

Overview of NASA-URC: CHAAT Objectives and Expected Significance

Under the Next Generation Airspace Transportation System (NextGen), airspace operators will assume new roles and responsibilities in reaction to a number of essential changes in Air Traffic Management (ATM), and the introduction of new automation technologies to support these important developments. These far-reaching changes are being pursued to address the unprecedented growth in the demand for air travel, and the acknowledged inability of the current system to meet this demand. NextGen is more than a “modernization program.” It is a complete transformation of the existing National Airspace System (NAS) if the goals of NextGen are to be realized (JPDO, 2006). These transformations will be achieved through a user-centered, system-comprehensive strategy that promises to meet the demands of future air travelers while continuing to improve security, efficiency, and safety.

Perhaps the most impacted roles in NextGen will be that of pilots and air traffic controllers (ATCs). In all manner of traffic situations and environments, future pilots operating in NextGen environments may well be assuming expanded responsibility for flight planning, separation, and many other aspects of ATM. Assigning ATM responsibilities to the flight deck will demand that aircrews perform more strategic and tactical flight planning, use enhanced traffic information and interact with automation tools. For pilots to maintain safe levels of performance and effectively execute new NextGen capabilities, several critical technologies are under development: Cockpit Situational Displays (CSD) that will provide enhanced situation awareness, Automated Separation Assurance System (ASAS) technologies to improve safety margins in higher density airspace environments, and automation-assisted planning tools that allow accurate and timely 4-D trajectory-based operations. With the incorporation of these technologies, air crews will be better equipped to perform their NextGen-related functions. ATCs, on the other hand, will be using automation tools that enable them to safely and effectively share responsibility for separation assurance with aircrews, while at the same time being centrally involved in managing aspects of new ATM concepts such as dynamic airspace configurations and super-density operations (SDO). Presently, the impacts of these NextGen ATM concepts and technologies (and corresponding shifts in operator roles and responsibilities) are undecided, yet their success in meeting NextGen objectives depend on effective function allocations between pilots, ATCs and automated tools, user-centered integration of ATM and other automation tools, and effective training of current and future operators.

The challenges of NextGen cannot be met without reliable and valid measures of operator (pilot and controller) performance that can assess the impact of changing task demands on system performance. Unfortunately, reliable, valid, and robust measures of human operator performance in current-day airspace systems are unavailable (e.g., Rantanen, 2004). Thus, assessments of the impact of new technologies on future operators in NextGen will be limited by the inadequacy of these metrics. For NextGen concepts to be properly evaluated, either existing measurement techniques must be identified or new measurement techniques must be developed that are reliable, valid, and sensitive to the changes in operator performance brought about by NextGen. We propose to establish a NASA Group 5 University Research Center, the *Center for Human Factors in Advanced Aeronautics Technologies (CHAAT)*. CHAAT’s research focus will be to assess and validate operator performance

metrics in NextGen environments. Moreover, we will assess how proposed changes in NextGen change the job of current-day expert pilots and ATCs, and student pilots and ATCs as they may well be the first class of NextGen operators. Through research and educational development, and collaborations with NASA, FAA, private industries and universities, CHAAT will increase the number of degrees awarded to students in the aeronautics field, especially those from minority and underrepresented groups.