

Robot Combat League

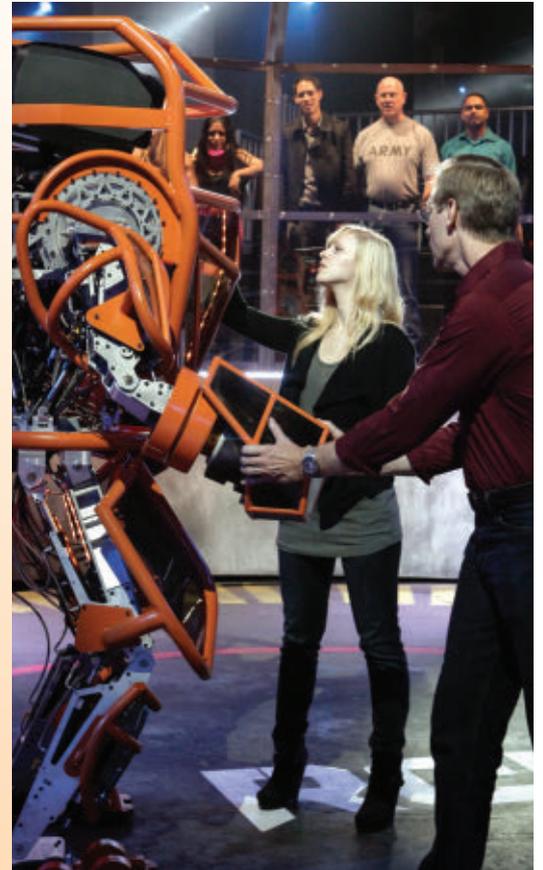
As seen
through the
eyes of a
contestant



I feel the adrenaline building as we do the final pre-fight checks on our massive robot before the match. We need to make sure all of the joint pins are secure, the actuator mounts are not fatigued or cracked, and the hydraulic and pneumatic lines are tied down so they won't get ripped out. We examine the armor on Crash's arms; we're worried about that. The armor has been bent back to shape since the last fight, but still limits Crash's mobility.

As my daughter, Amber, reaches up to check a shoulder joint, I am awed by the sheer size of Crash. He's certainly not the scariest robot in the competition, but it still feels wrong to hear Amber call 826 pounds of walking destruction "cute." As he stands at the entrance to the tunnel that leads into the arena, Crash's seven foot nine inch tall frame looks like it will just barely clear the tunnel roof. With our checks complete, we wipe off the last of the slippery hydraulic fluid from Crash's feet to maximize traction, even though we know it won't be long before he is drenched in more fluid from the upcoming mayhem.

"Ready for pressure?" The call comes down from the engineer at the safety override console. "Ready," we yell back as we step back from the robot. "Clear the bot! Going to half pressure," he calls out. "Robot clear," we respond. "Half pressure! Stand clear!" I watch Crash power up, his legs straightening the few inches needed to take the weight of his frame off of the maintenance stand. One of our pit crew dashes in behind the robot and removes the stand, then shouts up "Stand is clear!" I hear the hydraulics whine as the safety engineer calls out, "Going to full pressure!" I watch carefully for problems as the engineer moves Crash through his startup routine, testing the range of each joint and actuator. I need to make sure there are no leaks or cables getting pinched.



Dave and Amber Shinsel with Crash.

Turn Your Weakness Into Strength

Satisfied that Crash is ready to go, Amber and I step over to our ready room to go over any final strategies.

This will be our second fight. Our first fight against Steel Cyclone was the first time anyone had ever walked two giant humanoid robots into a ring and started pounding on each other. We really had no idea what strategies would work, and we were still getting used to how to control our robot. We've watched six fights since then, and learned a lot by observing our opponents. Tonight, we go up against Brimstone.

He is a big, hulking brute with padded leather armor that punches just bounce off. As the "Jockey," Amber controls Crash's arms. As the "Tech," I control the legs. It's critical that we work together in sync, but we're sure that the special bond between father and daughter will help us here. Plus, since we are both engineers, our brainstorm sessions have paid off with what we hope will be winning tactics.

