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Senior Leader Perspective: Recently, the world and more specifically, the Department of Defense was taken back when China released a statement suggesting it would become the *"world's primary AI innovation center by 2030"*. In response to this statement, and the growing need to increase the Navy's capabilities surrounding data mining and machine learning, deep learning, and more broadly, artificial intelligence, the Office of Naval Research has stood up an Artificial Intelligence (AI) Sprint Team with a specific focus towards realigning many of its S&T investments towards these areas. The team is composed of Project Officers from each of the departmental codes and is intended to identify connection points across each of ONR's mission areas ranging from Air, Surface, Subsurface, Expeditionary, C4ISR, and Human Performance. One output was the release of a special program announcement on "Advancing Artificial Intelligence for the Naval Domain". Interest from both academia and industry was readily apparent as ONR received over 300 responses ranging on basic science topics from heterogeneous data fusion and hierarchical deep learning, to more advanced application areas such as decentralized perception and planning in dynamic environments.

While DoD has seen a number of Artificial Intelligence revolutions over the past decades, this "renaissance" appears to be here to stay. The battle for AI superiority will be won through the minds of innovative experts from academia and industry here at home. ***Dr. John Tangney, HS COI Navy Lead***

Hail & Farewell

Hail - Dr. Corde Lane was appointed Acting Director of the Human Research and Engineering Directorate of the Army Research Laboratory in December 2017. He leads basic and applied research and advanced development spanning three core areas – human behavior, human capability enhancement, and integration of humans and systems. His organization is headquartered at Aberdeen Proving Ground, MD, and includes 20 sites co-located with the Training and Doctrine Command Centers of Excellence; the Research, Development, and Engineering Command Centers; Program Executive Offices and Program Managers; and ARL Open Campus Partner facilities. He also oversees domain assessments for the Army Human Systems Integration program.

Hail - New "At Large" members Ms. Collette Flournoy, Dep Chief of Naval Operations (Manpower, Personnel, Training, and Education) and Mr. Eric Sikorski , PM Training Technology Development, Combating Terrorism Technical Support Office

Hail/Farewell - Dr. Carolyn Parish, Lead Social and Behavioral Scientist for The MITRE Corporation. She has taken Dr. Gary Klein's place on the HS COI project team—welcome! Gary will be hard to replace.

Farewell - Dr. Lane replaced Mr. John Lockett,. Many deserved thanks for keeping the COI so well informed as Army Lead.

OUR HUMAN SYSTEMS COI

http://www.defenseinnovationmarketplace.mil/coi_humansystems.html

Vision: Develop & deliver new human-centered technologies to select, train, design, quantify, protect, and operate for measurably improved mission effectiveness.

Mission: Enhance mission effectiveness through: 1) Integrated simulations for mission training and experimentation, 2) Human-machine designs for mission effectiveness, 3) Assessment of operator effectiveness, 4) Operating through battlespace stresses and 5) Mastering the PMESII battle space.

Key Products: Integrated service roadmaps; COI taxonomy, budget & programs; seedling and tri-service ARAP proposals, collaboration opportunities; success stories.

HS COI Contact Rosters: End of newsletter.

Key Personnel	
OSD Chair: Dr. Ben Petro (acting)	OSD
COI Chair: Dr. Kevin Geiss	AFRL
Navy Lead: Dr. John Tangney	ONR
Army Lead: Dr. Corde Lane (acting)	ARL
Army Lead: Mr. Doug Tamilio	NSRDEC
WG Chair: Dr. Todd Nelson	AFRL
PAE&T Lead: Dr. Glenn Gunzelmann	AFRL
SICP Lead: Dr. Todd Nelson	AFRL
PSWP Leads: Dr. Michael Lafiandra & Dr. Peter Squire	ARL ONR

Feedback: If you have content or suggestions please send to our Newsletter Editor: **Alan.Livada.ctr@us.af.mil**

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COI HIGHLIGHTS - *Past Events*

