

SpaceX Crew Dragon Relied on Automation

With well over 16 million views in less than a month of the live video simulcast of the August 2nd splashdown on various YouTube channels, there can be no denying the worldwide interest in SpaceX's Crew Dragon. The last manned US launch was in 2011, and we were all missing the thrill of seeing a rocket blast straight up into the air with brave souls on board who would be able to tell incredible stories about their journey.



We think it's pretty exciting too – not only the going up into orbit and to the International Space Station (ISS) again part, but also the incredible technology utilized and how it was used that allowed the mission to happen at all. We thought it would be interesting to take a look at some of the modern and automated features built into Crew Dragon that worked in concert to help NASA astronauts Bob Behnken and Doug Hurley complete their mission and return home safely.

Engineering.com put it best with an article titled, "This Ain't Your Parents' Space Shuttle". Just one look at this picture from inside the cockpit (image credit: NASA) and immediately, you can spot several things that to astronauts in decades past would look like props from a futuristic movie. Bulky buttons and switches have been replaced with sleek, easily programmable touchscreens that allow for easier sending and receiving of information, checking the capsule's different systems for warnings, and much more.



The touchscreens even work with the astronaut's gloves on, so there is hope that someday all of us will be able to keep our hands warm with our favorite gloves and check email on the phone at the same time. Clearly the spacesuits and helmets look more like regular clothing and less like the Michelin Man. Surely, only the best and brightest product integrators, automation specialists, and new and existing SpaceX personnel put their heads together for this project. In addition to obviously working with NASA's team, they were also joined by sixty Cal Poly Engineering graduates who had some SpaceX-directed role on this project.

Crew Dragon is fully autonomous, and designed to navigate the entire mission on its own. If a situation warrants so, or it is desired, the crew can seize control and pilot the vehicle manually. Behnken and Hurley did just that on the way to the ISS, representing the very first use of those manual controls while in space.

Arguably, two parts of the Crew Dragon mission were the most crucial and dangerous – docking with the International Space Station and the time between re-entering Earth's atmosphere and splashdown. Automation and advanced technology were depended on to make both happen.

Until about one-eighth of a mile away from the ISS, Astronaut Hurley was piloting the vehicle using touchscreen controls. (Can we take just a moment to appreciate how cool that is?) At that point, the automated docking program "took the wheel" and shortly thereafter, the ISS crew welcomed the two travelers from Earth. During descending through the atmosphere, temperatures on the outside of Crew Dragon may have reached 3500 degrees Fahrenheit.

While a heat shield was installed on the outside of the capsule to help protect the astronauts inside (like always), internally an automatic system had the same job. A gas was released inside the vehicle to help it stay more temperate so the crew wouldn't have any issues from the extreme heat. Other automated tasks toward the end of the mission involved slowing down Crew Dragon enough so at the moment of splashdown, it would be less like – to use a pool analogy – a cannonball and more like gently dipping toes in the water.



There were two set of parachutes, each group deployed according to factors like the speed at which the capsule was falling and a particular distance from Earth's surface. Just like a seamstress nipping a thread that has served its purpose, an internal, automatic mechanism, triggered again by certain factors, cut the lines of the first set of parachutes to facilitate both separation from Crew Dragon and clearance for the second and final set to open. All went according to plan and design, making the moment of splashdown picture-perfect!

Crew Dragon splashed into the history books at 2:48pm on August 2, 2020. In a year that will be remembered for a lot of challenges, even a global-wide COVID-19 pandemic couldn't stop the mission. In fact, since the inception of the joint project between NASA and SpaceX, the project has had historical significance. Crew Dragon is the first ever spacecraft built by a private company to give astronauts the ride of a lifetime into orbit. We can't wait to see what technological advancements and automated systems will be in future collaborations between NASA and SpaceX.

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We partner with our customers to clearly identify their challenges and understand their goals. Based on our findings and our extensive experience in manufacturing, we design and engineer the best custom solutions for them.

We specialize in:

- Design, engineering, fabrication, and assembly of custom industrial automation and robotics solutions
- Cutting-edge and modern lean automation and lean robotics
- Machine-control software development
- Integration of automation equipment
- Vision-guided robotics, inspection systems, and adaptive controls