

# EXCELLENCE

# IN MISSION READINESS

Enabling Readiness and Enhancing Capabilities  
for the Future Force



**Honeywell**

# NEW DEFINITIONS OF/INPUTS FOR MISSION READINESS

From the days of Sun Tzu's maxims on war preparation to today, readiness has remained a much discussed topic in the military. Complicating the discussion today is the fact that the definition for mission readiness has expanded.

While it originally meant being up-to-date with equipment maintenance and training to ensure the readiness of personnel and equipment, the term is often used in far broader context. It is now used to describe the ability of a military force to fight and meet its mission demands.

Lost in this debate over what mission readiness is and whether any one particular force is currently ready for any one particular task is the opportunity to make the very term mission readiness more useful and forward thinking. Excellence in mission readiness can go beyond a functional state of preparedness to an ultimate state of predictiveness, performance and precision.

This ebook will examine what it takes to reach this idea of excellence in mission readiness, the challenges that await and the tools available to solve them.

“  
The art of war teaches us to rely not on the likelihood of the enemy's not coming, but on our own readiness to receive him; not on the chance of him not attacking, but rather on the fact that we have made our position unassailable.  
”

Sun Tzu, The Art of War

# TAKING READINESS TO THE NEXT LEVEL

Achieving a state of forward-looking performance and taking readiness to the next level requires focusing on a number of areas:

- Understanding the role of data and the nature of today's connected battlespace
- Keeping equipment upgraded so it performs at its best
- Implementing tracking and monitoring to provide a clear picture of the state of equipment and predict maintenance needs or likely mishaps
- Precision and accuracy in mission tasks and navigation
- Situational awareness of possible hazards or threats in a range of operating environments and suggested approaches
- Communication capabilities and clarity in communication

Let's look at each of these areas in turn.



# THE ROLE OF DATA IN MODERN MISSION READINESS

From data can come insight, and military forces are wealthy with data. Unfortunately, using this data on equipment levels, maintenance schedules, inventories, procurement pipelines, personnel levels and so on to improve mission readiness can be difficult.

Most of the data available to military planners is descriptive. It accurately illustrates what is in place where. But to understand readiness in a world of diverse conditions, you need more connected data sets and predictive analytics.

To use a simple example, knowing the number of operational aircraft only gives you a partial picture of readiness if you can't correlate that information with fuel levels and de-icing equipment in the theater in question. For a simple example like this, it is possible for humans to put the pieces together, but in the complexity of the real world, it will require analytical systems performing complex calculations to gain the predictive insights to optimize readiness and the costs of sustainment.

An eight-year [study](#) of the South Carolina Army National Guard found that Honeywell® Health and Usage Monitoring Systems saved \$2.1 million in parts costs and operation support. The study found a 75% reduction in unscheduled maintenance, a key indicator of mission readiness. Unscheduled replacements were reduced to less than 4% of total maintenance actions.

Traditionally, this analysis involves collecting all the data centrally before processing, but as data volumes grow, the cost and time lag involved in data transport increases. Event processing at the edge or in the cloud will enable data policy rules to execute on data in real or near real time, enabling critical insight into flight, environment and conditions that require in-the-moment decisions.

With predictive analytics in place, data can more efficiently be used to track equipment, plan for logistical efficiency, understand likely maintenance issues and the health of systems, plan optimal flight paths, improve navigation and landing, and enable greater accuracy in accomplishing mission tasks. Readiness becomes more than a focus on up-to-date maintenance and upgrade of equipment.

Finally, collecting and analyzing data is also critical in the resource planning and budgeting of mission readiness, with its best outcomes in savings and more efficient allocation of funds.



# THE CONNECTED BATTLESPACE



The very nature of warfare has changed, and so has the way adversaries are engaged on land, on sea, in the air, and across the information environment. Today's integrated systems enable the benefits of data and communications that improve operational and mission performance for flight crews, command post decision makers and maintenance chiefs. In aviation, those integrated systems are known as the Connected Aircraft.

