THE BENEFITS OF DRONE TEST SITES

By Andre P Meredith

World Airnews guest columnist SAAF senior staff officer air certification and author of 'The Drone Safety Handbook' Andre Meredith sheds light on what is going to become a very important component of these unmanned aircraft.

Militaries around the world have recognised the need for purpose-built test areas for decades, and this makes sense in consideration of the significant risk levels attributed to most forms of military testing. In a similar manner, drones present unique challenges to aviation – the removal of the pilot from the cockpit requires a plethora of drone-specific technologies to enable safe operation and seamless airspace integration. This becomes even more of an issue for Beyond Visual Line of Sight operations (BVLOS), or operations requiring extended flight over densely populated areas.

Many of these technologies are still new, unproven or undependable when compared to the established technologies associated with the century-old manned aviation environment. In addition, the rapid advancement of drone utilisation requires an equivalent level of advancement in supporting technologies.

Considering the abovementioned, many civil Aviation Regulators have begun to understand the benefits of dedicated Drone Test Sites. Drone Test Sites can take on different 'forms' including areas, volumes and corridors, and can be permanently and exclusively allocated for drone flight, or be situated within a segment of flexible use airspace, requiring special permissions for manned aviation to operate in. In other words, whichever way it is defined, drone operations should always receive priority within such regions. This course of action will be beneficial if it involves testing of unproven technologies.

The site should include a volume of 'sterile' airspace above a corresponding surface area devoid of people or public property. The surface area of a test site should be described in terms of its outer edges and a "minimum safety distance" or Buffer Zone. The remainder is the normal flight region where testing and other flight operations may take place. The Buffer Zone width should be determined based on a failure and uncontrolled descent at the maximum forward velocity of the drone. It should also consider the maximum expected debris spray area upon impact with the ground. No flight should take place beyond the Buffer Zone edges. This will cater for any catastrophic failures during testing and help to contain risks during testing within acceptable limits.

It goes without saying that movement of people within the test site and control of other forms of aviation through the corresponding airspace volume above it should be strictly managed to reduce risk. The size of the test site, including the volume above it, would be largely dependent on the requirements. These requirements could stem from national imperatives or could be set by a specific user base or be derived through specific academic/research initiatives.

There are many benefits associated with the establishment of an official Drone Test Site, including the following:

- **Experimental Drone Flight Testing**
  A Drone Test Site provides a safe, segregated area where experimental drones can be flown and tested. If anything goes wrong and the drone crashes, it will be within the Test Site borders, with no risk to third parties.
- **Experimental Drone Ground Systems Testing**
  The Drone Test Site could also be host to ground-based drone system testing and including facilities for (amongst others) environmental, structural and communications system testing.

- **Experimental UAV Payload Testing**
  A Drone Test Site can be used to test the performance of new payload types, including high-risk radiating payloads, carriage and/or release of solid payloads and carriage and/or dispensing of liquid payloads.
- **Novel Drone Technology Evaluation**
  A Drone Test Site may be used for testing and experimentation relating to novel drone technologies, including evaluation of the effectiveness of new Sense and Avoid technologies, communications technologies, data link technologies, navigation technologies, artificial intelligence, novel drone materials and production methods, experimental software, and so on.
- **Novel Application Development**
  Novel drone applications (new uses) can be tested and perfected at the Drone Test Site before marketing or inclusion in Operator documentation
- **Drone Regulation Validation**
  A Drone Test Site could be valuable to test and validate the viability and practicality of new or proposed drone Regulations. National Aviation Regulators could task stakeholders to fly drones within the ambit of the proposed regulations to test applicability and simulated compliance in real-world conditions, before promulgation. The exclusivity of the Drone Test Site could help to expedite the process.
- **Operating Procedure Development**
  New drone operators can use the exclusivity and security of the Drone Test Site to help develop and validate their own operating procedures and processes.
- **Drone Demonstrations**
  The safety, security and exclusivity of the Drone Test Site would be ideal to stage demonstrations to prospective customers.
- **Trade Exhibitions**
  The safety, security and exclusivity of the Drone Test Site would be ideal to stage drone Trade Exhibitions ("Trade Shows"). This could make allowance for drone flight demonstrations, technology exhibits, static exhibits, workshops and presentations.
- **International Collaboration**
  A Drone Test Site is the ideal place to energise and host UAV-specific international collaboration.

