Proposed Amendments to SACAA Part 101 Regulations Progress and Future Outlook

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ABSTRACT

Part 101 of the South African Civil Aviation Regulations governs unmanned aircraft systems (UAS) operations and was introduced early to ensure aviation safety. However, the framework was largely adapted from manned aviation regulations and applies a uniform, certification-driven approach to operations with very different risk profiles. As the UAS sector has evolved, concerns have emerged regarding whether the current regulatory structure continues to support innovation, accessibility, and compliance, particularly for low-risk operations, research activities, and emerging manufacturers.

This paper presents a structured review of Part 101 and a proposal for targeted amendments developed through stakeholder consultation, expert engagement, and comparative benchmarking against international regulations and standards. The proposed framework introduces a proportionate, risk-based regulatory architecture, differentiated operational categories, and dedicated provisions for institutional and research operations whilst managing safety and security risks associated with unsecured airspace. The analysis demonstrates that a risk-based approach can reduce regulatory barriers and improve compliance while maintaining core aviation safety objectives.

Keywords: UAS, Part 101, Civil Aviation Authority, Drones

1. Introduction

Part 101 of the South African Civil Aviation Regulations, published under the Civil Aviation Regulations of 2011, provides the regulatory framework governing the operation of Unmanned Aircraft Systems (UAS), commonly referred to as drones. The regulations consist of six subparts that prescribe requirements relating to registration, certification, licensing, operational limitations, maintenance, and oversight. These provisions were introduced at a time when unmanned aviation was emerging rapidly and when safety assurance was the primary regulatory priority.

A substantial portion of Part 101 was adapted directly from international manned aviation frameworks, particularly those developed by the International Civil Aviation Organization (ICAO). While this approach ensured alignment with established aviation safety principles, it also resulted in the application of regulatory concepts originally designed for small manned aircraft to unmanned systems with fundamentally different risk profiles, operational characteristics, and use cases.

South Africa was among the earliest countries to introduce comprehensive drone regulations and was the first to permit Beyond Visual Line of Sight (BVLOS) operations under regulatory approval in 2015. These developments positioned the country as an early leader in unmanned aviation regulation on the African continent. However, more than a decade after the promulgation of Part 101, questions have emerged regarding whether the current regulatory framework continues to support innovation, accessibility, and sector growth, or whether it has become a constraint on the development of the national drone ecosystem (SACAA, 2011).

This paper examines whether the current Part 101 regulations foster or hinder innovation in South Africa’s unmanned aviation sector. It reviews the structure and intent of the existing regulatory framework, analyses key limitations that have emerged in practice, and presents the proposed amendments developed through recent stakeholder consultations. The paper argues for a risk-based, proportionate regulatory approach aligned with international best practice, while ensuring that drones remain accessible to a broad range of users, including manufacturers, commercial operators, and academic and research institutions whilst managing safety and security risks associated with unsecured airspace. In doing so, the paper seeks to contribute to the ongoing reform of South Africa’s unmanned aviation regulatory framework in a manner that balances safety, innovation, and inclusivity.

1.1. Background

South Africa has been involved in the development and operational use of unmanned aerial vehicles since at least the 1980s. The South African Air Force (SAAF) re-activated 10 Squadron in January 1986 and equipped it with the domestically developed Denel Dynamics Seeker family of unmanned aerial vehicles for reconnaissance and artillery support roles. The Seeker UAV first saw active service in 1987 during the South African Border War, where it was deployed operationally from forward bases in Angola to conduct real-time reconnaissance and intelligence gathering, including detection of enemy positions and mobile surface-to-air missile systems (Pilot’s Post, 2021; Allworth, 2021). In this period, the UAVs contributed tactical intelligence that informed SAAF mission planning and battlefield awareness. Beyond military applications, the Seeker family continued to be utilised in the 1990s for internal security tasks, including monitoring of national events and support to civil agencies, demonstrating an early transition of UAV use into non-combat roles (Pilot’s Post, 2021). South African defence industry actors such as Denel Dynamics, CSIR, and others have maintained continued involvement in UAV concepts and system development, contributing to the country’s longstanding role in unmanned aircraft research and application (Military Africa, 2022). The historical progression of these early military and subsequent civil UAV applications in South Africa is summarised in Figure 1.