First, we know our robot's key weakness is that his arm actuators break easily. To turn this to our advantage, Amber

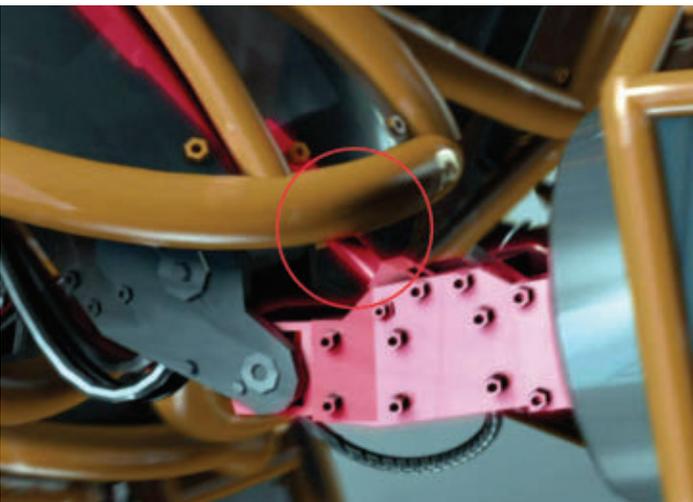
figured out how to twist back and forth in rhythm to get a broken arm swinging, and turn it into a deadly mace. Second, hydraulic fluid is slippery. Very slippery. When our arm actuator breaks, it inevitably sprays hydraulic fluid everywhere, so our strategy is to turn our broken arm towards our opponent and soak him with our own



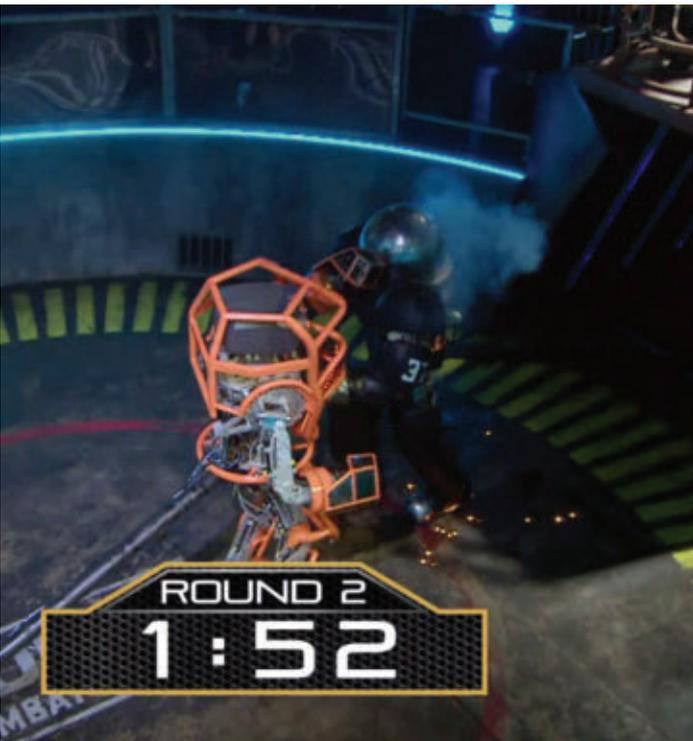
Crash defeats Steel Cyclone.



Dave and Amber controlling Crash.



The armor clearance problem.



Crash catches Brimstone by surprise.

hydraulic fluid. Once Brimstone gets slippery, we can push him into a corner and land a flurry of punches while his mobilization is restricted. Plus, with all that leather that's on him, it's going to be hard to clean out the fluid between rounds. So, Brimstone should be dripping and slipping for the whole fight.

"Devonric is hyper-aggressive," says Amber, referring to Brimstone's Jockey. "He'll expect us to be cautious and come out slowly. He's expecting an easy win." "Yes," I agree. "Let's surprise him ... I want to come out really fast and try to catch Brimstone before his stabilizing bar is even out of his tunnel." "Yeah, I really like that." Amber then replies, "It will put him off balance." "And as a bonus," I continue, "regardless of which robot takes damage, any hydraulic fluid that spills will be on their side of the arena. We can make sure they stay in the fluid and get less traction." "That sounds great," replies Amber with a mischievous smile. "Just remember to push him into the wall like we discussed, so I can really hammer on him."

