

Artificial Intelligence for Beginners

AI, Aviation, and Human Destiny

BY THOMAS ATWOOD PHOTOS BY LUCIEN MILLER & TOM ATWOOD

Artificial intelligence (AI) was once the subject of science fiction, but today, it is rising all around us, like a “boomer” atmospheric thermal. AI is now in our satellites, drones, radio-control airplanes, self-driving cars, and—in one of the most important contexts of all—manned aviation. In the skies above, AI will enhance our familiar GPS applications that guide every aircraft. AI may even be connected to the furthest horizons of our species.

Today, although largely behind the scenes, airborne machines are learning all the time, and this is burgeoning AI. Machine learning has been used by biologists in aerial surveys of forests and crops. Down next to the tarmac, robot lawn mowers map their work areas and actually learn to avoid obstacles—and they get smarter each time they tidy up the local airport or grass glider field. Are these machines truly “smart”? Not really, although many can “see” with infrared vision and seem very efficient. These drones operate according

to a set of programmed rules, much like the autopilots in an airliner. Another category of AI on the rise is what geeks call “neural networks.” These are nothing more than large collections of computer microchips engaged in what computer aficionados refer to as “parallel processing.” The largest employ millions of components and, although tiny in size, can recognize faces and even pilot chatter. Neural networks are being developed that will recognize the patterns in human piloting

The Boeing ScanEagle is a long-endurance unmanned aerial vehicle (UAV) designed and built by Insitu, Inc., a subsidiary of Boeing. The ScanEagle uses sophisticated software to provide advanced intelligence, surveillance, and reconnaissance to its operators.



Above: 4Front Robotics, based in Calgary, Alberta, produces this twin multirotor. It is used in search-and-rescue efforts and infrastructure surveys.



Above right: The Beijing-based drone manufacturer Zonghangzhi Technology produces this large-scale T333 coaxial dual-rotor UAV. It is seen, here, at the 2018 AUVSI Xponential conference in Denver, Colorado.



Right: MSP produces diverse robotic aerial vehicles. Not all need to be brainy. In Target mode, this sleek, turbine-powered machine will only require military-grade radio control.

during landings and takeoffs, with the goal of making autopilots even smarter.

But how smart can robots be? Research under the direction of Professor Hod Lipson at Carnegie Mellon University involves robot arms that, surprisingly, are said to be aware of their own actions. That is, their operating systems are programmed to “think” about themselves—and may represent a real step toward self-aware flying machines. Think Canadarm2 on the International Space Station.

Rumors have circulated for some years that classified smart missile technologies have sometimes included short English voice commands as part of the command and control conversation between operator and missile. These largely unverifiable reports would suggest operators flying drones on

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Made by Textron Systems, this sleek flying wing can take off in VTOL mode, then fly horizontally. Note the pivoting motor mounts aft of the trailing edge.

The Houston Mechatronics Aquanaut is a submersible that is controlled with mouse clicks. This robot flies to the bottom of the sea and performs work using acoustic, optical, and laser-based tools.



the battlefield can get feedback from an underway smart missile in canned English sentence fragments.

But where does all this lead? There is the quandary of empowering a machine to make lethal strike decisions on its own. There is already a strong bias among commentators against allowing drones to both identify and shoot targets on their own. Human pilots,

it is felt, must be in the loop.

The largest ethical dilemma may arise when we contemplate the possibility of giving a machine, sometime in the distant future, humanlike self-awareness—in theory, the very apogee of robotic AI. Would sending a “thinking” robot on a military mission make it a kamikaze?

European parliaments have already grappled with the logical consequences and even enacted

legislation to grant truly smart machines traveling the air, land, and sea a “robot bill of rights.” Such rights would belong to a class of robotic AI personhood, as it were. A counter movement has emerged arguing that this could violate the rights of humans.

In any case, AI is viewed as ascendant and unstoppable by many of the greatest thinkers of our time, from Ray Kurzweil to Elon Musk. Certainly, aviation will be one of the most profoundly affected industries, and the benefits for pilots and passengers alike will be immense. The optimistic view is that we will manage and work so closely with AI that we will in some sense merge with it. Is the smartphone already the start?

Researchers pushing the vanguard in the search for extraterrestrial intelligence have argued that first contact, if it happens, may well be with robotic AI agents in the cosmos. Such robots, it is thought, will have likely outlasted their biological designers. Incredibly, this vision now seems technically feasible.

Back here on Earth, some believe the first profoundly intelligent AI will emerge in less than a decade. That is very soon, indeed. One thing seems certain: In addition to aviation in all its future forms, the destiny of humankind itself will likely be inextricably bound with AI over the long term. †