FEATURE ARTICLE

Operational UAS Experience

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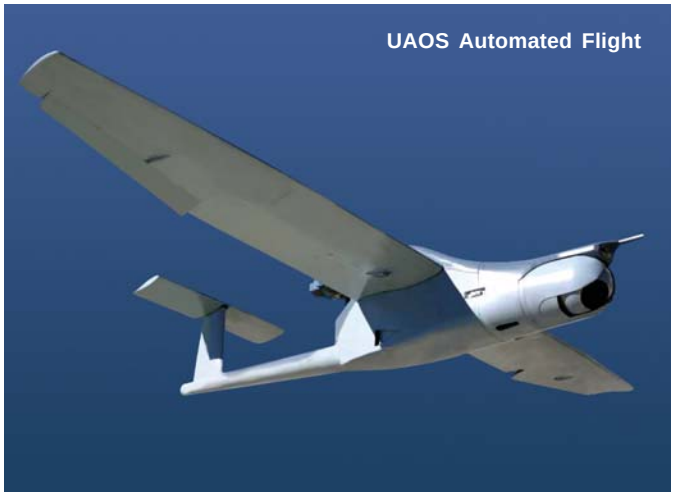
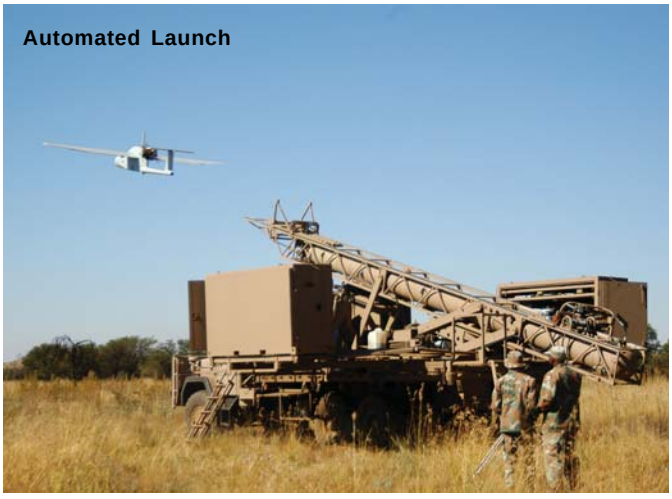
The first Unmanned Aerial Observation System (UAOS) (Vulture is ATE's marketing name for the system) was delivered to the Artillery Formation of the South African Army in 2006. Following the delivery, the user was trained in operating and maintaining the system. Both the system and the students were then evaluated during an Operational Test and Evaluation (OT&E) phase. During this OT&E phase, the user operated and flew the system in a simulated operational environment to determine whether the system fulfilled the user requirements and anticipations. The UAOS was also integrated into the Artillery Target Engagement System (ATES) in which the UAOS is only one of the 'observers' for ATES. The main purpose of these observers is to supply target information and fire correction data following an artillery engagement on the target.


UAOS Automated Flight


Automated Launch

The UAOS completed the OT&E phase successfully and obtained a formal Product Baseline (PBL) status. Certain observations were made during ATE's qualification and the user's OT&E of the system. These observations culminated in a list of new and additional requirements that the user required to have included in a follow-on production order.

The Adaptation Phase of the UAOS was then negotiated and contracted as the 1st phase of the Production Contract for the remainder of the UAOS systems required by the user. The purpose of the Adaptation Phase is:

- to adapt the design of the UAOS, taking into consideration the observations and resulting new requirements made during testing of the first system;
- due to changes required on ATES, the UAOS design was to be adapted to standardise (or meet the integration requirements) of the updated ATES.

Both the adapted ATES and UAOS are known as the Build A Configuration of the systems. The observations being addressed during the adaptation phase are limited to those that fitted within the budget and schedule constraints of the project. The major adaptations performed to the different Configuration Items (CIs) for the UAOS are the following:

Air Vehicle (AV)

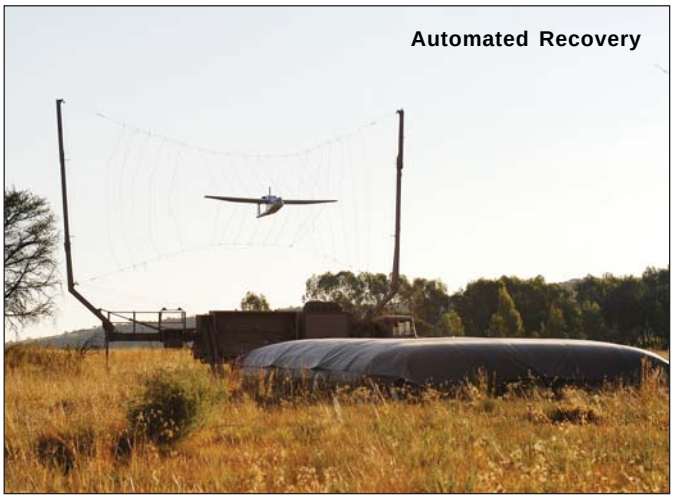
- Changing the servos used on the Air Vehicle to the ATE developed Digital Servo Units.
- Improvement in the flight control systems.
- Fitting of an upgraded engine.
- Incorporation of an Emergency Recovery Parachute Module.

