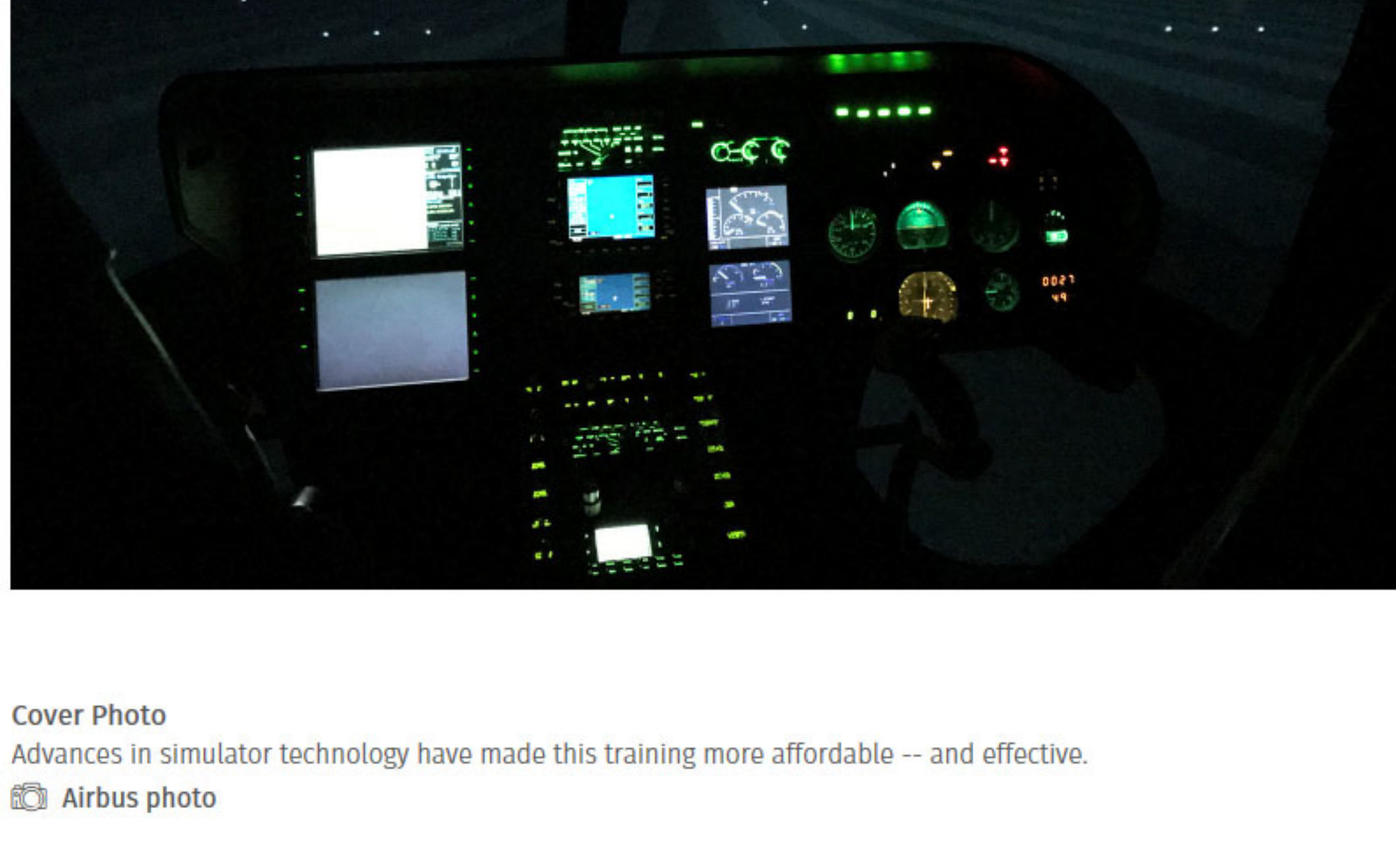


Simulator Training Hits Its Stride

Terry Palmer • 2019 Winter

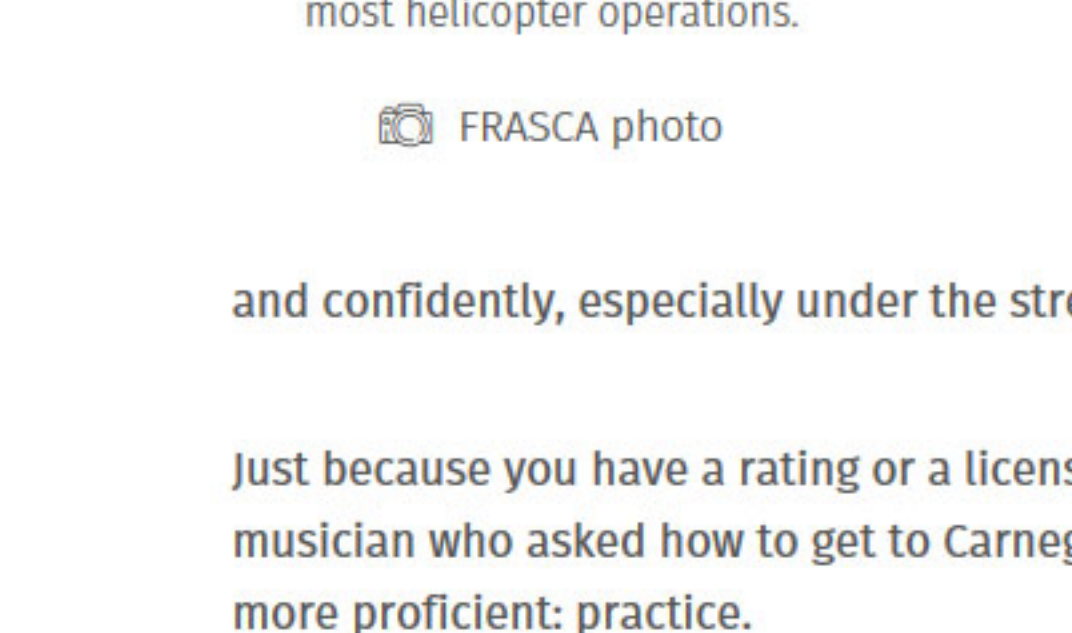


Cover Photo
Advances in simulator technology have made this training more affordable -- and effective.
 Airbus photo

For many years, the helicopter industry has seen simulator training as something the big operations do. Yes, the top-of-the-line Level D simulators do provide a great training environment. But it also costs a great deal to rent these devices, if one is even available for your aircraft.

Many in our industry prefer to conduct all training in an aircraft. "I want my training to be as realistic as possible," said one pilot I spoke with, "and what could be more realistic than training in an actual helicopter?"

Actually, training in a simulated environment offers a host of benefits for pilots and operators, including enhanced realism. And the good news is that you don't necessarily have to spend a fortune to reap those benefits.



Simulator visuals provide realistic scenarios for most helicopter operations.
 FRASCA photo

The Goal: Proficiency

The goal of all training for helicopter pilots is proficiency, which is defined as "thorough competence acquired through training or practice." Note the emphasis on practical skills—proficiency is about knowing how to do something well or to use a tool appropriately.

A pilot is managing risk throughout the flight, assessing multiple inputs in an environment where a favorable outcome sometimes demands the correct input in seconds. In this context, proficiency means being able to recall and carry out procedures and maneuvers quickly, efficiently, and confidently, especially under the stress of an emergency situation.

Just because you have a rating or a license does not mean that you are proficient. Instead, just like the musician who asked how to get to Carnegie Hall, I have one answer for pilots who want to become more proficient: practice.

Yet, in many ways, our industry has unrealistic expectations for pilot training. Training at flight schools is performed to a set training schedule that was approved by regulators and has not changed much over the years. The student is financially motivated to move through the training as quickly as possible. Meanwhile, there is no incentive to take advantage of simulation technology as both the student and instructor want to build their flight hours, as that metric commonly stands in for a pilot's proficiency.

