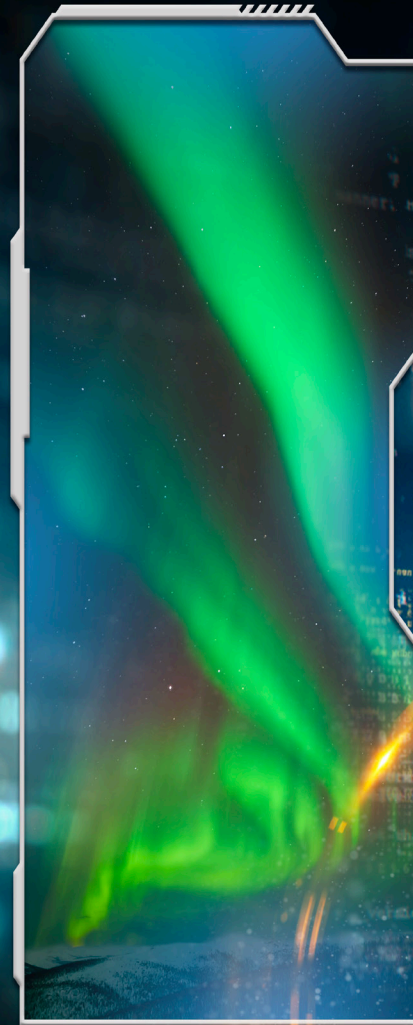


# WEATHER DRIVES BEHAVIOR



FLIGHT PLAN

2022



**557TH WEATHER WING**  
DETERRENCE THROUGH OPS





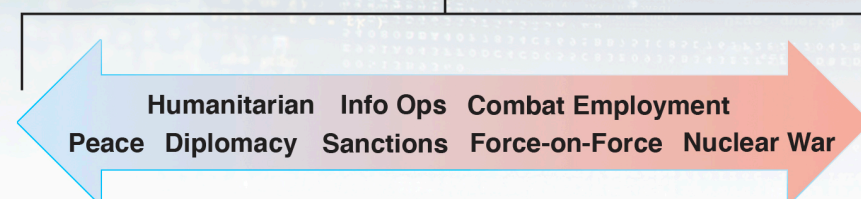
## 557TH WEATHER WING FLIGHT PLAN

### The Bottom Line –

#### DETERRENCE!

The 557th Weather Wing's operations directly contribute to the nation's ability to deter its enemies across the conflict continuum in support of Combatant Commanders. This flight plan communicates why we exist as a wing, how we fight, and what we bring to the fight. Each of our 12 operational squadrons is uniquely focused on a specific aspect of the National Defense Strategy (NDS).

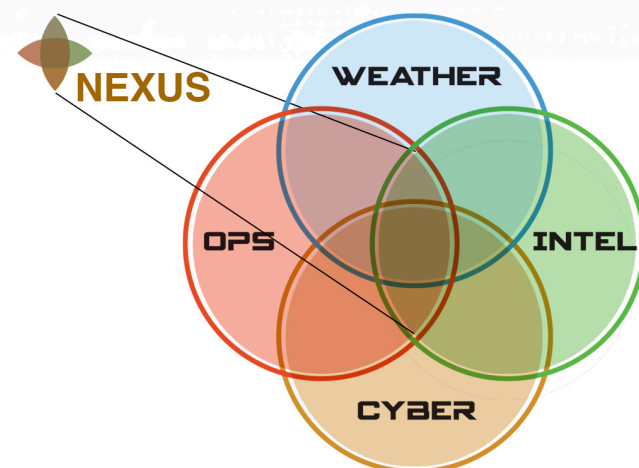
Strategic Deterrence – **NUCLEAR TRIAD**  
Conventional Deterrence – **AIR SUPERIORITY**  
Integrated Deterrence – **INFORMATION DOMINANCE**



### Why We Exist:

- Predict environmental threats.
- Protect U.S. / Allied Forces and contribute to positive mission outcomes.
- Deny the enemy victory; expose adversary intentions.

Weather drives behavior, cyber enables behavior and intelligence interprets behavior. 557 WW exploits the **Nexus** to influence behavior!



### What We Bring to the Fight:

- Assess and predict adversary behavior by accurately depicting and forecasting environmental conditions.
- Influence operational decisions to overwhelm adversaries, while maximizing kinetic and non-kinetic effects and options.
- Drive behavior through authoritative data, actionable information, and asymmetric knowledge.

557 WW provides environmental forecasts designed to enable Combatant Commanders to achieve theater and global outcomes across the competition continuum.



## INFORMATION WARFARE - AF FORCES CYBER

On 11 October 2019 557th Weather Wing was assigned as a subordinate unit to the newly activated Sixteenth Air Force, headquartered at Joint Base San Antonio-Lackland, Texas, and is the first-of-its-kind Numbered Air Force (NAF). Also known as the Air Force's Information Warfare NAF, the 16th integrates multisource intelligence, surveillance, and reconnaissance, cyber warfare, electronic warfare, weather, and information operations capabilities across the conflict continuum to ensure that our Air Force is fast, lethal and fully integrated in both competition and in war. 16th AF provides mission integration of IW at operational and tactical levels... recognizing the role of information in creating dilemmas for adversaries in competition and, if necessary, future conflicts.



**WHAT IS INFORMATION WARFARE?** The employment of military capabilities in and through the information environment to deliberately affect adversary human and system behavior and preserve friendly freedom of action during cooperation, competition, and conflict. While any capability can be used to create an informational effect, the principal Air Force capabilities integrated and applied to achieve desired effects in the information environment are cyberspace operations; electronic warfare; information operations; and intelligence, surveillance, and reconnaissance, AND WEATHER.



# DISTRIBUTED GLOBAL OPS

## 557 WW



### 557 WW Mission:

Apply science to mission, predict and influence behavior

### 557 WW Vision:

Recognized as an operational Wing conducting offensive operations imposing cost on the adversary.

### 557 WW within 16 AF Mission Directive:

The Commander, 16 AF, Shall: Synchronize daily operations of Cyber, ISR, EMSO, IO, and Global Weather capabilities across the competition continuum.

### 557 WW Mission Essential Functions:

#### MEF 1

Operate systems that continually collect, process, and protect environmental data to exploit the air, land, space and cyberspace domains.

#### MEF 2

Rapidly create, disseminate, and integrate environmental intelligence to give CCMDs and Force Providers the decisive advantage across the range of military operations.

### OUR MISSION CONTRIBUTIONS:

- Electro-Magnetic Spectrum Operations maneuver space
- Orbital Warfare
- Generate Combat Power
- Resource Protection
- Operational Planning (asset, logistics, and timing optimization)
- Targeting/collection optimization through the Intelligence Community
- Defensive Cyber Operations
- Predict adversary behavior
- Expose adversary intentions

### 557 WW'S MAJOR NDS FOCUS AREAS:

- Create maneuver space across all domains.
- Influence allied and adversary decisions.
- Shorten military engagements by reducing risk to force and mission.



### COMMANDER'S LEADERSHIP PHILOSOPHY:

Empower people to do great things and get out of the way

Expect hard work, reward initiative

You get what you tolerate; your tolerance sets standards

Trust in the foundation of command

It's ok to dissent, but we must support final decisions

It's more important to be your best than to try your best

Know when to lead and when to follow

Bad news doesn't get better with time – tell the boss quickly and offer solutions

Know your responsibility and authority. If a decision is yours to make, make it.

