Volaris engages pilots in fuel reductions

Marco Antonio Charles, Senior Manager of Software Governance and Fuel Efficiency Operations, and **Luis Fernandes San Miguel**, Fuel Efficiency Manager, both at Volaris share the flight to efficiency: how Volaris Pilots contribute to optimizing fuel consumption and minimizing emissions

In the dynamic world of aviation, the role of pilots extends beyond navigating aircraft through the skies. The industry faces escalating challenges due to growing environmental concerns, regulatory and cost pressure. Addressing these challenges requires a comprehensive and proactive approach, including pilots' involvement, as they play a significant role in fuel efficiency through optimal adjustments and applying appropriate flying techniques at each phase of the flight. These initiatives aid in substantial cost reduction, which is crucial for airlines' financial health, and to position them at the forefront of sustainable aviation practices. In an era where environmental consciousness is paramount and regulatory frameworks are tightening, engaging pilots in fuel efficiency is no longer a choice but a necessity.

VOLARIS

In 2006, Volaris began its aviation journey with two aircraft leased from TACA. Despite the 2008 financial crisis, the airline expanded internationally in 2009 and continued to grow, acquiring its first Airbus A320neo in 2016. The 2020/21 COVID-19 pandemic presented significant challenges, but Volaris thrived, using its ultra-low-cost carrier model to outpace competition. Now, Volaris leads in Mexico's domestic market and operates with three Air Operator Certificates in Mexico, Costa Rica, and El Salvador. Only last year, Volaris transported over 33 million passengers, operating a fleet of 124 aircraft of the Airbus A320 Family, including 75 neos. Environmental, Social, and Governance factors are critical in aviation, and Volaris actively complies with these standards, focusing on reducing emissions and ensuring company equity. Embracing technology is vital for Volaris and pilot engagement is required for successful implementation. Volaris' resilience and innovative approach to the changing aviation industry demonstrates its commitment to sustainability and exceptional service.

COOPERATION WITH STORKJET

Figure 1: StorkJet products used by Volaris. Source: Internal resources, 2023

Volaris formed a strong and productive collaboration with StorkJet in 2019, marking a significant milestone in the development of operational excellence. While collaborating with various suppliers for different aspects of business, their relationship with StorkJet stands out, particularly in fuel efficiency. StorkJet's innovative tools (figure 1) have become an integral part of the airline's operations, enabling effective tracking and optimization of fuel consumption, a critical component of commitment to sustainability and efficiency. Volaris initiated its approach by integrating StorkJet's Advanced Aircraft Performance Monitoring tool, the AdvancedAPM, as a foundational step. To complement this, it has adopted FuelPro, which plays a crucial role in its ongoing efforts to accurately monitor fuel consumption and fuel efficiency initiatives. However, strategy extends beyond simply tracking performance from a fuel efficiency perspective. A key aspect of the approach involves understanding how to effectively

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communicate these insights to the pilots in a manner that is both positive and constructive. For this purpose, they have been engaging with FlyGuide for several months. Currently, FlyGuide is fully integrated into everyday operations. Volaris put it through a series of tests to ensure it works well and to demonstrate how it can be beneficial.

USE CASE 1: DISCRETIONARY FUEL

Using StorkJet's fuel efficiency dashboard, FuelPro — the collected data revealed an interesting trend among Volaris' pilots. They often request additional fuel with no apparent correlation to the factors one might expect, such as flight duration, time of day, adverse weather conditions, or expected delays. This pattern persists across various sectors, suggesting no connection between pilots' discretionary fuel selections and fuel over-burn, which varies depending on aircraft type and performance. Figure 2 below illustrates no observable link between the discretionary fuel amounts recorded by Captains and instances of fuel overburn.

