A DATA DRIVEN APPROACH TO OPTIMIZING CONTINGENCY FUEL

Honeywell

This paper describes the various factors that impact fuel allowances and how Statistical Contingency Fuel programs can unlock huge savings for airlines. Honeywell Flight Efficiency can drive data-driven Contingency Fuel decisions that reduce landing fuel loads while prioritizing safety.

Many airlines are pledging to reach net-zero carbon emissions by 2050, one step further than the previous industry plans to halve emissions by 2050. These ambitious sustainability commitments are resulted from the constant pressure from government officials and the general public to reduce their environmental impact.

In order to assist airlines in their ambitious sustainability goals, ICAO has proposed a basket of measures including aircraft technology improvements, sustainable aviation fuels, market-based measures (carbon offsets), and operational improvements.

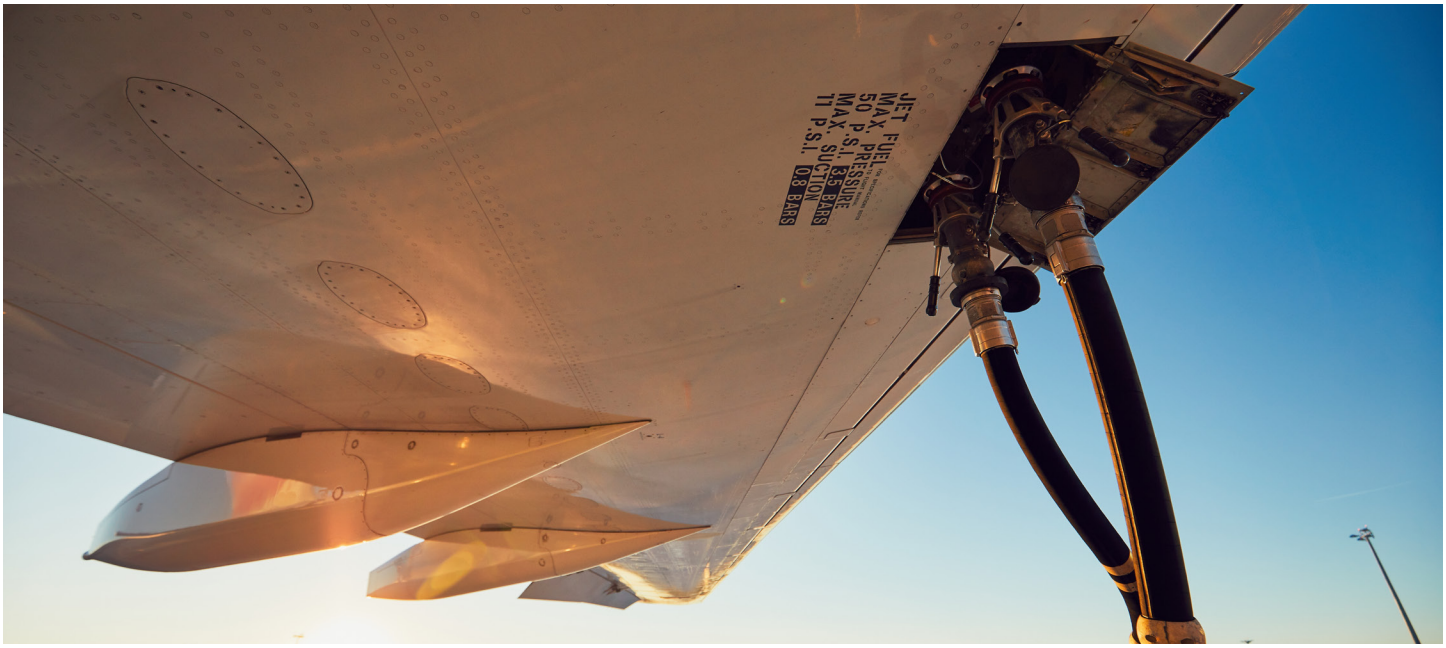
The latter can be divided into two main categories – optimization of air traffic management (ATM) and operational procedures. While ATM optimization ultimately relies on the regulators' involvement, more efficient operational procedures and fuel dispatch optimization are something that each airline can work on autonomously.

More efficient Flight OPS procedures such as single-engine taxiing, reduced acceleration altitude and most optimal flap settings might require amendments of the airline's Standard Operating Procedures (SOP) and possibly additional training of the flight crew. This brings additional complexity towards the adoption of these best practices.

