

Notes on TULIPS Demo 17/09/2024 – Jens van den Berg

The TULIPS demo was an interesting presentation and proof of concept that was related to unattended “refueling” (recharging) of electric aircraft.

The demonstrator was the NLR Pipistrel at the RAC (Rotterdamse Aero Club) at Rotterdam The Hague Airport.



Figure 1. NLR Pipistrel at RAC (img src. Jens van den Berg)

The system demonstrated by Tibor van Steenis showed off potential future wireless power-off capabilities for the Pipistrel charging system. A dashboard with several parameters was shown with live data from the aircraft being broadcast via Wi-Fi to a screen in the conference room.

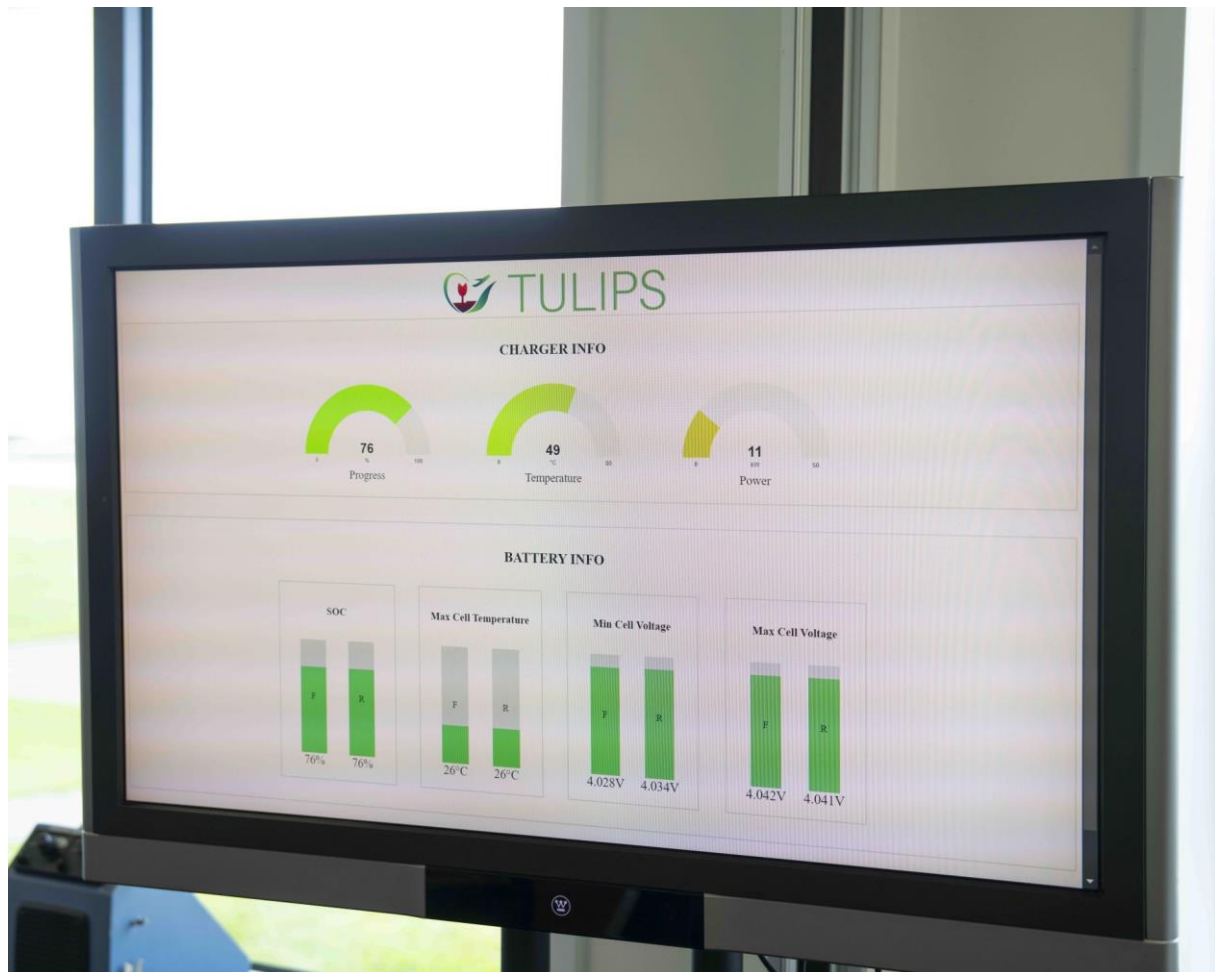


Figure 2. TULIPS WiFi Dashboard for Pipistrel Charging (img src NLR LinkedIn)

The first demo showed the remote data viewing capabilities of the prototype system and the manual remote shut-off. This system is an improvement on the existing safety protocols that were also shared during the presentations. The current protocols suggest first walking towards the burning aircraft to shut down the charging process.

This can now be done remotely, and thus also more safely.

The second demo of this system was the automatic remote shut-off of the charging process. Tibor emulated the internal aircraft system on his laptop and manually created various fault codes such as battery cell overheating and overvoltage. The system showed the error on the dashboard and shut-down the charging process on its own.

This then aligned very well with the second presenters, Freek Vermeulen and Ijsbrand Kruihof from Bosch who came to demo their camera-based smoke and fire detection system. They mounted two cameras aimed at the aircraft and connected them to their video server. Using deep learning Bosch was able to train an A.I. on images with and without fire and smoke. This allowed them to create a standard pixel pattern that the A.I. then associates with smoke and fire both during the day and in low light conditions using infrared.