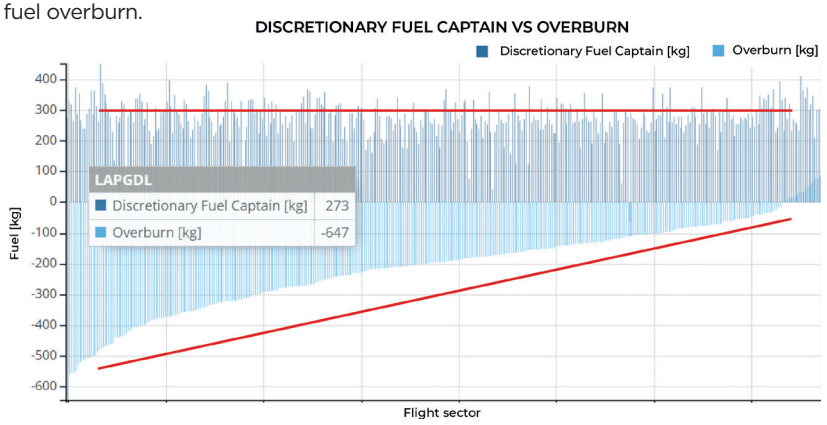

Figure 2: Discretionary Fuel Captain vs Overburn. Source: FuelPro — StorkJet, 2023

The objective was to analyze this trend and develop effective strategies to communicate these insights to the pilots. Volaris aimed to simplify and clarify the data, turning it into practical knowledge. This would empower pilots to make more informed decisions about allocating discretionary fuel.

Volaris' approach is focused on changing the pilots' approach from a 'just in case' to a 'just as needed' mindset. This is achieved by showing pilots solid data, such that 98% of flights on a specific route with a given aircraft were subjected to significant fuel underburn and did not need additional fuel, as illustrated in figure 3. With StorkJet's EFB application, FlyGuide, Volaris presents this information in a clear and easy-to-understand format. Volaris' aim is not to draw comparisons between individual performances but to offer a general perspective on fuel consumption, providing pilots with an intuitive solution to make more efficient choices.

In the example in figure 3, it is shown to the pilots that the average underburn for this specific route, using the specified aircraft, is 659kg, and only during 14 of 449 flights did a fuel overburn occur. This might lead the pilots to question the cause of such a trend. To address this, FlyGuide provides additional insights, revealing that the actual trip distance was, on average, 107NM shorter than planned, and the Zero Fuel Weight was, on average, 2138kg lighter than projected in the Operational Flight Plan. These two elements — the shorter trip distance and the lower actual Zero Fuel Weight substantially impact fuel consumption.

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Pilots can easily understand why the Trip Distance is shorter using the map feature, which highlights historical shortcuts on the route. As shown in figure 4, a key observation is that the STAR is hardly ever executed according to the full published procedure (marked with a magenta line), leading to a significant reduction in the average journey distance. Such detailed information gives the pilots the knowledge they need, to make informed choices, like deciding whether carrying discretionary fuel on these routes is necessary.

