There’s no question it could be done; it’s a technical feat,” said Cummings, who researches unmanned vehicles.

UAVs on a carrier is coordinating sensors on the flight deck and making sure everyone has access to all the information they need.

Mary Cummings, a former Hornet and A-4 Skyhawk pilot who is a professor at MIT’s Humans and Automation Lab, said the most difficult part of putting a system in place is ensuring that the humans in the loop can do their jobs.

There is still human interaction in a UAV landing similar to what occurs in a manned recovery. For one, both manned and unmanned aircraft need to be aware of each other’s presence and maintain a safe distance.

Besides the new hardware and software, that flight looked just like any other manned landing. And that was the point: The X-47B is supposed to operate like a manned aircraft, with no special procedures, accommodations and allowances.

There needs to be more research before his work is installed on a UAV, he said.

“Based on that training data, we trained our model so that when new data comes in, it has our algorithm to classify the sequence of gestures,” he said.

In the journal article, he wrote that the system accurately recognizes gestures 75.37 percent of the time.

For one, his project used a calm, well-lit laboratory setting, not a cluttered and fast-moving environment like a flight deck. As such, he must find a way to negate these variables so they don’t interfere with his system, he said.

“We started from this controlled environment. Obviously, on the deck they have a glaze effect [on the camera lens] and a lot of people moving along, so we didn’t take those sorts of factors [into account], but that’s future work,” he said.

Remote Control Approach

While Song and other researchers at MIT have developed a way to recognize hand signals to control UAVs, Northrop Grumman has developed a special remote control system for maneuvering the company’s unmanned combat air system — the X-47B — on flight decks.

Tighe Parmenter, director for business development for Northrop’s Unmanned Combat Air System Aircraft Demonstration team, said his company’s UAV will be moved by an “experienced operator” equipped with a control device that’s attached to the wrist, waist and one hand.

Controllers will have access to both a display and controls that will allow them to adjust the plane’s throttle, lower the tailhook, apply the brakes and several other functions. The commands will go from the control system to the UAV via a digital datalink.

“There are remote-controlled trucks, there are remote-controlled airplanes, but this is on steroids,” Parmenter said.

Northrop has tested the control system with X-47B mission operators, all of whom are pilots, many with naval aviation backgrounds.

“One of the biggest things we’re proud of is that every function we have on this airplane can be done by a person who is smart on naval aviation,” he said.

“A mission operator could be a senior enlisted person who is perhaps an air traffic controller or an [operations specialist]. The interfaces are very simple: keyboard and mouse.”

Northrop also has developed and tested a system for autonomous landings. In July, software and hardware developed for the X-47B was installed on an F/A-18D Hornet, allowing the fighter jet to emulate the UAV’s landing program.

The modification allowed the X-47B’s program to take control of the Hornet and land the plane on the deck of the carrier USS Dwight D. Eisenhower while the plane’s pilot kept his hands off the controls. The process was aided by a series of automatic messages between the plane and the carrier. The plane’s approach was tracked with GPS, and automatic adjustments were made to ensure the Hornet was on the proper trajectory.

Besides the new hardware and software, that flight looked just like any other manned landing. And that was the point: The X-47B is supposed to operate exactly like a manned aircraft, with no special procedures, accommodations and allowances.

There is still human interaction in a UAV landing similar to what occurs in a manned recovery. For one, both manned and unmanned aircraft need to receive clearance from air traffic control. From there, the landing signal officer is responsible for safety. The LSO must still accept the plane via the “pickle switch,” and can wave off an approach if an unsafe condition develops.

Mary Cummings, a former Hornet and A-4 Skyhawk pilot who is a professor at MIT’s Humans and Automation Lab, said the most difficult part of putting UAVs on a carrier is coordinating sensors on the flight deck and making sure everyone has access to all the information they need.

“There’s no question it could be done; it’s a technical feat,” said Cummings, who researches unmanned vehicles.