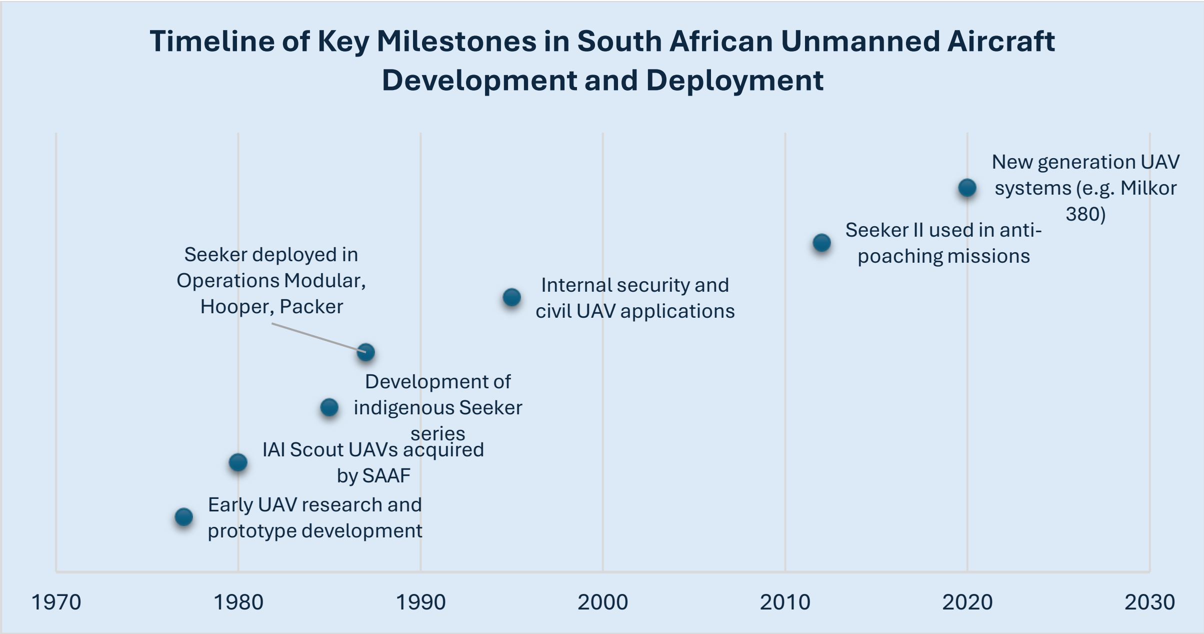

Figure 1: Key milestones in UAS development in South Africa

This early technological leadership placed South Africa among the first countries in Africa to develop, deploy, and operationalise unmanned aircraft systems at scale. The same pioneering role extended into the regulatory domain when South Africa introduced comprehensive drone regulations under Part 101 in 2015, becoming one of the first countries globally to authorise BVLOS operations within a formal regulatory framework. The introduction of Part 101 represented a significant milestone in establishing safety oversight for an emerging industry and provided legal certainty for early commercial and research operators.

The principal strength of the current Part 101 framework lies in its strong emphasis on safety and accountability. Mandatory registration, certification, and licensing requirements ensure that operators and aircraft are subject to regulatory oversight, thereby reducing risks to airspace users and the public (SACAA, 2011). However, over time, concerns have emerged regarding the stringency and complexity of these requirements and their suitability for the diverse and rapidly evolving range of UAS operations (Chirwa and Singano, 2024).

Industry feedback suggests that the cost, administrative burden, and procedural complexity associated with compliance have created significant barriers to entry, particularly for small operators, start-up manufacturers, and academic and research institutions. At the CSIR UAV Colloquium held in 2024, participants reported that a substantial proportion of drone operators operate outside the formal regulatory system, with estimates indicating that approximately 90 per cent of operators are not fully compliant with existing requirements. The high cost and extended timelines associated with licensing and certification were identified as key drivers of non-compliance, raising concerns that overly restrictive regulation may inadvertently discourage lawful participation while failing to achieve its intended safety objectives (Chirwa and Singano, 2024).