Just then, the call comes over the loudspeakers: "Fighters to your pods!" I feel my adrenaline spike with

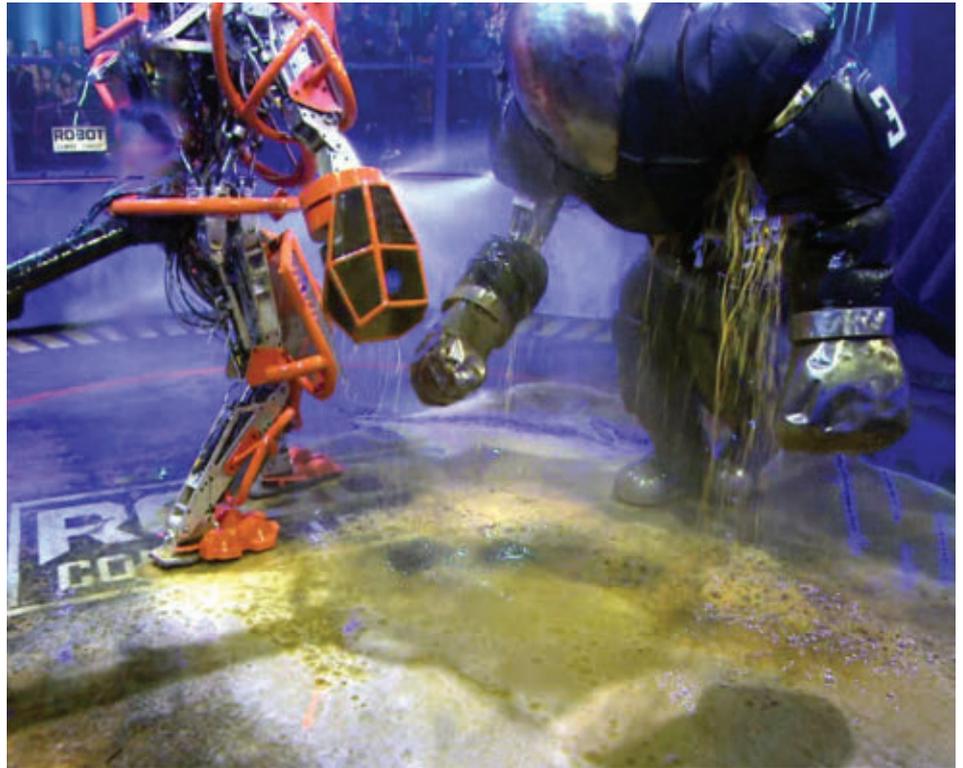
"We never expected how loud the fights would be. Imagine being in a steel factory, with people beating on metal with 40 pound hammers! Now, picture that noise being drowned out by a screaming audience! It was so loud, we could barely hear the siren that signaled the end of the rounds! It was very hard to hear each other, so I got in the habit of watching Amber out of the corner of my eye, so I could see what she needed me to do."

anticipation as we climb up the stairs to our fighting stations above the arena. The crowd is cheering as we emerge onto the fighting platform and our opponents Devonric and Russell step out onto theirs. Devonric is pretty cocky, dancing on the platform and taunting us. Yeah, he definitely thinks this will be an easy win. His partner, Russell is more reserved and disciplined. He's smart, and that worries me.