New-hire training is little better. In many operations, these pilots go through a training program that covers company operations, policies, and procedures. Then they immediately move into a ground school on the aircraft-specific model. On average, the ground school is completed over two to four days. At that point, the pilot is trained in either a simulated environment or the actual aircraft. The flight hours for this training average eight to 12 hours, depending on the complexity of the aircraft. IFR training averages a bit longer.

Recurrent training has similar challenges. Most operators have not reviewed their recurrent training programs for many years. It has become a box to be checked as opposed to an opportunity to review and strengthen a pilot's skills.

The Technology Learning Curve

These decades-old training schedules have not kept up with the increasingly complicated aircraft and avionics of modern aviation. Technology is the problem (and as we'll see later, it's also the solution).

Don't get me wrong. I love glass cockpits, navigation displays, and all the cool things in an electronic flight bag. But as a pilot, you are responsible for the safe conduct of the flight. You have to know the details of how to use the aircraft's systems and equipment properly, how to maintain its airworthiness, and how to recognize and deal with failure modes. And you have to know them to the point of proficiency.

We are now accustomed to being surrounded by technology, and often we don't take the time to properly learn every function of that technology. Some people might only use their phones for daily tasks such as calls, texts, and web browsing. When they need to figure out how to use a more complicated function, such as a three-way conference call, they google it or dig into the owner's guide.

That's fine for a phone but completely unacceptable when you are training to pilot a more complicated system such as an aircraft. Pilots need a complete understanding of the aircraft in order to make real-time decisions when problems may arise.

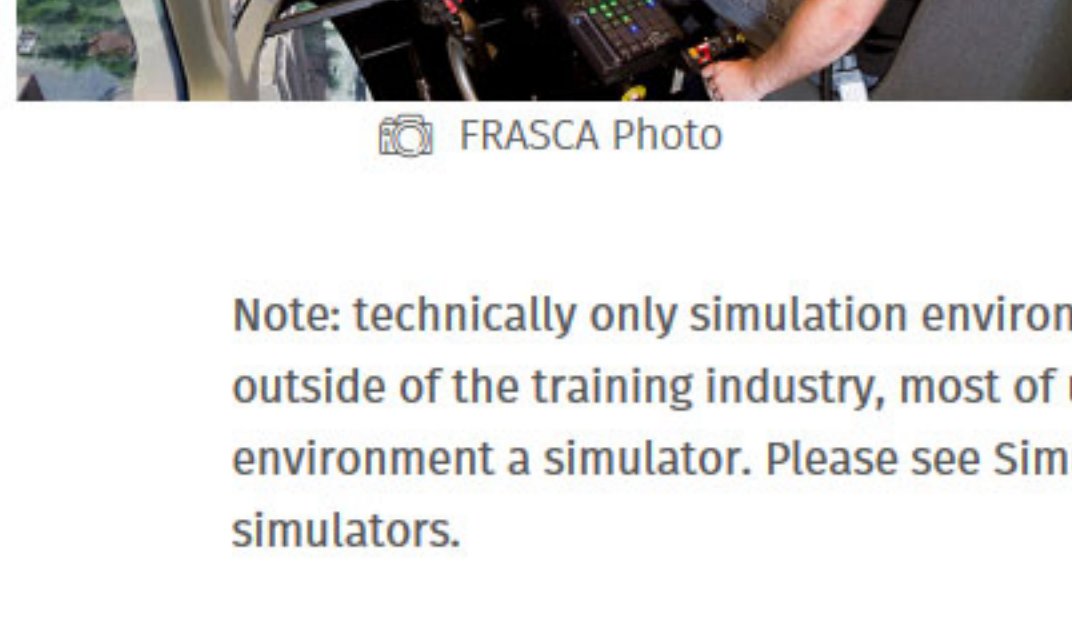
Pilots use simulator training to learn aircraft-specific systems and procedures. They can also learn multifunction displays, digital cockpits, and enhanced visual systems. They can develop the ability to accurately operate the technology, fly the aircraft, and make the decisions necessary for a safe mission.

But many pilots pass check rides without being completely comfortable with all the functions in the digital cockpit equipment. In other words, they are not proficient.