These developments have prompted renewed reflection on South Africa’s position as a regulatory pioneer in unmanned aviation. While the country was an early leader in the field, several jurisdictions have since adopted more flexible, risk-based regulatory frameworks that differentiate between low-risk and high-risk operations and reduce regulatory burdens for benign use cases. This shift raises the question of whether South Africa's regulatory framework has kept pace with international best practice or whether regulatory rigidity now risks constraining innovation and sector growth.

In response to these concerns, the CSIR convened a national UAV colloquium in 2024 and subsequently hosted a multi-stakeholder workshop at the Southern African Transport Conference 2025. These engagements brought together regulators, industry representatives, researchers, and operators to assess the performance of the existing regulatory framework and to identify areas requiring reform. The outcome of these consultations was a comprehensive proposal for amendments to Part 101, aimed at introducing a proportionate, risk-based structure aligned with emerging international standards while preserving the core principles of aviation safety. This paper builds on this process by documenting the motivations for reform, outlining the proposed amendments, and considering their implications for the future of South Africa's unmanned aviation sector.

1.1.1. Overview of current UAV framework

Part 101 of the South African Civil Aviation Regulations establishes a comprehensive regulatory framework governing the certification, registration, operation, and oversight of Unmanned Aircraft Systems. The framework is structured into six subparts that together regulate the full lifecycle of UAS operations, from aircraft approval and operator certification to operational limitations, safety management, and enforcement.

Figure 2 provides a schematic overview of the current Part 101 regulatory structure and illustrates the regulatory flow from aircraft approval and registration through operator certification and operational control. The framework adopts a highly centralised, certification-driven model in which most non-private operations require formal approval at both aircraft and operator level prior to any operational activity.

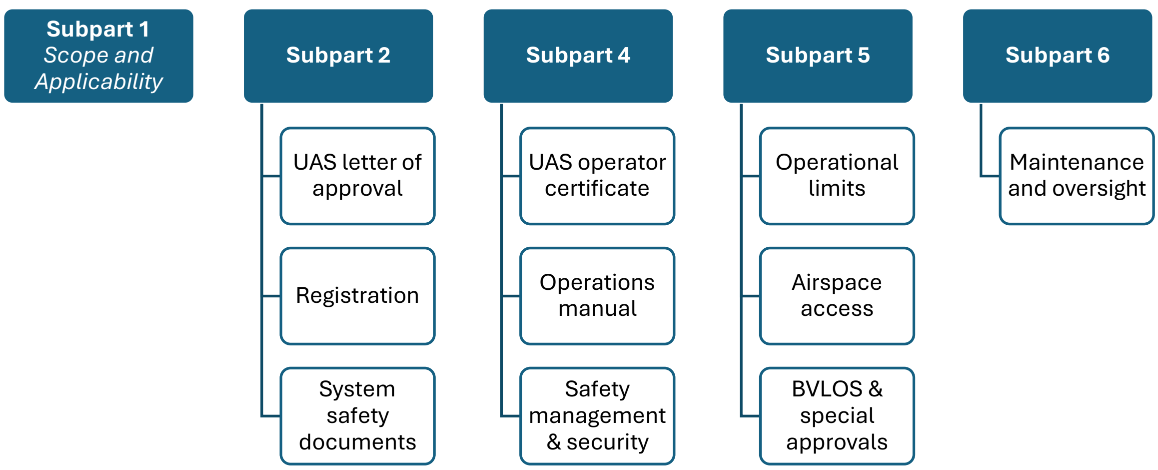

Figure 2: schematic overview of the current Part 101 regulatory structure

At the entry point of the framework, Subpart 1 prescribes general applicability, operational categories, and exclusions, defining the scope of UAS activities subject to regulation. Subpart 2 establishes mandatory aircraft-level approvals, including the requirement for a UAS Letter of Approval (UASLA), system safety documentation, altimetry requirements, and registration on the civil aircraft register. These provisions effectively treat each unmanned aircraft as a certified aviation product subject to continuing oversight (SACAA, 2011).

