#ArchitectingAviation

# GLOBAL IMPACT ASSESSMENT: AIR TRAFFIC FORECAST & OPERATING SCENARIOS

Forecasting global air traffic up to 2070 to derive requirements for new aircraft designs and operating scenarios for their economic and ecological assessment

The global impact assessment is based on a global air traffic forecast and the computation of operating scenarios for the analyzed aircraft types. The air traffic forecast translates global socio-economic development into air traffic demand, factoring in fleet development and airport capacity constraints (Figure 1, Air traffic demand & Fleet development). The operating scenarios for the analyzed aircraft types are derived from a global fleet assignment model, which considers, among other factors, each aircraft type's flight performance characteristics and direct operating costs (Figure 1, Operating scenarios). The resulting flight plans of the global fleet and individual aircraft are used for the global impact assessment.

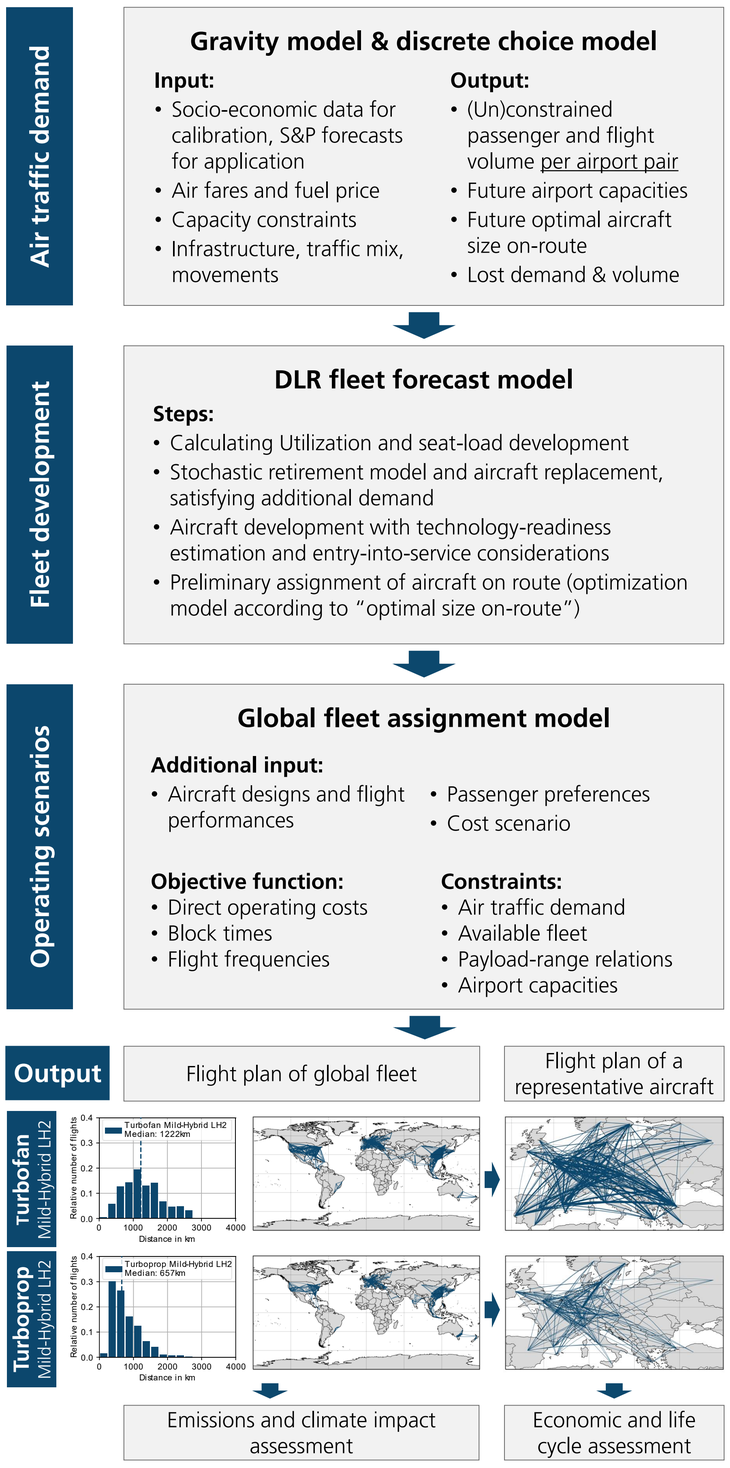


**Figure 1: Workflow for air traffic forecast and calculation of operating scenarios.**

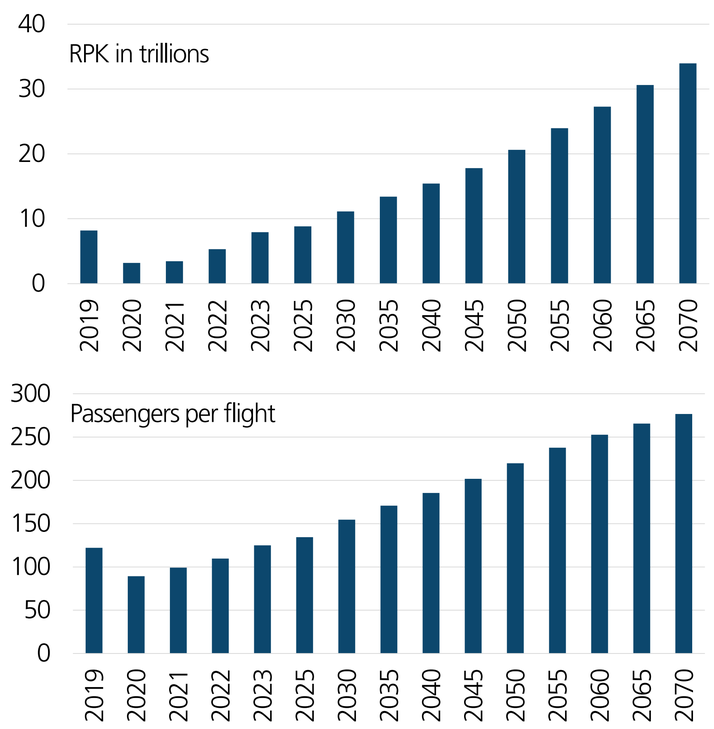


**Figure 2: Development of RPK and passengers per flight in the global ATS from 2019 to 2070.