TO PERFORM EFFICIENT OPERATIONS

FOS
SPS
As the aircraft manufacturer, we provide our customers with comprehensive performance data allowing the aircraft to operate within the certified flight envelope and in compliance with operational regulations. Apart from the traditional paper-based data that is provided in the Airplane Flight Manual (AFM), ATR has developed the APS, ATR Performance Software, allowing easier and faster calculations for day-to-day airline operations. The APS package is composed of the Flight Operations Software (FOS) and the Single-point Performance Software (SPS).

The FOS is designed to compute all performance data required to ensure the safe and optimal operations of ATR aircraft. The FOS is a PC-based software allowing performance computations for various flight phases. FOS is composed of five computation modules and several database managers, all detailed in the joined leaflets. The FOS is a user-friendly application, with cockpit ‘look and feel’ interfaces that provides straight-forward access to takeoff, landing cards and weight and balance computations. The SPS can be hosted on any type of Class 1 or Class 2 Windows-based Electronic Flight Bag (EFB) as well as on ground PCs. The SPS allows end users being more autonomous in the calculation. It affords the operators a “less paper” solution on board the aircraft, provided appropriate operational approval has been obtained from local Authority. The SPS is composed of three computation modules and two specific databases, all detailed in the joined leaflets. SPS administration is done thanks to the FOS.

The APS, derived from AFM data, offers the best guarantee in terms of performance analysis reliability. FOS and SPS are invaluable tools at each step of your operations: flight preparation, in-flight and for flight analysis.
Three database managers are included onto the FOS, each dedicated to a certain type of data: aircraft, airport and route. The data are managed in dedicated files, thus not interfering with the settings defined in the computation sessions. The database parameters can be managed manually or may as well be automatically imported from specific data sources (airport data files, navigation database).

The operator is responsible for the databases content; ATR does not provide any airport, obstacles and routes data.

**FOS FLEET FILE**

All aircraft from the operator’s fleet may be managed in the FOS Fleet file. The aircraft are clearly identified, and their main characteristics having an impact on performance are defined; mainly airframe, engine and brakes.

Any aircraft from the Fleet file is then easily selectable in the computation session, making it convenient to compute the performance with one or several aircraft from the fleet.

Aircraft allowed within the FOS fleet file are as per the license agreement signed by the operator.

**AIRPORT DATABASE**

The operating airports are managed in the Airport database. The runway main characteristics are defined – i.e. lengths, slope, width – as well as the surroundings constraints having an impact on the takeoff limitations – i.e. obstacles, approach climb gradients.

Several airports may be defined in one Airport database. The operator has the possibility to manage as many Airport databases as wished to organize its network as convenient. Once the Airport database is filled, one or several airport(s) data are easily selectable in the computation session.

The Airport database information may be imported from specific data files – SITA\(^{(1)}\) or EAG\(^{(1)}\) airport data files, PEP\(^{(2)}\) Airport database. The data are then automatically loaded, thus accelerating the database filling. The Airport database is unique and common to FOS and SPS; same Airport database(s) can be used in both software.

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(1) SITA and EAG are airline services providers. (2) PEP is the Airbus performance software
The operating routes are managed in the Route database. The route characteristics are first defined – i.e. departure and arrival airports, waypoints, en-route obstacles. Then the legs are selected on a graphical map, which facilitates the route design. Several routes may be defined in one Route database. The operator has the possibility to manage as many Route databases as wished to organize its network as convenient. Once the Route database is filled, one or several route(s) data are easily selectable in the computation session. The route waypoints coordinates may be imported from a navigation database (ARINC 424-9 format) – e.g. the GPS navigation database loaded in the aircraft. The waypoints coordinates are then automatically loaded, thus accelerating the database filling.
Five computation modules are included onto the FOS, each dedicated to a certain computation type. For each module the computation parameters are defined in a “computation session” file. The session is a unique file that combines all the computation data:

- One aircraft selected from the Fleet database
- Airport(s) or Route(s) Data selected from the Airport or Route databases
- Assumptions and settings of the computation
- Results

The computation session runs independently from the databases, ensuring the full traceability of all computation data, assumptions and results. The computation session content depends on the FOS Module; layout being the same for each module, making the filling of the session very efficient and methodic for a trained user. Computation sessions can be managed to ease FOS utilization. It makes very convenient the performance computations with different settings and assumptions to cover the entire operating conditions.

