Honeywell

Delivering ATM modernisation
through partnership and innovation

Collaborating to advance innovation:

Honeywell is a key player in Air Traffic Management (ATM) modernisation, and is the worldwide leader in technology development.

It's a well known fact that key parts of today's global airspace are operating at capacity. Like a fully inflated balloon, the airspace and ground infrastructure is limited to a set operational volume using current Air Traffic Management (ATM) and airport processes and technologies. Due to the limited availability of fixed air traffic routes and approach trajectories, as well as runways and taxiways, the operational efficiency within this confined airspace is in decline.

With the market demands on air transportation projected to more than double in the next 20 years, how can these extra aircraft be added into our already crowded airspace? And with the airspace balloon filled to capacity, what will be done about the environmental factors, such as fuel consumption, noise pollution, CO_2 emissions and more, that come with the addition of extra flights? These are serious concerns that need to be addressed before the proverbial ATM balloon bursts.

Maximising the safe and efficient use of airspace and airports is critical to accommodating future air transportation demand. As a global aerospace technology leader, Honeywell has been applying our ATM thought leadership and development expertise to pioneer a number of technologies to support the modernisation of the world's airports and air traffic system.

Being a dedicated industry partner, we are also actively involved in key global programs to listen to customer needs, collaborate with leading industry and government entities, and provide implementation guidance for the deployment of new concepts and solutions into the ATM environment. These engagements include research agreements with the U.S. Federal Aviation Administration (FAA) for the Next Generation Air Transportation System (NextGen), and being the only U.S. company selected as a Tier 1 Performer for the Single European Sky ATM Research (SESAR) program, an initiative founded by the European Commission and EUROCONTROL to reform the architecture of the European ATM system.

The goal of these initiatives is to make the global air traffic system safer and more efficient using technologies that allow aircraft to fly more optimised routes to save fuel, reduce emissions, lower noise levels and arrive in a precise location at a precise time – maximising airspace capacity, improving on-time arrivals, and increasing airport efficiency, capacity and safety. These solutions must also operate seamlessly, with interoperability among all components to allow for the worldwide standardisation of technologies.

The ATM Ecosystem by Honeywell

ATM TECHNOLOGIES

Honeywell Aerospace is actively involved in the development of the **NextGen** and **SESAR ATM solutions**

AIRPORT SYSTEMS

High Airfield Productivity
- Advanced Visual Docking Guidance System (A-VDGS)
- Airfield Ground Lighting
- Fixed Electrical Ground Power (FEGP)
- Fuel Farm Management Solutions

GROUND SYSTEMS

Precision Landing Guidance
- SmartPath® Ground-Based Augmentation System (GBAS)

AIRBORNE SYSTEMS

Aircraft Technology
- SmartRunway®
- SmartLanding®
- Traffic Collision Avoidance System (TCAS)
- Flight Management System (FMS)
- SmartTraffic™
- Datalink Systems

AIRPORT SYSTEMS

Efficient Terminal Management
- HVAC & Lighting Controls
- Operations Centre
- Integrated Building Management System
- Public Address (PA) / Voice Alarm (VA)
- Fire Alarms
- Energy Management
- Service & Maintenance
- Scanning & Mobility Solutions for Baggage Handling and Process Control

GROUND SYSTEMS

Airport Security
- Access Control Closed Circuit Television (CCTV)
- Perimeter Intrusion Detection System (PIDS)

ATM SYSTEMS/PLANNING

ATM Modernisation
- Trajectory Management
- Aircraft Separation Tasks
- Approach and Departure Management
- Flight Planning GDC
- Airport ATM

Leading by example. From technology innovations vital for next generation ATM system implementation to active participation in industry partnerships and global development programmes, Honeywell is helping drive ATM modernisation:

Key Technologies

- **Ground Proximity Warning System (GPWS)** – Invented and introduced technology (1975)

- **Traffic Collision and Avoidance System (TCAS/ACAS)** – Technology development and introduction (1985)

- **Enhanced Ground Proximity Warning System (EGPWS)** – Invented and introduced technology (1996)

- **Ground-Based Augmentation System (GBAS)** – First internationally certified CAT-I system (2009)

Industry Initiatives

- **FAA NextGen** – Funded development partner

- **FAA System Engineering 2020** – Partner on Boeing team

- **SESAR Joint Undertaking** – Funded development partner

With system deployment underway, FAA's NextGen is targeted by 2018 to save up to 1.4 billion gallons of fuel and 14 million tonnes of CO_2, with a 35% reduction in flight delays. It is projected to generate approximately US$23 billion in operational benefits. Implementation of the SESAR system should facilitate a threefold increase in capacity; a 50% reduction in air navigation costs; and cut an aircraft's environmental impact by up to 10% per

flight. Beyond these benefits, both systems will result in higher-performing ATM systems that respond to the rising consumer demand for more environmentally sustainable air travel.

