

# AFRL FIGHT'S ON!

THE AIR FORCE RESEARCH LABORATORY

VOLUME 42  
SPRING 2021

## MY JOURNEY TO INSPIRE

S&T Professionals from Across AFRL Energize Workforce During Event



I'm a huge TED Talk fan. Whether I agree with the overall message or not, I always find something useful to contemplate. So, I was extremely excited to learn about the AFRL's TED-like event: Inspire. I went to YouTube and watched all the exciting past Inspire presentations. I couldn't wait for the day I could inspire others the same way that I was.

I put this thought in the back of my head and continued to dive headfirst into my research. I used a portion of my first year at the AFRL to present my research inside and outside the organization via conferences, leadership meetings, and lecture series. As a junior researcher, it was important for me to present my efforts and welcome constructive feedback from various audiences on the connection between my work and the future fight. Towards the end of my first year, I felt comfortable presenting my work, so when the call came to participate in Inspire 2020, I applied. To my joy, I was selected to join seven other inspiring speakers from various units of the AFRL.

I currently research ways of bringing humans and technology closer to more natural communication by using speech. Similar to how graphical user interfaces revolutionized how we interact with the personal computer, I believe a similar paradigm shift is on the horizon with voice interfaces. With guidance from my Inspire coaches, there was an opportunity to talk about and demonstrate what this might look like.

The thought of co-presenting with a voice interface was both exciting and terrifying. I thought the demonstration would be

**Dr. Nia Peters giving a talk titled "Toward Natural Human-Machine Communication," in which she discussed how her passion for language and technology drives her desire to develop a conversational interface that will enable humans and machines to communicate seamlessly.**

engaging and an excellent illustration of our research. However, I couldn't help thinking about everything that could go wrong. I put those fears aside and embraced the help of my colleagues, coaches, and the Inspire planning and logistics team. Although the preparation was extensive, I was able to articulate my research, demonstrate Conversational AI capabilities, and express some of the challenges.

Before Inspire, I was used to presenting to leadership or to a scientific audience, but I wasn't as familiar with the TED Talk-style structure. Needless to say, it was a steep learning curve, but looking back I wouldn't change a thing. I acquired a new skill, engaged with very talented and knowledgeable individuals, and shared my passion for language technologies and their benefit to the Warfighter and to the world. ★

Dr. Nia Peters, Research Electrical Engineer, RHWS

# AFRL'S SPHINX

## Serves as 480 ISRW Analysis and Exploitation Teams' Measure of Effectiveness Tool

Sphinx is a collaborative, networked, predictive analysis software capability that offers a unique intelligence analysis fusion resource. This includes a measure of effectiveness (MOE) assessment mechanism for both individual analysts and team performance as well as After-Action Report (AAR) and debrief capabilities for the Command, Control, Intelligence, Surveillance, and Reconnaissance (C2ISR) community. Sphinx is targeted as an enterprise-wide solution for the 6,700 personnel in the 480th Intelligence, Surveillance, and Reconnaissance Wing (ISRW). It's also currently used by the Combined Air Operations Center (CAOC) in the US Central Command (USCENTCOM) as a source for predictive analytics and analysis MOE tracking. This analytical collaboration prototype empowers analysts with the ability to generate predictive assessments on high-value problem sets and Priority Intelligence Requirements (PIRs). Users generate a predictive assessment using industry standard estimative language, including a free text justification and linked sources associated with their analytic process. After submitting an initial response, analysts are able to view other analysts' predictions and update their dynamic predictions as events unfold.

Predictions are evaluated based on ground truth outcomes using a Brier score to assess accuracy. The Brier score metric measures the accuracy of probabilistic predictions that additionally account for the magnitude of responses (Brier, 1950; Rufibach, 2010). Brier scores are calculated on a range

of 0-2, with scores lower than 0.5 considered moderately accurate, while scores approaching 0 are considered to be very-accurate (e.g., much like golf scores where lower values equate to better performance). Individual performance metrics are tracked and aggregated, facilitating the identification of gaps, such as lack of actual ISR collection; knowledge of collection or information that might have been available; training deficiencies; or analytical tradecraft shortfalls. In the fourth quarter of 2020, Sphinx was evaluated with four 480 ISRW Distributed Common Ground System (DCGS) Analysis and Exploitation Teams (AETs), consisting of 45 individual analysts answering 42 questions, providing 48 assessments as part of a mixed individual and group response approach.