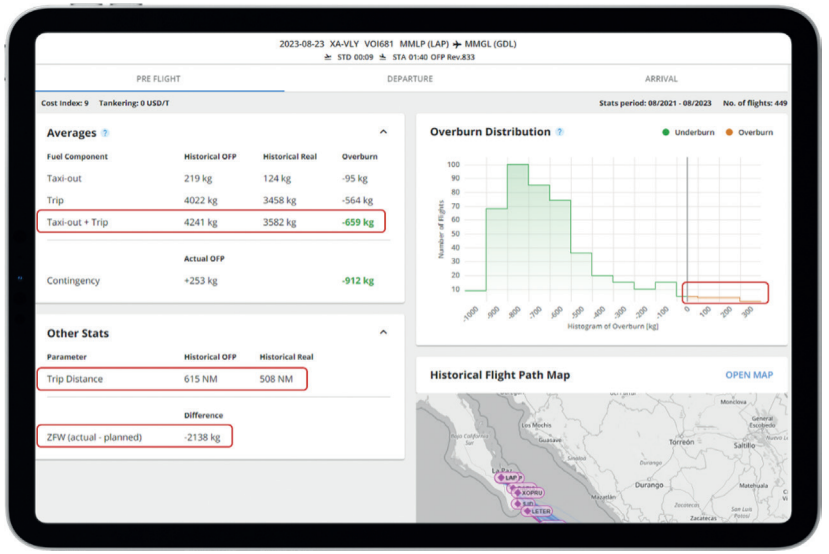

Figure 3: Fuel Briefing module. Source: FlyGuide — StorkJet, 2023

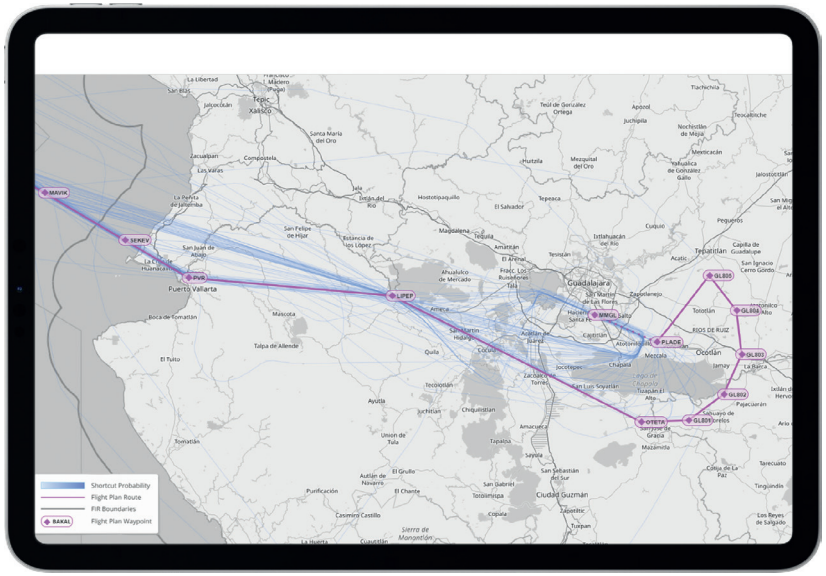

Figure 4: Briefing — Historical Flight Path Map. Source: FlyGuide — StorkJet, 2023

USE CASE 2: TOP OF DESCENT

Adjusting the Top of Descent is a crucial element in managing the descent phase of the flight efficiently, as it greatly affects fuel usage and overall operational effectiveness. When the Top of Descent is timed accurately, the aircraft can engage in an idle or low-power descent, which is far more fuel-efficient than a powered one. Through StorkJet's analysis, Volaris has identified specific airports where the discrepancy between the actual and optimum FMS speeds is notable. This analysis helps investigate the causes of such variations and, ultimately, guides the pilots toward complying with the most efficient flight paths. Figure 5 provides an example from SJO Airport, where it's noted that pilots, on average, fly 26 knots faster than the speed recommended by the FMS.

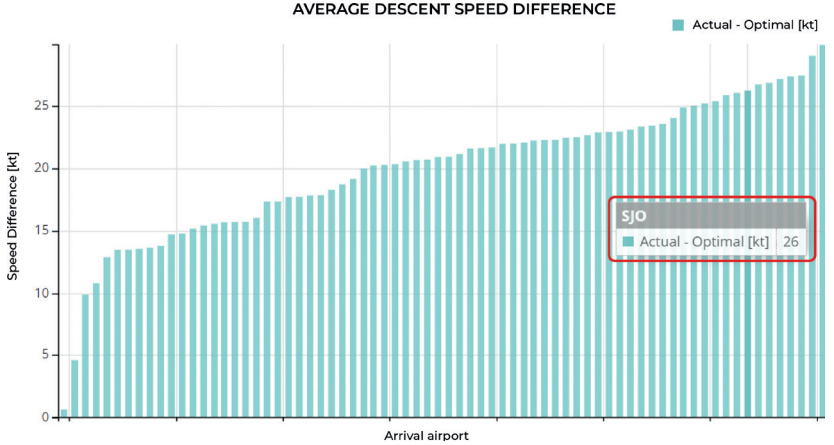

Figure 5: Average Descent Speed Difference. Source: FuelPro — StorkJet, 2023

With insights into the airports where pilots' descent speeds exceed the optimal range, Volaris has a chance to explore the underlying reasons further. This exploration is made possible by examining detailed data from StorkJet's fuel efficiency solution. The analysis is crucial to crafting more effective strategies to boost operational efficiency and has revealed that the pilots often didn't anticipate the shortcuts during arrival, lacking historical data on previous flights at the specific airport. However, the FlyGuide Briefing module has been instrumental in addressing this issue. It informed the pilots that at SJO airport, the STAR section is typically not executed according to the full published procedure, as shown in figure 6, indicating the high probability of a shortcut that pilots could plan and prepare for during the briefing. Consequently, this knowledge allows for better adjustment of the Top of Descent, helping the pilots avoid challenging situations regarding aircraft energy management in descent for instance being too high, too fast, and, at the same time, too close to the airport.