Subpart 4 introduces the UAS Operator Certificate (UASOC) as the primary mechanism for authorising commercial, corporate, and non-profit operations. The UASOC regime requires applicants to obtain organisational certification, develop and maintain an approved operations manual, establish safety management and security systems, maintain detailed records, and submit to continuous surveillance and audit by the regulator. This subpart mirrors the organisational certification model used in manned commercial aviation (SACAA, 2011).

Operational control is addressed in Subpart 5, which prescribes detailed operational limitations relating to weather conditions, controlled airspace access, dangerous goods, accident reporting, human factors, general restrictions, and Beyond Visual Line of Sight operations. These provisions impose strict altitude, airspace, and location limitations and require formal approval for higher-risk operations such as BVLOS, night operations, and controlled airspace flights (SACAA, 2011).

Collectively, the current framework adopts a uniform regulatory approach in which most non-private operations are subject to full organisational certification, irrespective of operational risk, aircraft mass, or complexity. While this structure provides a high level of safety assurance, it also results in significant procedural complexity, extended approval timelines, and high compliance costs, particularly for low-risk operations, small operators, manufacturers, and research institutions. This architecture forms the basis for the regulatory challenges examined in subsequent sections and motivates the proposed transition toward a proportionate, risk-based regulatory model.

2. Document review methodology

The proposed amendments to Part 101 were developed through a structured, evidence-based regulatory review process combining stakeholder consultation, expert engagement, comparative regulatory benchmarking, and clause-by-clause redrafting. The methodology was designed to ensure alignment with international best practice while addressing operational and institutional needs specific to the South African context.

The overall process is summarised in Figure 3, which illustrates the sequential stages of consultation, benchmarking, analysis, and drafting, while the principal documentary and consultative inputs used at each stage are summarised in Table 1.The process comprised five sequential stages: stakeholder consultation, expert validation, document and standards review, comparative regulatory analysis, and regulatory drafting.

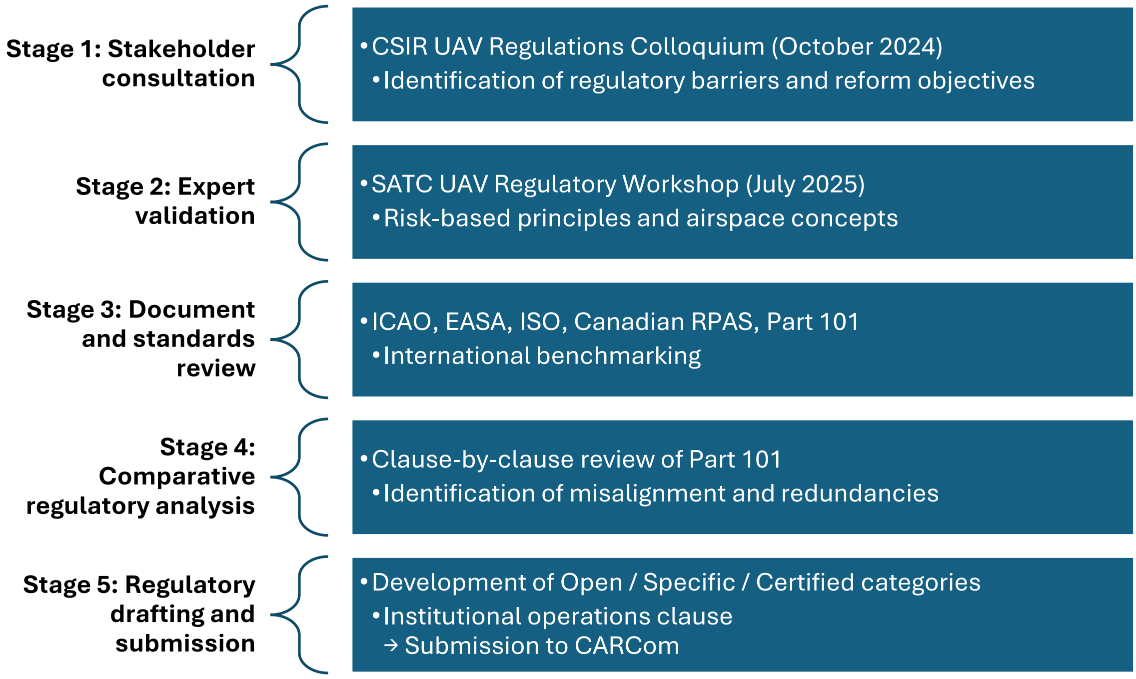

Figure 3: Methodology used for regulatory review.

