



ANNEXURE C: DETAILED TECHNICAL SPECIFICATION

FOR THE PROVISION OF REMOTELY PILOTED AIRCRAFT SYSTEM (RPAS) / UNMANNED AERIAL VEHICLE (UAV) SERVICES WHICH INCLUDE ALL RELATED INFRASTRUCTURE, RESOURCES, CREW, RPAS/UAV OPERATION, HARDWARE AND SOFTWARE, CCTV SURVEILLANCE AND RELATED AUXILIARY SUPPORT REQUIRED TO PROVIDE THE RPAS/UAV SERVICES NATIONALLY ON AN AS AND WHEN REQUIRED BASIS FOR A PERIOD OF 1 YEAR (12 MONTHS)

ABBREVIATIONS

TFR	Transnet Freight Rail
SANS	South African National Standards
SACAA	South African Civil Aviation Authority
UAV	Unmanned Aerial Vehicle
RPAS	Remote Piloted aircraft system
ICASA	Independent Communications Authority of South Africa
ROC	Remote Operator Certificate
FPS	Frames Per Second
GPS	Global Positioning System
ITU-T	International Telecommunications Union - Telecommunication
ISO	International Organization for Standardisation
IEEE	Institute of Electrical and Electronics Engineers
SABS	South African Bureau of Standards
CENELEC	European Committee for Electro technical Standardisation
SITA	Integrated Information and Telecommunications Services
ASL	Aerial Services Licence
URS	User Requirement Specifications
PSIRA	Private Security Industry Regulatory Authority
SLA	Service Level Agreement
RLA	RPAS Letter of Approval
RPL	Remote Pilot Licence



1. PURPOSE

- 1.1** This document defines the detailed technical and functionality requirements of the Remotely Piloted Aircraft System (RPAS) / Unmanned Aerial Vehicle (UAV) services which include all related infrastructure, resources, crew, RPAS/UAV operation, hardware and software, CCTV surveillance, and related auxiliary support required to provide the services at 9 x provinces (Northern Cape, Free State, North West, Mpumalanga, Limpopo, Eastern Cape, Western Cape, KwaZulu-Natal, Gauteng) on an as and when required basis for a period of 1 year (12 months)
- 1.2** A further Service Level Agreement (SLA) will be signed with the successful bidder. The interface or flow of information amongst Transnet Freight Rail (TFR) Security and Forensics department, bidder, as well as the services anticipated will be clearly outlined in this document.

2. BACKGROUND

- 2.1** Vandalism and theft are running rampant around TFR infrastructure. There are initiatives that are to be executed for the mitigation of these criminal activities such as procuring RPAS/UAV with its related infrastructure, resources, operation, software, and databases as a service at selected TFR high risk sites nationally.
- 2.2** A short term solution ran from November 2016 to February 2017, after which a month-to-month RPAS/UAV service was used. There is currently no permanent contract to facilitate the roaming surveillance of TFR Rail Network infrastructure/environment and the month-to-month RPAS/UAV sourcing contract is not financially viable.
- 2.3** This leads to a request of RPAS/UAV surveillance service at identified hot spot areas nationally for a period of 1 year (12 months). Allocated RPAS /UAV will be deployed nationally based on crime trends and patterns and TFR's requirements at no extra cost to TFR.
- 2.4** Legal flight aspects of the RPAS/UAV system need to be taken into consideration as the South African Civil Aviation Authority (SACAA) has strict regulation around such technologies.

3. AREAS OF DEPLOYMENT

- 3.1** The RPAS/UAVs will be deployed 9 x provinces (Northern Cape, Free State, North West, Mpumalanga, Limpopo, Eastern Cape, Western Cape, KwaZulu-Natal, Gauteng) for a period of 1 year (12 months) on an as and when required basis.
- 3.2** TFR will redeploy the RPAS/UAV to any Transnet facility based on crime trends and patterns as well Transnet's specific requirements. TFR will provide a 48 hours' notice (Or less as agreed between the parties) to the service provider for such deployment changes at no additional cost to TFR.
- 3.3** All RPAS/UAV teams should be highly flexible and mobile to ensure capability to operate in different areas during operations and within shifts.
- 3.4** The bidder must be certified by SACAA and able to provide the service at areas that they will be deployed to.