Connected Aircraft capabilities include the use of data and communication, sensors, and tracking from nose to tail and from aircraft to ground. They can reduce time on the ground and troubleshooting costs. They can also help monitor fuel usage for insights on fuel use and efficiencies and provide cybersecurity protection.

- Connected communications provide the ability to connect in real time and as needed, greatly improving command clarity and decision making.
- Connected tracking can help you understand mission progress and reinforces the safety of personnel during hazardous missions.
- Connected diagnostics in real time can reduce operational disruptions by as much as 35% and provide additional safety reassurance.
- Connected flight bags and situational information provide for optimal flight paths and weather avoidance.
- Connected ground operations reduce the time spent on the ground and cut troubleshooting costs.

**Together, Connected Aircraft solutions can make more efficient the task of maintaining mission readiness for the modern warfighter.**

# THE IMPORTANCE OF UPGRADES

According to the testimony of many current military officials in the United States, mission-capable rates have decreased with budget cuts and restrictions. Often, this makes it difficult to find budget for upgrading equipment.

But to sustain their missions, aircraft require ample supplies of spare parts and upgrades to their capabilities. Military aircraft perform under incredibly demanding conditions every time they take to the sky, and small upgrades can have major impacts.

That is why modernization strategies should be a critical part of mission readiness. Upgrades are essential for advancing the capabilities of our warfighters and their equipment to ensure the accomplishment of mission objectives.



Maj. Gen. John Rauch Jr., Air Force chief of safety and commander of the Air Force Safety Center, told lawmakers that pilots are undertaking inherent risks by flying older planes.<sup>1</sup>

<sup>1</sup> <https://www.stripes.com/military-leaders-more-training-newer-aircraft-needed-to-halt-aviation-crisis-1.532592>

# TRACKING AND MONITORING

Closely related to the issue of upgrading equipment is the idea of tracking and monitoring it. Without the ability to effectively track a machine's location and readiness status, leaders will struggle to assess readiness quickly.

Honeywell Health and Usage Monitoring can provide a 20% reduction in maintenance test flights and a 5 to 10% reduction in scheduled maintenance.<sup>2</sup>

One form of monitoring that can provide enormous benefit is connected maintenance. This enables ground crews to identify components that will require maintenance or replacement before the aircraft lands and to ensure that spare parts are available, if needed. Capturing and analyzing aircraft data on usage and wear enables crews to more efficiently inspect systems, leading to more rapid and streamlined maintenance processes and aircraft that are more frequently mission ready.

Data analytics can provide military leaders with the intelligence needed to quickly view the current operational status and location of equipment. With accurate data, defense leaders can make the correct decisions about transporting equipment or putting vehicles into the shop for necessary maintenance updates.



<sup>2</sup><https://aerospace.honeywell.com/en/~//media/aerospace/files/infographics/hums-ig.pdf>

# PRECISION NAVIGATION AND MISSION READINESS



Location is a crucial factor in readiness. Since Global Positioning System (GPS) was created more than 20 years ago, robust positioning, navigation and timing (PNT) capability has emerged as a core and defining ingredient of a modern, networked military that can operate with precision.

Precision tactical sensor products perform critical functions

for missiles, munitions, ground-based navigation, antenna stabilization, pointing and commercial survey mapping.

Inertial Measurement Units (IMUs) are extremely valuable tools that help people, vehicles and machines measure motion and calculate changes in position, anywhere in the world, even where GPS signals are intermittent. In addition to providing precision

in navigation, targeting and landing for manned missions, IMUs provide the basis for autonomous positioning for unmanned aircraft and drones.

As drone use increases in the military, the reliability and accuracy of the drones and the IMUs used to guide them will play a larger part in keeping these drone forces mission ready.



