IBM

Pilots prepare for takeoff like never before

FlightSafety revolutionizes pilot training with data and AI

by Allison Leking

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In 2009, Chesley "Sully" Sullenberger successfully landed a commercial airplane on the frigid Hudson River after a flock of geese flew into both engines, disabling them. All 155 souls on board survived. Captain Sully was dubbed the hero pilot behind the "Miracle on the Hudson."

The airline industry lauds Sullenberger as an aviation and safety expert because, in a moment of crisis, he tapped into his pilot training to save lives and avoid tragedy. This worst-case scenario—a dual engine failure—is what pilots prepare for but hope to never encounter.

FlightSafety International, a provider of professional aviation training, recognizes that all pilots are not created equal. Take for example, two differing pilots—one who is aggressive on the controls and one who is smooth. Both receive Federal Aviation Administration certification, but the more aggressive pilot is going to provide a less desirable passenger experience. FlightSafety established the unofficial "Captain Sully standard" as a target for pilots graduating from flight school. But how does the organization identify pilots who either have the natural ability to meet the Captain Sully standard or best train students to a higher standard?

In addition to training pilots to a higher standard, FlightSafety sought to speed its training throughput to keep pace with proposed demand. In 2017, the aviation industry announced that, based on aircraft sales from major airlines, it would need an additional 637,000 new pilots by 2021. FlightSafety strategists knew that the response to this demand lay somewhere in the flight simulator data.

FlightSmart objectively monitors

4,000+

variables in real time

Speeds training throughput to help provide for the predicted need of

637,000

new pilots by 2021

Extract data intelligence from flight simulators

Full flight simulators are large systems—for comparison, roughly the size of a work truck. The interior replicates a full-scale cockpit, with sensors, gauges and backlit screens. These devices cost millions of dollars to engineer and manufacture. To mimic an authentic flight experience, simulators such as the FlightSafety FS1000 are equipped with advanced audio, visual and full-motion capabilities.

As pilots train, simulators generate vast amounts of real-time data around every maneuver, button-push and screen-touch. FlightSafety wanted to harness this data and extract meaningful insights from it. Equally significant, FlightSafety recognized the importance of data exhaust. The company decided to work with IBM because the United States Department of Defense ranked IBM as one of its top three AI vendors, and IBM has a proven track record in data security.

IBM and FlightSafety now capture and make sense of this digital exhaust. After pilots finish a training session, they can pull up a dashboard that breaks down their performance into charts, reports and analytics. The dashboard highlights what the pilots did, how they performed and where they can remediate. The pilots can view how many tasks they executed, whether their reaction times are improving after an emergency procedure, and which parameters they should focus on next. The system provides insights relative to each pilot's level of training, and it notes whether the pilot is making normal progress or has items that need addressing.

By reviewing this data comprehensively, instructors can see which of their pilots are excelling, which ones need additional attention and whether there are negative trends developing—not just among individual pilots, but across a population set as well.

Apply agile to pilot training

FlightSafety leaders joined forces with experts from IBM and applied the IBM Garage™ model, a bold, comprehensive approach to innovation and transformation that quickly creates and scales new ideas. Together, they began to explore how data could transform the traditional syllabus-driven approach to pilot training—where regardless of pilots' mastery of a particular skill, they practice that skill as much or as little as the curriculum dictates—and move toward adaptive learning concepts.

People in aviation tend to thrive on structure and discipline, so the predictable cadence and rapid iteration of the IBM Garage was a great fit for FlightSafety. During an IBM Garage Enterprise Design Thinking™ Workshop, IBM data scientists and FlightSafety aviation experts brainstormed ways to incorporate AI and machine learning into FlightSafety's business. The workshop resulted in a vision and a roadmap for a minimum viable product (MVP) built for the cloud with open source technologies for advanced analytics.

"The way the IBM Garage model is set up, there's a lot of interaction. I think it's more fun when you have that type

of collaborative environment," says Bert Sawyer, Director of Government Strategic Management at FlightSafety. "It's exciting because there are all these new insights as the teams work through two-week sprints and start to ask questions and make suggestions."