Figure 3. Bosch A.I. smoke and fire detection cameras installed at RAC for TULIPS demo (img src Jens van den Berg)

For the demo, there was a smoke flare set off behind the charging system of the Pipistrel. The camera and video system was able to detect smoke within about 30 seconds of it appearing, and the system was able to relay that information to the fire response team at Rotterdam The Hague Airport who took the opportunity to show off their incredibly rapid response time as well.

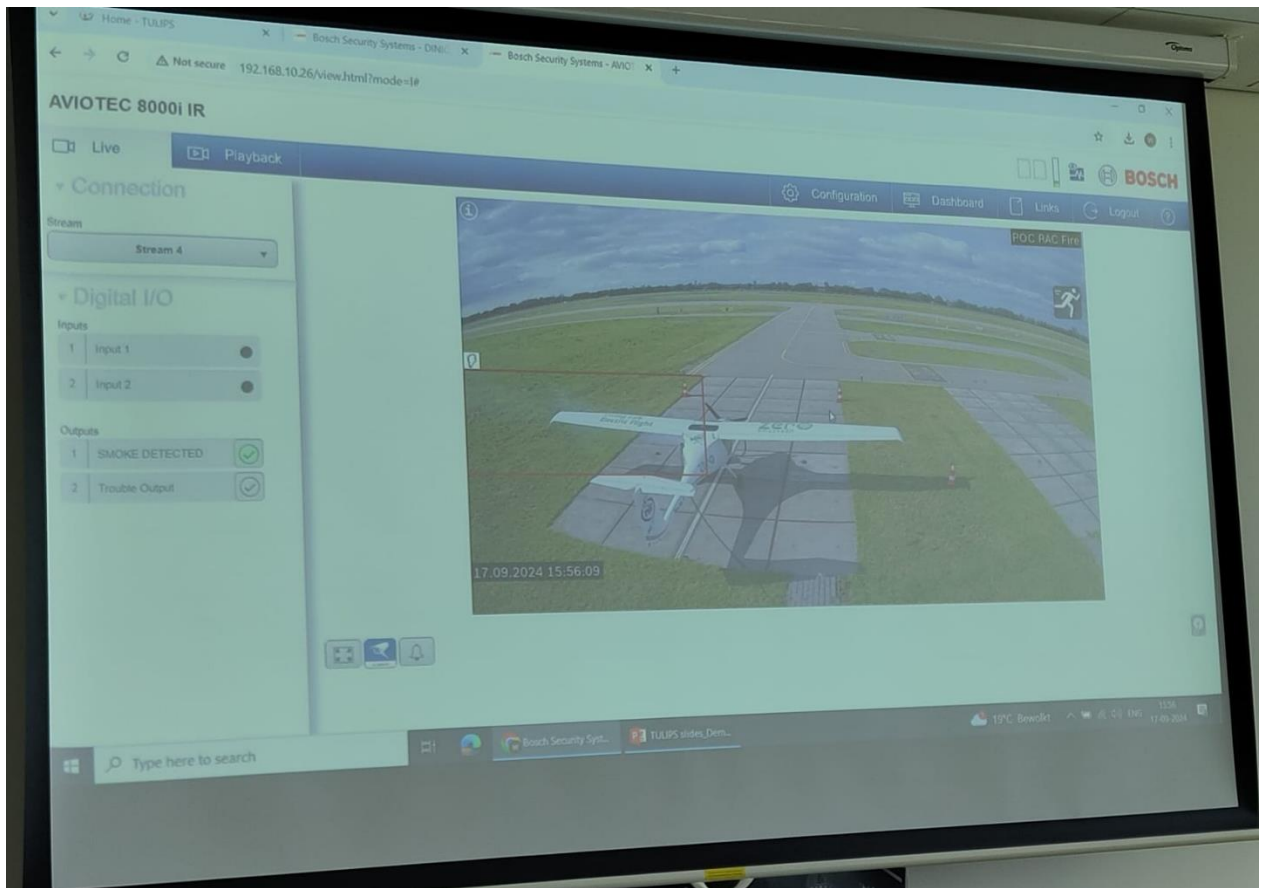


Figure 4. Bosch A.I. Camera system accurately detecting smoke during the Pipistrel demo (img src Jens van den Berg)



Figure 5. Fire Department arriving at camera smoke detection demo (img src Jens van den Berg)



Figure 6. Bosch Fire and Smoke detection demo start (img src NLR LinkedIn)



Figure 7. Fire Department arriving at camera smoke detection demo (img src NLR LinkedIn)

The presenters and panelists ended the day by speaking about the slow pace of safety regulations that potentially hold back the sector from making strides in sustainable aviation. Tibor spoke about how in the UK “defueling” fuel based aircraft was translated to “discharging” for electric aircraft which led to hilarious instances of no passengers being allowed on board when the batteries are being discharged. Daan van Dijk spoke about fire regulations that base the category of fire on the size of the aircraft which conflict with other safety standards which suggest 1000L per battery pack, resulting in roughly double the amount of water previously required for an aircraft the size of the pipistrel.

Jurjen de Jong and Stijn Donckers finished off the day by being optimistic and discussing, among other things, the strides made in the automotive sector on charging standards and how it would save the aviation industry some development time if we could learn from that sector and implement or certify those systems for use in general (and eventually commercial) aviation.



Figure 8. Daan van Dijk (left) Stijn Donckers (middle) and Jurjen de Jong (right) at TULIPS panel discussion (img src NLR LinkedIn)