Several countries have established Drone Test Sites or "test corridors":

- **United States of America**
  The FAA has established seven (7) permanent Drone Test Sites within the following regions:
    - North Dakota: Northern Plains UAS Test Site, Grand Forks, ND
    - New York: Griffiss International Airport (NUAIR)
    - Virginia: Virginia Polytechnic Institute and State University (Drone Park)
    - Texas: Texas A&M University Corpus Christi (Lone Star UAS)
    - New Mexico: New Mexico State University (UASFTC)
    - Alaska: University of Alaska Fairbanks (ACUASI)
    - Nevada: Nevada Institute for Autonomous Systems
- **United Kingdom**
  The UK has established the Wales UAS Environment (WUASE) based at West Wales Airport Aberporth.
- **Spain**
  BCN Drone Centre, Barcelona.
- **Malawi**
  UNICEF Humanitarian Drone Testing Corridor (June 2017 to June 2018).

It is interesting to note that Malawi was the first African country to have established a drone test area. The "air corridor" was established in mid-2017 in collaboration with UNICEF, initially to explore the use of drones for medical delivery and other humanitarian crisis support services. The first experiment, which took place in March 2016, involved aerial delivery of blood samples to assist with HIV diagnosis. The second, in April of the same year, involved the use of drones to support emergency services after floods ravaged large parts of Malawi.

The success of the experiments led to the establishment of the 80km diameter x 400m high air corridor, which covered a surface area of 5000km2. The establishment of the test corridor was strongly backed by the Malawian government, citing their willingness to embrace technological innovation in support of humanitarian relief and other national ambitions.

The test corridor, which remained active until June 2018, was used to evaluate and mature technologies relating to aerial imagery, aerial communications and low volume medical transportation, all in support of humanitarian and emergency support initiatives.

Countries that have established Drone Test Sites have undoubtedly calculated the advantages and are reaping the benefits, especially in the area of technology development. In addition to the benefits provided to the local development sector, international collaboration remains a key benefactor towards the development of processes, procedures, regulations and rules for the safe and seamless integration of drones into the national airspace; any nation having an established Drone Test Site, where such philosophies and frameworks could be tested in a safe, secure environment, will undoubtedly become a leader in this regard, as well as in many other drone-related fields.

Whatever the specific uses, a Drone Test Site will be an asset to any nation intent on drone development, airspace integration, legislative development and the development of related technologies. It provides a safe, secure and purpose-built environment where such endeavours could be tested and experimented with, and will, as a bonus provide a valuable platform for any nation wishing to collaborate or compete on international levels. ✈

WHO IS ANDRE P. MEREDITH?

Andre Meredith matriculated in 1989 and, following attestation in the South African Air Force, completed his Bachelor of Mechanical Engineering degree at the University of Stellenbosch in 1994. He then embarked on a long and diversified career in the SAAF which included aspects of design engineering, engineering management, project engineering, system engineering and finally certification of military air systems.

It was during his tenure as Chief System Engineer that he became interested in UAVs, and embarked on a process which eventually culminated in the completion of a Master of Science in Engineering degree at the University of Stellenbosch with research into the feasibility of utilising large UAS for long range maritime search and rescue.

As Chief Certification Officer he provided oversight and guidance to Defence Industry on safety, regulation and testing of various military UAS. This included the Type Certification of the Dynamics Seeker 400 UAS, which at the time was only the second Type Certified UAS in the world. He also wrote the policy for the regulation of military UAS operations in the South African Department of Defence, and served as the military UAS advisor on the Aerospace, Maritime and Defence Industries Association of South Africa (AMD) UAV Forum.

In addition to his military duties he also spent some time as an Air Certification Consultant to operators of commercial UAVs, enabling them to apply for technical clearance certificates. It was during this time where the need for structured safety guidance to commercial and recreational UAV operators was identified, which led to the development and publication of his first book entitled "The Drone Safety Handbook".

Operators of Commercial and Recreational "drones" need to understand the importance of safety and also need to understand the potential risks to third parties – and how to identify, eliminate or at least manage these risks. Andre has opted to share his certification and technical risk management experience accumulated over the course of more than ten years, towards the eradication of unsafe drone operations and the improvement of safety towards the general public.