In the air, on the airfield or at the terminal, Honeywell's technologies increase airport access and capacity, improve routing efficiency, reduce operating costs and make intelligent airports and aircraft a reality for the next generation ATM system.

And we continue to drive innovation, as our technology development programmes create new solutions to meet the unique and evolving needs of government agencies and aviation customers for integration of technologies across the global ATM infrastructure.

Creating the intelligent airport.

Airport Solutions

Honeywell's technology starts working the moment passengers reach the check-in desk. Our innovations help to get passengers through the terminal as quickly and safely as possible. From the scanner that checks boarding passes to the building management solutions that ensure comfort and safety, Honeywell technologies optimise the curb-to-gate process for improved operational efficiency, increased airport capacity, and an enhanced passenger experience.

Take control of airport operations by combining Honeywell's security, life safety, energy management, and building controls into a seamlessly integrated solution.

Airport Terminal Building Solutions

- **Efficient Terminal Management** – improves comfort, enhances operational efficiency and ensures a safer terminal environment for workers and passengers:
  - HVAC & Lighting Controls
  - Operations Centre
  - Integrated Building Management System
  - Public Address (PA)/ Voice Alarm (VA)
  - Fire Alarms
  - Energy Management
 - Service & Maintenance
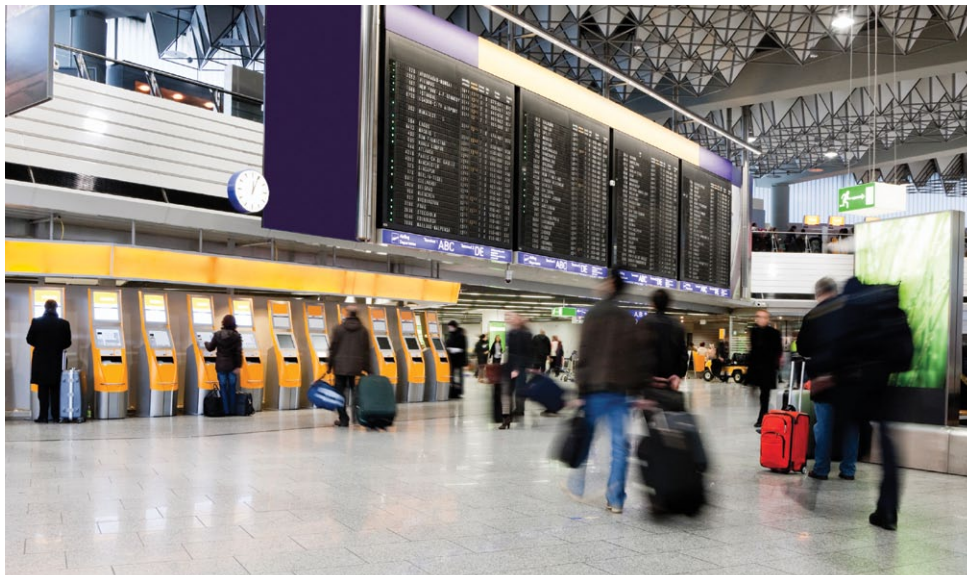
For the many complex tasks and functions that occur on your runways, taxiways, aprons and around airport fence perimeters, our integrated solutions help maintain safe and efficient airside operations.

Airfield Ground Solutions

- **High Airfield Productivity** – optimises airport capacity and prevents runway traffic delays whilst increasing operational safety:
  - Advanced Visual Docking Guidance System (A-VDGS)
  - Airfield Ground Lighting
  - Fixed Electrical Ground Power (FEGP)

- **Airport Perimeter Security** – safeguards people, assets and intellectual property through the centralisation of integrated security systems:
  - Access Control Closed Circuit Television (CCTV)
  - Perimeter Intrusion Detection System (PIDS)

- **Runway and Passenger Safety** – reduces the risk of damage to aircraft, equipment and passengers by maintaining safe and efficient operations on runways, taxiways and aprons:
  - Smart Runway® (Runway Alerting and Advisory System)

At the forefront of innovation, Honeywell's ground based technologies are an integral part of the airport infrastructure required to support next generation ATM operation. These advancements help to increase airspace and airport capacity, enhance aircraft approach and optimise taxi management for safer and more efficient airfields.
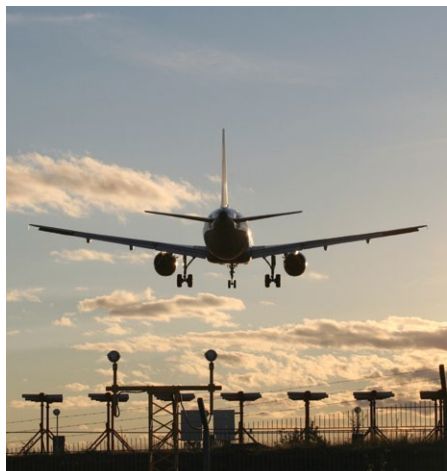
Ground Based Traffic Management Solutions