# SITUATIONAL AWARENESS

Maintaining situational awareness is required for mission success, but also for readiness. Loss of situational awareness not only endangers aircraft and crew, but it could also cause accidents or issues that take equipment or personnel out of readiness.

Ground proximity warning systems and traffic control and awareness systems can help extend pilots' awareness beyond their line of sight. The solutions can direct pilots' visual scans and provide visual or audio alerts.

One of the most pervasive hazards pilots and crew need to be aware of, and a major challenge to mission readiness, is weather.

## THE MANY INFLUENCES OF WEATHER

Weather can affect everything, from take-off to landing, from mission readiness to mission success. It can make certain tasks harder, more dangerous or even impossible. Accurate weather forecasts are even more critical to air operations than to land, and are necessary for larger areas, including take-off, engagement, and pickup and landing zones.

Weather issues can include everything from rain showers to sandstorms. Some major hazards:

- Sky cover can affect visibility for pilots as well as certain target acquisition and sensing devices.
- Density altitude and pressure altitude both impact how much an aircraft can carry.

- Precipitation, one of the most obvious of weather events, affects visibility. Extreme events like thunderstorms can create micro bursts and lightning that can be very disruptive or dangerous.
- Surface winds can create dangerous wind shear and affect aircraft ground speeds. Winds aloft can affect how much fuel flights use and certain navigation tasks.
- Temperature at both extremes can create issues. High temperatures reduce lift capacity, while cold temperatures create the risk of icing and can increase maintenance tasks significantly.
- Turbulence, whether due to severe weather or clear air turbulence, can cause serious issues, including crashes if experienced during take-off and landing. It may even require the canceling of all operations.

Static weather forecasts are a good start, but modern connectivity and radar allow for a constantly updated view of what lies ahead. It is even possible to give pilots suggested alternatives or recommendations while in flight, helping them avoid weather hazards.



# COMMUNICATION READINESS

Ultimately, communication is the foundation of military readiness. After all, no matter how prepared your aircraft and crew are, if you can't relay that information to command or obtain orders from command, you are not truly ready.

So today, when it comes to mission success, there's no substitute for seamless, reliable, fast and secure communication capabilities. The U.S. Department of Defense describes communication readiness as being a "net-centric vision [that] requires a dependable, reliable, ubiquitous network."<sup>3</sup>

Communication readiness requires a dependable, reliable and ubiquitous network, according to the U.S. Department of Defense.



This means, in part, that readiness requires technologies like satellite communications, airborne routers and aircraft data gateways that can enable informed, reliable situational awareness to support command decision making and peak performance of air, land and sea assets.

Getting data to all users across multiple security domains remains a challenge, even with modern technology. The ability to quickly deploy this communication equipment can also be a serious issue and hazard for mission readiness.

Connected defense solutions strive to solve these challenges by delivering trusted data and providing the secure channels to communicate with warfighters and assets in the field. They allow for true command, control, communications, computers and intelligence (C4I) throughout the battlespace.

Regardless of the technology, wherever and whenever communication is a crucial part of mission readiness and success.

<sup>3</sup><https://dodcio.defense.gov/In-the-News/DoD-Information-Enterprise-Architecture/Communications-Readiness-CR/>

# MAINSTAYS OF READINESS: ENGINES AND ACTUATORS



At the core of mission readiness are foundational components such as engines and control actuators.

Actuators are responsible for moving or controlling a mechanism or system, typically operated by electric current, hydraulic fluid pressure or pneumatic pressure. They are found throughout defense equipment, from naval ships to aircraft to tactical missiles and guided munitions, where reliable actuators are critical to precision control.

Depending on the type of actuation system, valuable hours in preparedness may be spent on tests, maintenance and repairs. Thus the quality of the actuator influences readiness just as much as it influences the ability to achieve precise movements.

For their part, the reliability of engines has a direct and obvious correlation with readiness. Issues with engines not only endanger crews and missions but can lead to lengthy maintenance downtime. As missions take place in varied environments, often representing some of the toughest and most challenging tasks on and off of the planet, the ability of an engine to do its job in extreme heat, cold and so on is another aspect of readiness.