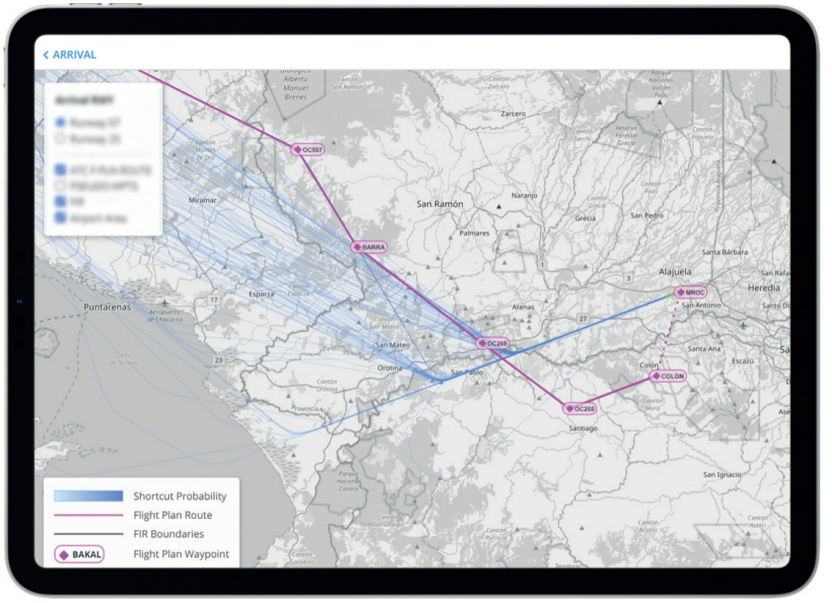

Figure 6: Briefing — Historical Flight Path Map. Source: FlyGuide — StorkJet, 2023

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The picture in figure 7 presents a key aspect of the FlyGuide app — the Feedback regarding the given initiative. In this case, Vertical Profile — Descent. This function plays an educational role, giving pilots detailed and practical feedback on their previous flights. It simplifies the process for pilots to understand the nuances of their flight performance and provides tips for enhancing future flight manoeuvres. For example, in the flight presented, the descent was initiated later than ideal, as marked. This delay required the use of speed brakes to create additional drag, to bring the aircraft back on the optimum descent profile. However, this adjustment resulted in increased fuel consumption. By adjusting the descent management, pilots can positively impact on the environment. In the given example, optimizing descent could lead to a reduction of 145 kg in CO_2 emissions, showcasing the significant environmental benefits of such adjustments.