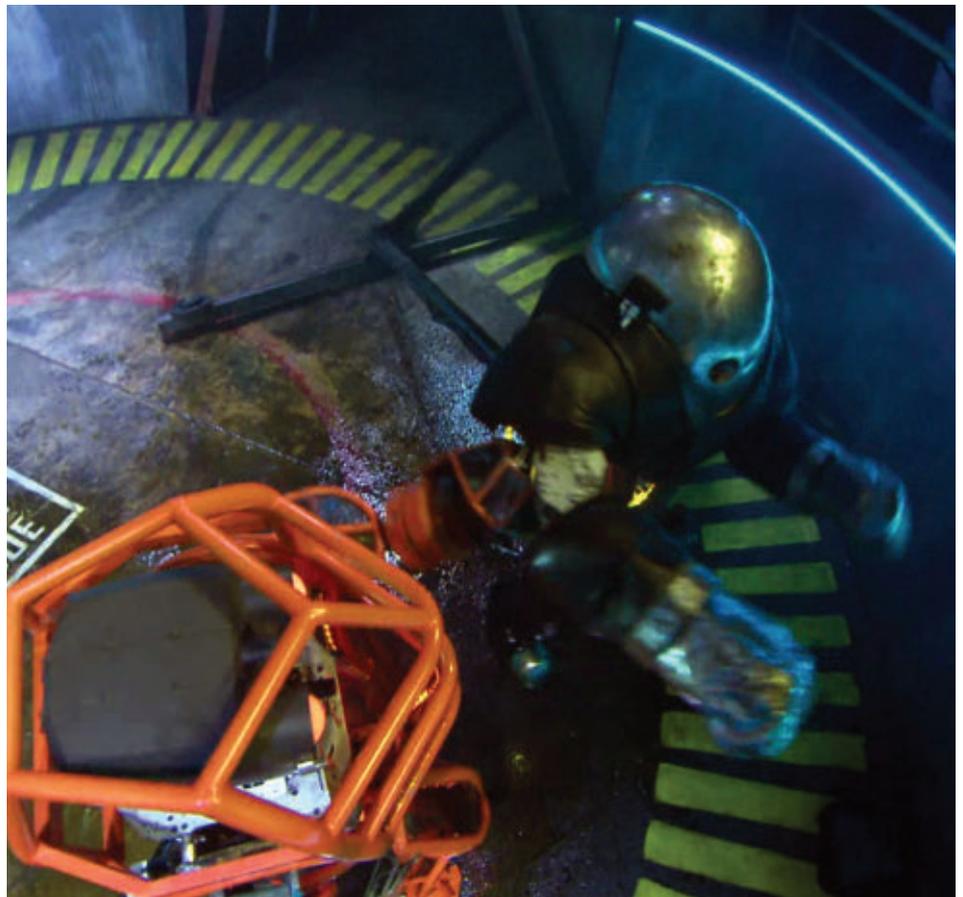
I help Amber strap into the exo-harness that translates her movements into the signals that will control Crash's upper body, and then help her move forward to the edge of the fighting platform. She tests the fit and movement of the harness, knowing that a good fit is critical to assure our robot will follow her motions. Looking at the control computer, I can see the harness accurately tracking her as she twists and leans side to side, and practices a few punches. I notice she's keeping her elbows up to avoid one of the situations that can cause our arm actuators to break.

As Amber settles into her harness, I climb into my pod, strap into my chair, and check the action of the joysticks and levers that control Crash's lower body. While the exo-harness the Jockeys wear makes upper body control fairly intuitive, the legs are a bit trickier. The joystick on the right controls the step direction; the levers on the left control the knee bend, step speed, and step length. Get the wrong combination and the robot will slip, hop, or jerk, and sometimes go into weird oscillations. I've seen contestants even break their own leg actuators by moving wrong.

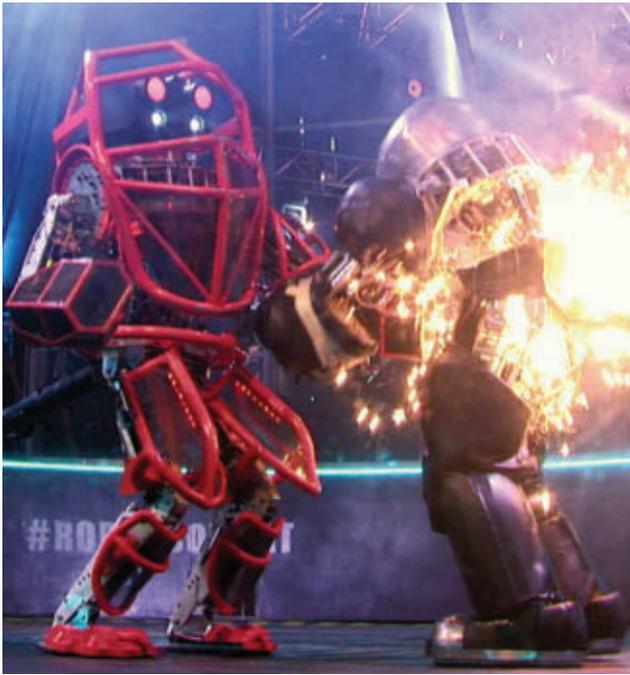
All this would be difficult enough, but the robots also have a long boom rigidly attached to their backs that ends in a stabilizing T-bar. The pressurized hydraulic fluid, fiber optic cables, and power cables all run down the inside of the boom. Walking with it is kind of like towing a trailer. If you want to step to the left and back, you first must step to the right, then back up, then sidestep



Round 1: Brimstone in a pool of hydraulic fluid.