**TAKEOFF AND LANDING CHARTS**

This module computes takeoff and landing charts in which the limiting takeoff and landing weights are displayed, depending on the weather conditions, the runway and obstacles data defined in the Airport database and operational regulations. The benefit of specific aircraft setting (reverse, air conditioning, Boost, RTO power) can be easily assessed, as well as the performance decrement brought by a dispatch under MEL.

In the takeoff charts, the takeoff speeds ($V_1$, $V_{r^*}$, $V_T$) linked to the limiting weight are displayed. They are optimized in order to provide the maximum allowable payload.
IN-FLIGHT PERFORMANCE

This module computes single/twin-engine performance data (fuel consumption, time, distance…) for all “high-speed” flight phases: climb, cruise, descent and holding. This module is used to compute the performance tables given in the Flight Crew Operating Manual (FCOM).

It is an essential tool for flight ops engineers to conduct all kinds of performance studies, e.g.: edit the performance tables required by the flight planning system providers, edit long range cruise table, etc.

FLIGHT PLANNING LOG

This module computes operational flight planning logs with accurate fuel predictions for routes extracted from the Route database, under the selected flight conditions.

There is also a possibility to link a single-engine computation to the flight planning computation and define the decision points on the route; similarly to what is done in Module 4 – En-Route Net Flight Path.

EN-ROUTE NET FLIGHT PATH

The en-route net flight path module is dedicated to the calculation of regulatory performance in case of an engine failure during the flight. This is useful when operating on routes overflying mountainous areas. This module determines the weight limitations or the route decision points and allows flight ops engineer elaborating consigns for the flight crew.

The En-Route Net flight Path analysis can also be performed with the accurate values for the route (takeoff weight and fuel on board) in the Module 3 - Flight Planning Log.

CRUISE PERFORMANCE MONITORING

The Cruise Performance Monitoring module is used to monitor performance degradation over time. The aircraft real performance is measured in cruise and compared to the theoretical one; deviations in engine performance or fuselage drag are assessed. The main objectives of this module are:

- To adjust the aircraft performance factors used in the Module 3 - Flight Planning, or in any flight planning system or Module 2 – In-Flight Performance.
- To detect aircraft performance degradation and make appropriate corrective actions.
Two specific SPS database managers are included onto the FOS to administrate SPS configuration and fleet files. The airport database is common to both FOS and SPS.

An update module, also part of the FOS, allows the SPS administrator creating SPS update packages, to be then distributed to the SPS on users’ platforms. The administrator selects one or more databases to be included in the update package and specify a validity date for each. The validity date concept eases the databases' management on the SPS user platforms: databases are automatically activated when their validity date is reached; this allowing doing updates in advance on remote platforms.

The operator is responsible for the databases content; ATR does not provide any airport and obstacles data.

**SPS Configuration File**

General SPS settings, as interface behavior and allowed computations options – access to en-route failure computation, modify runway option, print option, etc. - , are defined in the SPS configuration file. The operator has the possibility to manage several SPS configuration files, for example, one configuration file for ground stations and one configuration file for EFB.

SPS configuration file updates can then be included in SPS update package to be distributed on each SPS users’ platforms.
SPS FLEET FILE

All aircraft for which SPS is used can be managed in the SPS Fleet database. The aircraft are clearly identified.

Their main characteristics having an impact on takeoff and landing performance computation, and additional ones - speeds settings, default configuration, crosswind limits, dispatch factors, etc. - are easily defined. Weight and balance parameters - aircraft related weights, crew and passengers’ weight, cabin configuration, etc. - can also be managed for the SPS weight and balance module use. A specific file containing all the characteristics of one given aircraft can be furnished by ATR on request. This file eases the database filling and is chargeable.