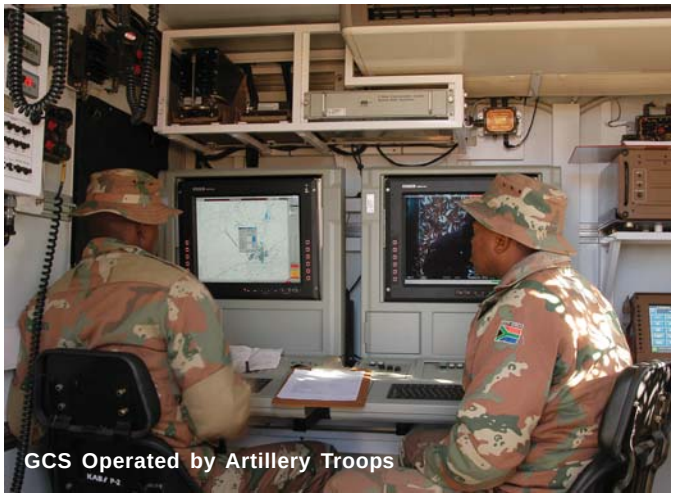
Launcher System (LS)

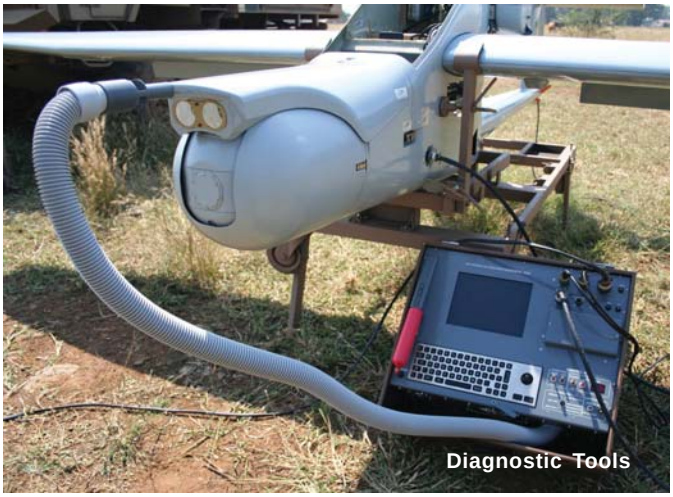
- Increasing the launch speed to provide a higher safety margin.
- Fitment of a higher capacity Auxiliary Power Unit (APU) and to increase the number of batteries.
- Replace the vacuum pump used with a newer pump with improved capacity.
- Changes to the hydraulic system to provide an electrical driven slave pump, rather than the previously used hand pump or external hydraulic slaving.
- Increased robustness by improvements to the electrical control system, including the addition of redundant proximity sensors on all safety critical and mission critical systems.

Recovery System (RS)

- Similar changes to the electrical and hydraulic system as the Launcher System, i.e. the same hydraulic power pack with the electrical driven slave pump and the higher capacity


Automated Recovery


GCS Operated by Artillery Troops


Diagnostic Tools

APU.
- Decrease the un-deployed height.
- Improvements on the braking system and airbag.

Ground Control Station (GCS)
- Reduction of the height of the container. This required a total re-packaging of the equipment inside the GCS.
- Several improvements in the electrical system, including:
  - reducing the possibility for operator error in the deployment and un-deployment operating phases,
  - addition of auto start functionality for the APU,
  - more robust 24V power supplies.
- Accommodating and interfacing to the new ATES equipment installed in the GCS.

Optical Day Payload
- Mechanical design changes for improved robustness and sealing.
- Improved functionality for Built-In-Testing, improved low light performance and auto-tracking.