Crash traps Brimstone in the corner of the fighting arena.



The Brimstone kill shot.

left. Oh, and you need to make sure you don't back your T-bar into the side of the arena or into the tunnel where it can get stuck. Of course, you have to keep all of this in mind while trying to fight against another 700+ pound robot intent on destroying you. Fun!

The engineer at the safety override console calls over to us. "Ready for control?" I put my controls at neutral as Amber straightens and puts her arms down. "Ready," we call in unison. "Clear the bot! Robot going live," he calls out. "Robot clear" echoes back up from the tunnel. "Robot is live," he yells over to us.

I watch Crash on my tunnel cam as I do a few experimental knee bends to assure Crash is responding well, and settle in to wait for the call to enter the arena. I look over to Amber and say, "Here we go, are you ready?" "Yes," she replies. "Remember to stay to their left initially to throw Devonric off. He likes to use his right hook a lot." "Okay, let's kick some bot," I shout back over the noise as the lights change and the crowd starts yelling.

RCL Host Chris Jericho walks out to the edge of the arena. I can hardly hear him over the crowd as he yells "Crash, Prepare for Battle!" Watching my tunnel cam, I march Crash out the tunnel and up to the yellow starting line, making sure I don't step over it as that will incur a penalty. Now that Crash is out of the tunnel, Amber can check out how Crash is responding. She does several big twists followed by some jabs and a couple of round-house punches, and is satisfied we are ready.

Round 1

The lights change again as Chris leads the crowd in the countdown. "Three ... Two ... One ... Fight!"

Our opponents expect us to be timid and slow. We definitely surprise them by rushing out as Amber immediately starts pounding on Brimstone on their side of the ring. Brimstone quickly springs a leak in his left arm, but it's not slowing him down. Amber is punching hard when our right arm breaks and starts gushing fluid. True to our plan, Amber keeps swinging the damaged arm, soaking Brimstone's feet and side. I shift right to lure Brimstone close toward the wall, and then suddenly sidestep left, then forward. Now next to him, Amber twists and starts punching Brimstone in the side. Brimstone steps further right, trying to avoid her hits and we follow, pinning Brimstone to the wall to limit his mobility.

As Amber delivers a series of kidney punches from the side, Brimstone catches on fire! Amber continues pounding away and breaks Brimstone's right arm actuator. The hydraulic fluid that's spraying puts the fire out as the referees blow the horn to tell us to separate. We back off and both robots return to the center of the ring. The horn blows again, and we engage. With just 10 seconds left in the round, Brimstone starts gushing fluid from his midsection from all the pounding, and starts to collapse just as the round ends.

This is definitely not what Team Brimstone expected from the "father/daughter" underdog team with the cute looking robot!

As we unstrap and hurry down to inspect Crash, our pit crew puts the maintenance stand under Crash's boom and the control engineer shuts down the hydraulic pressure so we can safely work on the robot. We have 20 minutes and two assigned pit crew techs to assist us with damage repair. We know we have a broken right arm actuator, and I ask the techs to start pulling that actuator while I inspect the left. We discover that the armor mounting bracket of the left arm has bent, causing the armor to interfere with the arm movement. This worries me, because if Amber bends that arm too far during the next round, our own armor will break our actuator. I discuss it with the control engineer, and we decide to limit the range of motion in the robot control software. I go back to helping replace the right arm actuator, and we get it done in less than 10 minutes. I remember the first time I replaced an actuator; it took me over 30 minutes. (By the end of the competition, I would be so practiced at it that I could replace one in about five minutes if I cut a few corners.)

With the actuator in, I start to replace the armor on the right arm, only to discover that its bracket is also bent and the armor will interfere too much with our right arm range of motion. Rather than limiting our right arm, we decide to leave the armor off. It's a risk, but we don't see a better option because there aren't any tools strong enough to bend the heavy bracket back into shape in time for the next round.

As I help Amber finish wiping the rest of the hydraulic fluid off of Crash's feet so he won't slip, we discuss the fight so far. We are feeling optimistic. We definitely won

the first round with Brimstone taking significant damage, but we know that can turn around in a heartbeat. We pressurize Crash and test the range of motion on our arms. While the left is somewhat limited, we can live with that. We finish up just before the horn blows ending the repair period. We are ready to go for the next round!

