also sufficiently energetic to shake loose stage 3 including deploying the parachutes on the Service Module and the Command Module/

S7 JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Prototype	Flight 1	Flight 2	Total	Total
1	Stoyanov, Toshko	BUL	180	180	180	300	840
1	Vanikova, Katerina	CZE	Ariane 44L	514	214		728
2	Vishiniakova, Anastasiia	RUS	Cyclone 3	510	183	196	706
3	Stan, Eduard	ROU	Ariane 3	508		184	692
15	Van Milligan, Allison	USA	Saturn 1B SA-205	420	DQ	122	542
20	Kelton, Daniel	USA	Bumper WAC B-7	341	79		420

S7 JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Russia	706	644	630	1980
2	Poland	671	631	590	1892
3	Ukraine	622	613	612	1847
7	USA	542	420		

SAM missile at the Bulgarian Military Museum.
Photo by Jon Stenberg.

Launch Escape Motor. All five parachutes deployed successfully, and Chris finished in 14th place overall.

Mike Nowak fulfilled a lifelong dream when he was chosen to fly S7 at the World Championships. He chose the Little Joe II as an "entry level" prototype. It was complex enough to build and had a great data set and workshop drawing. The major drawback is that it is a single stage prototype, which would keep it from being very competitive. Mike's flights in the high winds were straight and true, which was quite unusual that day. All the chutes came out, and the model recovered safely, placing Mike 20th in his first WSMC.

Marc McReynolds, a veteran U.S. Scale flier, was also a first timer in FAI S7. Mark entered a Spartan ballistic missile interceptor that was very nicely done. On his first flight, the parachute stripped. Marc repaired the model and was able to get a good flight in near the end of the second round. For reasons that were unclear, his final score did not reflect the successful flight. Marc finished 22nd, and the U.S. Team officially finished 7th. This was the first WSMC in a long time that had all three team members post qualified flights in S7.

The final standings in Senior S7 were extremely close. The winning model was a Saturn IB by Marek Bujak of Poland. This model beat the 2nd place model (Soyuz U-FG TMA-3 by Mikhail Noritsin of Russia) by a single point (753 to 752). 3rd place went to an Ariane 44L model by Bedrich Pavka of the Czech Republic, which edged an Ariane L-01 from Slovakia by only three points.

The winning Polish model had an incredible amount of detail—the key to getting a high score in S7. His model had detail on the Service Module, LOX/fuel tanks (weld lines, flight termination lines, external tunnels, fill/drain plumbing), and fins

S7 JUNIOR INDIVIDUAL RESULTS

Place	Name	Country	Prototype	Flight 1	Flight 2	Total	Total
1	Bujak, Marek	POL	Saturn 1B SA-208	553	200		753
2	Noritsin, Mikail	RUS	Soyuz U-FG TMA-3	550	185	202	752
3	Pavka, Bedrich	CZE	Ariane 44 L-48	509	216		725
14	Flanigan, Chris	USA	Saturn 1B SA-205	470	174		644
20	Nowak, Mike	USA	Little Joe II A-004	371	102		473
22*	McReynolds, Marc	USA	Spartan M2-34	407	DQ	*	*

*Official score does not reflect successful Flight 2

S7 JUNIOR TEAM RESULTS

Place	Country	Flier 1	Flier 2	Flier 3	Total
1	Ukraine	694	696	693	2083
2	Romania	703	796	570	2069
3	Russia	543	752	696	1991
7*	USA	644	*	473	1117*

*Official score does not reflect successful Flight 2

(vehicle support ribs and tubes). These models take hundreds and hundreds of hours to construct. As one of the Polish competitors said, "No job, no girlfriend, no life. Just build scale model." While it might be an exaggeration, it reflects how serious S7 competitors can be.

All of the winning S7 models had flights that earned more than 200 flight points. Flights points are critical towards achieving a competitive S7 score. Flight points can be scored for clusters (up to a limit), staging, parachutes deployed, streamers deployed, and special effects. When these models fly, it looks like an aerial circus!

One shocking result of 2014 WSMC Senior S7 is that Alexsandr Livykh didn't win. His Soyuz model is very, very good, and he has won many World and European championships. However, both of his flights were DQ'd, when one of the 11 parachutes on each flight failed to open.

Winning Team Silver in S8

by Brendan O'Bryan

It was the first round of S8D and windy. The sound of the rocket motors pierced the silence with their cry, while I tried to keep my radio control glider from going too far downwind. My dad said, "a little to the right, more, that's good!"

One strategy I used was to fly in rising air and not sinking air because then I stayed up longer. I used spotters to tell me where good air was. Another strategy I used was to follow another team's glider if it was getting into good air or lift and I also tried to see where the birds were—if they were circling, there was probably some rising air there.

"Now more to the left, and keep it in the wind."