Following the user-centered and agile IBM Garage Methodology, the team co-created the first iteration of FlightSmart, an adaptive learning technology that integrates with a flight simulator. Each new iteration of FlightSmart incorporated user and instructor feedback, even around design details such as changing the dashboard background color to match the dark screens found in an aircraft cockpit.

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In spite of the COVID-19 pandemic, FlightSafety's commitment to innovation maintained pace. The agile and collaborative IBM Garage approach easily transferred from face-to-face interactions to virtual teamwork. "If we hadn't implemented the IBM Garage model, our development pace would have slowed severely when COVID hit. We'd probably be months behind where we are today," Sawyer explains. "But, working virtually, we were able to keep the expertise of all the people on the IBM-FlightSafety team."

As students train in simulators, FlightSmart objectively monitors approximately 4,000+ variables in real time. The data shows a student's performance on specific maneuvers and also distinguishes different flying styles. Based on these trends, the team created user personas such as Timid, Reactive, Risky and Aggressive.

Industry standards dictate where an instructor may sit in the simulator. The assumption is that the instructor sees everything the pilot is doing. As it turns out, the data tells a different story. When FlightSafety and IBM began to analyze flight simulator data, patterns of sensitivity showed that despite such close proximity to a pilot under instruction and deliberate observation, the technology captured

nuances that a human simply could not. Take rudder controls, for example. An instructor lacks the ability to determine how much force a pilot is applying to the rudder controls because the pilot's feet are hidden under a console. But excessive use of rudder controls can lead to negative outcomes in certain circumstances. With FlightSmart, instructors can see previously latent behaviors in the data and can apply personalized coaching when needed.

AI-driven pilot training transforms aviation

and increase the speed to competency. Data shows not just whether a pilot is technically executing a maneuver correctly but also how smoothly. By unearthing personas and insights, instructors can customize and adapt training for an individual or a group of individuals who fly similarly. Pilots can spend less time on the skills they've recently mastered and more time learning where it's needed most. These insights reduce student attrition and instructor burden. As one instructor put it, having an objective, automated breakdown of performance for each maneuver is a "huge improvement" over the tools they use now.

FlightSmart has the potential to establish new standards for aviation. In addition to transforming pilot training, data insights could affect the airline industry's approach to insurance, aircraft manufacturing and pilot retirement age. Furthermore, the algorithms, advanced analytics and data modeling embedded in FlightSmart could readily transfer to other industries.

Imagine what AI and machine learning could do for train engineers, shipping captains, truck drivers and surgeons.

For its first use case, FlightSafety successfully deployed FlightSmart at a US Air Force base in Columbus, Mississippi. By improving training and safety, FlightSmart can reduce pilot errors

Data can also help predict a military or commercial aviator's career path. Early on, an instructor can use data and AI to spot aggressive pilots who would excel with combat aircraft, or clearly identify the lowest-performing students who are unlikely to achieve certifications. Simulators cost approximately USD 1,000 per hour to operate, so being able to

predict a student's likelihood of success can help FlightSafety and its customers save a significant amount of time and money. A student who goes through flight training and fails to attain certification is a "million-dollar mistake"—literally. That is the approximate cost that a customer, such as the Air Force or an airline, invests in each individual pilot.

The next time you're enjoying complimentary pretzels and in-flight entertainment, take comfort in knowing that FlightSmart is training more pilots, more efficiently, who are on the path to realize their full potential—the Captain Sully standard.

Want to see how data and AI can help your business take off? Experience virtual IBM Garage.

About FlightSafety International

Founded in 1951, FlightSafety is a professional aviation training company and supplier of flight simulators, visual systems and displays to commercial, government and military organizations. Headquartered in the US in Melville, New York, FlightSafety employs approximately 5,000 people and delivers more than 1.4 million hours of training each year to customers from nearly 170 countries.

Solution component

- IBM Garage™