

Role of Human Factors in the FAA



In the Federal Aviation Administration (FAA), **Human Factors** is defined as a “multidisciplinary effort to generate and compile information about human capabilities and limitations and apply that information to equipment, systems, facilities, procedures, jobs, environments, training, staffing, and personnel management for safe, comfortable, and effective human performance” (FAA Order 9550.8A). FAA human factors researchers seek to understand the physical, behavioral,

cognitive, and social characteristics of aviation professionals—such as pilots, air traffic controllers, technical operations specialists, and aircraft maintenance technicians—and the systems that they use.

FAA human factors engineers and practitioners apply human factors knowledge to improve safety, efficiency, performance, and reliability of the National Airspace System (NAS) through a focus on human performance of air traffic control and technical operations personnel as impacted by new and modified systems, procedures, and training. FAA human factors specialists working in the Office of Aviation Safety (AVS) apply human factors knowledge to develop regulatory material for aircraft certification and operational approvals for advanced flight deck technologies, procedures, and training, monitor compliance with regulations, and address continued operational safety.

Goals

The overall goal of human factors in the FAA is to support the attainment of high levels of human-system performance across all aviation domains. Within AVS, the focus of human factors efforts is on ensuring minimum acceptable performance levels are met whereas the Air Traffic Organization (ATO) and the Office of NextGen (ANG) focus on maximizing human-system performance. This requires an integrated “system of systems” approach that considers the complex interactions among people, technology, procedures, and organizations rather than just a “system by system” approach. This integrated approach requires advocacy, education, and collaboration among human factors organizations within the FAA and close coordination with industry, academic, and international partners. Important subgoals of FAA human factors efforts include:

- **To maintain, and when possible improve, aviation safety by reducing the impact of human error.** Human error has been identified as a factor in two-thirds to three-fourths of recent aviation accidents and incidents, including several recent high-profile cases. FAA human factors personnel seek to understand the many potential contributors to human error, such as inadequate training and procedures, conflicting roles and responsibilities, badly designed

equipment, poor communication, fatigue, distraction, and organizational factors. FAA human factors personnel provide data to support the development of or updates to FAA regulations, procedures, training, and equipment to reduce the frequency and severity of human errors and to recommend mitigations and best practices that reduce error consequences. This activity is supported by conducting incident and accident investigations and analyzing event data to understand and further mitigate human factors issues.

- **To increase the efficiency and performance of the NAS by improving the quality of operational decisions and facilitating operational actions.** FAA human factors personnel seek to understand how human operators make decisions (e.g., What information does a Technical Operations Specialist need when diagnosing a problem?), what factors affect decision-making (e.g., Has the pilot received sufficient training to respond to this situation?), and how decisions are implemented through actions (e.g., How long does it take a controller to enter a new route into the automation system?). This knowledge is applied to the development and evaluation of procedures, tools, standards, policies, and organizations. Identifying these factors can help prevent systems from presenting conflicting or confusing information, can help operators manage their workload across multiple tasks and maintain their situational awareness, and can improve acceptance and trust in the system.
- **To facilitate proposed changes to the NAS to address operational needs.** FAA human factors personnel conduct field studies, surveys, and high-fidelity simulations. They review the content of voluntary safety reports to understand the goals, tasks, and behaviors that present the most significant human performance challenges to pilots, controllers, and maintenance technicians. Within Air Traffic Control (ATC), this knowledge is used to inform user-centered requirements for equipment upgrades, revisions to procedures, and changes to training programs. This includes ensuring that new capabilities are useful, effective, and provide measurable benefits by setting systematically derived, science-based, human-performance targets that can be measured and tracked by programs to ensure that they are achieved.
- **To increase the utilization of new capabilities.** NextGen capabilities, such as new decision-support tools, can achieve projected benefits only when the human operators choose to use the new capabilities and use them effectively. FAA human factors personnel seek to understand the factors that affect the utilization and reliance on automation, such as trust, definitions of roles and responsibilities, job demands, organizational structures, and the timing of implementation and training. Factors affecting this goal include issues of over-reliance on technology, skill degradation, resilience, and failure recovery.
- **To reduce programmatic risks.** Over the last 20 years, several major FAA system acquisition programs have experienced significant cost and schedule impacts because human factors were not adequately considered in the acquisition and development process. A program that does not conduct human factors integration activities, that poorly times the implementation of changes, or that trains personnel only on individual systems rather than on integrated overall services, is running significant risks that may not become apparent until the new system or tool installed and used in the operation. FAA human factors personnel seek to maximize human-system performance by applying recommended practices throughout the acquisition lifecycle to

mitigate such risks to the system development process throughout the acquisition lifecycle to mitigate such risks.

Personnel and Resources

FAA human factors personnel currently reside in several organizations, including the Office of Aviation Safety (AVS), the Air Traffic Organization (ATO), and the Office of NextGen (ANG). These organizations maintain sponsorship, collaboration, and oversight relationships depending on requirements, resources, and expertise needed to complete projects and activities. There is no single line of reporting for FAA human factors personnel and each organization pursues human factors goals and agendas to support the needs of the specific lines of business. Activities such as the ANG Human Factors Coordinating Committee and AVS Human Factors Coordination Team provide opportunities for FAA human factors personnel, contractors, and outside organizations to share information.

Significant FAA assets include world-class human factors laboratories and simulation capabilities at the William J. Hughes Technical Center in Atlantic City, NJ and the Civil Aerospace Medical Institute (CAMI) in Oklahoma City, OK. FAA human factors personnel collaborate with national and international organizations, such as the Department of Transportation John A. Volpe National Transportation Systems Center, the National Aeronautics and Space Administration (NASA), the MITRE Corporation, EuroControl, the European Aviation Safety Agency (EASA), and the International Civil Aviation Organization (ICAO), as well as numerous universities and industrial partners. FAA human factors projects are funded primarily through several RE&D budget lines, with additional funding from specific F&E and Ops programs.

Customers and Sponsors

The primary users of FAA human factors products are other organizations within AVS, ATO, and ANG that are responsible for developing systems, implementing training programs, developing certification and operational approval guidance, and writing regulations. US and international segments of the aviation industry also capitalize on FAA R&D products to ensure safety, efficiency, and compliance. FAA human factors program activities are sponsored by elements of the AVS, ATO, and ANG organizations with distinct focus areas:

- **AVS** is responsible for the certification, production approval, and continued airworthiness of aircraft. AVS is also responsible for the certification of pilots, mechanics, and personnel in safety-related positions. AVS conducts safety data analysis and event investigation. AVS develops and applies policies, regulations, and guidelines. Current AVS-oriented human factors efforts support all AVA activities and include policy for pilot training, avionics systems, ADS-B applications in the flight deck, electronic flight bags, Data Communications, flight crew fatigue, and voluntary safety reporting.
- **ATO** is responsible for the entire ATC operation, including staffing, personnel recruitment (in collaboration with AHR), selection, training, system development and implementation, and operational service delivery. The main focus areas of current ATO human factors efforts are training, safety, system design, and developing standards.
- **ANG** develops concepts to meet the future needs of the ATO and AVS. Current ANG human factors efforts focus on human performance risks, training implications, and maintenance issues,

including issues resulting from NextGen technology enhancements and ensuring human factors is incorporated into system development activities as a matter of process.

FAA human factors Personnel also work closely with the labor unions representing the affected user communities (e.g., NATCA, PASS, ALPA, IAM&AW), and with industry organizations representing other stakeholders (e.g., AOPA).