At the end of every decision is an Airman, civilian and their families

Nobody is perfect – Know the difference between a mistake and a crime

Just because you're moving, doesn't mean you're headed in the right direction

- 557TH WEATHER WING COMMANDER



# RED/BLUE FORECASTING

## 1ST WEATHER GROUP CONTRIBUTIONS TO DETERRENCE:

1st Weather Group leverages talented, multi-capable Airmen and advanced application techniques to apply the science of environmental forecasting to mission outcomes. Comprised of six squadrons each focused on unique problem sets, 1 WXG exploits operational-level environmental knowledge to predict and influence adversary behavior, as well as deliver decision-quality forecasts and weather threat assessments to commanders at all levels. 1 WXG Airmen compete in the Information Warfare realm every day, sitting alongside mission partners to analyze adversary actions and generate fresh insights for commanders. Finally, 1 WXG units generate combat power for combatant commands as the go-to sourcing solution for theater Base Operating Support. These Airmen leverage their in-garrison training and experience while in a deployed environment to provide resource protection for weapons systems and personnel in the joint fight.

**1 WXG IN THE FUTURE: 1 WXG is rapidly accelerating operations to meet demands for near-immediate information. This will be accomplished by the following:**

### Initiative #1 - Migrate to the Cloud

Migrate to a distributed operations framework operating in the cloud to enhance survivability in a contested environment and increase production capacity.



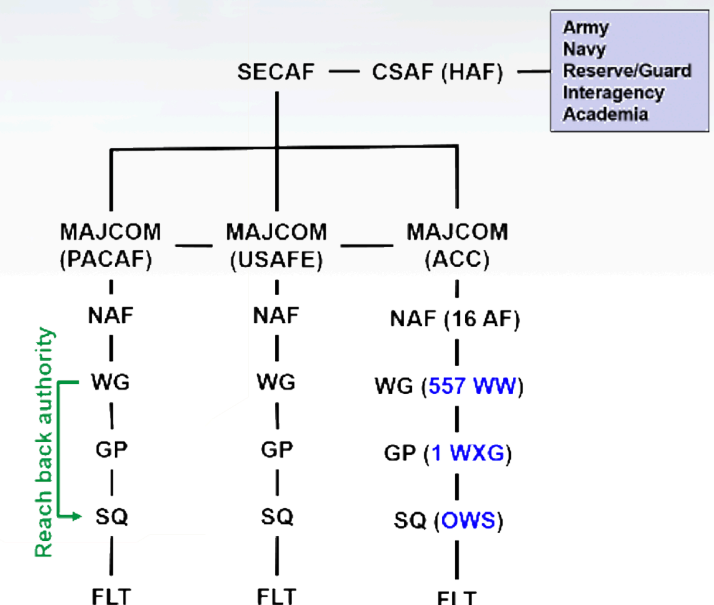
## TASKING AUTHORITIES

**“557 WW... is a specialized mission wing under ACC to streamline the execution of weather support to global operations.”**

*Program Action Directive 14-03, Realignment of the Air Force Weather Agency, January 2015*

### How the Wing is Tasked:

- Contingency or Crisis Action - operational requirements for environmental data and intelligence are documented in OPLANS and OPORDs (usually within Annex H).
- Exercises - CCMD and MAJCOM exercise support requirements are documented in the Joint Training Information Management System (JTIMS) and/or in EXORDs.



557 WW... is a specialized mission wing under ACC to streamline the execution of weather support to global operations. 557 WW's manpower baseline is based on its assigned mission – to generate Information Warfare (IW) outcomes. The Wing Commander has decision authority on resource allocation and is accountable to the chain of command (16 AF/CC & COMACC) to accomplish this mission. Accordingly, the Wing is predominantly an Employed-in-Place / Persistently Employed force that publishes global/regional products via AFW-WEBS and JET accessible by any CAC-holding DoD member. Requests for Wing support beyond its mission directive come at the expense of its capability to meet its assigned mission. Resources to accomplish this support will be allocated at the discretion of echelon commanders within the Wing.

The 557 WW Commander and subordinate group/squadron commanders establish priorities, allocate resources, assess surge capacity/capability, determine training requirements, report readiness posture, and establish COOP for their commands within the Wing.

The method to request 557 WW capability follows joint/institutional processes that allows senior leaders/commanders within the Wing to prioritize and allocate limited resources to missions/requirements. The method to fill requirements/requests includes the chain of command.

*Joint and Air Force Publications and Instructions are being changed to reflect that our [557 WW] lines of authority have moved from HQ USAF (when AFWA was a FOA) to the NAF and MAJCOM Commanders and to reflect institutional requirements processes!*

**557 WW Commander**





# AUTHORITIES

## COMMAND AUTHORITY

(Title 10, United States Code)



557 WW is baslined to accomplish its tasked mission -- to generate Information Warfare (IW) outcomes. As such the Commander has decision authority on resource allocation and is accountable to the chain of command (16 AF/CC & COMACC).



President of the United States (Commander-in-Chief)



Secretary of Defense



Secretary of the Air Force



Major Command (ACC/CC)



Numbered Air Force (16 AF/CC)



Wing (557 WW/CC)

1 WXG/CC



and



2 WXG/CC

Subordinate Squadron Commanders

## COMBATANT COMMAND AUTHORITY

(Title 10, United States Code)

Combatant command (command authority) provides full authority over assigned forces to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority). The military services provide forces and equipment as directed to the combatant commands. 557 WW receives tasks (operational or exercise orders) from combatant commanders, normally via their air component command, through ACC and 16 AF.



COMBATANT COMMANDERS



Issue OPORDs/EXORDs ACC - 16 AF - 557 WW

## STAFF AUTHORITY

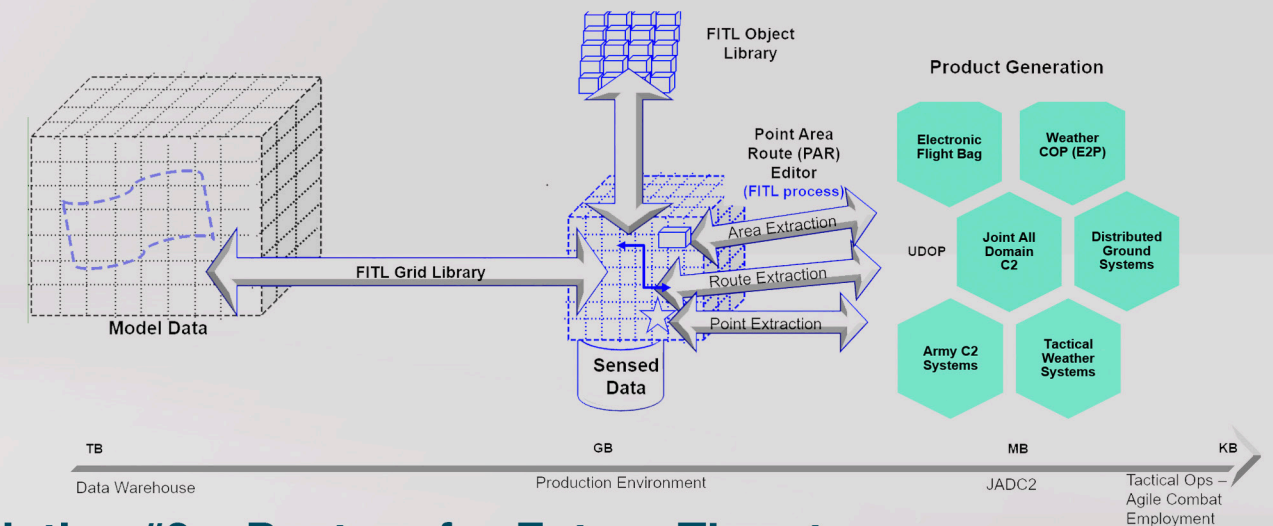
Chief of Staffs and staff functionals at all echelons (SECDEF, SAF, HAF, ACC, 16AF, 557 WW, etc.) have NO command authority. They exist to support their respective echelon's secretary or commander to accomplish the organization's mission to organize, train and equip. Staffs develop operational and functional instructions, manuals, and guidance; however, commanders have legal authority to accomplish the assigned mission how they see fit.