Round 2

We come out even faster this time, dashing across the ring. Brimstone is slipping and slower to get off the line, and we catch him before he can get his boom out of the tunnel. This limits their movements, allowing Amber to really hammer on Brimstone. Amber nails Brimstone in the head making a huge dent. I think she enjoyed that after Devonric's pre-fight taunts.

The rest of Round 2 is pretty even, with each robot landing good solid punches. Russell is demonstrating great footwork, making it hard for me to press our initial advantage, and Devonric is doing a good job blocking and timing his punches. The final punch from Amber bends the actuator on Brimstone's left arm causing it to spray fluid, but we know that's not going to hurt them much. We're certain that they'll be able to fix the damage during the repair time without a hitch.

As we run down to the pit, I confirm that Crash only has minor damage on the left arm, so as one of the techs works on that, I go over the rest of the joints and fittings, making sure nothing has worked itself loose under the pounding. My only worry is Amber pulled her shoulder during that round; I'm concerned she might aggravate it in the next one. With repairs done, Amber and I go over the robot, cleaning up every bit of hydraulic fluid to make sure we are not dripping. This fight is close enough that any small thing could tip the balance.

Another concern is the rule for a third round knockout; if you are knocked out during the final round, you automatically lose the entire fight. Amber says, "We just have to be very careful in this next round, and not get knocked out." "Yes," I agree, "but this goes both ways. You have been pounding on their armor. I think their armor and the actuators below have been weakened significantly. We're pretty sure we are ahead on points, but we don't want to leave it to chance. If you see a good opening to take them out, go for it."

Round 3

As we come off the starting line, our boom gets hung up in the tunnel, slowing us down momentarily. Team Brimstone has figured out our



"I am incredibly proud of Amber. She was so fierce, and so smart. I think she is a great role model for young women, proving that they can do anything they set their minds to."

strategy, and takes advantage of our delay to come out fast, meeting us on our side of the arena for the first time. However, we quickly push them back into the center. Both robots are swinging away trying to get some solid hits in,



Scorpio cuts AXE in half.

while at the same time blocking the opponent. The fight seems to be evenly matched, when Amber and I both see Brimstone momentarily pull both arms back, leaving his entire front exposed.

Out of the corner of my eye, I see Amber pull back for what I can tell will be a massive hit, so I step forward just as she swings. Her punch times perfectly with my step, and Crash's fist blasts right through the armor and steel actuators of Brimstone's torso, shearing the hardened steel like butter and traveling completely through to Brimstone's spine. As she pulls back for another punch, Brimstone topples forward, sparks and smoke flying from his destroyed mid-section. We back off as Brimstone collapses forward and catches on fire! The horn sounds, ending the

match, but we can hardly hear it over the screaming of the crowd. We've done it! We've defeated the fearsome Team Brimstone!

We're almost in a daze. This puts us into the semi-finals! Then, we realize that this also means we will have to fight the most feared robot in the competition: Scorpio. With razor knives on his fists, Scorpio has already cut two other robots completely in half. Not only does Team Scorpio have a fierce robot, their Jockey, Diana knows how to use those knives to dig into a robot to rip out wires and hoses. Plus, Scorpio's Tech, Chris is very good at controlling the feet. But, that's for another day.

For tonight, we'll celebrate and enjoy the feeling of victory!