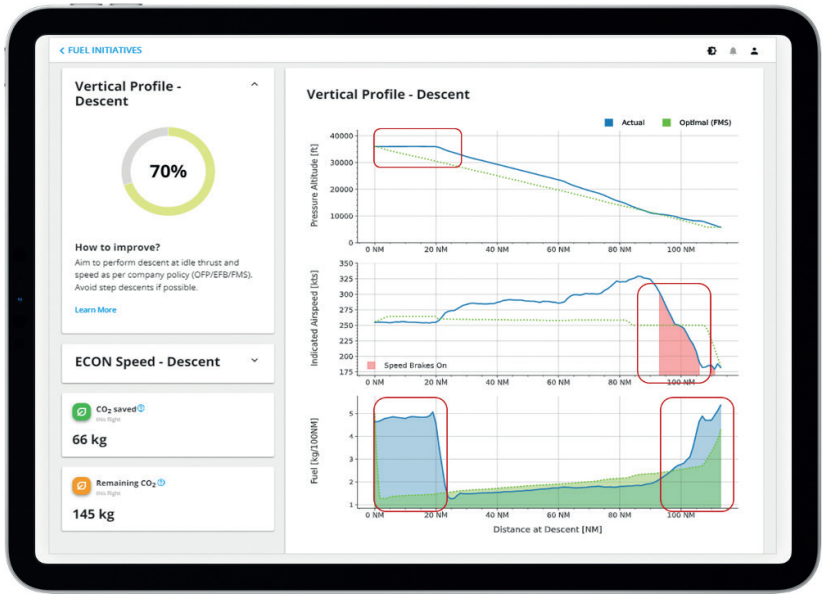

Figure 7: Feedback — Fuel Initiatives. Source: FlyGuide — StorkJet, 2023

It's easy to assume that because of ATC restrictions and the constant presence of heavy air traffic, pilots have limited scope for enhancing their efficiency in the skies. This perspective suggests that such external factors may be a roadblock to potential pilot operational performance improvements. A review of the pilots' performance in FuelPro is essential to determine whether there is potential for progress. The data, illustrated by figure 8, clearly indicates that there are indeed

pilots who manage to perform this initiative at this airport with a higher degree of efficiency. Volaris' goal is to engage pilots whose performance can be improved, offering them the support they need to boost performance and help them to fly smarter, not harder.

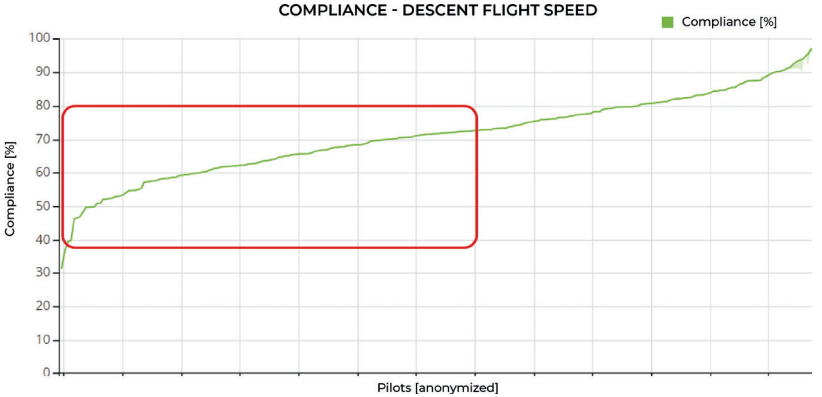

Figure 8: Compliance — Descent Flight Speed per Pilot. Source: FuelPro — StorkJet, 2023

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USE CASE 3: SINGLE-ENGINE TAXI-IN

Pilots may face several challenges when performing a single-engine taxi initiative, typically to save fuel or reduce engine wear. Moving around highly congested airports can be challenging due to long taxi routes and complicated taxi instructions — where to go, where to stop, and how to get to the assigned stand. Navigating through this while trying to perform the taxiing most efficiently can be challenging, especially at busy airports like Cancun, MX. This is another instance where StorkJet offers valuable assistance. Using FuelPro makes the potential for improvement analysis easy and straightforward, and FlyGuide supports pilots in decision-making.

Figure 9 shows that the maximum allowable single-engine taxi time at Cancun Airport in Mexico (CUN) is 6 minutes and 36 seconds. It was observed that pilots, on average, utilize Single-Engine Taxi-In only for 4 minutes and 14 seconds, indicating that there is potential for further improvement in this area. This includes the cool-down time from when the aircraft vacates the runway to when the engine is shut down.