The configuration management has been designed to be widely opened and allows the SPS administrator defining any cabin configuration for cargo and passengers aircraft.

The operator has the possibility to manage several SPS fleet file, for example, one SPS fleet file for ground stations containing all the operator’s aircraft and one SPS fleet file for EFB containing only one aircraft or one aircraft type. SPS fleet file updates can then be included in SPS update package, to be distributed on each SPS users’ platforms.

Aircraft allowed within the SPS fleet database are as per the license agreement signed by the operator.

AIRPORT DATABASE

The airport database is unique and common to FOS and SPS. Same airport database can be used in both software. Please refer to FOS databases description for details about Airport database.
The SPS is composed of three complementary computation modules: weight and balance, takeoff and landing. The SPS has been designed to fit the ATR Class II EFB screen dimensions, but it can be perfectly used on any other Windows based platform.

Each module has been designed to be independent with nevertheless a commonality for Minimum Equipment List (MEL) items between takeoff and landing modules and a possibility to transfer weight and balance outputs (weights and CG) to takeoff and landing modules.

The computation outputs can be printed under data card format for takeoff and landing. The load and trim sheet can be printed as well.

Particular computations can also be saved on request.

A virtual keyboard has been developed for SPS use and a specific colour code, similar to FMS one, has been applied to SPS interfaces for the sake of clarity.

*: The EFB Electronic Display Unit is the PilotView® CMA 1100, manufactured by CMC Electronics.

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As for the takeoff module, landing limiting weight and landing card including all necessary parameters for landing (speeds, Required Landing Distance or Actual Landing Distance depending on the computation type, go-around capability, etc.) can be easily computed from atmospheric day conditions and aircraft status. Contaminated runways can be selected as well as approach type and go-around gradient. NOTAM can also be considered for the time of the computation session, thanks to the “Modify” function that here allows reducing the Landing Distance Available (LDA). MEL items can be easily incorporated into computation; all MEL items having an impact on performance being available for selection. MEL items are shared between takeoff and landing modules. An item selected for landing will be already selected for takeoff and vice versa.

In the SPS Landing module there is a possibility to perform two computation types. Either the computation is launched in dispatch conditions; in that case regulatory coefficients will be considered and RLD will be displayed with associated parameters. Or the computation is launched considering an en-route failure; in that case computation will consider failure coefficient and will end up with an ALD together with the associated parameters. All en-route failure items having an impact on performance are available for selection.

Thanks to the weight and balance module the loadmaster or the pilot can generate its load and trim sheet that could be then electronically signed. From aircraft and crew configuration, SPS calculate all necessary weight and index based on the cargo and passengers loading in the aircraft. A graphical output can be established and displayed with zero fuel, takeoff and landing dots checked within the operational and certified flight envelopes limits. The SPS can propose an automatic distribution of passengers in each of the cabin zone. Some weight deviations to the defined configuration can be considered for the time of the computation session. Once calculation is done, there is a possibility of transferring takeoff weight and CG in the takeoff module and landing weight in the landing modules. The load and trim sheet can also be printed on any installed printer.

*: Module under development.
SYSTEMS REQUIREMENTS

Systems requirements for FOS/SPS software:

- Microsoft® Windows XP, Vista or Seven
- A minimum of 128 MB of RAM for Windows XP (512 MB recommended)
- A minimum of 1 GB of RAM for Windows Vista (2 GB recommended)
- A minimum of 1 GB of RAM (32-bit) or 2 GB of RAM (64-bit) for Windows Seven (4 GB recommended)
- 32 or 64-bit processor compatible with Microsoft® Windows operating systems
- 200 MB of hard disk free space
- A CD-ROM drive (if installation via CD-ROM)
- SVGA graphic 16 bits with a minimum resolution of 800 x 600
- A local or network printer (optional for SPS)

APS updates can be either delivered via DVD or downloaded from the APS download platform using customer’s personal login. Customer will be notified by e-mail when a new APS version is available.