**WHITE PAPER**


A collaboration between Straten Consulting Services Limited (CSL) and SMART Aviation Solutions Ireland

# AFOS — Defining the Airline Flight Optimisation System

## A White Paper Introducing AFOS, SMARTSlot® and a New Era of Collaborative Airline Efficiency

***J. van Hoogstraten***

*Straten CSL/Smart Aviation Solutions Ireland*

*Contact email: info@stratencsl.co.uk*

*www.stratenscl.co.uk and www.sasi.ie*

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## Abstract

The aviation industry has developed highly effective systems for managing airspace and airport capacity — namely, Air Traffic Flow Management (ATFM) and Airport Collaborative Decision Making (A-CDM). However, these frameworks operate independently, leaving a critical operational gap: a real-time optimisation layer that allows airlines to manage and coordinate their own trajectories, slots, and performance outcomes across both domains.

This white paper introduces the concept of the Airline Flight Optimisation System (AFOS) — a new category of collaborative technology designed to connect airline operations with ATFM and A-CDM environments through predictive, data-driven decision-making.

Developed by SMART Aviation Solutions Ireland (SASI), the AFOS model is embodied in SmartSlot®, a platform that continuously performs a four-stage optimisation cycle — **Predict, Decide, Negotiate, Execute (PDNE)** — to enhance flight efficiency, slot adherence, and sustainability.

AFOS functions as an intelligent intermediary between the sky and the ground, enabling airlines to share intent data, optimise trajectories, and recover network performance collaboratively with air navigation service providers and airports.

The paper defines AFOS architecture, outlines its integration with existing systems, and presents measurable performance benefits including improved on-time performance, reduced reactionary delays, and lower $CO_2$ emissions.

In doing so, AFOS establishes a third operational pillar — complementing ATFM and A-CDM — to deliver a fully connected, collaborative, and sustainable aviation ecosystem.

## 1. Introduction

The aviation ecosystem has evolved into a network of connected yet fragmented decision systems. Air Traffic Flow Management (ATFM) balances network demand and capacity, while Airport Collaborative Decision Making (A-CDM) optimises turnaround performance at the airport. Yet no system exists to empower airlines to predict disruptions, negotiate slot and trajectory options, and collaborate seamlessly with both air traffic and airport systems.

That missing layer is the Airline Flight Optimisation System (AFOS).

SMART Aviation Solutions Ireland (SASI) introduces SMARTSlot®, the world's first AFOS platform — a predictive, data-driven, and collaborative optimisation engine that enables airlines to continuously manage and enhance flight performance between the boundaries of airspace and apron.

AFOS is not a reinvention of ATFM or A-CDM. It is the bridge between them — an airline-centric layer of intelligence that unifies intent, performance, and collaboration into one continuous optimisation loop.

## 2. The Industry Context — Solving Yesterday's Problems

Aviation's digital transformation has produced a wealth of operational data, yet the industry still manages flights through distinct silos:

- ATFM regulates network demand and capacity.
- A-CDM coordinates airport stakeholders for ground efficiency.
- Airline Operations Centres (OCCs) manage the schedule between those constraints.

Each function works effectively in isolation, but collectively they lack real-time synchronisation. Airlines remain reactive to network slots, airport delays, and weather disruptions — relying on manual coordination, tactical replanning, and fuel-heavy recovery manoeuvres.

The consequences are well known: inefficient slot utilisation, unstable CTOTs, wasted fuel, and mounting $CO_2$ emissions — despite a digital ecosystem capable of doing far more.

## 3. The Missing Layer — The Case for AFOS

Airlines require a sovereign optimisation layer — an intelligent system that continuously monitors every flight, anticipates constraints, and collaborates with ATFM and A-CDM through live data exchange.

An AFOS executes a closed-loop process built around four continuous stages:

1. **Predict** – Anticipate airspace, weather, and airport constraints.
2. **Decide** – Compute the most efficient slot and trajectory combinations.
3. **Negotiate** – Exchange optimised intent with ATFM and A-CDM systems in real time.
4. **Execute** – Apply and monitor the solution operationally, validating outcomes post-flight.

This Predict–Decide–Negotiate–Execute (PDNE) cycle gives airlines continuous situational awareness, operational control, and measurable efficiency gains.

## 4. SMARTSlot® — The World's First AFOS Platform

Developed by SMART Aviation Solutions Ireland (SASI), SMARTSlot® represents a new class of airline technology — one designed to optimise not just the schedule, but the entire flight lifecycle.

SMARTSlot® integrates seamlessly with existing OCC and flight planning environments, creating a live collaboration channel between airlines, airports, and ANSPs.

SMARTSlot® Architecture:

- IFOMS – Integrated Flight Operations Management System: Provides the operational core, uniting dispatch, slot, fuel, and trajectory data within one decision framework.
- C-TOMS – Collaborative Trajectory Optimisation Management System: Acts as the intelligent interface to ATFM and A-CDM, sharing airline intent data via SWIM, FF-ICE, and DPI/FUM protocols.