4. LICENCING AND ACCREDITATION REQUIREMENTS

- 4.1** The bidding company and its Directors must be accredited with Private Security Industry Regulatory Authority (PSIRA) to provide the services required. Only active and valid PSIRA certificates of a bidding company and its Directors would be accepted.
- 4.2** The bidders must comply with all SACAA requirements for commercial operation of RPAS/UAV.
- 4.3** The bidder must adhere to SACAA and Independent Communications Authority of South Africa (ICASA) regulations.
- 4.4** Bidding companies must comply with all SACAA regulations below for commercial operation of RPAS/UAV. Proof of compliance in a form of copies of certificates and letters with logos and contactable references of SACAA and other relevant authorities must be provided with the bids. Information provided will be subject to verification with SACAA and other relevant authorities.
 - 4.4.1** Valid bidding company's proof of registration of RPAS from SACAA;
 - 4.4.2** Valid bidding company's Remote Piloting License (RPL) from SACAA (Pilot licence);
 - 4.4.3** Valid bidding company's RPAS/UAV Letter of Approval (RLA) from SACAA;
 - 4.4.4** Valid bidding company's RPAS/UAV Operator Certificate (ROC) – including line item allowing night operations from SACAA
 - 4.4.5** Valid bidding company's Air Service License (ASL) issued by the Air Service License Council (which resides at the Department of Transport)
 - 4.4.6** Any other operational requirements as listed by the SACAA and;
 - 4.4.7** Valid bidding company's ICASA certificate for air band radio in operation.
- 4.5** The bidder must have pilots that can operate RPAS/UAV and/or show capacity to provide them. All pilots must have the expertise of 6 months or more to operate an RPAS/UAV. Provide pilot licencing from SACAA to prove the pilot expertise.

5. OPERATIONAL TEAM COMPOSITION AND BROAD SCOPE OF REQUIREMENTS

- 5.1** The bidder shall deploy and operate the number of RPAS/UAV and associated operational teams as per Transnet's requirements from time to time.
- 5.2** The service must be provided with teams that are responsible for:
 - 5.2.1** Deployment and all related activities (Example: Operational deployment plan);
 - 5.2.2** Flying the RPAS/UAV;
 - 5.2.3** Conducting active surveillance during the flight of the RPAS/UAV and;
 - 5.2.4** Communicating with the corridor Security representatives, rapid response teams and Emergency Response Centre.
- 5.3** For purposes of this tender, the service includes a team and a vehicle with capabilities below:
 - 5.3.1** Off-road travel and high clearance (4 x 4 is a requirement) to ensure teams are highly mobile during operations. Teams will be requested to relocate from one place to another during a shift for tracking and tracking of suspects and operational reasons;
 - 5.3.2** A vehicle that is equipped to allow for monitoring of the surveillance camera during the RPAS/UAV Operation;



5.3.3 The engine, generator, electronics and charging system of the RPAS/UAV proposed must be fully integrated into the body of the vehicle.

5.3.4 The cost of the vehicle must include travelling of average 5000 kilometres (km) per month. Excess kilometres will be averaged with other vehicles. Reconciliation of the overruns and underruns will be done on a quarterly basis. Vehicles must be rotated in a relevant geographical area to limit excess kilometres.

5.4 Compliant RPAS/UAV with capabilities below:

5.4.1 RPAS that complies with the stipulated specification;

5.4.2 ICASA and SACAA approved;

5.4.3 Rapid deployment;

5.4.4 Charging station;

5.4.5 Charging facilities for the RPAS/UAV and;

5.4.6 Mobile charging station fitted in the vehicle.

5.5 Qualified RPAS/UAV pilot:

5.5.1 Pilot included as a team member;

5.5.2 Proficient in flying the RPAS/UAV and;

5.5.3 Standard qualifications or accreditations to operate the RPAS/UAV.

5.6 Spotter with responsibilities below

5.6.1 Responsible for monitoring the CCTV surveillance equipment during the flight and should be experienced and proficient in surveillance operations and;

5.6.2 Responsible for communication with the Corridor Security representatives, Rapid Response teams and Emergency Response Centre.