Epilog

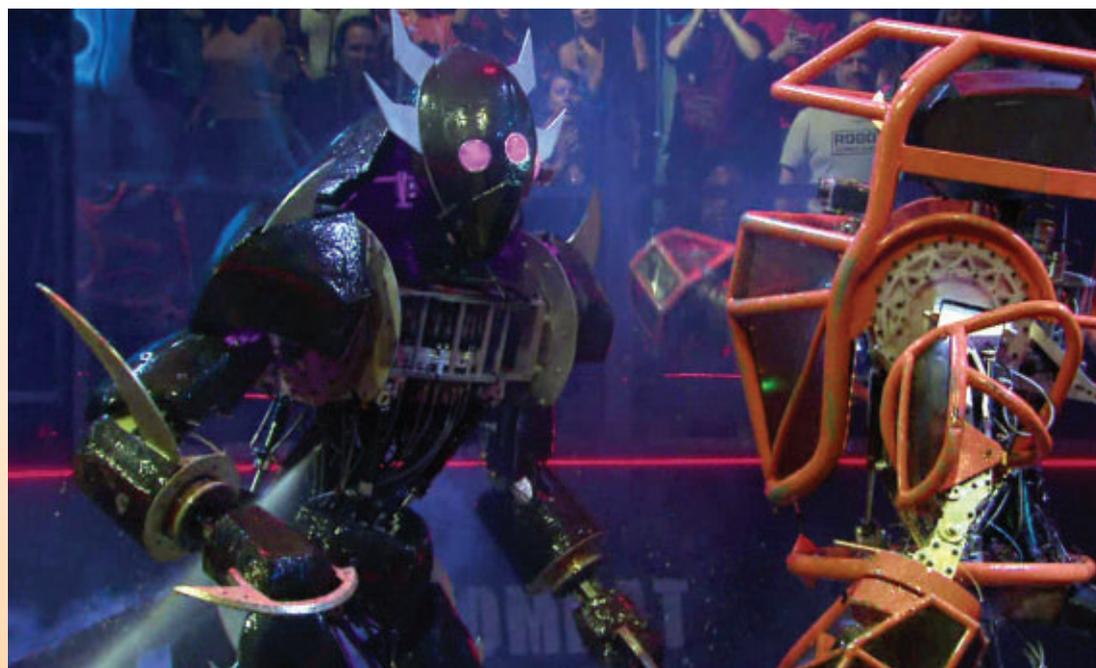
Team Crash went on to fight Scorpio in one of the best fights in the competition.

True to form, Crash quickly broke his arm, but Amber brought her "broken arm mace" strategy into play with deadly effect, completely knocking the chest armor off of Scorpio. At one point, Chris maneuvered Scorpio to the side and behind Crash, and Diana dug her knives into Crash's side.

However, Dave and Amber managed to get off the hook and turn the tables, forcing Scorpio into the corner while Amber pounded on Scorpio.

In the third round, Scorpio got a long "mega drill" weapon, but again Team Crash managed to avoid being eviscerated by it, and used their less powerful weapon to hook Scorpio's chest plate and rip it off for the second time. Amber tried to land a killing blow into Scorpio's exposed chest, but Diana blocked skillfully, preventing a knock-out. The battle ended in a tense judge's decision, but once again Crash emerged victorious, winning two of the three rounds.

In the final Championship fight, Crash slugged it out with Steampunk in an epic five round battle that lasted over two hours. In the first round, Crash broke both arms, but that did not seem to slow down Dave and Amber at



Scorpio without his chest plate.

all. Amber twisted her body back and forth, and pounded Steampunk until he collapsed just as the bell sounded. Crash dominated Steampunk in Round 2, and was fighting strong in Round 3 when suddenly his left hand flew off. That round was awarded to Steampunk.

The damage to Crash's wrist was too severe to fix in time, and Crash had to go into Round 4 with his left hand completely missing. Dave remembers the feeling. "As Crash emerged from the tunnel with one hand completely missing, a horrified moan arose from the crowd. But then, a chant started up in the crowd, raising our spirits as it grew louder with each repetition: 'You don't need no hands, Crash, you don't need no hands!'" Despite only having one hand, Crash held his own, but then in the last second, he lost his other hand and was left standing at the end of the round literally with no hands!

“The other contestants were amazing. We had MMA fighters, an Olympic champion, and some of the smartest men and women that we’ve ever met. Amber and I felt truly honored to be competing with them.”

With the Championship and \$100,000 on the line, the teams were tied going into the final round, making for an incredibly tense repair period for Team Crash, who needed to get both hands repaired and reattached. “The timer was ticking down,” says Dave. “We’d fixed the right hand, but we had less than one minute remaining, and still did not have our left fist reattached because the high pressure air hose that actuated the wrist lock was broken.

In a ‘hail mary’ moment, I braced myself and held the two broken air hoses together just long enough for Amber to throw the pressure switch, and for Ross to slam the fist into place. In that very second, the horn went off and the officials shouted ‘Hands off the robot!’

We backed off, hoping that the hand would stay on ... and it worked! We were so excited, and we could never have done it without Ross. It was perfect teamwork.”

Equipped with both hands, Crash battled it out with Steampunk in a very close final round. The tension was thick as Chris Jerico slowly announced the news: “The winner of the fifth round, and the fight itself, with a score of 30 to 27 ... the new Robot Combat League Champion is ... Amber and Dave — Team Crash!” **SV**

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