Communication System

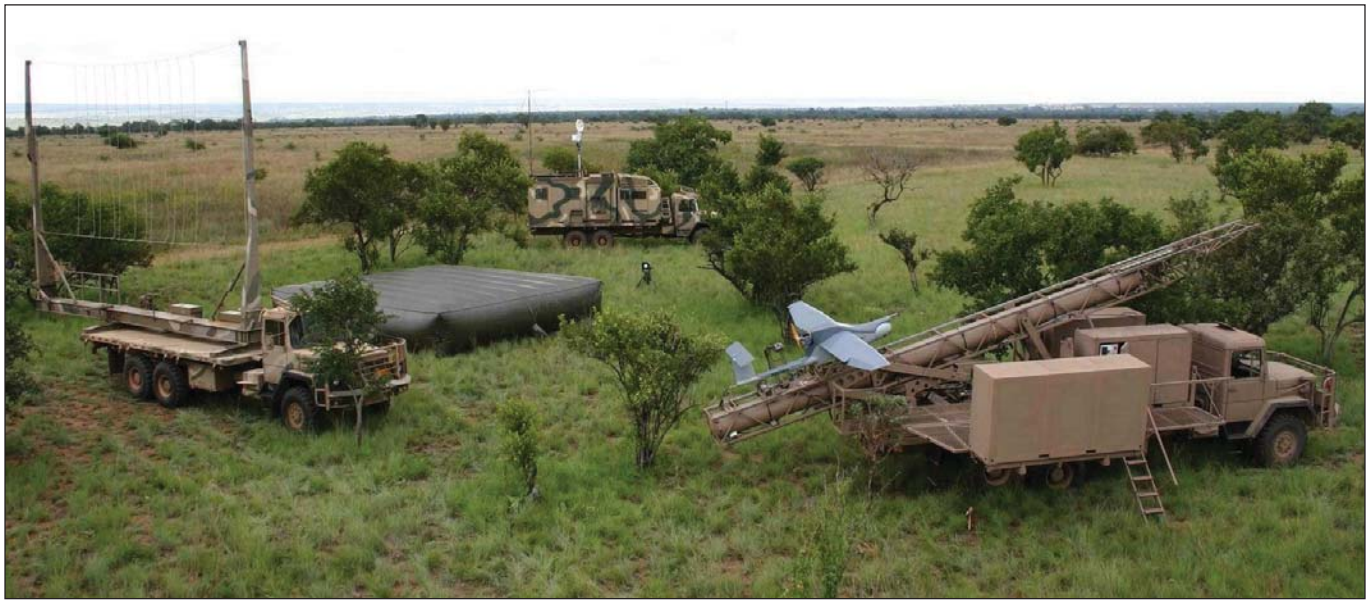
Where the communication system installation was previously the responsibility of the end-user, this was changed and ATE is now also responsible for the installation of the communication system. This system allows for voice as well as data communication. It includes the installation of a number of HF and VHF radios to communicate with ground as well as airborne receivers, communication hubs, antennas, radio data control units.

Mission System

Besides the extensive changes to the Launcher System, Recovery System, Ground Control Station and Air Vehicle mentioned above, the functionality of UAOS was also drastically upgraded and improved with major changes to the Mission System. The Mission System consists of the Computer Software Configurations Items in the AV, GCS (including the Mission Control Computer, Navigator Workstation and Observer Workstation) and LS (for controlling the AV launch). The major functionality improvements being:
- Multi-target capability.
- Improvements to the Automatic Flight Control System for improved flight performance, including improvement in the recovery accuracy of the Air Vehicle into the Energy Absorption Device of the Recovery System.
- Large number of improvements to the User Interface to increase robustness and ease of operation of the system.
- Flight planning now includes receiving initial flight plan data from ATES and approving the flight plan by ATES before the start of a mission.

Logistic Support System (LSS)

The LSS is being updated to accommodate all the adaptations made to the system. This includes updates to all the logistical analysis performed, technical documentation, training documentation and the determination of spares. The LSS system also includes the packaging of the spares, marking of the system to the client's requirements and providing specific hardware elements to the AV, LS, RS and GCS. The LSS also includes the supply of all the other user equipment



previously provided as client furnished equipment.

Qualification

The Adaptation Phase also makes provision for performing the delta qualification that must be performed on the system to establish the new Build A Product Baseline. This qualification will again use a bottom up approach and qualification will be performed on the lowest possible level.

Training

Following qualification, a training and Operational Test and Evaluation (OT&E) phase will follow. The training phase utilizes facilitator and learner guides, to equip technical as well as operational personnel with the skills to operate the system confidently. A combination of course work and practical activities is involved. During the OT&E phase, the system will ultimately be flown in a simulated operational environment by the newly trained operators.

Interoperability

Following the successful introduction of the Build A System into the South African Army Artillery Formation, these systems can now be made available to other potential users within the South African National Defence Force.

Typical applications will include border surveillance and intelligence operations. For border surveillance, UAOS would typically be deployed from a secure area close to the border and then perform an aerial patrol along the border to either side of the launch area. Any suspicious activities would be observed by the payload operator, who could at the same time determine accurately and efficiently the co-ordinates of such activities. These co-ordinates would be passed onto a response team, who could then react accordingly. Observing these activities from the air will also advise the response team if any weapons and possible hostile actions could be encountered. Intelligence operations would typically involve the UAV circling at predefined locations and observing and relaying the activities to the Ground Control Station. Peace missions on the African continent are also being considered for the Vulture system.

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