6. FUNCTIONAL REQUIREMENTS

6.1 TFR expects to achieve the following key high-level service objectives from the services required:

6.1.1 meets TFR's business needs for highly available, reliable, scalable, and secure surveillance services;

6.1.2 maintains compliance with best practices, government regulations, applicable legislations, and International obligations;

6.1.3 TFR may request the service provider to fly a day or night shift. Flight time will be informed by the crime trends and patterns. It is envisaged that most flying will occur during the night as currently crime is more likely to occur during the night;

6.1.4 the service provider must ensure that 100% of the services required are always available for the duration of the contract;

6.1.5 the service provider needs to provide own security to secure their RPAS/UAV and operators in and around the TFR environment. TFR will not be held responsible or accountable for any injury/ death or loss that may be incurred due to criminal incidents;

6.1.6 the successful bidder must facilitate contact with the response teams to be deployed whenever malicious incidents are identified. All these activities need to be aligned with the ground security teams to ensure a safe working environment;

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- 6.1.7** the bidder will strive to provide a continuous live or real time surveillance video footage length to the transnet control centre of the duration of flight (minimum actual flight time of 6 x hours) in a day (24 hours).
- 6.1.8** The RPAS/UAV system must be able to be controlled via remote control and all communications must be ICASA approved;
- 6.1.9** The RPAS/UAV must be able to operate in day and night conditions. During the night the RPAS/UAV must have a camera with thermal imaging capabilities detecting heat emitted from objects to track and trace the suspects and during the day it must have an optical camera mode that is ideal to capture good quality images in day/night conditions;
- 6.1.10** The RPAS/UAV must be battery operated. Transnet will not accept fuel operated RPAS/UAV.
- 6.1.11** The RPAS/UAV system must have a Global Positioning System (GPS) system built in;
- 6.1.12** The RPAS/UAV must have a tool to measure the wind speed and indicate whether the RPAS/UAV can fly or not.
- 6.1.13** The RPAS/UAV proposed must be able to operate without a runaway.
- 6.1.14** The RPAS/UAV must be able to operate a minimum distance of 10km beyond visual line of sight meaning they should cover a minimum operational radius of 20km.
- 6.1.15** The bidder will be responsible for any harm or damages that their equipment caused by their operations. Transnet will not be held accountable for damages caused by the bidder's equipment during operations.
- 6.1.16** An 8-hour flight is expected in a day (24 hours). Based on the 8-hour shift, TFR would require a minimum actual flight time of 6 x hours. The flight time lost to issues beyond TFR and bidder's control (E.g. Industrial strike, adverse weather conditions etc.) will be banked on a daily basis and the bidder will have to reimburse TFR by flying extra hours to make up for lost flight time on a monthly basis. Flight hours beyond the minimum expected 6 hours may not be offset against shortages where less than the minimum flight time of 6 hours occurred, as the supplier is expected to fly 8-hour shifts.
- 6.1.17** The bidder shall deploy and operate the number of RPAS/UAV and associated operational teams as per TFR's security requirements from time to time.
- 6.1.18** RPAS/UAV must have the capacity to be airborne continuously for a minimum sixty minutes in normal Conditions before battery change is required.
- 6.1.19** Due to great distances that need to be covered, TFR wants to deploy Fixed wing RPAS/UAV. However, due to operational specific requirements, a Multi rotor will be required from time to time. Considering this the bidders are required to provide proposals and quotations for both Fixed wing and Multi rotor drones. In a case where there is a price difference between the two types of RPAS/UAV (Fixed wing and Multi rotor), Transnet will reimburse the bidders based on the type of RPAS/UAVs deployed between the two per month.



7. THE TENDER REQUIREMENTS

- 7.1** The Bidder must comply with the requirements stated in the Detailed Technical Specifications of the tender.
- 7.2** The roles and responsibilities of each party should be clearly outlined in the tender / bid documents to ensure that liability is properly assigned and the submitted bid price has regard to this.
- 7.3** Transnet intends to split award this tender. If the Bidder does not perform according to the agreed contract and Service Level Agreement (SLA), Transnet will refer to the termination clause as per performance agreement.
- 7.4** The bidder shall ensure that the latest released versions of the service required is provided.
- 7.5** TFR will rely on the bidder's advice, skills, expertise, and experience.
- 7.6** Bidders must submit a complete pricing schedule and delivery times for RPAS/UAV services to be provided monthly (Refer to scope of requirements on clause 3 above). The price schedule must include monthly RPAS/UAV operating costs, Project Management fees, Licence fees (Monthly/annually), travel, meals and accommodation, Pilot fees, support staff and crew fees, vehicle/base station fees, CCTV Surveillance cost, Video footage storage costs, communication costs, monthly rental costs per RPAS/UAV (Fixed wing and Multi rotor), and related auxiliary support costs. All costs of functions required for a RPAS/UAV service must be included. Transnet will not accept any additional costs once the contract is awarded.
- 7.7** Bidders must provide all parameters put in place to secure the safety of their operational teams. The bidder will be expected to sign a non-disclosure agreement and must always treat operational plans as confidential.
- 7.8** The bidder will be expected to testify in court in the event where arrests were effected as a result of RPAS/UAV operation.