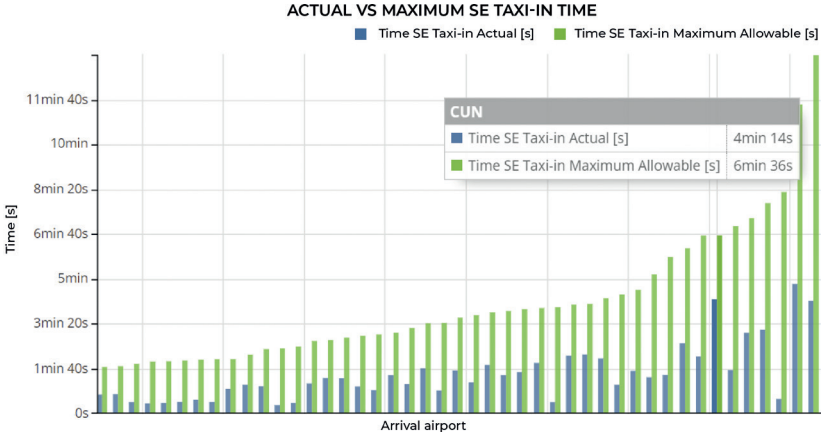

Figure 9: Actual vs Maximum Singe Engine Taxi-In Time. Source: FuelPro — StorkJet, 2023

FlyGuide, StorkJet's EFB application, offers the opportunity to display historical airports' taxi-in routes for pilots and the probability of their occurrence. This feature positively contributes to the crew's situational awareness and reduces their workload. FlyGuide assists pilots by streamlining taxi procedure preparation, advising on the best moment to shut down the second engine, indicating the expected parking stand, and the most probable and optimum ways to get there. The information is displayed on a map, as presented in figure 10, showing the precise timing for shutting down the second engine. This timing is based on models specific to each aircraft tail, ensuring accuracy and efficiency.

Figure 10: Cancun Airport Map with indicated taxiways. Source: FuelPro — StorkJet, 2023

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USE CASE 4: BEST CONFIGURATION FOR DEPARTURE AND ARRIVAL

FlyGuide plays a crucial role in enhancing pilots' understanding of how choosing different flap settings or thrust reverser configurations can lead to fuel savings. For example, higher flap settings typically result in additional drag, leading to increased fuel consumption. In contrast, using lower flap settings creates less drag during the approach, thereby boosting efficiency.

StorkJet's EFB app — FlyGuide, offers a feature that analyses the most fuel-efficient configurations tailored to the specific landing runway. This tool provides detailed information, taking into account various factors, such as intersections for vacating the runway, when multiple options are available. Figure 11 demonstrates this capability, highlighting elements like the use of low flaps and idle reverse thrust, in addition to single-engine taxi. It effectively displays the processes involved in both landing and taxi procedures. This module allows the pilots to find the most efficient configuration for each airport in the 'Airport Best Config' table. Not only does it suggest the best setup, but also shows the total amount of fuel used for taxiing and landing. The configuration shown in figure 11 is specifically tailored to reduce fuel penalty, ensuring the lowest possible fuel consumption for that airport.

If Air Traffic Control directs the pilot to land on a different runway, like 16L, the most optimum approach for efficiency involves using a Single Engine Taxi-In, Low Flap setting, and Idle Reverser. As depicted in figure 12, this strategy leads to a slight rise in fuel usage — just 1kg more than the most fuel-efficient method for that airport. Additionally, thanks to the data presented, the pilot can deduce that switching to High Flaps from Low Flaps can incur a greater fuel penalty, increasing fuel consumption by 13kg.

