Speaker 1: Well, Sputnik was launched in 1958, and it was launched as a surprise by the Russians and started off sort of a [00:00:30] Cold War in space. As a result of that, we developed a lot of technology, math, education to help out AND create a new generation of engineers so we could catch up with the Russians.

Speaker 2: This is a new and strange environment for us, this, suddenly finding yourself in orbit.

Speaker 1: Eventually, President Kennedy saw it as a challenge and sent us on a course to the moon.

John F. Kennedy: We choose to go to [00:01:00] the moon in this decade and do the other things. Not because they are easy, but because they are hard.

Speaker 4: Houston. Tranquility base here. The Eagle has landed.

Neil Armstrong: That's one small step for man, one giant leap for mankind.

Speaker 1: [00:01:30] Space permeates our daily lives today. The GPS that we use in our car to get from point to point, that's all happening from orbit. The weather we receive at night on the daily weather channel in your local news, that's coming from orbit. So everywhere we look, satellites are having an impact on our daily lives. Sputnik was a basketball-sized satellite that got launched 60 years ago. In the interim, we've developed [00:02:00] satellites, their size of school buses, to do the job. Now today, we're turning that around with the miniaturization of technology that's become available, and we're coming back to that CubeSat, bread box, Sputnik-sized satellite.

Speaker 6: The CubeSat Standard was invented by CalPoly, out in San Louis Obispo, and they created what we call a P-POD, which is a poly-picosat orbital deployer, and this deploy is sized such that multiple CubeSats can fit into that [00:02:30] deployer. It allows for universities, as well as small companies like ours, to launch their technology into space and get some space rated hardware and learn from the space environment in a cost-effective manner.

Speaker 7: Champagne Urbana Aerospace, or CUA for short, spun out of the University of Illinois, the aerospace engineering department, in 1998, and the vision is improving [00:03:00] the available technologies that the aerospace industry has to enhance flight and space flight. A little more specific vision is with the micro-propulsion systems that we do for small spacecraft, about the size of a shoe box. We believe our technologies can enhance those systems for both maneuverability and then de-orbiting so that ultimately, you can help alleviate the [00:03:30] ongoing orbital debris problem that is starting to escalate.

Speaker 1: We've been at it for 60 years now, launching satellites into orbit, and so it's become a concern that satellites that have gone past their end of life, things that have collided with each other created debris, which scatters about. There may be a chain reaction, eventually, something called a Kessler Syndrome that could be set off.

Speaker 7: There are presently some 30,000 pieces of space [00:04:00] debris in orbit that are bigger than 10 centimeters. These are in low earth orbit or abbreviated LEO, and at that orbital altitude, the velocities are on the order of eight kilometers per second, which translates to about 17,000 miles per hour. One of the critical things is you do not want these objects colliding because at that kind of speed, [00:04:30] two objects that collide end up creating hundreds to thousands of much smaller objects. So the Kessler Syndrome is what happens when this becomes a sort of runaway cascade, and now you have so much space debris that you could no longer safely launch any new satellites through that debris field, let alone people. [00:05:00] Many companies recognize this Kessler Syndrome problem, so they are trying to practice what is called responsible space and what that means is providing micro-propulsion for the satellites, new satellites that are going up.

Speaker 6: CUA has developed small, low-risk, cost-effective propulsion technologies [00:05:30] that are triple purpose. First, the thrusters can extend your mission by orbit-raising to a higher altitude. Second, the thrusters enable orbital collision avoidance, and finally, the thrusters can be used at end of life, after the mission has been completed, to reenter Earth's atmosphere, thus decreasing potential orbital debris.

Speaker 7: The CHIPS system uses a micro-resistor jet, and [00:06:00] that super heats the refrigerant and it comes out as thrust. Main thrust would propel it this way and then attitude control and rotate, and you can even do true roll maneuvers. The Monofilament Vaporization Propulsion System utilizes a combination of 3D printer technology to feed and melt a plastic fiber, and then vaporize it [00:06:30] to give you thrust. The FPPT System uses a high-voltage discharge to create a plasma that then vaporizes a little bit of Teflon. It also is ionizing that Teflon and using electromagnetic acceleration to get very high velocity out of the ions.

DUPLEX stands for Dual Propulsion Experiment, so this is a CubeSat [00:07:00] that has been funded by NASA, their tipping point program. And what this would do is we're putting one MVP System on one side of the spacecraft, one FPPT System on the other side of the spacecraft, and this will give us flight heritage for both systems so that future customers will have lower risk because the systems have flown, and it will make those systems [00:07:30] more commercially marketable. The launch date is tentatively mid-2022 for the DUPLEX. CUA has had a very positive, symbiotic relationship with the University of Illinois for over 20 years now. It allows us to work closely with some of the greatest engineering and scientific minds in the world.

Speaker 1: [00:08:00] We send our students over to CUA to act as interns. CUA sends tasks and projects over to us to work on and report back to them, so it's a great

	benefit for students to be able to put their hands on real space flight hardware and real space flight projects.
Speaker 8:	I've worked on a few projects with CU Aerospace, starting with the Drag Sale Mission. It's utility, or purpose, is intended to help mitigate space debris.
Speaker 1:	[00:08:30] Imagine a thin Mylar film, thinner than a human hair, that's ejected out the back of the satellite and interacts with what little atmosphere there is up there to create drag that slows the satellite down and returns it into the atmosphere where it burns up safely. That kind of technology is what we need today to help clear out the low earth orbit environment.
Speaker 8:	When companies engage with students while they're in school, on a day-to-day basis, those students can recognize [00:09:00] what they're learning really is used in the industry. And so when they go and get that job, they'll be coming in knowing how to use their skills, and that is an efficient education. It's very important for the next generation of the American workforce, not just engineers, so when companies make that investment, they'll be very competitive in the world.
Speaker 1:	When I was growing up space [00:09:30] was something that was done in a research lab at a government facility. Very few people got to interact with it. All the superstar engineers were the folks developing satellites. And now, you flash forward 40, 50, 60 years, and today students are building satellites right here in our development lab. We're starting to see the development of a new generation of commercial space.
Speaker 7:	I see this expanding wave of space interest and [00:10:00] launches to be a really exciting time in our future for the aerospace industry. Innovation is the key element that has driven the aerospace industry over the years, the decades, and is going to play a critical role as we talk about colonizing Mars, and then ultimately reaching out to the stars.