Table 1: principal documentary and consultative inputs used

Input category	Information Source	Role in the amendment methodology
Stakeholder consultation	UAV Regulations Colloquium Report (CSIR, 2024)	Identification of regulatory barriers, non-compliance drivers, research constraints, licensing challenges, and reform priorities
Industry practitioners	Colloquium presentations and discussions	Practical operational challenges, administrative bottlenecks, and sector-specific needs (inspection, research, training)
Expert validation	SATC UAV Regulatory and Airspace Management Workshop Report (CSIR, 2025)	Strategic validation of risk-based approach, airspace structuring concepts, certification thresholds, and innovation impacts
International expert input	Keynote presentation by Prof. Tomasello (EASA) at SATC 2025	Adoption of European risk-based categorisation principles, low-altitude airspace layering, and BVLOS integration concepts
Regulatory baseline	South African Civil Aviation Regulations Part 101	Clause-by-clause assessment of existing framework and identification of structural misalignment

National technical standards	SA-CATS 101	Assessment of certification, operations, maintenance, and oversight provisions
International aviation guidance	ICAO RPAS guidance material	Benchmarking of safety assurance principles and certification philosophy
International regulation	EASA Regulations 2019/947 and 2019/945	Reference model for Open / Specific / Certified categorisation and proportional oversight
International national frameworks	Canadian RPAS Regulations	Benchmarking of licensing thresholds, operator requirements, and operational flexibility
International technical standards	ISO 21384 series	Alignment of safety, airworthiness, maintenance, and operational governance
Policy and implementation literature	Selected international UAS policy reports	Identification of regulatory trends and implementation challenges
Draft regulatory framework	Proposal for the Amendment of Part 101 (Chirwa et al., 2025)	Development, consolidation, and validation of revised regulatory architecture
Institutional innovation input	Colloquium and SATC research discussions	Design of the dedicated institutional and research operations clause
Regulatory submission process	Internal CSIR technical and legal review	Consistency checking and preparation for CARCom submission

2.1. Stakeholder consultation and problem identification

Initial problem identification was undertaken through the UAV Regulations Colloquium convened by the CSIR in October 2024. The colloquium brought together industry operators, researchers, training institutions, and legal experts to assess the impact of the current regulatory framework on innovation, compliance, and research activities. Key challenges identified included high compliance costs, lengthy approval timelines, lack of risk differentiation, and disproportionate regulatory burdens on academic and institutional users(Chirwa and Singano, 2024).

2.2. Expert input and strategic validation

Expert input was subsequently obtained through the UAV Regulatory and Airspace Management Workshop held at the Southern African Transport Conference (SATC) in July 2025. Contributions from international and national specialists, including a keynote presentation by Prof. Tomasello (EASA), informed the adoption of risk-based categorisation, low-altitude airspace structuring, and proportional certification thresholds (Chirwa, 2025).

2.3. Document review and regulatory benchmarking

A targeted review of regulatory and technical reference documents was conducted, including the existing Part 101 regulations, ICAO guidance material, EASA Regulations 2019/947 and 2019/945, the ISO 21384 series, and selected national frameworks. These documents, listed in Table 1, were used to establish international benchmarks and to identify structural misalignments in the current South African framework (Chirwa et al., 2025).

2.4. Clause-by-clause comparative analysis and drafting

Each subpart of Part 101 was reviewed clause-by-clause and compared against corresponding provisions in international standards and regulations. As illustrated in Figure 3, regulatory constructs were redesigned where misalignment or redundancy was identified, resulting in the development of a categorised, risk-based framework and the introduction of a dedicated regulatory provision for institutional and research operations.