# THEATER OUTCOMES

## Initiative #2 – Data-Centric Operations and C2 Systems

Employ machine-readable code to expand content and simplify introduction of environmental characterizations in planning and execution in the Joint All-Domain Command and Control (JADC2) architecture. By characterizing the environment once and delivering this characterization in multiple configurations, end users are provided a common depiction of the operating environment.



## Initiative #3 – Posture for Future Threats

Reliance on machine-readable code will pave the way for greater use of Artificial Intelligence (AI) and Machine Learning (ML). This will guide informed decision making processes and maintain a higher operational tempo than potential adversaries.







17 OWS

## CHINA AND NORTH KOREA

### 17TH OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 17th OWS Geckos deter our adversaries by synchronizing diverse talents with innovative tools and continuous process improvement to tackle emerging problem sets in the United States Indo-Pacific Command area of responsibility. Leading the way in the 557th Weather Wing, the Geckos are forging the future to expose, predict, and influence adversary behavior through integration with 16th Air Force and DoD-level intelligence partners. Sharing this information with warfighters across the combatant command synchronizes operations plans thereby optimizing execution from the tactical through the strategic levels of warfare. The Geckos' dynamic team of Joint weather and cyber professionals includes the Joint Typhoon Warning Center (JTWC). The JTWC provides the DoD with tropical cyclone forecast data in the Pacific and Indian Ocean basins, accounting for 75% of the Earth's tropical cyclone activity.



### UNCLASSIFIED VIGNETTES:

Exercise Cobra Gold is a multi-lateral Joint Chiefs of Staff exercise in Thailand to test and evaluate the readiness of our combined armed forces, share TTP's, defend networks in a modern INFOSEC environment, and command and control interoperability aimed primarily at countering near peer aggression and maintaining solidarity in the region. In coordination with U.S. Army Pacific (USARPAC), the Geckos were integral in the planning stages of Cobra Gold, providing mission-limiting data that was included in the Joint Intelligence Preparation of the Operational Environment as well as Road to War briefs that were used during pre-exercise academics. As the Lead Meteorological Production Unit, the 17th OWS provided daily Joint Operations Area Forecasts and held METCONs with component SWOs at USARPAC, PACAF and U.S. Pacific Fleet to ensure a single, joint and unified forecast. This is just one of the numerous unique types of exercises and operations the Geckos support that validates our ability to support OPLAN execution.

The 17th OWS provides weather intelligence across four security enclaves to an assortment of METOC and IW users. The team's heightened focus on understanding how weather drives behavior fosters vigilance in their daily operations. Recently the Geckos identified potential adversarial information warfare tactics through counter-offensive weather measures. The situational understanding of their area of responsibility allowed members to identify and report suspect commercial weather data manipulation in high-interest areas to the Intelligence Community. Upon further analysis, intelligence analysts determined that the Geckos had exposed adversarial intent and gained a better understanding of their behavior. The fidelity of information enabled critical lines of effort to remain tasked.



2 WSS

## DEFENSIVE CYBER OPERATIONS

### 2D WEATHER SUPPORT SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 2d Weather Support Squadron is tasked to provide persistent and proactive cyberspace defense to assure Trans-regional, Multifunctional, Multi-domain capabilities, mitigating solar, atmospheric and cyber threats across the range of military operations.

The squadron is composed of 46 personnel within the weather and cyber career fields. Functional subject matter experts from each area work together to defend the weather weapon systems, network platforms and the Mission Relevant Terrain-Cyber.

These defensive cyber operations are vital to deterring adversaries and safeguarding the data integrity of the 557 Weather Wings high performance computing center and disparate mission systems, assuring data integrity of critical weather information utilized by 10 combatant commands, 16 agencies, 6 geographically separated units, and the Intel community at large. Trust in these products is critical to enabling informed decisions allowing warfighters to choose the weather for battle to drive the adversary's behavior, while facilitating information protection for the United States of America and its Allies interests.



### UNCLASSIFIED VIGNETTES:

(2 WSS) plans and executes defensive cyber operations to secure, protect, and defend 557 WW mission-critical information systems. As part of these ongoing operations, 2 WSS recently partnered with 852 Cyber Protection Team (CPT) to conduct "hunt ops" for known State-Actors who consistently target DoD information systems and networks for adversarial gain. Key to the success of this operation, 2 WSS partnered with 38th Engineering and Installation Group to install a remote network connection, which enabled 852 CPT to conduct hunt operations from their home station and employ all available tools. Building upon the success of the operation, the 2 WSS partnered with 852 CPT to develop a two-day training course that significantly improved 2 WSS's knowledge and utilization of cyber defense tools, techniques, and procedures.

Critical to defensive cyber operations, 2 WSS developed and implemented a bi-weekly Cyber Threat Synch to resolve known vulnerabilities and improve the Wing's risk mitigation strategy for cyber. Through this forum, mission partners within the Wing are able to synch, prioritize, and develop solutions for remediating cyber vulnerabilities. Within weeks of implementing the Cyber Threat Synch, the team quickly resolved two significant vulnerabilities and enhanced the Wing's cybersecurity posture within their \$322 million dollar data center. Since these efforts will remain ongoing, the synch will continue to align the Wing's mission priorities and assess forces and risk to mission, with cybersecurity baked into the process vice being a reactive to rising cybersecurity challenges.

Weapons system maintenance is a key component of the 2 WSS's proactive cyber defense strategy to ensure early warnings and indicators of compromise are rapidly identified. In coordination with the Cyberspace Vulnerability Assessment/Hunter Program Management Office, 2 WSS ensures our weapon systems are up-to-date with the latest hardware and software. 2 WSS maintainers preformed a significant upgrade on two weapon systems in less than a week. This maximized the cybersecurity capabilities of the two \$300K weapon systems and increased the Wing's defensive cyber operations (DCO) posture by 200%. The team also created new maintenance SOPs to further expedite processes for future upgrades.