**

The air traffic forecast predicts an average growth rate of 2.8% per year in revenue passenger kilometers (RPK) (Figure 2, top). As a result, RPK are expected to quadruple between 2019 and 2070. Due to limited airport capacities – since airport infrastructure grows slower than air traffic demand – the forecast indicates an increase in average aircraft size, from approximately 120 seats per flight to 270 seats per flight (Figure 2, bottom). This increase is primarily driven by a significant rise in the number of aircraft with more than 300 seats, and those with more than 400 seats, starting in 2040 (Figure 3). Historically, aircraft size and operating distance in the air transportation system (ATS) have been closely linked: larger aircraft are typically operated on longer distances (Figure 4, left). However, the air traffic forecast anticipates a shift, with most aircraft with more than 250 seats being operated on routes shorter than 4000 km in 2070 (Figure 4, right). This shift has direct implications for the design of future aircraft concepts. Narrow-body aircraft will continue to operate on routes up to 5000 km, with the majority of available seat kilometers (ASK) being offered on flights shorter than 2000 km (Figure 5, top). Wide-body aircraft, which were previously designed for ranges exceeding 10,000 km, will primarily operate on routes below 4000 km (Figure 5, bottom). Therefore, the introduction of large aircraft with a shorter design range could offer both economic and ecological benefits.