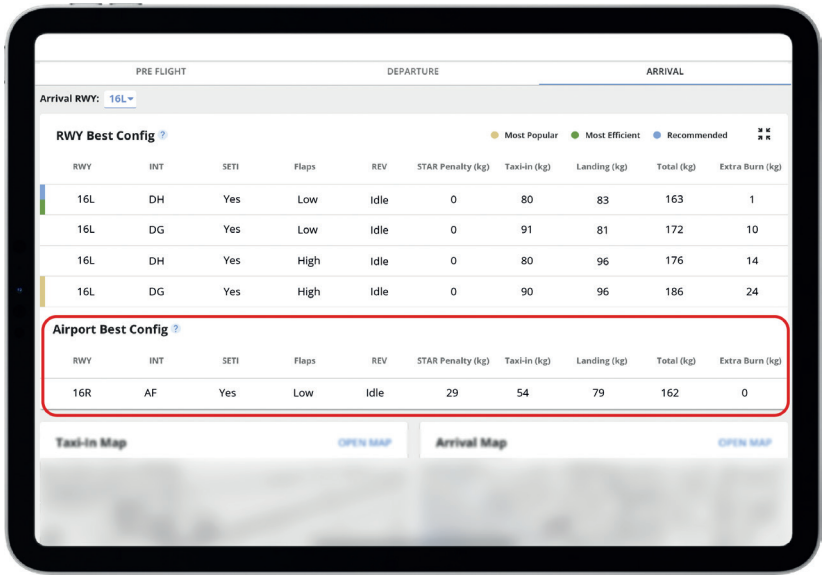

Figure 11: Arrival Configurations. Source: FlyGuide — StorkJet, 2023

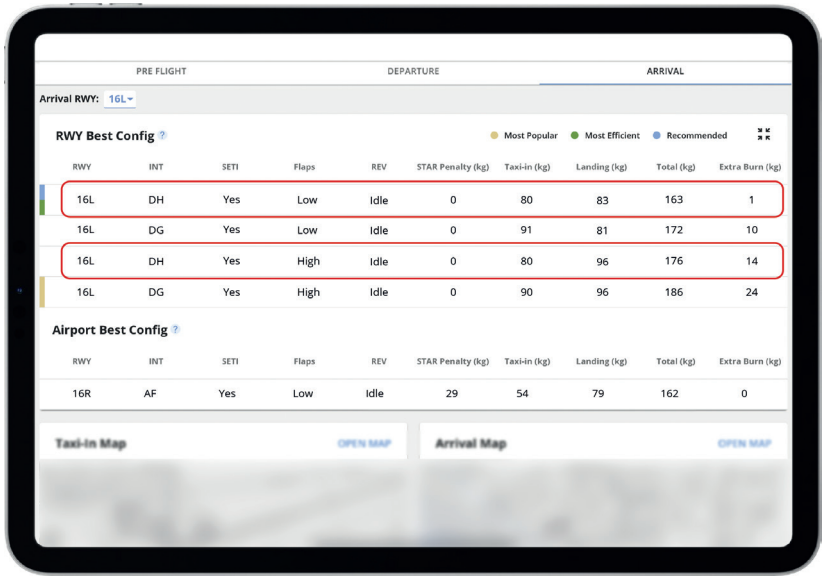

Figure 12: Arrival Configurations. Source: FlyGuide — StorkJet, 2023

FlyGuide's capabilities extend beyond managing landing and arrival. It covers all flight phases, providing pilots with strategies to maximize fuel efficiency throughout different stages of a flight. By presenting this data, FlyGuide significantly boosts understanding of how to save fuel and encourages pilots to adopt more efficient practices during their flights.

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USE CASE 5: FEEDBACK AFTER THE FLIGHT AND FUEL SCORES

The Fuel Scores module in FlyGuide, presented in figure 13, provides pilots with the tools to become more involved in the company's fuel policy and operational procedures. This feature improves their involvement and allows for more informed feedback. Pilots benefit from exclusive access to their personal flight histories, enabling a detailed review and reflection on their previous performances. Moreover, the system presents a performance score linked to specific fuel initiatives and easy-to-understand tips. This method educates pilots and offers them straightforward, practical advice to enhance their performance in upcoming flights.

