Executive Summary

This project report presents a study on how data science & analytics is affecting the current Aviation industry and its impact on four main sectors: - Fuel Management, Predictive Maintenance, Ticket Pricing and Airport Logistics. Findings are supported by relevant case studies and ongoing research. Implementing data science approaches to the aviation sector poses many different challenges. However, the benefits realized in terms of monetary gain and operational efficiency far outweigh the burden of these challenges.

A single aircraft operation generates about 2.5 billion terabytes of data, most of which currently goes unutilized. Making use of this data can help in predicting how future operations should be conducted. Fuel management aims at reducing costs related to fuel. The pilot study on fuel management using data science has already resulted in saving hundreds of million dollars for Southwest Airlines. Predictive Maintenance is another field where defects can be known before failure occurs by analyzing data generated from flight sensors. Combining data science models with predictive analytics can result in reduced equipment downtime, as failure is diagnosed at an initial stage and is faster to repair. This can result in huge savings in terms of longer aircraft availability. Ticket pricing is undergoing change from static to dynamic pricing which has allowed airlines to offer personalized services to customers resulting in additional revenue, as has been done by Southwest Airlines. In airport logistics, turn-over processes such as de-icing have been optimized through analytics resulting in the reduction of delays and wait times as was the case at Stockholm airport.

From the literature survey, it can be concluded that data science does indeed drive positive change in the aviation sector. Challenges faced can be mitigated using synchronized data (i.e. across disparate data sources), having more trained professionals, use of good quality data and ensuring data security to avoid tampering with datasets. Virgin Atlantic has combined the data science optimization models with Internet of Things (IoT) and analyzed all the critical data generated by the aircraft in a synchronized manner. This has resulted in highly accurate predictive maintenance as many different datasets are analyzed concurrently.

Data analytics presents a multitude of opportunities for the aviation industry. Through further research, they can streamline maintenance, improve safety, and cut additional operational costs. Moreover, data analytics can help airlines to have a better understanding of their customers. They can study each individual's behavior, track their preferences, and thereby plan forthcoming demands. By leveraging big data, airlines can develop their operations and marketing policy, allowing them to stand out in an extremely competitive market.