The resulting draft amendments were compiled in a formal clause-by-clause format and submitted to the Civil Aviation Regulations Committee (CARCom), the statutory advisory body responsible for reviewing and recommending amendments to the Civil Aviation Regulations, for consideration. This step is critical, as CARCom serves as the formal mechanism through which regulatory amendments are evaluated prior to promulgation.

3. Key proposed changes noted and made to the part 101

The proposed amendments introduce targeted revisions to the structure and technical content of Part 101 to implement a proportional, risk-based regulatory framework and to address specific operational and institutional gaps identified through stakeholder consultation and comparative regulatory analysis (Chirwa et al., 2025). The amendments combine provisions adopted from selected international regulations and standards with new national regulatory constructs developed for the South African operational and research environment as summarized in table 2.

Table 2: Updates on the proposal to amendments for part 1017

Regulatory Domain	Legacy Framework (Part 101)	Proposed Framework	International Reference	Regulatory Impact
Scope & Categories	Uniform certification (ROC, ASL, RPL) for most operations	Risk-based categorisation: Open, Specific, Certified (101.01.1(2); Subpart 7)	ICAO (2022); EASA 2019/947; CARs Part IX	Enables proportional regulation and removes low-risk entry barriers

Registration	Registration required for all RPAs	Registration only for UAS ≥2 kg or with surveillance capability (101.02.4(8))	EASA Art. 14; CARs Part IX	Reduces administrative burden for hobbyist and academic users
Licensing	RPL required for all operators	RPL required only for Specific and Certified categories (101.03.1)	EASA Regulations 2019/947 and 2019/945	Improves accessibility while preserving safety for higher-risk operations
Operational Restrictions	BVLOS and night operations highly restricted	BVLOS and night operations permitted under waiver for Specific/Certified (101.05.11)	ICAO BVLOS; CARs Part IX	Enables advanced operations and research use cases
Institutional Operations	No differentiation from commercial users	Dedicated institutional exemptions and governance (101.01.2(4); Subpart 8)	Canadian research exemptions	Introduces formal academic and research regulatory pathway
Maintenance & Airworthiness	Limited guidance and oversight	Structured maintenance, configuration control, decommissioning (Subpart 6)	ISO 21384-2; ICAO; EASA	Strengthens accountability and certification readiness
Privacy & Data Governance	Not regulated	Dedicated data protection and privacy regime (Subpart 9)	ISO 21384-3; POPIA	Integrates aviation oversight with digital governance

3.1. Introduction of risk-based operational categories (Subpart 7)

The current Part 101 applies a purpose-based regulatory structure in which most non-private operations require Remote Operator Certification, Air Service Licensing and Remote Pilot Licensing, irrespective of operational risk (SACAA, 2011).

The amendments introduce a three-tier operational categorisation comprising Open, Specific and Certified categories, formally established under Subpart 7 (101.07.1-101.07.4) and referenced in regulation 101.01.1(2) (Chirwa et al., 2025).

This categorisation framework is adopted from:

- ICAO Model UAS Regulations (2022),
- EASA Regulations 2019/947 and 2019/945, and
- Canadian Aviation Regulations, Part IX.

The revised structure replaces the existing purpose-based classification system with explicit risk-based pathways governing registration, licensing, organisational approval and operational authorisation.

3.2. Revision of registration thresholds and requirements

Under the current framework, registration is required for all remotely piloted aircraft, irrespective of mass, equipment or operational risk (101.02.4).

The amendments introduce threshold-based registration requirements. Registration is required only for UAS with a Maximum Take-Off Weight of 2 kg or greater or for aircraft equipped with surveillance or data-capturing systems (101.02.4(8)) (Chirwa et al., 2025).

This approach is informed by:

- EASA Regulation 2019/947, Article 14, and
- Canadian Aviation Regulations, Part IX.

The revised threshold reduces administrative burden for low-risk and academic users while preserving oversight for aircraft presenting higher safety or privacy risk.

3.3. Revision of personnel licensing requirements

Under the current framework, a Remote Pilot Licence is required for all operators except private users, irrespective of operational risk (101.05.9(b)).

