

NASA's Next **GIANT LEAPS**

The U.S. puts its faith in Blue Origin, SpaceX and Dynetics to deliver lunar landers on the double



CREW DRAGON ON DECK

NASA and SpaceX enter the homestretch for crucial commercial crew test flight

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The pandemic is accelerating the trend toward remote operations



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SpaceNews convenes a panel of experts to examine recent space-related decisions from the FCC.

ABOVE: A team at the Jet Propulsion Laboratory developed the Ventilator Intervention Technology Accessible Locally (VITAL), a ventilator specially designed for treating COVID-19 patients but that is simpler and faster to build than conventional ventilators. Credit: NASA/JPL-Caltech COVER: NASA illustration

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Flying cubesats from home

Pandemic accelerates trend toward remote operations

Students operating the twin Electron Losses and Fields Investigation (ELFIN) cubesats were heading into finals at the University of California, Los Angeles, when they realized they needed to quickly transition to remote operations.

“As soon as all of us were done taking three-hour tests, we had three-hour meetings to figure out what we needed the satellites to do and how to make it as easy as possible from a software and technical

perspective,” said Sharvani Jha, ELFIN software development lead.

The COVID-19 pandemic has prompted cubesat operators across the country to abandon mission operations centers in favor of living rooms and kitchen tables. The trend now extends to NASA-funded missions like ELFIN and two science satellites operated by the Utah State University Space Dynamics Laboratory (SDL): Hyper-Angular Rainbow Polarimeter and Compact Infrared Radiometer in Space.

Both UCLA and SDL were working to establish remote operations prior to the

pandemic.

“We saw it as being very helpful to have added flexibility whether someone was on travel, supporting another program or supporting calls on weekends or during graveyard shifts,” said Tim Neilsen, SDL Commercial and Civil Space Division program manager.

Before the pandemic, SDL had secure communications links between its Logan, Utah, headquarters and ground stations at the NASA Wallops Flight Facility in Virginia to support missions like Hyper-Angular Rainbow Polarimeter, a three-unit SDL

DEBRA WERNER

COURTESY TIM NELSEN

“Some of us are seeing speed impacts from the number of people working from home and kids going to school remotely.”

Tim Neilsen, SDL Commercial and Civil Space Division program manager, shown left operating NASA-funded cubesats from his living room.

cubesat with an instrument from the University of Maryland, Baltimore County, to detect aerosol and cloud properties, and Compact Infrared Radiometer in Space, a six-unit cubesat built by Ball Aerospace to collect Earth imagery for scientific studies.

“What is new and what did require some serious thought and design work was that last leg from our headquarters into our individual homes using appropriate encryption and virtual private networking technologies,” Neilsen said. Now, seven SDL satellite operators can connect from their home workstations to the mission operations center central computers and servers in Logan, and from there to Wallops, he added.

Similarly, UCLA students began establishing remote access soon after ELFIN launched in 2018 alongside NASA’s Ice, Cloud and land Elevation Satellite-2.

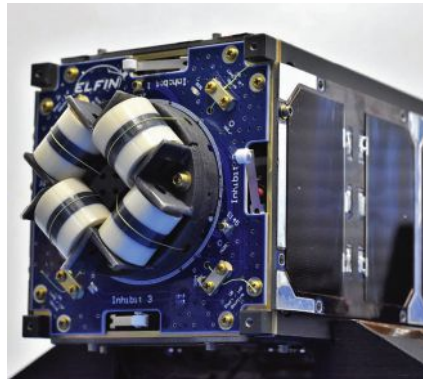
“We have winter break and summer break where we would not be in Los Angeles physically,” said Rebecca Yap, ELFIN mission operations manager. “Being able to set up a flexible operations workflow was important.”

During the school holidays, though, at least one ELFIN satellite operator remained on campus with access to the mission operations center and satellite communications antenna on the roof of a nearby building.

Since UCLA moved instruction online in March, that’s no longer possible.

ELFIN, a three-unit cubesat that detects energetic electrons traveling from the Van Allen radiation belts toward Earth, is continuing to perform its science mission. Remote operations, though, are making it hard to train new satellite operators.

“We can’t hold in-person training sessions for recruits,” Yap said. “And we are not physically present in the mission operations center to help them.”



UCLA students began establishing access for remote operation of the NASA-funded ELFIN cubesats soon after they launched in 2018.

In addition, ELFIN operators miss working together in the mission operations center.

“You make a lot more mistakes when you are operating remotely without someone looking over your shoulder or another operator to riff off of,” Yap said.

To prevent mistakes, the ELFIN team is restructuring operations and rewriting software. Now, ELFIN’s most experienced operators plan spacecraft data collection activities while recruits determine whether the satellites performed as expected. If not, recruits reload commands directing the satellite to gather the data.

SDL satellite operators in Utah also see

some of the drawbacks of working from home.

“Video conferencing is a wonderful technology,” Neilsen said. “But there are always communication challenges when the mission operations team is dispersed in multiple locations during an overpass, while planning for an overpass or analyzing data after an overpass. We need mature and well-designed tools to make up for the fact that we aren’t in a conference room working together on a whiteboard.”

In addition, SDL satellite operators are sometimes frustrated by slow internet connections.

“Some of us are seeing speed impacts from the number of people working from home and kids going to school remotely,” Neilsen said. “We certainly have seen some minimal impacts in that category, but luckily they have been very minimal.”

Overall, SDL remote operations are having “negligible impacts” on satellite operations,” Neilsen said. “We’re getting the job done and the cost to the customers has not increased on these two missions due to COVID-19.”

Meanwhile, UCLA’s ELFIN operators are nearly finished writing new software to make it easier to command the satellites remotely. **SN**

THE U.S. NAVAL RESEARCH LABORATORY (NRL) HAS MADE FEW CHANGES IN SATELLITE OPERATIONS DUE TO THE COVID-19 PANDEMIC.

Missions flown out of NRL’s Blossom Point Tracking Facility in Maryland were designed to operate in a “lights out environment,” Tim Kennedy, NRL branch head for mission operations, told *SpaceNews*. “Our mission planning, command and control and ground resource management software are able to perform all of the functions required to plan, set up and execute satellite ground contacts.”

If the software detects an anomaly, it pages mission operations personnel, who still have access to the mission operations center. “The policies and procedures for COVID-19 have not affected our existing on-call approach to mission operations, since only one or two engineers are required to come on-site,” Kennedy said. “However, distancing and cleaning protocols were put in place to address site access for these personnel.”