Together, these modules form the AFOS framework — a dynamic optimisation layer that ensures every flight operates with maximum predictability and minimum environmental impact.

## 5. AFOS in the Aviation Ecosystem

AFOS functions as the collaborative intelligence layer between airspace and ground operations — transforming fragmented decision-making into a unified, data-driven process.

## 6. Benefits Across the Ecosystem

For Airlines:

- Proactively recover lost slots and reduce reactionary delays.
- Stabilise CTOTs and rotations through predictive insight.
- Reduce $CO_2$ emissions through trajectory optimisation.
- Enhance on-time performance (OTP) and aircraft utilisation.

For ANSPs and ATFM:

- Access machine-readable airline intent for improved flow prediction.
- Reduce tactical communications and late change requests.
- Increase network stability and predictability.

For Airports and A-CDM:

- Improve milestone adherence (TOBT, TSAT).
- Enable smoother departure flow and stand management.
- Integrate trajectory intelligence directly into sequencing systems.

## 7. AFOS Value Metrics

Key measurable outcomes demonstrate the efficiency and sustainability benefits of AFOS deployments:

| Metric | Definition | Expected Outcome (SmartSlot®) |
|---|---|---|
| **Slot Recovery Rate** | % of flights improving CTOT by ≥ X min | +15–25% improvement |
| **OTP (D0/D15)** | Flights departing within thresholds | +8–12 points |
| **Taxi-Out / Holding Time** | Average minutes saved per flight | 2–4 minutes reduction |
| **$CO_2$ Efficiency** | Tonnes saved per flight | 150–300 kg reduction |
| **Milestone Stability** | TOBT/TSAT variance | −20–30% variance |

## 8. Alignment with the Future of Air Traffic Management

AFOS aligns naturally with the global transition to Trajectory-Based Operations (TBO) and System Wide Information Management (SWIM). By providing accurate, early, and machine-readable flight intent, airlines become active participants in managing airspace demand and environmental performance.

SMARTSlot® enhances rather than replaces existing infrastructure, providing a collaborative layer that connects airline operational intelligence with global airspace management networks.

## 9. Declaring a New Category — The Collaborative Operations Triad

SASI defines the Collaborative Operations Triad as the new operational framework for modern aviation:

| Domain | System Type | Core Stakeholder |
|---|---|---|
| **ATFM** | Air Traffic Flow Management | ANSPs / Network Managers |
| **A-CDM** | Airport Collaborative Decision Making | Airports / Ground Operators |
| **AFOS** | Airline Flight Optimisation System | Airlines / Operators |

Within this triad, AFOS acts as the airline's digital intelligence layer, harmonising decision-making and performance across all domains.

## 10. Conclusion — The Future is Collaborative

Aviation's future depends on closing the intelligence gap between airspace and ground operations. AFOS provides that missing link — empowering airlines to collaborate with ATFM and A-CDM systems through predictive, data-driven optimisation.

SMARTSlot®, developed by SMART Aviation Solutions Ireland (SASI), is the first operational embodiment of AFOS: a system designed to unify trajectory, slot, and turnaround intelligence under one continuous loop of optimisation.

ATFM manages the sky. A-CDM manages the ground. AFOS manages the flight between them.

## About Straten CSL

Straten Consulting Services Limited (Straten CSL) is a specialist aviation consultancy focused on the integration of airspace design, aerodrome safeguarding, and renewable energy development within complex aviation environments.

Founded to bridge the gap between aviation regulation and modern infrastructure development, Straten CSL delivers evidence-based, regulator-compliant solutions that enable safe, sustainable coexistence between airports, air traffic management systems, and new-generation technologies such as wind and solar energy.

Straten CSL provides end-to-end support across Airspace Design, Instrument Flight Procedure (IFP) Development, CNS Safeguarding, and Aviation Impact Assessment, applying ICAO, EASA, and UK CAA frameworks including CAP738, CAP764, CAP785, and CAP1616.

With a proven global track record — supporting projects across the UK, Europe, the Middle East, and Africa — Straten CSL combines operational expertise with technical innovation to deliver solutions that are safe, proportionate, and aligned with the future of integrated airspace and environmental planning.

## About SMART Aviation Solutions Ireland (SASI)

SMART Aviation Solutions Ireland (SASI) is an innovation and technology company dedicated to advancing the efficiency, safety, and sustainability of global aviation operations. SASI delivers integrated solutions across Air Traffic Management, airline operations, and performance-based optimisation — blending deep operational experience with intelligent digital design.

SMARTSlot®, SASI's flagship technology, is the world's first Airline Flight Optimisation System (AFOS) — enabling airlines to collaborate seamlessly with ATFM and A-CDM systems while achieving measurable performance, cost, and environmental benefits.