NDIA Human Systems Division Conference. The Conference was held March 13-14 with the theme *'Human Systems in Emerging Domains: Autonomy, Human Augmentation and Cyber.'* There was excellent government and Industry participation with well over 100 attendees. Along with great feedback from industry on the COI and HSI Metrics Panels, presentations, poster sessions and roundtable discussions , this was a very successful interchange on important human systems issues, technologies and future plans. We are reviewing the potential for merging with Human Factors Engineering TAG in the future. POC: Katie Smith, ksmith@sainc.com

NDIA Science & Engineering Technology (S&ET) Conference. Held March 20-22, 2018 in Austin, Texas, this was another great venue for the DoD to interact with industry. There were S&T presentations from Service Leads and Combatant Commands and Ms. Mary Miller presented the Undersecretary's priorities. In addition, the COI was able to communicate our continued impact on addressing warfighter capability needs in Dr. Geiss' briefing of the HS COI Update and with our new poster. POC: Katie Smith, ksmith@sainc.com

Major Annual Events/Activities	
Reliance 21 Meeting	Jan
ARAP Proposal Data Call	Jan
Roadmap Review (Every 18 months – not until 2019)	Mar
NDIA Human Systems Conference	Mar
NDIA S&ET Conference	Mar
HFE TAG	May
COI Information Exchange (cancelled)	Jun
DoD Lab Day/DARPA Day (cancelled)	Jun
Seedling Proposal Data Call	Jun
IR&D Technical Interchange (Biannual Not until 2019)	Jun
COI Steering Group/All Hands	Sept
I/ITSEC	Dec

Joint Department of Defense Exoskeleton Technical Interchange (ETI). On April 25-26, 2018, Office of the Undersecretary of Defense for Research and Engineering (OUSD R&E) sponsored the ETI hosted by U.S. Army Natick Soldier Research, Development & Engineering Center (NSRDEC) at the Lord Community Center in Natick, MA.

Major goals: 1) Learn DoD users' exoskeleton needs and applications across the Services, COCOMs, and Medical Community, 2) Leverage exoskeleton S&T advancements across the DoD, other US Government Agencies, industry, and academia, 3) Identify S&T gaps to guide future DoD S&T investments, and 4) Gain insight into the current and future planned directions for DoD exoskeletons. The ETI was attended by over 120 exoskeleton stakeholders from across DoD, industry, and academia to discuss DoD needs, DoD S&T investments, industry exoskeleton development activities, and the current state of the science. Industry expressed a strong desire to see specific requirements from DoD with regards to exoskeletons. Several key S&T technical areas were identified as common and critical to the realization of exoskeleton capabilities for DoD medical, logistics, and tactical applications. The need for a multidisciplinary initiative to support exoskeleton development was identified and a follow up DoD Exoskeleton Demonstration Day will be held at NSRDEC in August 2018.

POC: Jennifer Coughlin, HPT&B Directorate, jennifer.r.coughlin.ctr@mail.mil

Steering Group Lab Visit. Dr. Geiss hosted a very successful event on 8-9 May that achieved its goals of raising awareness of 711 HPW research capabilities and identifying opportunities for collaboration with other services. Numerous outstanding tours, technology demonstrations, and presentations at 711HPW and NAMRU-D gave a very rich understanding of their tremendous capabilities to the Steering Group and COI SMEs. *Key Events:* 711 HPW/RH's Advanced Hearing Protection & High Noise Chamber, Biodynamics Laboratory, Battlefield Air Targeting Man-Aided kNowledge (BATMAN), Wearables Confined Space Monitoring, Human Language Technologies and Trust Research, Cyber Visualization, IMPACT Testbed, Analyst Test Bed, ISR Analyst Performance (IAP) Tools, Operational Based Vision Assessment Lab, Synthetic Biology for Military Environments; Predictive Performance Optimization, Synthetic Teammates, Live Virtual & Constructive Training Test Beds, Centrifuge & Research Altitude Chambers, On-Board Oxygen Generation Systems Lab (OBOGS), Signature Tracking for Optimized Nutrition and Training. 711 HPW/HP efforts were Human Systems Integration Overview and Anthro Lab; 711 HPW/USAFSAM's En Route Care Training High Bay and NAMRU Naval Medical Research Unit's KRAKEN Spatial Disorientation System completed the tours. The plan is to meet quarterly at new locations.