8. SERVICE DEPLOYMENT

- 8.1** The deployment of services will be conducted through operational planning sessions that will be managed and controlled by Transnet.
- 8.2** The bidder is required to appoint a permanent dedicated Project Manager (PM) for the duration of the project.
- 8.3** The bidder will be expected to sign a non-disclosure agreement and must always treat operational plans as confidential
- 8.4** The bidder shall be responsible for maintaining log sheets of RPAS/UAV and personnel deployment per site on a shift basis.
- 8.5** The bidder will be required to submit copies of the log sheets to TFR monthly as supporting documents to the invoices.
- 8.6** The bidder will be required to keep the original log sheets for a complete shift during of the contract.



9. DESCRIPTION OF THE WORKS

- 9.1 TFR shall instruct the bidder to provide the services at the required sites based on the operational needs and planning.
- 9.2 The RPAS solution proposed must spot suspicious vehicles and persons on or nearby the TFR premises.
- 9.3 The Pilot and supporting teams deployed must spot potential intruders before an intrusion occurs (Real time). When the intrusion does occur, the teams must alert the response teams.
- 9.4 During intrusion, continuous and effective communications must occur between the RPAS/UAV teams and TFR. The RPAS/UAV teams will direct the response teams to locations of criminals.
- 9.5 The RPAS/UAV operators will be required to track and trace the intruders, thereby delaying them, while the response teams are activated and dispatched.
- 9.6 TFR requires the services of bidders who specialize in RPAS/UAV and understand how to use them effectively.
- 9.7 Except where otherwise stated in this specification, all equipment, installation must conform to the latest recommended National and International Standards below:
 - 9.7.1 South African Bureau of Standards (SABS)
 - 9.7.2 ISO 9001 Quality Management Systems
- 9.8 All standards and requirements in this document must be adhered to.
- 9.9 The bidder will own and/or be able to supply the entire RPAS/UAV, infrastructure, and staff. Proof of ownership of RPAS/UAV is to be provided with bid submission in the event where the service provider owns the RPAS/UAV. In the event where the service provider does not own the RPAS/UAV, a signed and stamped commitment letter from the OEM/owner of RPAS/UAV confirming that the OEM/owner will lease/sell the RPAS/UAV to the service provider. The commitment letter must be in an OEM/owner letter head with contactable references.
- 9.10 TFR will not take responsibility for the service provider's equipment, infrastructure, and staff, while executing their services to TFR. The service provider must provide own security for their teams.
- 9.11 The bidder will take responsibility for any penalties due to infringement on the operational capacities.
- 9.12 Bidders must certify that they are familiar with the requirements as stated in the technical compliance sheet and must state all instances where their equipment offered is unable to comply.
- 9.13 Technical datasheets (Software and hardware), brochures, and specifications of items/services offered must be submitted with the bids. The information on these supporting documents would be used by TFR Cross Functional Evaluation Team (CFET) to prove compliance to the tender requirements. The information required will be used to proof compliance to technical specifications (Part 1 – Technical Compliance to specifications).
- 9.14 Bidder must be able to source/supply additional RPAS/UAV and teams should an adhoc service be required.
- 9.15 The bidder must have capacity for the operation of the RPAS/UAV surveillance service at areas that they are bidding for at 9 x provinces nationally (Northern Cape, Free State, North West, Mpumalanga, Limpopo, Eastern Cape, Western Cape, KwaZulu-Natal, Gauteng).



- 9.16 TFR will provide a response team to be used to attend to malicious events in the area of monitoring.
- 9.17 All video footage and photos that would be recorded would belong to TFR.
- 9.18 The bidder must provide full details of the solution proposed and be able to demonstrate the capability of the entire solution that is being proposed to detect intruders during both day and the night times at TFR sites and environments. Transnet will conduct a site visit and evaluate performance of the solution proposed.