- **SmartPath® Ground Based Augmentation System (GBAS)** – enables aircraft to fly fuel-efficient descents, reducing diversions and holding patterns with improved navigation accuracy and flexibility over older Instrument Landing Systems (ILS):
  - Improves precision approaches and landings for increased airport capacity, decreased air traffic noise and reduced weather-related delays.
  - Augments Global Positioning System (GPS) satellite data and transmits digital guidance data to aircraft systems.
  - The first internationally certified CAT-I GBAS system.
  - Supports landing operations of multiple aircraft on multiple runways simultaneously, up to 26 unique approaches.
  - One SmartPath system installed in a typical airport can yield maintenance savings of up to $400,000 annually for an airport using ILS on two runways.

ATM solutions to fly smarter, safer and greener.

Airborne Traffic Management Technologies

From the moment a passenger boards a plane, we help make flights safer, more environmentally friendly and more cost-effective with solutions and services ready for today and optimised for future ATM system functionality:

- **Next Generation Flight Management System (NGFMS)** – enhances flight planning, navigation and guidance, and situational awareness for shorter, more direct flights; NGFMS is a modular Software Product Line built using completely new architecture that is designed for next generation ATM functionality:

  – NGFMS integrates Performance Based Navigation features that allow aircraft to fly automated flight paths with assured aircraft separation and obstacle clearance for increased airport access and airspace usage.

  – Integrates 4-D trajectory for more on-time scheduling, closer aircraft spacing for arrivals, continuous descent approaches to lower fuel costs and CO_2 emissions.

- **Go Direct Services** – increases capacity and airport access for enhanced air traffic flow:

  – Honeywell is certified to integrate Required Navigation Performance (RNP) into flight operations and aircraft.

  – RNP allows aircraft to fly within a very specific airspace corridor that can be made larger or smaller based upon the needs for that specific area.

  – Honeywell's Go Direct consultation services simplify the implementation of RNP AR into daily flight operations.

  – Honeywell offers the precision navigation hardware and software upgrades for aircraft to meet all the RNP AR requirements to improve routing efficiencies and access to high traffic and terrain challenged airports.

- **SmartTraffic™ for TCAS Traffic Computer** – delivers pilots a more intuitive display of surrounding aircraft, as it relates to their flight plan, for greater safety and routing efficiency:

  – SmartTraffic™ technology is the foundation for Honeywell's Automatic Dependent Surveillance-Broadcast (ADS-B) enabled Traffic Collision and Avoidance Systems (TCAS/ACAS).

  – ASD-B increases airspace capacity by allowing planes to fly closer together without sacrificing safety by broadcasting key aircraft data (call sign, position, altitude, velocity and more) and using GPS data to provide a radar-like air traffic control.

  – Incorporating TCAS Change 7.1 and Hybrid Surveillance, SmartTraffic provides the necessary technology and display of traffic information to enable pilots to reduce fuel burn, lower aircraft noise and decrease the likelihood of a missed approach for more timely landings.

- **SmartRunway®/SmartLanding®** – reduces the risks of runway incursions and excursions for improved airport surface and landing safety:

  – Software upgrades to an aircraft's existing Enhanced Ground Proximity Warning System (EGPWS).

  – SmartRunway® uses timely positional advisories and graphical alerts during taxi, takeoff, final approach, landing and rollout to improve pilot situational awareness and reduce the risk of runway incursions and collisions.

- SmartLanding® alerts pilots if the aircraft is approaching too high, too fast or landing long to improve flight safety through more stabilised approaches for a decreased risk of runway excursions.

- These upgrades can help limit runway incidents which have cost the airline industry up to US$100 million a year for passenger injuries and aircraft repairs and inspections.

■ **SmartView™** – increases safety and situational awareness using the latest synthetic vision technologies:

- SmartView provides a 3-D graphic view of the surrounding terrain, obstacles and runways fused with advanced symbology.

- Rendered from Honeywell's Enhanced Ground Proximity Warning System (EGPWS) database, the advanced symbology elements significantly reduce flight technical errors whilst reducing pilot workload.

- By offering pilots heightened visibility and situational awareness, this advancement will provide lower minimums for poor weather landings to help reduce air congestion, decrease emissions and lower fuel costs.