In addition to uptime, though, engine power and efficiency are an important part of mission readiness. Innovations can enable pilots to fly farther, faster and more efficiently. Better engines thus form a better foundation for all mission preparations and readiness.

# HONEYWELL PRODUCTS FOR MISSION READINESS

There are many technology providers today, but how many of those tech companies have a background in the high-stakes worlds of aviation and defense? At Honeywell, we understand the demanding task of maintaining mission readiness, and we provide solutions with the performance, reliability and safety to help you achieve that readiness.

## CONNECTED DEFENSE

**GoDirect® Connected Maintenance** is a nose-to-tail solution that analyzes aircraft data and delivers diagnostics as well as predictive and prescriptive alerts. It:

- Provides notifications with prescribed maintenance actions to help maintenance crews pinpoint the fault down to the subcomponent level
- Ingests fault data, system performance reports, flight schedules, unscheduled disruptions, flight data, maintenance data, MRO shop data, and weather data
- Goes well beyond the capabilities of current-generation solutions, which focus on system health monitoring and trend analysis

We are a trusted cybersecurity service and system integrator for government and civilian customers, bringing together best-in-class partners to offer customized solution sets. Our **Cybersecurity Assurance Center** is a key element of the cybersecurity protection we provide. The center specializes in data collection, penetration testing and predictive analytics that enable operators to stay a step ahead of the threat and take preventative action rather than waiting to respond after a cyberattack occurs. We also offer tailored Aerospace Cybersecurity Solutions.

**GoDirect Flight Services** are designed to help operators make flight operation decisions by collecting all flight data – flight plans, fuel usage, navigation charts, weather, aircraft performance and more – into one easy-to-access dashboard.

Using these inputs, predictions can be made about turbulence, runway hazards, fuel usage and route efficiencies.

**GoDirect Ground** gives ground crews the tools they need to manage turnarounds and get aircraft back where they belong – in the air – quickly and efficiently. The software solution uses mobile devices to manage turnarounds, reduce flight delays by 22% and improve on-time performance by 30%.

## UPGRADES

Honeywell provides **upgrades for a range of platforms** to extend the life of the aircraft and increase performance. We have many retrofit, modification and upgrade solutions. We offer options for:

M1 ABRAMS TANK	H-60	F-16
F-15	MQ-9 REAPER	CH-47
CN-325	UH-60	C-130
AH-64		

## TRACKING AND MONITORING

**Sky Connect™ Tracker** enables voice, data and position tracking. It enables real-time tracking of aircraft status, 3-D location, flight route and arrival time.

Our **Health and Usage Monitoring Systems (HUMS)** for helicopters provide diagnostic information required for optimum performance. HUMS sensors and embedded diagnostic software monitor and communicate the health and maintenance needs of critical components. It increases aircraft availability, reduces maintenance costs, optimizes parts inventory management, enhances safety and more.

**GoDirect Connected Maintenance** is a nose-to-tail solution that analyzes aircraft data and delivers diagnostics as well as predictive and prescriptive alerts. It:

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**Honeywell's Avionics Protection Plan** can help you keep your aircraft flying while controlling your annual maintenance budget. It is the industry's premier fixed-price protection plan.

## PRECISION NAVIGATION

Our **TALIN® family** provides precise, reliable, best-value solutions for inertial navigation system (INS) and GPS navigation. It is a proven solution, with over 15,000 TALIN systems deployed by land, air and sea on more than 60 military and commercial platforms worldwide.

Honeywell is the leading producer of precision **Inertial Measurement Units (IMUs)**, which are currently used by many of the leading aerospace, military and commercial customers across various industries for a broad range of applications.