POC: Dr. Todd Nelson, william.nelson.35@us.af.mil

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DoD Human Factors Engineering Technical Advisory Group (DoD HFE TAG). Hosted at Hurlburt Field FL, the theme of this year's meeting was "Special/Specialized Operators: Personnel, Training, and Acquisition Challenges" and included plenary session speakers including Dr. Kevin Geiss who presented a brief about the HS COI. Over 153 attendees from 12 Services/ Federal Agencies and 20 Academic /Non-Profit/Industries participated in 34 sessions. The TAG's goal was to share knowledge and lessons learned from these unique and elite groups to foster improved acquisition and training decisions and better performance. Additionally, focusing on the operators will drive further considerations in human factors engineering, survivability, and habitability considerations. POC: John Plaga, john.plaga@us.af.mil

COI HIGHLIGHTS - "*Next Up*"

COI Information Exchange. The exchange has been cancelled. POC: Katie Smith, ksmith@sainc.com

Seedling Data Call. The call is expected in early June, at which time the format will be provided to those that would like to submit a seedling proposal. Seedlings are 2 year programs that are considered high-impact opportunities. The scope of the proposal should be new ideas not ready for a big program. POC: Katie Smith, ksmith@sainc.com

ASBREM COI State of the Science for Autonomous Medical Evacuation (AME) Workshop. The workshop took place July 10-12 at MITRE in McLean, VA. The purpose was to bring together DoD SMEs from across the COIs to discuss and develop a common understanding of the S&T needed to develop/field autonomous systems-of-systems capable of monitoring, stabilizing, and evacuating injured warfighters from combat in areas where the US lacks air dominance. The main output was the ability of Reliance 21 COIs to develop coordinated research plans that recognize capabilities and address capability gaps. POC: Jackie Mutai, jackie.c.mutai.ctr@mail.mil

Autonomy CoI Hosting an Autonomy Software Architecture Workshop. The workshop will be held 18-19 July at MITRE's Mclean office with a registration deadline of 4 June. The government-only workshop goal is to examine the characteristics of autonomy software architectures for the control of autonomous systems from high-level planning through low-level control. The workshop also includes exploring the necessary or desirable characteristics of DoD autonomy architectures to promote reuse and investigate the benefits of principled architectures for autonomy. The desired output of the workshop is to rekindle collaborations from previous Autonomy Research Pilot Initiative (ARPI) efforts, build new collaborations around identified gaps, and inform future service investments and ARAP proposal submissions. POC: Katie Smith,

DARPA D60 Symposium. DARPA Day is cancelled, but there will be a symposium in honor of the 60th Anniversary September 5-7 at Gaylord National Harbor to highlight DARPA's work to create past, present, and into the future breakthrough technologies and capabilities. The symposium seeks to strengthen DARPA's innovation by engaging a broader swath of scientists and technologists across the nation's academic and industrial bases. The symposium will also inform stakeholders of DARPA's vision and priorities to better enable collaboration. POC: Katie Smith, ksmith@sainc.com

AUSA Announces 2018 Autonomy Symposium. The symposium will take place at the Cobo Center in Detroit, MI on 28/29 November 2018. Information is available at: https://www.ausa.org/army-autonomy-ai-symposium.
POC: Mike Karaki, mohamed.a.karaki.civ@mail.mil

International Corner

US/UK Human Systems Stocktake Workshop. The Office of the Under Secretary of Defense (Research & Engineering) (OUSD R&E) led a workshop on 21 -22 February, 2018 with the Defence Science & Technology Laboratory (DSTL) Porton Down. The workshop included UK and US Human Systems scientists and program managers with a goal to determine if DoD/DSTL Human Systems S&T could become an enduring thrust area within the US/UK S&T Stocktake function. Developed within four Human Systems R&D sub-domains, over fifteen new joint collaboration opportunities were defined from active on-going portfolios between the US and UK. A number of these collaborative areas were considered for formal Project (PA), Information (IEA), or Data Exchange Agreements (DEA). The workshop leaders defined three recommended topic areas for consideration of further Stocktake programmatic attention to US and UK Stocktake Principals: 1) Socio-cultural/influence, 2) Human machine teaming/human system integration (HMT/HIS), and 3) Human data science domains. Results to the Stocktake Principles are expected by June. POC: Dr. Bindu Nair, bindu.r.nair.civ@mail.mil