2 SYOS

## DATA MANAGEMENT/ USAGE INTELLIGENCE

### 2D SYSTEMS OPERATIONS SQUADRON CONTRIBUTIONS TO DETERRENCE:

2 SYOS operates the AF's largest Special Purpose Processing Node, a \$322M high performance computer crucial to generating critical environmental products and services supporting weather forecasters and command and control decision makers across the globe. They maximize trusted, reliable, and relevant environmental intelligence enabling warfighter operations. Our cyber professionals build and present a data operational picture through insights from environmental data ingest, management, and dissemination to enable the 557th Weather Wing's mission anytime, everywhere. This data ensures resource protection, operational planning, and intelligence collection for the DoD and partner organizations, and enables the DoD's sole space weather warning capability to secure the nation's strategic satellite fleet. 2 SYOS maintains the DoD's tactical weather location identifier program, which ensures transmission of and access to vital weather intelligence at deployed and oftentimes austere operating locations. Finally, 2 SYOS applies over 20,000 system patches annually to mitigate security vulnerabilities and assist defensive cyber operations for the 557 Weather Wing's Mission Defense Team.



### UNCLASSIFIED VIGNETTES:

- 2 SYOS manages and issues weather tactical location IDs in support of DoD operations and exercises. We manage 1,296 unique identifiers that are issued on an as needed basis and then reclaimed once the operation or exercise driving the effort ends. Recent notable efforts include:

*Exercise TRANSLUCENT BADGER, a contingency response event requiring weather support data at Lakehurst, New Jersey.*

*Afghanistan Retrograde, a multi-function aviation task force (MFATF) that required weather data to support Embassy Security during withdrawal of US forces from Afghanistan.*

- 2 SYOS manages and operates the 18K square foot strategic data center ensuring power, environmental conditions, and security for 76 TB/day data ingest, processing, and dissemination. The Systems Duty Officer supports ~3K systems across four security enclaves; ~4.7K trouble tickets and tracks ~1.3K production change activities per year.

*24/7 Staff continuously monitors environmental conditions, network, system, software, and data flow. Near immediate identification of problems and execution of restoration processes slashes downtime and outage to global users.*

*Technical support staff coordinates and integrates new capabilities into operations; ensures hardware installations meet all standards to maximize reliability over time.*



21 OWS

## RUSSIA AND EASTERN EUROPE

### 21ST OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

As NATO forces posture against increasing Russian aggression and Chinese influence in the region, the 21OWS Knights provide continuous joint operational-level weather support throughout the theater. Alongside Fleet Weather Center Aviation Detachment Navy personnel, the squadron's forecast products and support enhances the US and its Allies' ability to plan and posture operations and exercises throughout the theater. 21 OWS support also provides the intelligence community with situational understanding of environmental impacts influencing the adversary's behavior throughout the region. In alignment with efforts to deter and posture against Russian activities, 21 OWS products enable European Agile Combat Employment operations, Arctic Bomber Task Force missions, NATO Air Policing, NATO and Joint Coalition exercises, operations and exercises in Europe, and Intelligence, Surveillance, and Reconnaissance (ISR) missions. The squadron also manages the only European Mark IV-B satellite data station which is essential to ensure continual EUCOM METSAT capabilities.



### UNCLASSIFIED VIGNETTES:

- Deployment Support:** 21 OWS Knights deploy to support operations across the European continent to enable deterrence operations as well as interoperability exercises and training opportunities between the US, its Allies and partners. In Campia Turzii, a Romanian air base which permanently hosts MQ-9s supporting US and NATO operations in the Balkans and Black Sea regions, 21 OWS personnel provide continuous resource protection for personnel and aircraft. Deployed Knights directly support the European Deterrence Initiative and aide in the collection of actionable intelligence which is shared with Allies and partners. 21 OWS Knights also continuously deploy to support counter-terrorism and great power competition operations in Niger and Kenya.

- DEFENDER 2021 Exercise Series:** Throughout 2021, the 21 OWS Knights provided weather products that directly contributed toward exercise Defender Europe 21 (DE21). DE21 is a combined exercise with 28,000 troops from 26 nations over a four month time-frame. DE21 enabled NATO to test collective NATO and partner nation Russian deterrence tactics throughout Europe. The series of exercise events took place in the Balkans, Black Sea, Caucasus, the High North region, and Africa. The Knights contributed to DE21 exercises through resource protection, flight hazards and analysis charts that were utilized by operators, intelligence agencies, and mission planners throughout the various exercises and training events. The Knights also supported the first stealth bomber deployment, through the Bomber Task Force, into the Arctic from Keflavik, Iceland, showcasing NATO's resolve to deter Russia in any theater.







15 OWS

## ARCTIC AND UPPER LEVEL HAZARDS

### 15TH OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The Thunderbolts of the 15th Operational Weather Squadron safeguard the freedoms of the United States and its allies from the continuous and emerging hostile competitors by generating ready, innovative and professional forces. The Airmen of the 15 OWS lean into combat operations knowledge. Teams are forged by leveraging in-house tactical weapon system and software training and focusing on arctic region familiarization, leading the way to respond to future peer-to-peer conflicts. Innovative web-based cloud technologies have empowered the distributed operations capabilities by providing weather war fighters the ability to access data anywhere in the world. Airmen are then afforded the flexibility to execute their complete mission set cohesively in a decentralized environment. Those assigned to the 15 OWS accumulate the forecasting skill set needed to support manned and unmanned weapon systems across all branches. Holding the responsibility of ensuring the homeland's rapid response, deterrence against international adversaries is the Thunderbolts top priority. The diverse environmental and operational climate, embrace of tactical and technological expertise, and multi-capable, resilient Wingmen allow the Thunderbolts to strike anyone from anywhere.

### UNCLASSIFIED VIGNETTES:

- The 15 OWS is the lead weather unit responsible for the development of training and forecasting in the Arctic. After development and execution of specialized training, the 15 OWS will provide CCMD's with fully trained Airmen and pinpoint forecasting within the next highly contested AOR. The implementation and usage of red forecasting exercises will further integrate personnel into the forecasting process to outpace our adversaries in a contested battle space and a solution to a long-term strategic competition with China and Russia.



The 15th Operational Weather Squadron provided direct weather support to the Air Mobility Command's (AMC) Largest and Longest Full Spectrum Readiness Exercise, Mobility Guardian. As AMC's premier and flagship exercise, this is the only formal mechanism AMC has to assess and validate capabilities of rapid global mobility missions that resemble those implied in the National Defense Strategy (NDS). The 15 OWS provided tailored Terminal Aerodrome Forecasts (TAFs), custom Area Forecast Discussions, and Flight Weather Briefings while providing continuous resource protection. The weather products created supported AMC's first ever C-5 and KC-10 COMTT-A Operational Airborne Test. Additionally, AMC was able to successfully deploy and operate a Rapid Dragon C2 aboard a C-17 for the first time ever, proving the capability to mass deliver long-range strike weapons from a military cargo aircraft. The successful exercise provides CDR's with the ability to practice integration of combat and joint assets in a key design element to hone Mobility Air Force (MAF) core competencies while building joint interoperability.



The 15th Operational Weather Squadron solely provided a weather support team to aid in the success of Operation ALLIES WELCOME. The deployed team provided critical weather support to protect 10,000 Afghan refugees during the draw down of military presence in Afghanistan by providing tailored forecasts and briefings to installation leadership. The unparalleled support fulfilled SECDEF directive to provide asylum for Afghan nationals who provided assistance to DoD partners during the Afghanistan Campaign over the last 20 years.