On the other hand, fuel optimization can be an easy win for reducing fuel and carbon emissions. It is achieved by judiciously reducing landing fuel loads while prioritizing safety. The carriage of accurate fuel amounts on a flight is directly correlated with the number of historical data insights during the planning and execution of a flight. The more historical data available, such as Flight Plans and QAR data, the more opportunity exists to find potential gaps. These insights help pilots and dispatchers learn from the past and enable them to make better decisions. There are four fuel allowances, which are subject to optimization:

- Contingency fuel
- Alternate fuel
- Taxi fuel
- Discretionary / Pilot Extra fuel

The biggest potential for savings can be attributed to contingency fuel optimization, which can achieve up to 0.6% savings of the total trip fuel.



Here are the estimated savings, assuming an example airline with an aircraft fleet of 40:

SAVING CALCULATOR FOR CONTINGENCY FUEL: 3% ERA TO 90% SCF					
	# of Aircraft	**#of Flights**	**Savings per Flight**	**Total Fuel Savings**	**Total CO2 Savings**
Short Haul	30	45,000	4 kg	196,875	620,156 kg
Long Haul	10	6,000	120 kg	718,200	2,262,641 kg
Total	**40**	**51,000**	**124 kg**	**915,075**	**2,882,486 kg**

Assumptions:

Short Haul

- **current CONT fuel policy: 3% ERA**
- **current average CONT fuel: 320 kg**
- **SCF (90% coverage):270 kg**

Long Haul

- **current CONT fuel policy: 3% ERA**
- **current average CONT fuel: 1460 kg**
- **SCF (90% coverage): 1080 kg**

Contingency fuel is loaded to address unforeseen circumstances and enable airlines to avoid the severe financial and operational implications of needing to divert to another airport due to a minimum or emergency fuel situation.

There are multiple approaches towards planning contingency fuel. Operators can choose, based on the amount of available data or the complexity of their flight planning system.

The ICAO requirements, combined with EASA-established variations mandate:

BASIC PROCEDURE

5% trip fuel, or
3% trip fuel ERA, or
20 minutes flying time,

REDUCED CONTINGENCY FUEL (RCF) PROCEDURE

5% fuel needed from decision **point to destination**

STATISTICAL (SCF)

Statistically covers the deviation from planned to actual trip fuel calculated for the respective **city pair/aeroplane** combination

The majority of operators use the basic procedure – most typically 5% or 3% of the trip fuel allowance. However, these conservative fixed contingency fuel requirements were set many years ago, when flight planning and fuel management systems lacked the accuracy that is available today. Such solutions enable advanced airlines to utilize performance-based methodologies. Some regulations permit operators to apply statistical calculation methods for calculating the exact amount of contingency fuel needed, based on historical data, or simply put – Statistical Contingency Fuel (SCF).

This results in the most accurate contingency fuel planning. However, most accurate doesn't always mean the smallest amount – a good SCF algorithm will sometimes suggest a higher contingency fuel allowance than the fixed 5%. This might be due to repetitive historical diversions from the planned route, holding patterns at arrival or many other reasons. Ideally, such cases should be further analyzed to make sure the planned trip fuel allowance is being estimated correctly.

A great side effect of a successful Statistical Contingency Fuel program is that it leads to reduction of discretionary or extra pilot fuel. Once the pilots trust that the contingency fuel amount is sufficient to cover any unexpected deviations, they will cease to over-compensate with discretionary fuel. SCF combined with a pilot briefing for the historical utilization of discretionary and contingency fuel is a great way to inspire trust of the calculation.