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US-Japan Science and Technology Forum. The 29th annual event was sponsored by the Japan Society of Aerospace Companies and Vanderbilt University on 15-16 May 2018 with Dr. John Schlager of AFRL presenting a general programmatic overview on human autonomy at the forum. The purpose of AFRL's participation is to continue AF/International Affairs discussions involving the Autonomy technologies dialogue with key Japanese industry POCs. As AFRL refines the government-to-government Autonomy Data Exchange Agreement, the US and Japan's Ministry of Economy, Trade, and Industry (METI) are pursuing a formal RDT&E Memorandum of Understanding (MOU) to enable rapid access to Japan's highly technological industry base. The goal is to develop a US-Japan METI collaborative autonomy project for advancing human-on-the-loop integration. POC: Dr. John Schlager, 711 HPW/RH, john.schlager@us.af.mil.

DoD Electro Optic Survivability (EOS) Project Arrangement with the United Kingdom. Under The Technical Cooperation Program MOU, an EOS PA is under development to investigate Optical Countermeasure (CM) and Protection Measure (PM) capabilities for platforms, systems and personnel through R&D, prototyping, demonstration, and test and evaluation to enable transition of enhanced capabilities to the warfighter. This agreement includes addressing optically-based CM and PM for platforms, systems, and personnel across sea, land, air and space domains as well as jointly developing and evaluating CM and PM technologies, components, prototypes, and systems. Dr. Leon McLin, 711 HPW/RHDO, leon.mclin@us.af.mil

NATO Symposium: Human Factors and Medicine - HFM-300/RSY, Symposium on Human Autonomy Teaming (HAT). The upcoming Symposium in Portsmouth HK 1 in Oct 2018 will address human-autonomy teaming and human automation cooperation from the perspectives of the overall system, technological factors, human factors, operational issues, and corresponding legal and ethical questions. It connects domains and bridges science with applications and operations. Some topics: 1) Operational requirements, hopes and concerns from military, 2) Human–machine interaction, communication & cooperation, 3) Joint learning/training, 4) Ethical, legal and social aspects of HAT to include trust & accountability and 5) Assessing risks /benefits: Performance and Effectiveness Metrics. POC: Dr. Mark Draper, mark.draper.2@us.af.mil

COI Highlight

Human Machine Teaming, Artificial Intelligence

Human Language Technology (HLT) Program. AFRL's Airman Systems Directorate delivered new high-performance Chinese-English and Korean-English translation models to DARPA Quantitative Crisis Response (QCR) for Pacific Command (PACOM) operators. DARPA's QCR Program aims to rigorously assess effects of the volleys of information traded through social media and other communications channels. The program is developing suites of largely automated digital tools that can help operational partners better understand how information is being used by adversaries as well as quantitatively predict and assess—in real time and at scale—the effects of those campaigns and of countermeasures. One desired tool is highly-tailored, high-performance machine translation of incoming foreign language messages. DARPA selected AFRL/RH to develop and extend this capability using their expertise in machine translation, to translate Chinese and Korean social media content. AFRL/RH delivered new high-performance Chinese-English and Korean-English translation models for integration. These new capabilities were successfully demonstrated for the PACOM-affiliated Army "Information DOMinance" (IDOM) cell located at Joint Base Lewis-McChord. POC: Jeremy Gwinnup, 711HPW/RHXS, jeremy.gwinnup.1@us.af.mil

NSRDEC 6.1 funded effort "Characterizing Human Control of Small Autonomous Robot Swarms". NSRDEC Cognitive Science Team has recently begun a new effort in Human-Machine Teaming investigating the best way for a single human to control a swarm of robotic agents in real time. The state of the art currently is either real-time control of one agent or waypoint/beacon control or pre-programed maneuvers of a swarm of agents. We aim to address this gap by starting from basic psychological principles of ensemble perception, multiple-object tracking, and perception-for-action to identify what features of swarm control schemes would make them easiest to learn and most intuitive to use. POC: Dr. Robb Wilcox, Robb.c.wilcox.civ@mail.mil