2 CWSS

## OPERATIONAL TESTING, ENVIRONMENTAL COLLECTION, DT&E/TTP DEVELOPMENT

### 2D COMBAT WEATHER SYSTEMS SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 2d Combat Weather Systems Squadron (2 CWSS) is charged to innovate, test, and exploit environmental systems technology. Nicknamed "The Herd," 2 CWSS optimizes deterrence by empowering multi-capable Airmen for environmental intelligence superiority through a test-perfect-collect mantra. As the sole operational test unit for Air Force Weather Weapons Systems, the Herd tests strategic and fielded systems for all 557 WW mission contributions - the Herd is the final check before going live. Additionally, 2 CWSS conducts environmental reconnaissance for targeting/collection optimization, whole-of-government resource protection, and operational planning. Combatant commands employ the expertise of 2 CWSS to assess and develop environmental sensing strategies focused on environmental choke points, sensor suite optimization, data dissemination, and sustainment. Employment of one-of-a-kind teams comprised of Weather, RAWs, and Communication operators creates efficiencies gained and shared across test and collect mission sets. In essence, 2 CWSS establishes an asymmetric advantage to deter adversaries in each form by accelerating decision making abilities through operational test and environmental data collection.



### UNCLASSIFIED VIGNETTES:



During an operational utility evaluation, the Operational Test & Evaluation Fielded Systems Flight identified three critical vulnerabilities while ensuring the suitability and effectiveness of an upgrade to a fielded systems radar. The 2d Combat Weather Systems Squadron led engagements with various stakeholders to identify and verify vulnerability solutions prior to fielding. By testing, identifying, and fixing critical problems found in fielded systems, 2 CWSS mitigates interruption to operations and ensures information dominance through vigorously-tested Air Force Weather Weapons Systems' abilities to gather and disseminate environmental intelligence.



The 2d Combat Weather Systems Squadron conducts Operational Test & Evaluation on six strategic Programs of Record on behalf of the 557th Weather Wing. During an operational test of the Space Weather Analysis and Forecast System, 2 CWSS personnel identified Space Summary Bulletins were not updating with necessary information to forewarn of mission impacting solar activity (electro-magnetic spectrum impacts). The outage significantly affected space forecast support, EMSO, orbital warfare, and battle management. A fix was implemented within 24 hours, and ensured critical electromagnetic impacts were available to all DoD warfighters.



A team of weather system maintainers from the 2d Combat Weather Systems Squadron deployed to Andersen AFB, Guam, in July 2021 to install a Portable Doppler Radar (PDR) weather system. PACAF through ACC requested the PDR to fill an environmental data gap resulting from an outage of the island's fixed weather radar. During peak typhoon season and a high operations tempo, the PDR supported six major joint and coalition exercises/operations, strengthened seven United States' partnerships and projected the enduring presence of a bomber task force for USINDOPACOM. The rapid deployment of the 2 CWSS team displayed the squadron's ability to stand ready and solve global environmental data collection challenges.





16 WS

## MODELING & SIMULATION, TAILORED AUTOMATION, AI/ML

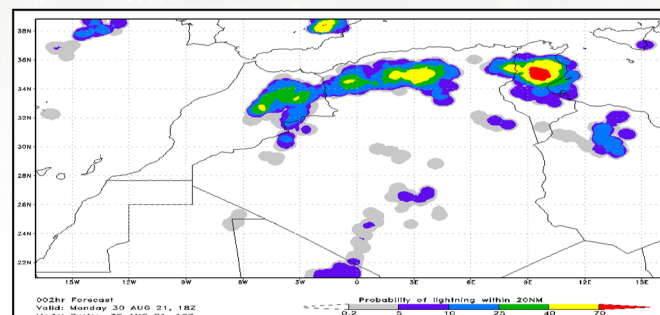
### 16TH WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 16 WS supports deterrence via contributions to: Resource Protection, Operational Planning, Targeting/Collecting Optimization, and Predicting Adversary Behavior. These contributions are made through four flights with specific missions: Tailored Products/Applications, Special Capabilities, Core Models, and Data Science/Analytics. The Tailored Products & Applications Flight provides tailoring of environmental output to meet specific warfighter needs via specialized models, algorithms, applications and through continuous stakeholder engagement. The Special Capabilities Flight empowers mission success with software expertise and employment of DevSecOps (Development Security and Operations), leveraging HPC (High Performance Computing), Edge and Cloud computing platforms. The Core Models Flight operates applications that produce global weather analyses and forecasts, which are in turn provided directly to warfighters or used as input for further tailored products and applications. The Data Science and Analytics flight generates and delivers actionable insights through operationally-focused data science. The flight offers three primary capabilities with model verification, alphanumeric data management, and artificial intelligence/machine learning.



### UNCLASSIFIED VIGNETTES:

- 16 WS rapidly tailors high-resolution ensemble model output for exercises in support of CCMD deterrence operations. A tailored 16 WS ensemble forecast for lightning was crucial to EX AFRICAN LION (6 CCMDs and 10 nations) as it enabled the Commanding General to make a successful "go" call for a multi-national Joint Forcible Entry jump, despite nearby lightning. This capability also ensured up to the minute resource protection on personnel and assets throughout the exercise.



- Accurate predictions of mission-limiting crosswinds enables improved operational planning and greater time on target for ISR and other deterrence aircraft around the globe. This enables customers to make mission decisions with a greater return on success as well as ensure mission planning support for combatant commanders globally.

Point Ensemble Probability (PEP) forecast identifying hurricane driven cross winds at a location in Puerto Rico in 2020

FERNANDO LUIS RIBAS DOMINICCI	18.4600 lat	-66.1000 lon	3 meters elevation	MAR
MODEL BOX INFO	18.4755 lat	-66.1390 lon	2 meters elevation	BL
20 km MEPS JLT 28/02/2020				
Surface winds	20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02
Wind Gusts GT 25 KT	0	0	0	47 43 46 40 31
Wind Gusts GT 35 KT	0	0	0	21 21 11
Wind Gusts GT 50 KT	0	0	0	7
Wind Gusts GT 65 KT	0	0	0	13
LLWS GT 30 KT	0	0	0	27
SUS XWIND GT 15 KT RWY:27	0	0	0	16 11 12 7
SUS XWIND GT 25 KT RWY:27	0	0	0	16 11 12 7
SUS XWIND GT 35 KT RWY:27	0	0	0	16 11 12 7
Precipitation	20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02
Precip GT 0.05 IN in 6 hr	0	0	0	22 29
Precip GT 2.0 IN in 12 hr	0	0	0	22 29
FZRA GT 0.01 IN	0	0	0	22 29
SN GT 0.1 IN	0	0	0	22 29
SN GT 2.0 IN in 12 hr	0	0	0	22 29
SN GT 6.0 IN in 24 hr	0	0	0	22 29
Thunderstorms	20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02 04 06 08 10 12 14 16 18 20 22	02 02
Lightning within 10 NM	0	0	0	22 29
Sys Wx within 25 NM	0	0	0	22 29



26 OWS

## AFRICA AND HURRICANES

### 26TH OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 26th Operational Weather Squadron (26 OWS) Airmen collaborate with intelligence analysts to consider environmental assessments and analyses later fused into mission planning of bomber task force missions across multiple areas of interest in order to evaluate adversary behaviors. 26 OWS converges weather with intelligence to boost understanding of key Africa Command problem sets and peer adversary actions to further enhance understanding and effectiveness of Red



Forces forecasting within the areas of interest. Squadron cyber warriors stay ahead of threats through identifying vulnerabilities and proactively securing unclassified and classified IT assets and weather weapons systems that form the foundation of the unit's ability to execute its mission. Additionally, 26 OWS generates responsive deployment teams that inject weather intelligence into contingency operations and Combatant Command named operations. Furthermore, 26 OWS drives United States Northern Command risk management decisions as the Lead Meteorological Production Unit for the Atlantic and Eastern Pacific through hurricane forecasting, tracking, and notification to numerous critical Department of Defense sites within two hundred miles of vulnerable coastlines, in turn mitigating damage to personnel and assets, maximizing readiness and availability of assets to deterrence operations.