In early 2021, the DCGS conducted a second trial for Sphinx, with 350 analysts answering 81 questions and providing over 800 assessments. The emphasis for this second round of testing was scaling to a larger sample population and increasing the amount of data for after-action research and analysis. Feedback and performance benchmarks from these two large-scale evaluations have served to refine operational requirements for Sphinx. The system is currently onboarding to the Air Force's Platform One cloud-based hosting network to improve scalability and security. Future work includes upgrades to the User Interface (UI) as well as agile software development to support rapid and flexible system augmentation. These efforts will continue to ensure Sphinx serves as the preferred solution to satisfy the 480 ISRW's requirement for an operational analytical MOE capability in the DCGS, as well as address the continually evolving use cases and operational needs within the ISR domain. ☆

Dr. John Camp, Multi-Domain Systems Section Chief, RHWAS

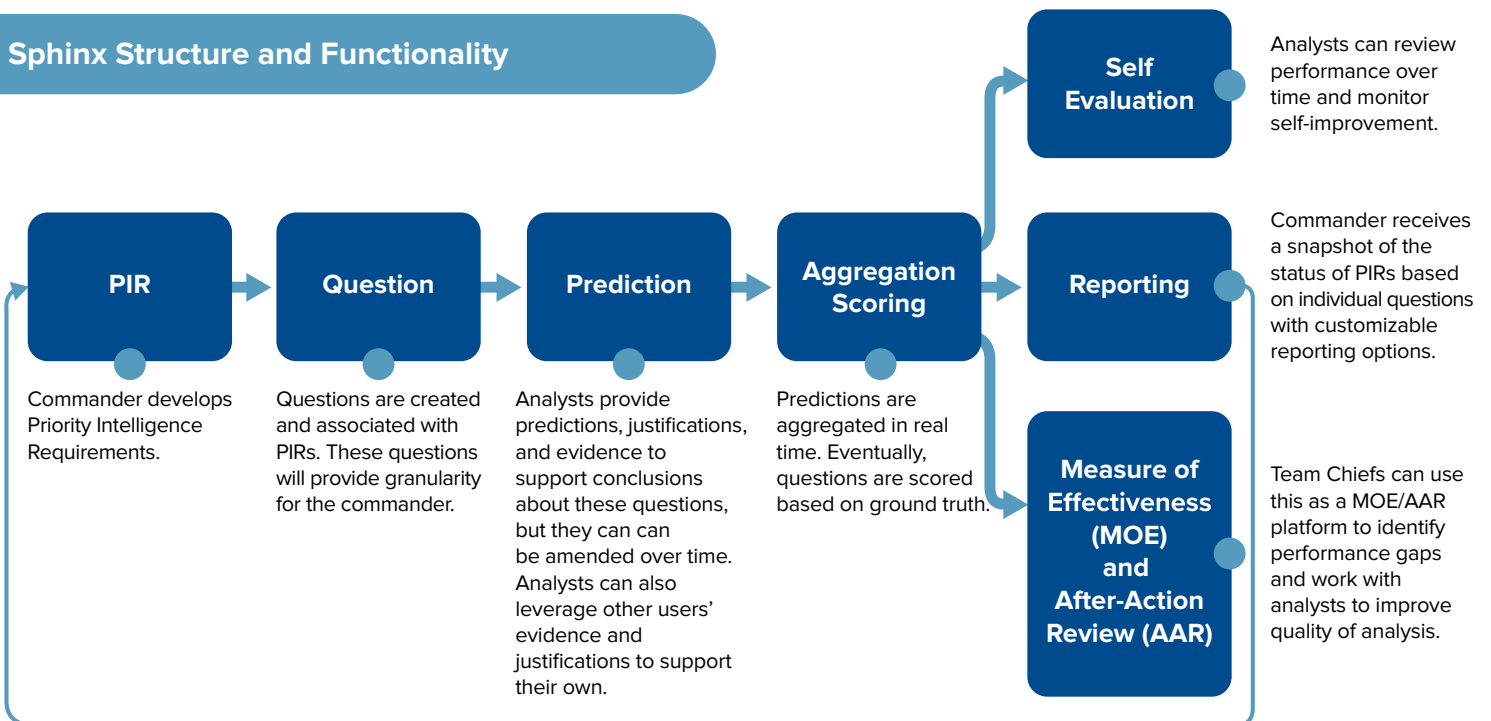
Dr. Jerred Holt, Joint All-Domain Integrated ISR Program Lead, RHWAS