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COI Highlight — Human Machine Teaming, Artificial Intelligence (Continued)

Army AI Innovation Institute (A2I2). The Army's new A2I2 is an emerging effort that will serve to coordinate collaborative efforts with Academia, Industry, and Government Agencies to support Army relevant R&D in AI & Machine Learning. Initial technical focus areas are: Autonomy with Human-Agent Teaming, Adversarial ML/Reasoning, Analytics for Situational Awareness and Resilient Tactical Networks and Deception. POC: Andrew P. Ladas, andrew.p.ladas.civ@mail.mil

Speech-to-Text for Enhanced PED (STEP) Operational Assessment. AFRL's Airman Systems Directorate's program improves the ISR Processing, Exploitation and Dissemination (PED) process by automating the capture, transcription, and dissemination of Full Motion Video (FMV) callouts by introducing automatic speech recognition technology. Researchers customized COTS software by using over 70,000 lines of operational chat and adapting it to the vocabulary and sentence structure used by FMV analysts. The result is a highly accurate automated transcription capability that significantly reduces the workload of the screener and improve the efficiency of PED operations. This tool was demonstrated for the 11th Special Operations Intelligence Squadron and the results indicated a credible increase in production efficiency with a 28% decrease in callout dissemination times for a 3 person crew construct, and a 51% decrease in callout times for a one person crew construct. Based on these results, AFSOC/A2X (Intelligence Directorate) leadership is recommending the full-scale deployment of STEP to the 11/SOIS within the next several months. POC: David Williamson, david.williamson.7@us.af.mil

Supervisory Control Technology Integration and Demonstration Program. AFRL's Airman Systems Directorate and Wright State Research Institute Unmanned Aerial Systems (UAS) researchers conducted integration and risk reduction flight tests to demonstrate a common interface for multiple vehicles and sensor payloads. This OSD funded team is chartered to enable multi-UAS command and control by a single operator using AFRL's Vigilant Spirit Control Station™. Flight tests used the RQ-7B Shadow and NAVMAR's TigerShark UAS; Shadow is a program of record for the U.S. Army and Marine Corp and the TigerShark is flown operationally by the U.S. Navy. February 2018 flight demonstrations used the TigerShark platform and demonstrated command and control of the vehicle and connectivity to the EO/IR sensor payload. During April 2018 demonstrations, the team completed integration flights with the RQ-7B Shadow and TigerShark, with the result of demonstrating sensor control for road following and sensor slaving to a fixed target respectively. These basic payload tasks pave the way for demonstration of more advanced payload operations during the September 2018 Capstone event.
POC: Guy French, 711HPW/RHCI, guy.french@us.af.mil

Synthetic Training Environment (STE). Army Research Laboratory's STE effort is the Army's future capability for Combined Arms Maneuver Collective Training in a multi-domain environment. AI-based capabilities will be critical components within the STE Common Synthetic Environment. This includes efforts in two major thrusts areas:

Training Simulation Software. The majority of current behavior implementations in training simulations are scripted and/or rule-based. Development and integration of advanced AI methodologies and resources is aimed at better simulations of autonomous forces and entities in the CSE to enhance training realism and fidelity.

Training Management Tools. Automated generation of militarily-relevant scenarios is being advanced through an innovative program to generate a large amount of content from a finite amount of exemplar content, while customizing to Soldier learning goals and limitations. AI-based adaptive tutoring capabilities aimed at accelerating learning will allow tailored instruction for individual Soldiers and teams based on their learning objectives, needs, and preferences.
POC: Ivan Martinez, ivan.m.martinez.civ@mail.mil