### UNCLASSIFIED VIGNETTES:

- 26 OWS is the Lead Meteorological Production Unit for U.S. Northern Command, responsible for forecasting tropical weather within the Atlantic, Gulf, and eastern Pacific. During the 2020 and 2021 hurricane seasons, the squadron was instrumental in providing the combatant commander and staff with a common-operating picture of threats, analyses, and assessments prior to, during, and after each storm's landfall. The advanced warning assisted in the relocation or sheltering of countless assets and personnel from all services. For example, during Hurricane Laura, weather intelligence drove the cancellation of Joint Readiness Training Center maneuvers, reducing risk to Army units tasked to deploy and the evacuation of B-52s from Barksdale AFB for the first time in 15 years. These actions ensured forces remained combat-mission ready and also reinforced a critical leg of the nuclear triad.

- 26 OWS has expanded its environmental intelligence operations in direct support to U.S. Africa Command through both in-garrison and in down-range capacities. At home station, 26 OWS Airmen simultaneously generate weather intelligence used for both coalition force resource protection and the prediction of adversary behavior based on environmental conditions at locations that change frequently. 26 OWS Airmen have deployed in support of a wide array of objectives to challenge irregular, extremist, and potential near-peer threats on this continent. One such mission involves squadron personnel expanding on their base operations weather support tasks to provide resource protection support for emerging unmanned aerial systems (UAS) requirements in Niger as well as counter UAS initiatives being fielded by threat actors with objectives detrimental to the stability of U.S. and coalition operations.





25 OWS

## SOUTH AMERICA AND TRANSREGIONAL ORGANIZED CRIME

### 25TH OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 25th Operational Weather Squadron (25 OWS), located at Davis-Monthan Air Force Base, AZ, generates asymmetric advantage through weather intelligence. The squadron integrates with Department of Defense and inter-agency mission partners to deter National Defense Strategy adversaries, deny them influence, counter threats from transnational criminal organizations, and ensure homeland security. 25 OWS continuously generates combat power by deploying Airmen forward to enable power projection to satisfy Combatant Commander requirements. When at home station, 25 OWS Airmen provide resource protection for 53 Department of Defense sites across North, Central, and South America, providing Commanders with time to mitigate risk ahead of destructive weather events, enabling a ready force and ensuring homeland security. 25 OWS also converges with multiple Information Warfare units, combining global weather forecast capability for friendly and adversary locations with current intelligence to predict and counter adversary behavior and expose adversary intentions. By generating these insights, 25 OWS enables our nation to compete in the Gray Zone, achieving U.S. interests and deterring adversary escalation.



### UNCLASSIFIED VIGNETTES:

In March 2021 the government of Belize officially requested a supplemental ground based aviation radar from the U.S. in order to fill a gap in the counterdrug operational site picture off the coast of Belize and Honduras. Tasked to support U.S. Southern Command, the 25th Operational Weather Squadron provides the partner nation invaluable weather intelligence to develop a common operating picture, secure ground radar equipment, and protect personnel in the event of inclement weather to include tropical forecasts. This cooperative endeavor led to air tracks of interest and interdictions of suspicious aircraft movements, deterring transnational criminal organizations from conducting trafficking operations.



The National Air Security Operations Center in Sierra Vista, Arizona relies on the 25th Operational Weather Squadron to provide daily environmental data to secure America's most vulnerable entry points. Utilizing a national strategic asset, the MQ-9, Customs and Border Protection routinely flies intelligence gathering missions near the Southern border and has detected over 6,300 illicit activities resulting in more than 2,000 arrests and seizure of thousands of pounds of narcotics. Without the timely, accurate, and relevant weather inputs, these highly sensitive aircraft remain grounded and entry of illegal substances and personnel go unhindered.

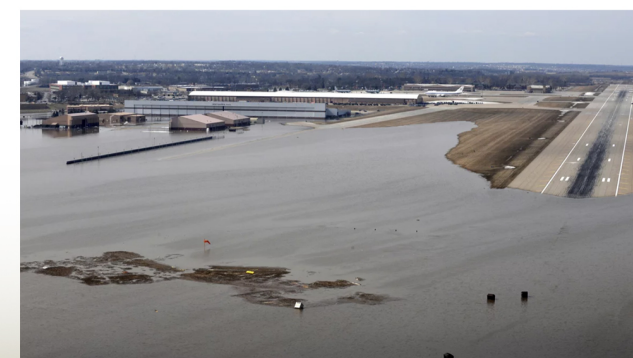
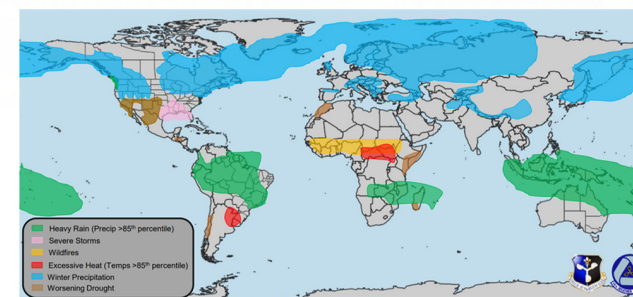


14 WS

## CLIMATOLOGY

### 14TH WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 14th Weather Squadron (14 WS) collects, protects, and exploits authoritative climate data to develop competitive advantages for the Department of Defense, intelligence Community, and NATO as the primary source of authoritative global surface and upper air observations. The 14 WS collects, stores, and assesses the past, present, and future state of the global atmosphere. This information (over 1 billion observations annually) and tailored climate analyses are used by military planners for air, sea, and land operations. Intelligence analysts use it to correlate adversary action with environmental indices, which helps to predict future adversary decisions. 14 WS climate products also assist in refining weapon systems basing and employment decisions, sensor fielding strategies, risks to installations and their resiliency, and informs national and inter agency policy worldwide.



### UNCLASSIFIED VIGNETTES:

The 14 WS recently authored the Arctic Climate Assessment. Information provided in the assessment is a mix of threats to airfield and installation operations, as well as general climatological patterns. The assessment provides Combatant Commanders insight into targets of opportunity for when certain parts of the Arctic are more susceptible to risk than others. The Arctic Assessment in combination with our Country Snapshots provide Combatant Commanders environmental risks to both friendly and adversarial forces within the region.