Dr. John Kegley, Research Psychologist and Sphinx Team Lead, RHWAS

Ms. Heidi Harkins, General Engineer and Sphinx Engineering Lead, RHWAS

Dr. Bradley Schlessman, Research Psychologist, RHWAS

### Sphinx Structure and Functionality



# THE HUMAN COMPONENT OF THE MACHINE

Team members across the AFRL and industry have come together to address the Manned-Unmanned Teaming (MUM-T) component supporting the Skyborg Vanguard. The Human Systems Integration (HSI) team is addressing several components where the human operator, air or ground based, will interact with a dynamic, unmanned air vehicle. A Skyborg-enabled human operator is different from a Remotely Piloted Aircraft (RPA) pilot, since the human operator is not envisioned to be trained as a pilot: The majority of vehicle control, response, and, in some cases, decision making after being given a task are done by an onboard autonomous agent. The MUM-T construct, when viewed from this aspect, requires a holistic approach to include, but not limited to, mission planning and debriefing, including integrated planning with unmanned assets. This also includes transferring manned and unmanned asset utilization data to different Human-Machine Interfaces (HMI) on air and ground operator Battle Management Command and Control (BMC2) stations, operator and maintainer training, and understanding what data is required to maintain situation awareness of ownership, along with the unmanned assets under the operators authority while maintaining a manageable cognitive workload.

To do this, the HSI team has gathered initial mission planning and human-machine-interface designs and requirements related to RHWC's SkyFlagOne (SF1) Command and Control (C2) HMI, RHWL's Metis Mission Planning software, and RHWL's Live Virtual and Constructive Network Control Suite/Performance

Evaluation Tracking System (LNCS/PETS) from across the greater HSI team. This also includes collaboration from related RH and RQ 6.2 and 6.3 efforts as well as our Skyborg HSI System Design Agent (SDA) teammates. The team is specifying data and design requirements for an initial implementation of the prototype debrief capability that focuses on analyzing flight test and modeling and simulation test results. These data requirements will inform the adaption of the LNCS/PETS operations-focused debriefing capability to support Skyborg engineering analyses. The ability to bring multiple 6.2 and 6.3 efforts together with rapid technology development under the Skyborg Vanguard helps develop and define HSI standards for MUM-T and mission execution in a purposeful and relevant application space. ☆

Ms. Kristen Barrera, Principal Research Psychologist, RHWC



## 2020 FOURTH QUARTER AWARD RECIPIENT

### RH

#### Collaboration

RHW Support Skyborg Team

Ms. Kristen Barrera

Mr. Allen J. Rowe

Mr. Michael Lambert

Mr. Brandon Nolan

Lt John Gillispie

Ms. Sarah E. Bowman

Mr. Philipp Peppler

Lt Lauren Gallego



Courtesy Photo Artwork by AFRL

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## FIRST QUARTER AWARDS

### 711 HPW

**Civilian Category III**  
Dr. John Kegley

### RH

**Senior Noncommissioned Officer**  
MSgt Jeffrey Held  
**Company Grade Officer**  
1st Lt Meghan Strang

## SPECIAL AWARDS

### MILITARY AWARD

**Meritorious Service Medal**  
Lt Col Jesse Somann

### RHW CERTIFICATES OF SERVICE

**40 Years of Service**  
Dr. Timothy Anderson  
**10 Years of Service**  
Mr. Stephen D. Plassman

## 711TH HPW/RHW

### Hails

Michael Neill • Justin Nelson  
2Lt Emmie Swize • 1Lt Sarah Soffer  
Capt Foster Davis • 2Lt Michaela Dimappi  
TSgt Joel Dumont • Capt Paul Grossi  
Michael Dougherty • Grace Cope  
Lt Col Christopher Terpening • Mr. Dave Hoeflerlin

### Farewells

TSgt Derek Smith • 1Lt Malissa Perez  
Lt Tyler Lucas • Maj Eric Wolf  
Lt Col Jesse Somann • TSgt Kacper Sovinski  
Lt Lauren Gallego • Maj Peter Leestma  
1Lt David Clement • Lt Col Tamara Borchardt  
Brian Geier • Maj Kyle Hart • Mr. Casey Phillips



Published quarterly since 2001, Fight's ON! continues to serve as the Division publication for our partners and features innovative science and technology that is accelerating and revolutionizing readiness.

Distribution Statement A / Approved for public release; distribution is unlimited.

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Cleared / Case # AFRL-2021-2055

711 HPW/RHW Core Research Areas:

- Cognitive Models
- Personalized Learning and Readiness Sciences
- Systems Analytics
- Collaborative Interfaces and Teaming
- Multisensory Perception and Communication