NSRDEC in Collaboration with CABCS/Tufts University. Increasingly, military teams are starting to incorporate robots into their organizational structures and to work alongside humans in shoulder-to-shoulder interaction. These complex team structures offer numerous advantages, but also present unsolved challenges to manage and coordinate the actions of all the agents. Currently, it is far from clear how such coordination should take place as there are no studies that investigate mixed-initiative human-robot teams using autonomous robots. This project aims to directly address this literature gap by developing and testing a novel platform for human-robot teaming in virtual reality (VR) environments. The long term goal involves conducting a formal investigation and constructing a corpus to be used as a research tool and evaluation platform.
POC: Dr. Robb Wilcox, Robb.c.wilcox.civ@mail.mil

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COI Highlight — Human Machine Teaming, Artificial Intelligence (Continued)

Autonomous Task Manager for Intelligence, Surveillance, and Reconnaissance (ISR) Human-Machine Teams. AFRL's Airman Systems Directorate developed a prototype Autonomous Task Manager (AM) that dynamically distributes tasks to ISR agents and automated agents by using intelligent decision logic. Through simulation, the 711 HPW team demonstrated the AM can reduce the cognitive burden to the human by maintaining performance across multiple tasks while moderating workload. The team found that through simulation, the AM performs roughly 11% better than the human on all tasks alone for all conditions. This technique demonstrates a performance and workload-based tasking allocation method for ISR agents in dynamic and complex environments. POC: Ms. Jennifer Lopez, jennifer.lopez.11@us.af.mil

Human-Agent Teaming (HAT). Army Research Laboratory's HAT program considers the potential capabilities of future intelligent technologies to conceptualize completely novel interactions amongst heterogeneous teams of Soldiers and intelligent agents, as well as reconceiving approaches and requirements for the specific training demands for Soldiers resulting from new HAT concepts. The program has numerous products with important innovations:

1) Deep Learning systems for detecting human states across large, diverse data collections

2) Capabilities for real-time interpretation of human-agent team performance

3) The Situation awareness-based Agent Transparency model, which identifies and organizes data an agent needs to share with the human teammate to support their situation awareness, trust, and appropriate reliance upon the agent

4) Human-AI Reinforcement Learning approaches through Human-in-the-loop systems that provide improved decision-making in dynamically changing environments where data availability and computational resources will be limited

5) Joint Human-AI decision making capabilities developed through principled frameworks for integrating human and AI decisions and AI-based approaches to orchestrating information flow among team members.
POC: Bill Evans, arthur.w.evans20.civ@mail.mil

Synchronizing Mobility Aircrews and Resources for Transportation (SMART) Team. AFRL's Airman Systems Directorate SMART team is developing work-centered design and collaborative automation concepts to optimize crew mission scheduling, readiness and training advancement for mobility operations. Recently, the team worked with the 62nd Wing operations group and conducted observations at three C-17 squadrons. This data gathering provided valuable information on the complexities of balancing crew mission scheduling and training activities.
POC: Mr. Jeff Wampler, jeffrey.wampler@us.af.mil

Task Force True North (TFTN) Initiative. AFRL's 711 HPW is contributing to the TFTN through the utilization of machine learning and explainable artificial intelligence (XAI) approaches to assess squadron level risk for suicide within units across the Air Force population. The 711 HPW XAI approach provides overall metrics and evaluations of interventional strategies developed under TFTN. The use of big-data approaches can be used for precision interventional targeting of "at risk" squadrons for future embedded Operational Support Teams, which is a program led by the Air Force Surgeon General's office. POC: Dr. Ryan Kramer, ryan.a.kramer2.mil@mail.mil

Cognitive Science and Human Robot Teaming Program Review. The Office of Naval Research is hosting the review from May 29 - 1 June 2018 at the Holiday Inn, Ballston in Arlington VA. POC: Dr. Thomas Mckenna, tom.mckenna@navy.mil