14 WS provided PACAF an assessment of their Agile Combat Employment (ACE) model based on authoritative climatological data. This information provided the Air Force component of INDOPACOM if and when airfields within the region would be most susceptible to weather events like tropical cyclones, ceilings and visibility limitations, and high winds. Additionally, the 14 WS weekly "State of the Climate" brief highlights every combatant command and the Arctic on recent meteorological activities, linkage to climate oscillations, their impacts, and sub-seasonal to seasonal outlooks, with a prediction confidence level. This weekly briefing helps Combatant Command staff keep their commanders informed of long-term environmental risks and opportunities to enable effective decision-making to enhance deterrence.

14 WS Systems Flight (functioning as an installation Communications Squadron) includes a cybersecurity team maintaining a cyber-secure environment for the DoD's only authoritative climate archive. 14 WS boasts some of the best NIPR and SIPR Assured Compliance Assessment Solution (ACAS) scores across Air Combat Command, ensuring the adversary does not puncture our internal network or gain back-door access to the rest of the Air Force Network through the 14 WS's connection.





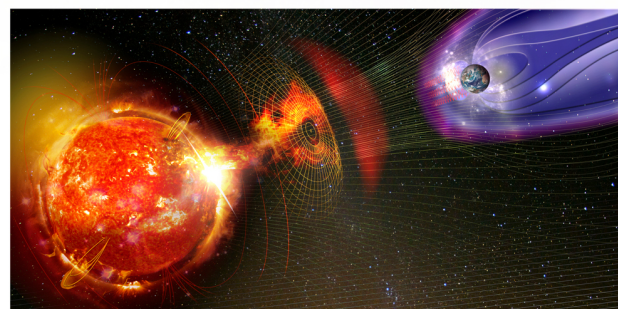


2 WS

## ORBITAL WARFARE, ELECTROMAGNETIC SPECTRUM, NATIONAL INTELLIGENCE ASSETS

### 2D WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The 2d Weather Squadron (2 WS) leverages exquisite capabilities to deliver space and terrestrial environmental intelligence to the Joint Force, Allied Partners, and Defense and Intelligence Community Agencies. A truly multi-domain organization, the 2 WS' global and cyber footprint enables rapid, decision-grade response to evolving geopolitical and environmental events around the world and at all enclaves. As the Lead Weather Unit for Space and Intelligence Community Support, the 2 WS serves as the Department of Defense focal point for environmental effects on space systems and adversary activities. Due to a unique concentration of scientists, maintenance personnel, and technicians, 2 WS personnel are regarded as the subject matter experts for space and terrestrial impacts to the electromagnetic operating environment (EMOE) as well as the go-to unit for Red Force forecasting and analysis.



### UNCLASSIFIED VIGNETTES:

**Weather Intelligence Flight.** The Weather Intelligence Flight arms the Intelligence Community, Combatant Commanders, and National Leaders with top secret environmental forecasts and assessments that advise strategic planning and drive tactical effects and operations. During the destabilization of Afghanistan in 2021, the flight provided over 200 specialized weather forecasts and assessments to key decision-makers that aided evacuation of more than 85,000 people from Afghanistan while simultaneously informing actions used to deter local extremist groups from hostile acts against evacuating forces.

**Solar Observatories.** Five, globally-dispersed Detachments and Operating Locations make up the Solar Electro-optical Observing Network (SEON), which provides 24/7 ground-based optical and radio surveillance of solar activity. SEON analysts alert Department of Defense and civil agencies to the presence of energetic solar outbursts that can overwhelm electromagnetic signals and act as precursors to satellite damaging solar energetic particle events. The positive attribution of radar and satellite sensor anomalies to solar activity (vice adversary action) provided by SEON is key to missile detection reliability and nuclear deterrence.

**Space Weather Operations Center.** The Space Weather Operations Center (SpWOC) provides space and electromagnetic (EM) environmental threat assessments that enable positive anomaly attribution and resolution as well as multi-domain freedom of maneuver via three distinct operational areas: Battle Management, Orbital Warfare, and Electromagnetic Spectrum Operations (EMSO). SpWOC support promotes deterrence by exploiting the present and future state of the space and terrestrial weather environments to optimize weapon system employment, enhance command and control lines of communication, and assure allied access to space and the EM spectrum while denying adversaries the same.



28 OWS

## IRAN AND MIDDLE EAST

### 28TH OPERATIONAL WEATHER SQUADRON CONTRIBUTIONS TO DETERRENCE:

The men and women of the 28 OWS leverage a sparse network of sensors to provide information superiority in support of US CENTRAL COMMAND's mission to enable joint military operations and activities with allies and partners to increase regional security and stability in support of enduring U.S. interests. The 28 OWS influences a key source of information superiority by actively converging with other intelligence sources to construct adversarial patterns of life within this increasingly complex security environment. Additionally, the 28 OWS serves as a critical node for raw environmental intelligence data directly from various ground, space and cyberspace sources for further exploitation to afford flexible decision space to our national command authority.



### UNCLASSIFIED VIGNETTES:

Since 1980, the United States military has joined Egyptian armed forces in Exercise BRIGHT STAR. This exercise tests and evaluates the readiness of our combined armed forces, promoting communication interoperability in irregular warfare scenarios aimed primarily at countering Iranian aggression in the region. The 28 OWS, as the exercise's Lead Meteorological (and Oceanographic) Production Unit, contributes an overarching sight picture of environmental information in order to provide decisional authorities an asymmetric warfare advantage. Rehearsing military maneuvers with key allies in the region allows the 28 OWS to maintain a strategic reliance and assert an arc of influence with our regional partners.

The men and women of the 28 OWS are postured militarily to rapidly generate high-priority, decision grade environmental intelligence to enable senior US CENTRAL COMMAND leaders the opportunity to predict adversarial capabilities. The 28 OWS supplies 47 coalition nations with vital information and assets for use on the ground, air and sea to expand the competitive space, seizing the initiative to challenge our competitors where we possess advantages and they lack strength. This capability was emphasized when Al Asad Airbase was targeted by more than a dozen Iranian ballistic missiles on 8 January 2020. 28 OWS instantly assumed the base weather functions of the installation and quickly provided USCENTCOM decision makers the weather intelligence required to facilitate the safe evacuation of over 50 coalition aircraft and 1,000 troops.