There are several factors at work here. One is the firehose training model, which pours a huge amount of information onto the pilot in a short time—one of the least effective, yet all-too-common training methods.

Secondly, it is difficult to become proficient in technology without hands-on practice. Studying from a book or PowerPoint presentation does not provide the muscle memory required to become proficient with the equipment.

The challenge that we are facing is that there is so much more to learn and no additional time to do it. This has put a greater burden on both the pilot and the instructor, who both feel pressured to complete the training in less time than is necessary to create true proficiency.



FRASCA Photo

Investing in Simulation Training

Today we need more training to get and stay proficient. This practice to proficiency is much more cost-effective in a simulated environment than in the aircraft itself, especially if it can be done in realistic scenarios that visually depict the uses and effects of the equipment. Simulation training should be a tool used by every operator, flight school, or private pilot.

Note: technically only simulation environments that offer motion are called simulators. However, outside of the training industry, most of us call any training device that seeks to duplicate the cockpit environment a simulator. Please see Simulator 101 on p. 44 to learn about the different types of simulators.

Simulation training offers substantial benefits for operators, trainers, and trainees:

- 24/7 availability. All weather or environments are available, around the clock.
- No risk to aircraft. Trainees can safely practice emergency procedures that would result in damage to an aircraft.
- No risk to personnel. According to the FAA, training flights accounted for 25 accidents in 2017.
- More realistic. Trainees can practice procedures and maneuvers to failure, past the point where an instructor in an aircraft would take control for safety, and trainers can introduce additional complications, such as weather or equipment malfunctions, as needed.
- More cost-effective. Simulator training does not increase your maintenance costs, burns no fuel, and aircraft are not diverted from generating revenue. Because any scenario is instantly available and instantly replayable, no time is wasted on repositioning aircraft or waiting for appropriate conditions.
- Immediate feedback. Simulator training provides trainees with immediate feedback; training can be paused at any time for immediate correction, repetition, or instruction.

A common question is "how much training do I need?" The regulators, aircraft manufacturers, or a company training manual might provide guidance for a specific aircraft or procedure. However, I encourage operators and pilots to really see these numbers as the minimum. Remember, proficiency is the goal.

The next question I get asked is "what should I train for?" The answer: train for the challenges in your specific operational environment. The National Transportation Safety Board specifically recommends simulator training for:

- Emergency procedures, including autorotations and recovery from unusual attitudes
- Scenario-based training tailored to the mission, including site-specific training on obstacles and terrain or flying in low-light conditions with night-vision goggles
- Degraded visual conditions, sound aeronautical decision-making, and inadvertent IMC encounters.

Training for Highly Complex Aircraft

Training in a Level D simulator is most useful when the aircraft is highly complex, with integrated technology. It is also a vital resource for training in aircraft requiring an FAA type rating, such as the S-92 or AW139, as well as a valuable training option for complex twin-engine aircraft in many of the complex mission profiles. Full-flight scenarios in both IFR and VFR are possible in Level D simulators.

In the Level D helicopter simulator arena, the leaders have been FlightSafety, CAE, TRU, and Thales. Their simulators have been installed in training centers around the world and are certified by many regulatory authorities.

Level D simulators provide an incredibly realistic training environment for those flying complex aircraft or high-risk missions, but training time in these devices can be equivalent in cost to training in an actual aircraft. However, there is a range of devices that deliver the substantial benefits of simulator training at a lower cost.

Training for Single-Engine Aircraft

The advanced avionics and flight procedures available in Level 6 and 7 FTDs are very useful for single-engine aircraft training. This level of simulation costs significantly less and is an affordable option for many operators. Quite often, the visual effects on these FTDs rival that of their larger Level D cousins. FTDs are often used as training for inadvertent entry into instrument meteorological conditions (IMC) and basic IFR instrument procedures.

When looking at Level 6 and 7 FTDs with or without a motion base, Frasca has been the industry leader. Frasca's FTDs are used around the world and provide all the functionality required for certification by regulators.