The amendments restrict licensing requirements to Specific and Certified Category operations only, as provided in regulation 101.03.1 and linked to Subpart 7 categorisation (Chirwa et al., 2025). Open Category operations no longer require a Remote Pilot Licence.

This approach is adopted from:

- EASA Regulations 2019/947 and 2019/945

Licensing requirements are therefore limited to operations presenting moderate or high operational risk, while low-risk research and educational activities are enabled without unnecessary licensing barriers.

3.4. Expansion of operational flexibility for BVLOS and night operations

Under the current framework, Beyond Visual Line of Sight and night operations are highly restricted and permitted only through ad hoc approval within the UASOC regime (101.05.11).

The amendments permit BVLOS and night operations under waiver for Specific and Certified Category operations in regulation 101.05.11, with categorisation and authorisation requirements linked to Subpart 7 (Chirwa et al., 2025).

This approach is adopted from:

- ICAO RPAS and BVLOS guidance material, and
- Canadian Aviation Regulations, Part IX.

The revised provisions expand operational flexibility for research and industrial applications while retaining approval-based oversight for higher-risk activities.

3.5. Introduction of dedicated provisions for institutional and research operations (Subpart 8)

The current Part 101 applies identical licensing and certification requirements to commercial, institutional and research users and contains no dedicated provisions for academic or experimental operations (SACAA, 2011).

The amendments introduce a new Subpart 8: Research and Educational Operations (101.08.1-101.08.5) and associated exemptions under 101.01.2(4) (Chirwa et al., 2025).

This Subpart introduces:

- blanket exemptions for recurring low-risk Open Category research operations,
- institutional-level responsibility and registration, and
- project-based approvals for experimental activities.

The concept is informed by Transport Canada’s use of exemptions and special authorisations to accommodate research and experimental RPAS operations under the Canadian Aviation Regulations, Part IX; however, the structure and scope of Subpart 8 constitute a new national regulatory construct developed specifically for the South African academic and research environment.

3.6. Strengthening of maintenance, authorisation validity, and airworthiness provisions (Subpart 6)

The current Subpart 6 provides limited guidance on maintenance oversight and configuration control, with UAS Maintenance Technician authorisations valid for 24 months and subject to periodic renewal and retraining (101.06.3).

The amended Subpart 6 introduces a comprehensive maintenance and continuing airworthiness framework, including approved maintenance programmes, maintenance logs, modification control procedures and decommissioning requirements (101.06.1-101.06.9) (Chirwa et al., 2025). These provisions are adopted from:

- ISO 21384-2,
- ICAO continuing airworthiness principles, and
- selected EASA maintenance oversight practices.

The amendments further revise authorisation validity and renewal requirements. The validity period of UAS Maintenance Technician authorisations is extended from 24 months to 60 months (101.06.3(5)). Renewal does not require retraining, provided that the holder demonstrates continued competence and compliance with approved maintenance standards. The primary purpose of renewal is to maintain current records and regulatory oversight rather than to impose recurrent training obligations.

3.7. Introduction of privacy and data management provisions (Subpart 9)

The current Part 101 contains no explicit provisions addressing privacy, data protection or data governance (SACAR Part 101, 2011).

The amendments introduce a new Subpart 9: Data Protection and Privacy (101.09.1-101.09.7) (Chirwa et al., 2025). The Subpart introduces:

- privacy impact assessments,
- encryption and data security requirements,
- data retention limits, and
- compliance with the Protection of Personal Information Act.

These provisions are adopted from ISO 21384-3 and national data protection legislation and constitute the first explicit integration of aviation and data governance obligations within the South African UAS regulatory framework.

4. Why the Proposed Framework Provides a Sustainable Regulatory Pathway

The proposed amendments represent a structural re-design of the regulatory architecture governing unmanned aviation in South Africa rather than a routine technical update. The framework addresses fundamental limitations of the existing regulatory model and establishes a design capable of supporting long-term technological evolution, institutional participation, and industrial development without recurrent structural reform.