"Now dive! Get into the landing zone!"

"Good job Brendan," my dad said.

The flight order Zack, Alyssa, and I agreed on was as follows: Alyssa was going first, I was going second, and Zack was going third.

In the first round I went up. It was windy so I couldn't glide around for thermals. I just kept my front to the wind and looked for lift to the sides till my six minutes were up, then I landed in the landing zone. I got the max points possible, so I was very happy about that! My second flight didn't go as well because I could only stay up for three and a half minutes or so but I did land in the landing zone for an extra 60 points. On my third flight I only stayed up for three and a half minutes or so but again landed in the landing zone so I was happy about that.

We all had nine good solid flights and Alyssa, Zack, and I won a team Silver medal in S8D. After all the work the past two years it felt great to take home a Silver medal for the USA.

Conclusion

One of the great traditions of a WSMC is the awards banquet. Our Bulgarian hosts outdid themselves with great food and a live band that played until 1:00AM! It was a fun time to dress up, mingle with friends new and old, swap souvenirs, and put a nice wrap on a grueling eight days before the long flights home.

This event is the Olympics of rocketry, and the competition is fierce. Acquiring the modeling and flying skills to win an FAI medal takes far more effort than in U.S. competition, and those that follow this path become much better modelers in everything they do in rocketry as a result. As Trip Barber said, "This was my fifth consecutive WSMC as a competitor, and each time as I have learned unpleasant lessons from not having good enough models or flying skills to medal (sometimes even to qualify), I have changed my designs and flying practices, and practiced harder and more often at home, to get enough better to actually get an individual medal. This time we also, courtesy of Matt Steele and Steve Kristal's work, had motors that were equal to the best anyone else had, so we were competing on an absolutely level playing field in this regard. With persistence, Team USA can put more people on the Senior medal stand in future; this is tough competition, so it is not easy. Nor should it be."

Terrill Willard had this to say: "Considering that S3 was the event I had the most invested in emotionally and financially, I could stop there and say that my WSMC trip was horrible, but it really wasn't. It was great! Being my second trip to an Internats, I was better prepared and knew what to expect going in. If Apollo 13 was NASA's 'successful failure' then the 2014 World Champs was just that for me.

"Once again, we had incredible team dynamics. The Scale guys like Matt Steele and James Duffy helped those of us flying duration. The seniors chipped in to help the juniors. Those of us who only flew duration helped with S1 and S5 recovery and assisted on Scale day. It is exciting to be a part of all of that!

"Traveling with friends is just something to be appreciated. The bonds of shared experience get built on these trips. From carrying each other's equipment up and down eight floors of stairs every day, to enjoying the countryside in a foreign country, to trying new foods and making new friends; it's all good."

"We are extremely proud of the U.S. Junior team," said Aurora CEO and U.S. Team Manager John Langford. "These kids are not only the next generation of aerospace leadership; they are the best ambassadors for America that one could imagine. This is truly STEM education in action."

Special thanks goes to all who helped sponsor the U.S. Team, particularly the major financial sponsors Aurora Flight Sciences and the National Association of Rocketry. Estes Industries, Quest Aerospace, AeroTech, and Bob Smith Industries also provided great sponsor support.

Special thanks also goes to all the U.S. Team supporters who traveled with the team and had a part in its success: David Clark, Ellis Langford, Barbara Langford, Jim Kelton, Jon Stenberg, Dave O'Bryan, Marcia McReynolds, Chris Nowak, Angela Willard, Tim Van Milligan, Cynthia Van Milligan, Trish Berk, Michael Berk, Craig Vinyard, Albena Avramova, and Dimitre Avramov.

The 2014 U.S. Junior Team members: Team Manager Bill Stine, Stoil Avramov, Rachel Clark, Daniel Kelton, Emma Kristal, Rachel Nowak, Brendan O'Bryan, Alyssa Stenberg, Zachary Stenberg, Allison Van Milligan, and Ashley Van Milligan.

The 2014 U.S. Senior Team consisted of: Team Manager John Langford, Trip Barber, Chris Flanigan, Brock Hampton, Katherine Humphrey, Steve Humphrey, Steve Kristal, James Duffy, George Gassaway, Matthew Berk, Marc McReynolds, Kevin Johnson, Steve Foster, Jim Filler, Jay Marsh, Mike Nowak, Matt Steele, Herb Vinyard, and Terrill Willard.

The selection flyoff for the U.S. Team for the 2016 World Spacemodeling Championships will be held on the opening weekend of NARAM-57 in Tucson, Arizona. The NAR website's "FAI Spacemodeling" pages at www.nar.org/contest-flying/fai-spacemodeling (under the "Contest Flying" section) contain all the how-to and technical information needed to succeed at this challenging dimension of our hobby. Come measure your skills against the world's best and fly with Team USA!