■ **Protected Mode Controller Pilot Data Link Communication (PM/CPDLC)** – enhances the accuracy and relevance of Air Traffic Control (ATC) messaging:

- PM/CPDLC uses a data link connection in lieu of voice for communications between pilots and controllers.

- Enhances flight operations with regards to time and accuracy of communications, whilst helping to reduce flight delays and lower airline maintenance, administration and air traffic control costs.

No matter if it's on the ground or in the air, Honeywell is committed to making air travel smarter, safer and greener.

Navigating the Future
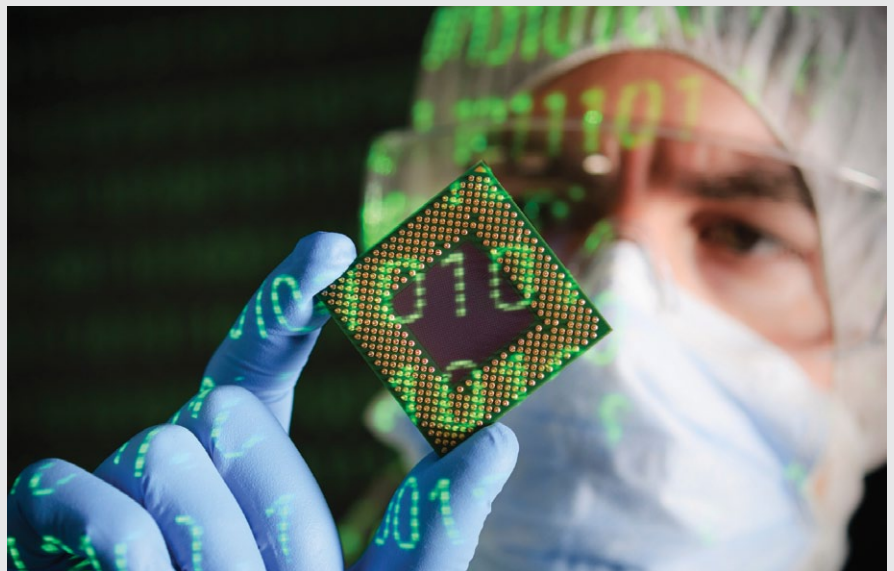
Honeywell's technology development teams drive innovation to meet the unique and evolving needs of the global ATM community. In addition to U.S. and European efforts under NextGen and SESAR, Honeywell has established an ATM Laboratory in China, and is working with top universities and industry partners to help modernise China's air traffic system. With already limited airspace in the east, and plans to expand and build new airports in the west, China is poised for exponential growth in both the air transport and general aviation sectors and faces a distinct set of challenges to create a modern ATM infrastructure. These issues include the need for additional airspace corridors, new and more direct routing procedures, automation to improve air traffic controller productivity, low-altitude airspace management, and introduction of numerous new airports.

Honeywell is currently advancing a spectrum of ATM technologies through its global network of ATM Laboratories, a few of which include:

■ **ADS-B In-Trail Procedures** – Honeywell is developing and certifying an In-Trail Procedures solution that uses ADS-B In technology, allowing aircraft to attain more efficient altitudes more often than current separation standards allow, thereby saving fuel burn. An ITP-certified fleet can save weight and fuel burn by loading and carrying less contingency fuel based on the expectation that desirable climbs will be possible more often. The economic benefit is expected to be in the range of US$200,000 to US$400,000 per year per airplane.

■ **Data Communication for ATM** – Honeywell is supporting the expansion of data communications capability globally in developing requisite policy, guidance material, standards, specifications and rulemaking that will minimize ATM transition impacts and optimise benefits.

■ **CAT III Avionics** – Honeywell is supplying red-label equipment to the FAA that supports the implementation of additional messages and algorithms for use in requirements validation efforts for GBAS. These efforts include data collection in conjunction with prototype CAT III ground equipment, procedure development, and Flight Inspection requirements development.

■ **Flexible Communication Avionics** – Honeywell is developing integrated architectures and demonstrations to advance multiple data links for future ATM systems, including L-Band line-of-site data link (LDACS), AeroMACS, and next generation SATCOM. These communications technologies promise to deliver the improvements needed to better integrate air and ground, supporting the seamless automation required for next generation ATM solutions.

Honeywell Aerospace

For more than 100 years, Honeywell has been a pioneer in aerospace innovation. Every minute of every day, aircraft with Honeywell technologies fly across our skies. In fact, our products can be found on virtually every type of commercial airliner, business and general aviation jet, military aircraft and space vehicle in operation today. From takeoff to landing, Honeywell solutions help make flying safer, more reliable, more efficient and more cost effective.

For more information on Honeywell Aerospace, visit us online at
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