During the SATC UAV Regulatory and Airspace Management Workshop, Prof. Tomasello emphasised that national UAS regulations should be designed to remain valid across successive technological generations, rather than being rewritten in response to each wave of innovation (Chirwa, 2025). The proposed framework reflects this principle through its risk-based architecture, layered regulatory design, and institutional enablement mechanisms.

4.1. Establishing long-term regulatory agility

A principal design objective of the framework is to decouple regulatory structure from technological change. By organising regulatory obligations around operational risk rather than aircraft configuration, mission type, or operational purpose, the framework remains applicable irrespective of future developments in autonomy, propulsion systems, sensor technologies, or traffic management concepts (Chirwa et al., 2025).

The Open, Specific and Certified categories introduced under Subpart 7 provide a stable structural backbone within which emerging technologies can be accommodated through operational authorisations and technical standards, rather than through repeated amendment of the primary regulations. This directly addresses the structural vulnerability of first-generation UAS regulations, which become obsolete as technology evolves.

4.2. Reducing the need for recurrent regulatory reform

The framework deliberately separates structural regulation from evolving technical detail. Core governance elements such as categorisation, certification thresholds and institutional provisions are embedded within Part 101, while changing technical requirements are referenced through international standards and subordinate guidance material (Chirwa et al., 2025).

This layered design enables future alignment with ICAO, EASA and ISO developments through updates to technical standards rather than through legislative reform. Regulatory evolution can therefore occur without destabilising the regulatory framework, reducing regulatory churn and preserving long-term legislative coherence.

4.3. Leveraging UAS technology use for Research and Development

A critical limitation of the existing framework is its failure to distinguish between commercial operations and educational or experimental activity. Under the current system, students and research institutions are required to comply with commercial-grade certification pathways that are misaligned with training and research objectives. Addressing this misalignment would enable a more supportive environment for innovation and, in turn, strengthen South Africa's global competitiveness in research and development across a wide range of economic sectors.

The introduction of simplified Open Category pathways and the dedicated institutional provisions of Subpart 8 establishes, for the first time, a formal governance layer for academic and research operations (Chirwa et al., 2025). This design lowers structural barriers to entry for students, enables long-term research programmes to operate under stable institutional authorisations, and integrates regulatory compliance into education and training pipelines rather than treating it as an exclusionary barrier.

4.4. Supporting local manufacturing and developmental testing Capability

The framework further establishes a coherent pathway for product development and testing. Alignment of maintenance, configuration control and airworthiness provisions with international standards under Subpart 6 provides manufacturers with a stable certification environment compatible with global markets (Chirwa et al., 2025).

At the same time, the integration of experimental and developmental operations within the regulatory framework reduces discontinuities between research, prototype testing and certification. This design enables iterative development while preserving oversight, strengthening the domestic innovation ecosystem and supporting international competitiveness.

4.5. Strategic significance of the proposed framework

Collectively, these design choices reposition Part 101 from a compliance-oriented, certification-driven regime to a development-enabling regulatory framework. The amendments establish a system that is structurally stable, adaptable to technological evolution, accessible to education and research, and aligned with international regulatory trajectories (Chirwa et al., 2025).

In doing so, the proposed framework provides an agile regulatory foundation capable of supporting the long-term growth of the South African unmanned aviation sector.

5. Conclusions

This paper has examined the structure of South Africa's current Part 101 unmanned aircraft regulatory framework and identified key limitations arising from its uniform, certification-driven design. While the framework successfully established early safety oversight, evidence from stakeholder consultation and comparative regulatory review indicates that it now imposes disproportionate regulatory burdens on low-risk operations, research activities, and emerging manufacturers, contributing to reduced accessibility and compliance challenges.

The proposed amendments introduce a proportionate, risk-based regulatory architecture aligned with international best practice and informed by local operational realities. By differentiating regulatory requirements according to operational risk and introducing dedicated provisions for institutional and research operations, the framework demonstrates how regulatory reform can preserve aviation safety while enabling innovation, research participation, and sector growth. The findings support the adoption of risk-based regulation as a sustainable pathway for the continued development of South Africa's unmanned aviation sector.

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