Our **embedded GPS INS (EGI)** military aircraft systems are self-contained, all-attitude, tightly coupled navigation systems. They provide outputs of linear and angular acceleration, linear and angular velocity, position, attitude (roll/pitch), platform azimuth, magnetic and true heading, altitude, body angular rates, time tags, and coordinated universal time (UTC) synchronized time.

We also offer a variety of Micro-Electro-Mechanical System (MEMS) IMUs and Inertial/Global Navigation Satellite Systems (GNSS) navigators for various uses.

## SITUATIONAL AWARENESS

Honeywell developed the first ground proximity warning system (GPWS) in the 1970s and introduced the enhanced ground proximity warning system (EGPWS) in 1996. The **Mark V EGPWS** exceeds Class A terrain awareness and warning system (TAWS) requirements and provides protection against controlled flight into terrain (CFIT) and windshear.

We pioneered Traffic Alert and Collision Avoidance Systems (TCAS) for military and commercial aircraft more than half a century ago and have delivered more collision avoidance systems than anyone else. Today, our latest system for military aircraft – the **MILACAS-XR** – represents a generational improvement over most of the military collision avoidance systems flying. It enables safer flight formations and doubles surveillance range to identify all aircraft within 100 nautical miles.

Honeywell's proven legacy in **Radar Altimeter Systems** provides the pilot with dependable, accurate altitude whether over ground, sea or ship-based platforms. Our leading technology in special mission capabilities ensures mission accomplishment and troop safety.

**Skyforce Sentinel** has become the multi-function display system (MFDS) of choice for UK military training and operational applications where weight, size and ruggedness coupled with flexibility of data management are paramount. The Sentinel is designed to reduce the demands of flying by offering a simple menu structure and clear display to improve situational awareness.

Our **Aircraft Environmental Surveillance System** combines our weather, terrain and traffic awareness solutions to create holistic understanding of the environment and improve flight safety.

## WEATHER

**IntuVue® RDR-4000** uses 3-D volumetric scanning and pulse compression technologies to provide a complete view of the weather from 0 to 60,000 feet across a 320 nm detection range. IntuVue has demonstrated a 26% improvement in weather hazard detection over conventional radar systems.

Our **Primus®** search and rescue weather radars integrate surveillance and search modes with color weather radar. We offer models that are well suited for the needs of today's light, medium and heavy helicopters. The radars offer ruggedized chassis and reduced electromagnetic interference (EMI) emissions and susceptibility.

**Weather Information Service** provides an electronic flight bag app to assist the flight crew in making strategic, in-flight decisions with respect to weather information by providing up-to-date weather data.

## COMMUNICATION READINESS

Our systems for connection and communication improve mission effectiveness, provide better tactical readiness and increase speed of decision making.

With **JetWave™ satellite communications system**, senior staff can access live video streaming of Forward-Looking Infrared (FLIR) camera footage from the aircraft back at command post or mission control and access the internet, send and receive emails and large files, and view map displays, even on transoceanic flights.

**Aspire™** is our next-generation satellite communications system for high-speed flight deck connectivity. It's smaller and lighter than comparable systems, making it ideal for fixed-wing and helicopter retrofits where size and weight are critical factors.

Our **GoDirect Router** is a reinvention of the airborne router – slashing size, weight and power consumption – without sacrificing any of the speed, performance or reliability. It offers the first true distributed architecture for the connected aircraft.

Honeywell's integrated space and terrestrial systems can provide concurrent mission performance and security through:

- Crystal Bird modeling, emulation and simulation platforms
- Trusted, secure communications and visualization architectures
- Highly integrated, custom microwave satellite payload solutions for failsafe, assured communications
- Big data analytics for data-driven space cloud and mobile networks and systems

## ENGINES AND ACTUATORS

**Honeywell Aerospace Engines** have been at the forefront of aircraft propulsion since 1953. Today our continuous improvement has led to engines that provide more uptime and more power with less fuel.

Our **actuators** deliver precision load management and motion control for an array of uses, including engine control, thrust reverse, space missions, missile steering and numerous marine applications.

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