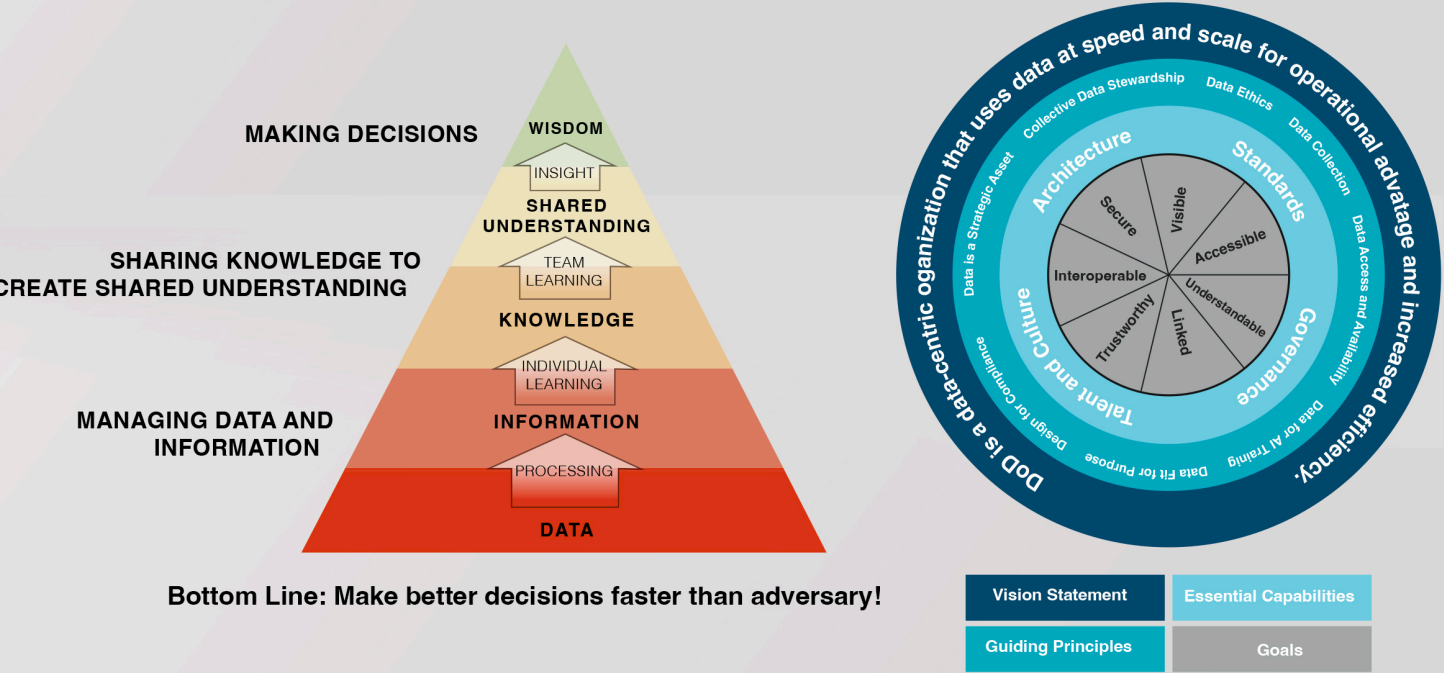
# SOLVING MILITARY PROBLEMS → GLOBAL OUTCOMES

## 2ND WEATHER GROUP CONTRIBUTIONS TO DETERRENCE:

2d Weather Group leads six operational squadrons and five solar detachments in the conduct of environmental and cyber intelligence operations for decision advantage across the competition spectrum. The organization's unique capabilities consist of: Global Climate Threat Tracking; Software Innovation and High-Resolution Modeling; Data Operations and Insights; Space and Electro-Magnetic Spectrum Operations; Operational Test; Cyber Defense; and Adversary Force Insights. History proves that the speed and accuracy of information available to military commanders is the significant factor in determining the outcome on the battlefield. Through the confluence of our mission sets, 2d Weather Group ensures timely, accurate, and relevant information access while denying adversaries opportunities to exploit friendly environmental data and systems for their own purposes.

## Initiative #2 – Data-Centric Operations and C2 Systems

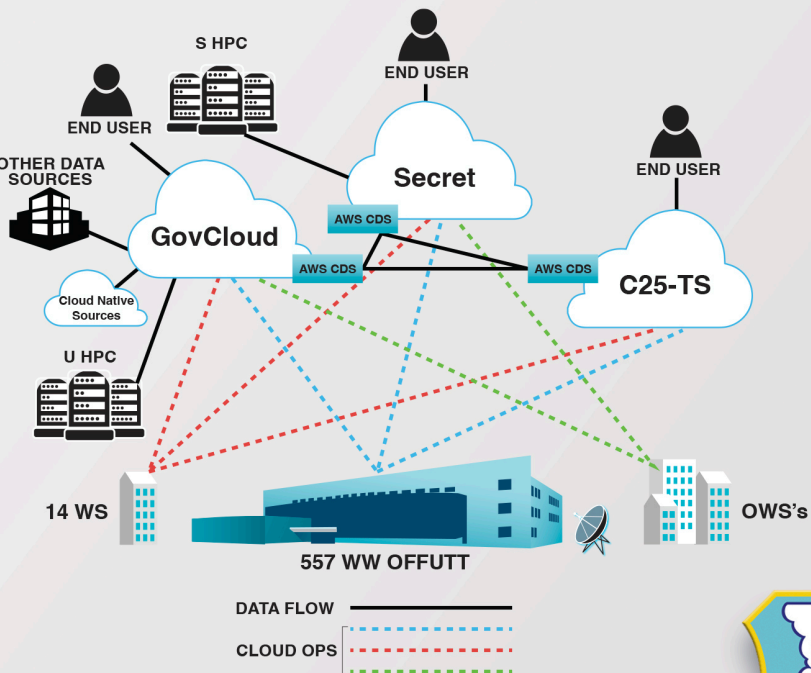
2d Weather Group has taken a holistic view of the USAF's data-centric operations and our organization's unique role in facilitating every tier – from data and information, all the way to the synthesis of knowledge and wisdom (diagram 1 below). The movement to the cloud allows our group to shift from the sustainment and monitoring of data servers, storage and distribution, and turn our focus to data management and exploitation – such a move is nested within DoD's JADC2 charter as the speed and scale of our data-centric operations affords us positional advantage and increased efficiency



## 2 WXG IN THE FUTURE:

### Initiative #1 – Cloud Migration

2d Weather Group continues to lead the charge for the 557th Weather Wing as we accelerate the transition to the cloud. Chartered as the primary liaison between Weather Wing units, Lead Command, and the System Program Office, our team ensures that the wing fulfills current combatant command commitments while expediting the timeline to meet a FY24 deadline to transition all circuit and data feeds to cloud across all enclaves. This capability migration is aligned with CSAF's "Design Implementation" Action Order to divest from legacy systems and focus on survivable, sustainable, and affordable platforms. The complete migration of the Special Purpose Processing Nodes to a single cloud solution allows us to execute Continuity of Operations Plans and consolidate Air Force Weather data holdings into a single repository. It is there where we will utilize Big Data solution sets and AI/ML enabled applications across all security classifications to deliver critical environmental intelligence and capability to decision makers and warfighters.



## Initiative #3 – Posture for Future Threats

Inherent in this is the need to maintain secure data, which is the impetus for our Defensive Cyber Operations. We look to enhance the Defensive Cyber Operations capability from our current "pacing unit" status, to a robust team in FY25 that is capable of maintaining protected and resilient connections across all nodes. We will use our new High-Performance Computer at Oakridge National Labs to produce decision-quality environmental impacts across operations while exploiting its capabilities to converge on Information Warfare tasks for Combatant Commanders. Additionally, 2d Weather Group looks to invest more in the use of DevSecOps principles, while taking data / information and deriving knowledge/ wisdom tailored to the warfighter's problem set(s). This transition is ongoing with the growth of a JEMSO and Orbital Warfare operational desks capable of providing maneuver space for ongoing mission sets across the globe.



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