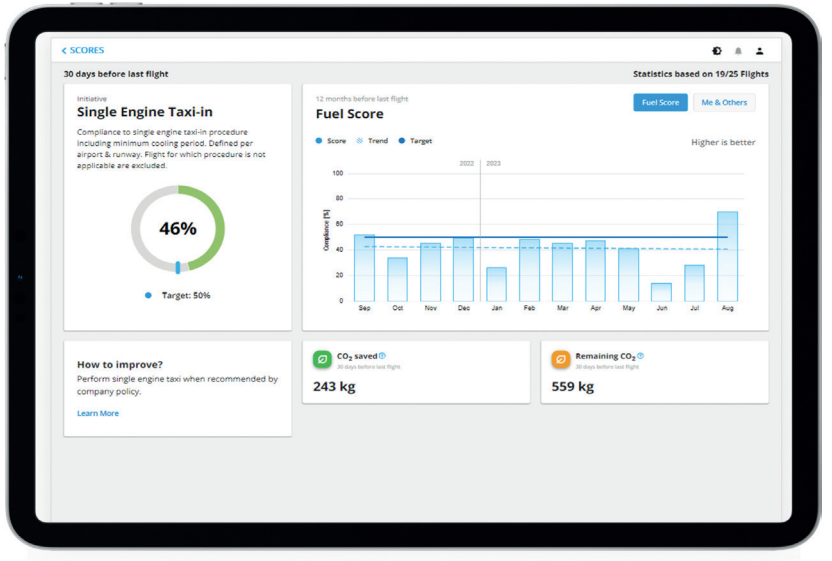

Figure 13: Feedback after flight. Source: FlyGuide — StorkJet, 2023

This approach focuses on evaluating pilots' fuel efficiency. Pilots can view their 'fuel score,' indicating how much fuel they saved compared to the maximum achievable savings. They also can explore each initiative in depth, analyzing their performance on individual flights or over longer periods, such as a month, and accessing all necessary data. Feedback is essential in this context, as it encompasses various aspects that ensure the app's reliability for pilots. This approach goes beyond simply measuring performance; it aims to actively engage pilots and ensure their accurate and efficient utilization of the tool.

SUMMARY

In the rapidly evolving aviation industry, the role of pilots is increasingly focused on fuel efficiency and environmental sustainability. Addressing these challenges, StorkJet's innovative FuelPro and FlyGuide applications are making significant strides. Through comprehensive data analysis, StorkJet identified a pattern of pilots requesting discretionary fuel without a clear correlation to typical influencing factors. This insight led to the development of strategies aimed at transforming complex data into actionable knowledge for pilots. The focus is on shifting pilots' mindset from a 'just in case' approach to a 'just as needed' strategy, encouraging more efficient fuel use. FlyGuide provides the pilots with clear and easy-to-understand information, enabling them to make informed decisions about fuel allocation. The application also aids in understanding variations in trip distances and Zero Fuel Weights, which impact fuel consumption. Additionally, FlyGuide's Feedback module plays a crucial role in educating pilots about their performance, offering detailed reviews and practical advice for future flights. By empowering pilots with this knowledge, StorkJet is enhancing operational efficiency and contributing to the broader goal of sustainable aviation practices.

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LUIS FERNANDEZ

Luis is an aeronautical engineer with eight years of experience in airlines' data analytics as FDM and safety data manager, operational cost optimization and fuel efficiency manager. In the past he worked as a mechanical engineer for several years, specializing in mechanical and fluid simulations. Currently he and his team are responsible for developing, implementing and monitoring fuel efficiency strategy and reducing overall operational costs in Volaris.

MARCO CHARLES

Marco and his team are responsible for Operational and Maintenance software, Fuel efficiency and Operational data analytics. With 26 years of experience in Airlines, Marco has worked in different areas such as Management information, Maintenance Reliability, Supply Chain, Crew Planning, Flight Ops, Software Implementation and Fuel efficiency. His main projects are focused on optimization technology tackling Spares Inventory cost, Crew headcount, Tail Assignment and a/c utilization, Fleet and Crew Tracking, Navigation and Fuel saving.

VOLARIS

Volaris is a low-cost Mexican airline and the largest Ultra-Low-Cost Carrier (ULCC) in Latin America. It is based in Mexico City, Guadalajara, and Tijuana. The airline offers scheduled flights across the Americas, mainly offering domestic flights within Mexico and international flights to the US. The fleet includes 124 aircraft, most of them neo models, serving 71 airports on three AOCs (Air Operator Certificates); one in Mexico, one in Costa Rica and one in El Salvador.

STORKJET

StorkJet helps airlines save fuel and reduce CO_2 emissions by utilizing data coming from the aircraft. With a strong research background, based on reinvesting 60% of the turnover in R&D and four EU research grants, the company developed the most precise aircraft performance models on the market. With this technology, StorkJet has optimized over 6,8 million flights. As a result, their clients save 67 million dollars and reduce CO_2 emissions by 234 thousand tons each year.

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