10. CAMERA AND SURVEILLANCE

- 10.1 The RPAS/UAV camera must have the capability to capture and record good quality surveillance video footage during flight time on day and night shifts as well as and when intruders are detected.
- 10.2 The video footage stored shall be date, time, and GPS stamped.
- 10.3 The camera must have the capability to perform surveillance, inspect, capture, and record video footage at the range / distance of the area under surveillance.
- 10.4 The cameras proposed must have variable visual, thermal, and infrared capabilities. The thermal camera resolution shall be a minimum of 640 x 512 at 30 frames per second.
- 10.5 The optic/normal camera resolution shall be a minimum of 4k at 30 frames per second.
- 10.6 The cameras offered must have electronic stabilization and scene tracking capabilities, follow people, vehicles, or any moving object of interest.
- 10.7 The cameras offered must be resistant to harsh outdoor and weather conditions such as temperatures ranging from -10 degrees Celsius to +40 degrees Celsius, heavily polluted atmospheric environment (Salt laden, industrial, and locomotive fumes, and severe dust conditions).
- 10.8 The surveillance system shall support SD cards.
- 10.9 The surveillance system shall be able to provide GPS coordinates to operational response teams to observed irregularities to quicken the response process.
- 10.10 The surveillance equipment should have the ability to automatically detect changes in interest and alert the RPAS/UAV team (Example, changes in areas of interest could be on the first flight 2 x cars were detected and on the second flight no cars were detected).

11. DETAILED TECHNICAL SPECIFICATIONS OF THE RPAS/UAV

- 11.1 Due to great distances that need to be covered, TFR wants to deploy Fixed wing RPAS/UAV. However, due to operational specific requirements, a Multi rotor will be required from time to time. Considering this the bidders are required to provide proposals and quotations for both Fixed wing and Multi rotor drones. In a case where there is a price difference between the two types of RPAS/UAV (Fixed wing and Multi rotor), Transnet will reimburse the bidders based on the type of RPAS/UAVs deployed between the two per month.



- 11.2 The RPAS/UAV proposed must have the capability to be airborne continuously in a single flight for 60 minutes or more in normal conditions.
- 11.3 The RPAS/Drone proposed must be resistant to temperatures ranging from -10 degrees Celsius to +40 degrees Celsius, IP rating at minimum IP45, heavily polluted atmospheric environment (Salt laden, industrial, and locomotive fumes, and severe dust conditions).
- 11.4 The RPAS/UAV must have the capability to fly during daytime and night-time (day shift and night shift) for the duration of the shift.
- 11.5 The ground control and flight control software of the RPAS/UAV proposed must include full engine control, health monitoring, and error handling to enable proactive intervention if required.
- 11.6 The engine of the RPAS/UAV proposed must be fully automated and have the capability to be unboxed, assembled, and launched rapidly.
- 11.7 The RPAS/UAV proposed must be licenced to operate with ICASA and SACAA.
- 11.8 The RPAS/Drone offered must be able to be controlled by means of a remote control.
- 11.9 The RPAS/UAV shall have the capability to rapidly change the battery to ensure quick turnaround times- hot swappable batteries.
- 11.10 The RPAS/UAV intelligence should allow for pre-configured way points for regular inspection/patrol routes.
- 11.11 The RPAS/UAV must be fitted with a GPS tracking device and have the capability to rapidly share the GPS coordinates with the response teams in the event of a detected intrusion.
- 11.12 To avoid interruptible surveillance and capturing of images during intrusions, the RPAS/UAV must have the capability to be recharged and launched within 5 minutes.
- 11.13 The RPAS/UAV proposed must have a laser pointer capability that can be turn on and off as and when required.
- 11.14 The RPAS proposed must have the capability to operate in an environment where there are no runways. Therefore, all RPAS proposed to provide the services that TFR require will not require a road as a pre-requisite for take-off and landing.

12. IT REQUIREMENTS

- 12.1 The section below discusses the IT requirements that the service provider must comply with as far as the desktop application/client access application that allows for the remote monitoring and access of the RPAS/UAV Surveillance system.
 - 12.1.1 The bidder will be required to upload all surveillance footage for each shift onto an online or cloud-based storage system that can be accessed by TFR through a secure authentication.
 - 12.1.2 The video footage will be required to be available for viewing and downloaded through secure authentication on the webpage application for a period of 31 days or more.
 - 12.1.3 Client Access to the application must be browser based.
 - 12.1.4 Minimum compatibility is Microsoft Internet Explorer 9 and higher as well as Microsoft Edge. Compatible with Google Chrome must be enabled.



- 12.1.5** No plug-ins are to be used a part of the RPAS/UAV application.
- 12.1.6** Application must use secure authentication and access must be controlled by profiles for each user types.
- 12.1.7** Full system recovery capabilities must be supplied should vendor no longer be in a position to supply services or TFR ends contract.
- 12.1.8** Data links and storage devices offered must be encrypted for security purposes.