Ab Initio Training

Advanced aircraft training devices (AATDs) are very useful at the flight-school level for teaching procedures and for practicing flight maneuvers, start procedures, and checklists. They not only prepare the pilot for flight in the aircraft but provide a safe and cost-effective alternative for much-needed practice.

Basic desktop training models are also very useful for training on different types of avionics and checklist procedures. Sometimes desktop simulation is used to teach "differences training" that demonstrate the variations among the simulator and models with different technology or equipment installed. These devices can also be used by pilots with only analog experience to become familiar with digital cockpits.

As the flight schools prepare pilots for careers in aviation, desktop trainers are an affordable resource for practice time on advanced technology and digital cockpits. A digital technology transition course could prepare new pilots for careers in many industry sectors and might also draw some experienced pilots that have been limited to analog cockpits. The ideal situation is to have a combination of hands-on training, practice equipment, and the time to practice to proficiency.

In some training situations, simply providing the aircraft and the ground crew that have added technology as a separate training segment. However, this has been mostly limited to some full-service training on the larger aircraft and a few factory courses.

Simulation Training Costs

Costs for simulator training vary, based on the type and function of the device and the customer's requirements. Rates may be higher for more complex simulation scenarios; operators who buy a bulk training package of a large number of hours in a year may pay less. The cost for full courses depends on the type of aircraft and the complexity of the course.

The cost to rent or lease simulators also varies, depending on the type of simulator, its location, level of demand, and whether an instructor will be provided. Full-service training providers such as FlightSafety, Airbus, Bell, and Coptersafety offer either a full-course price or hourly rate for simulator training. This can range from \$600 per hour for a Level 6 or Level 7 FTD to \$2,000 per hour for a Level D simulator without an instructor.

If you are looking to purchase a simulator, here are some ballpark costs. Again, you pay for complexity. An AATD costs between \$20K to \$100K. A flight school using an AATD to provide students with practice for IFR conditions would spend about \$80K for a device that would provide some FAA credit.

The price of purchasing an FTD ranges from \$800K to \$2.5 million, depending on the complexity. At the higher end of this scale are FTDs with functions that receive training credit, including NVG certification (a sophisticated projection system is required for NVG accuracy).

A Level D simulator can cost between \$6 million to \$20 million. This is a full-motion simulator designed and certificated to replicate an aircraft. This type of simulator can provide 100 percent training credit and pilot certification.

It's Worth More than Credit

Originally, operators looked for simulators to replace only the training credit required by the regulators. Therefore, much attention was paid to the amount of training credit offered by the different levels of simulation. Generally, only training in Level D simulators offers flight-hour credit. Operators, flight schools, and pilots are now realizing that the true value of training with simulation is not in the amount of credit issued by a regulator but rather in the resulting gains in proficiency.

A decade ago, only a small group of helicopter pilots trained in simulators. Aircraft manufacturers now have realized that providing this training is now a fundamental part of maintaining their customer base. There are new training centers opening worldwide, and a wide range of helicopter simulator options available.

Whether choosing a new helicopter or training for a rating, one of the challenges is to locate the appropriate simulators or training centers. The key is to know what type of simulator and training program fits your goals, operational requirements, and your budget. The aircraft manufacturer is usually a good resource for this information; you can also check out the Simulation Training Resource Guide on p. 47.

There is no one-size-fits-all answer to simulator training. But there is an answer that will fit most operations and budgets—and, as the NTSB has stated, "consistent, standardized simulator training will help prepare pilots for the unexpected and will decrease the risk of an accident."

To get the most out of your investment in simulator training, develop specific goals for the training that match your operational challenges. Then research the most cost-effective means to meet those goals. There are many resources to help you get started in building an effective simulator training program—and eventually a safer flight operation.

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About the Author

Terry Palmer

With more than 25 years of experience in aviation safety and training, Terry Palmer has received many awards, including the 2010 HAI Salute to Excellence AgustaWestland Safety Award. She currently serves on the HAI Training and Safety Committees. Terry is instrumental in advancing helicopter simulator training for FlightSafety, Coptersafety, and Helisim.

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