OTHER ACCOMPLISHMENTS

Automated Collaboration Collection & Relationship Understanding Environment™ (ACCRUE). Army Research Laboratory, Army Research Institute, DARPA, and OSD invested in a solution that analyzes the activity of human and electronic interaction networks, giving trainers and commanders insights into organizational performance down to the individual level. ACCRUE measures and visualizes electronic interaction networks and the network of human (face-to-face) interactions. It taps chat, email, and other electronic communications and measures staff interactions using badges that collect socio-metric data concerning face-to-face interactions. Algorithms fuse and analyze these data and visualize the network of activity. Trainers have used ACCRUE visualizations to identify, for example, brigade members who are completing their tasks but not integrating well with other staff, and officers who are taking over the work of their seconds in command.
POC: Jared Freeman freeman@aptima.com

OTHER ACCOMPLISHMENTS (Continued)

Trainable Undifferentiated Agents for Rapid Constructive Force Generation. Time and costs associated with developing, validating, and deploying adaptive human simulations (agents) are barriers to their wider adoption in domains, such as team training and intelligent support systems. The current state-of-the-art in agent development is for a team of AI, cognitive science, and subject matter experts to define, implement, and integrate the agent's knowledge and skills over a 3–15 year development period (depending on the task complexity). The goal of the Air Force Research Lab's effort is to dramatically reduce agent development time and costs needed to develop intelligent agents for team-training and intelligent mission support. Recently, in-house development and validation efforts for synthetic teammates have demonstrated their capability to support training in naïve human teams. A critical next-step is to minimize the time and cost required to produce agents capable of acting as teammates, adversaries, or aides. New capabilities proposed here will leverage recent in-house successes in computational approaches to text comprehension, situation awareness, and dialog management, as well as build on novel theoretical approaches to instructing artificial agents.
POC: Dr. Chris Myers, christopher.myers.29@us.af.mil

Closed-Loop Oxygen Generation and Delivery Program. This Air Force Research Lab effort resulted in maximized safe oxygen delivery and minimized oxygen/power consumption. S&T accomplishments: 1) successful mitigation of hypo/hyperoxemic events in pre-clinical/clinical models, 2) generating a novel mechanical ventilation/oxygen concentrator interoperable system and 3) receiving an FDA Investigational Device Exemption to conduct a first-of-its-kind clinical trial utilizing closed loop control of oxygen delivery during mechanical ventilation in trauma patients.
POC: Dr. Todd Nelson, william.nelson.35@us.af.mil

Cognitive Assessment Metrics and Emerging Reality Augmentation (CAMERA). AFRL's CAMERA program objective was to develop validated cognitive workload measures and metrics to assess the impact of Situational Awareness (SA) technologies on soldier cognitive workload. S&T accomplishments: 1) Developed scenarios that were designed to variously tax cognitive workload and SA, 2) Developed a high-fidelity PACOM environment with local national and insurgent behavioral profiles, realistic weather, wildlife, and audio, 3) Completed pilot studies to establish test methodology for means to collect physiological metrics such as voice data, eye movements/pupillometry, and electroencephalogram and 4) Approved FY17 STO-R to develop standard documented test bed to assess impact of new SA systems on decision-making and workload during the development cycle. POC: Dr. Todd Nelson, william.nelson.35@us.af.mil

Mission Prep and Debrief. The Air Force need is to address shortcomings in the current post-Air Tasking Order planning process for near-peer, contested operating environments—the sort of mission that Exercise Red Flag at Nellis Air Force Base simulates. Presently, the planning process is largely non-digital and consumes considerable time within each exercise. As a result, aircrews spend excessive time deciphering paper documents, copying information, and updating whiteboards which can result in dangerous transcription errors and misunderstandings. The most unfortunate training impact is the time taken from what the warfighters are there to do—tactical mission planning and execution. The research goals of this effort align with enduring challenges in machine intelligence and human-machine teaming. AFRL established a new testbed dedicated to make mission planning *faster, safer, and better* by:

1) Quickly parsing existing documents and data sources,
2) Keeping all planning documents, communications, and other materials digital,
3) Providing a user-friendly web application with best-of-class technology and
4) Integrating artificial intelligence technologies to understand, evaluate, and suggest plans

The system is now able to parse the Air Tasking Order and provide the mission commander and other planners with a set of web interfaces mirroring their existing process. Work continues with digital maps, cognitive agent assistance, and a flexible user interface. POC: Mr. Joshua Ziegler, 711HPW/RHAC

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