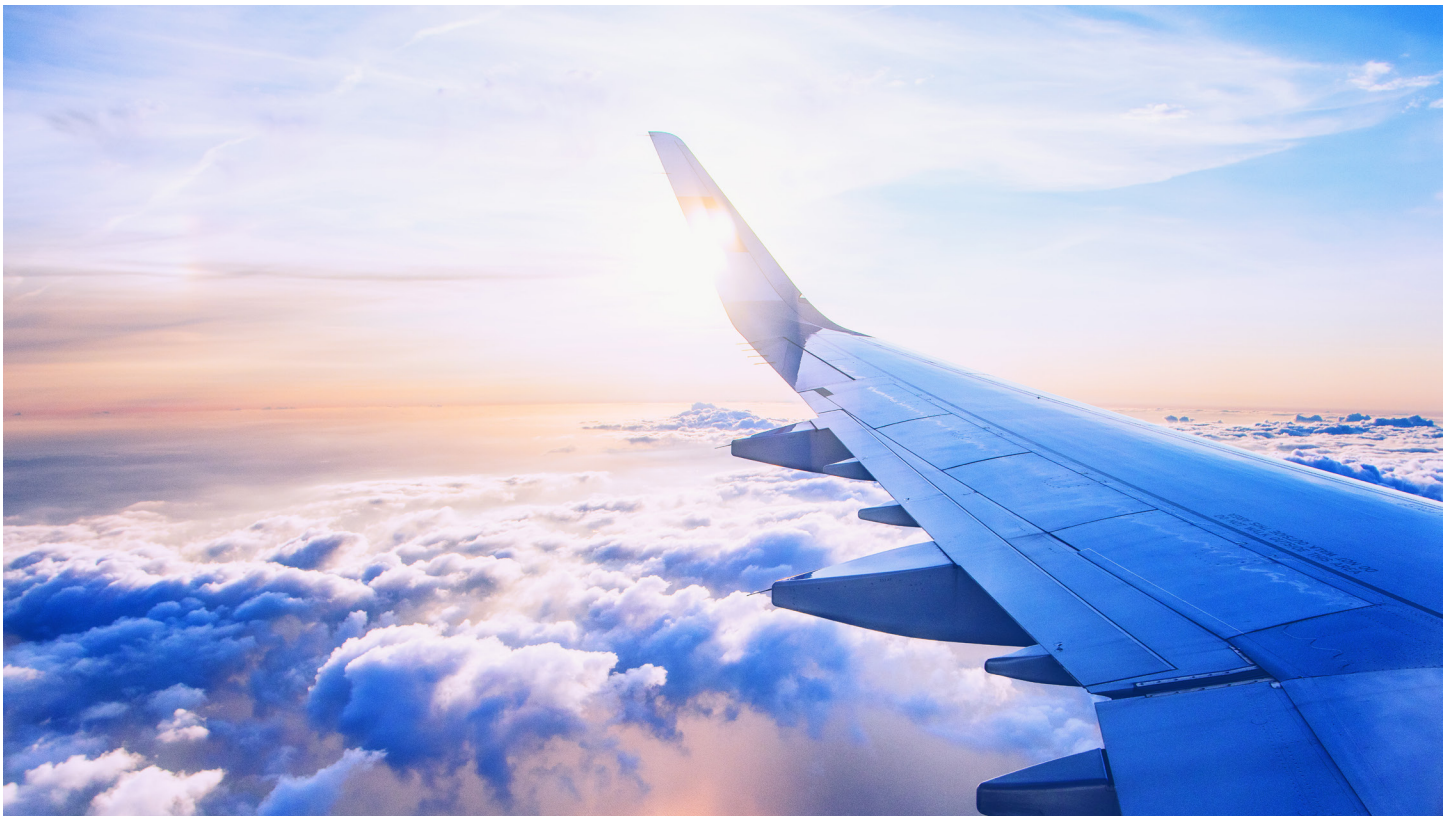
At the bare minimum, SCF must be calculated per the following group of historical flights – Departure Airport / Arrival Airport / Aircraft type. Depending on the analytical capabilities of the flight planning or fuel management system, additional parameters such as time of arrival or various performance factors can be added to the split. This is important because such factors can greatly influence the amount of planned SCF. For example, morning flights arriving at busy airports might be more prone to holdings and delays compared to evening flights on the same route with the same aircraft. Grouping of flights per scheduled time of arrival is no easy task and should be handled by automated clustering algorithms.

At the core of the calculation stands the trip fuel deviation of the actual fuel consumed, compared with the planned fuel amount. After a series of data transformation techniques and normalizations to account for route lengths and ZFW differences, the final output is 3 values – 90%, 95% and 99% percent coverage or CONT90, CONT95 and CONT99 respectively. Coverage is the percentage of flights that burn less than their contingency fuel. For example, a coverage contingency fuel value of 90% means that 90% of the flights should arrive with all their alternate and final reserve fuel intact. The choice of coverage is defined in the regulator's rules, but it is entirely up to the fuel dispatcher's discretion after a risk assessment, taking into consideration flight time, ERA availability, weather forecast at the destination and airport infrastructure.

There is one catch though – regulators require two years of clean data to calculate SCF. Airlines, which do not possess such amount of data can still achieve significant savings by adopting the reduced contingency fuel procedure. In the meantime, they can gather the needed data for SCF. This is easily handled by a proven data solution for automatic processing and storage of airline data.

According to IATA, 99% of planned contingency fuel is not burned and is carried in the aircraft tanks for the entire flight. This large and untapped potential savings can be utilized effortlessly through **Honeywell Flight Efficiency**. This best-in-class Fuel Management System offers automatic collection and cleaning of data, calculation of SCF, and direct feed to any flight planning system without any effort from the airline operator. Honeywell fuel dispatch experts tailor the algorithm per the operator's SOP to achieve the most optimum balance between safety and efficiency.

For more information, please refer to this case study, which uncovers how Lufthansa Cargo perfected their contingency fuel policy with the Honeywell Flight Efficiency platform.



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