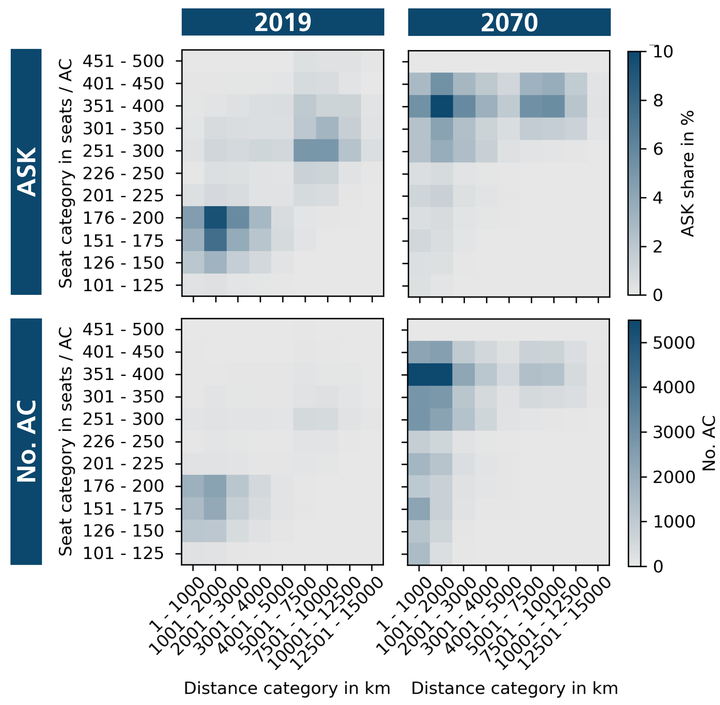


**Figure 4: Comparison of ASK and number of aircraft for routes of different distance and seat capacity categories in the ATS in 2019 and 2070.**

## Way forward

Throughout the runtime of the EXACT project (2024–2026), multiple assessment iterations will be conducted involving all relevant disciplines. The results presented here represent only the first iteration. For the second and third iterations (both in 2025), the introduction of a people-mover aircraft concept (large payload, short design range) is planned. Moreover, the impact of airport capacity constraints within the air traffic forecast will be analyzed by comparing it with an unconstrained air traffic forecast for the assessment.

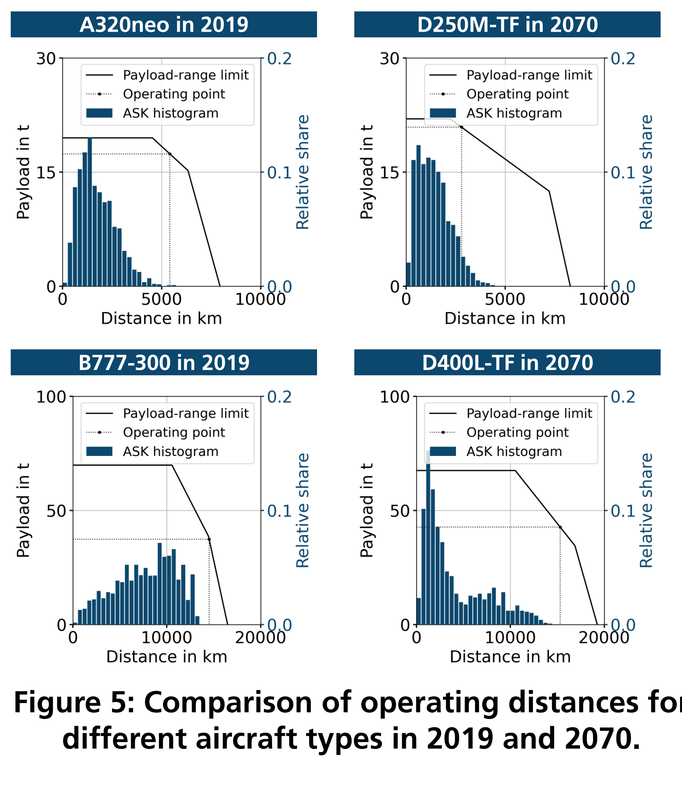


**Figure 5: Comparison of operating distances for different aircraft types in 2019 and 2070.**

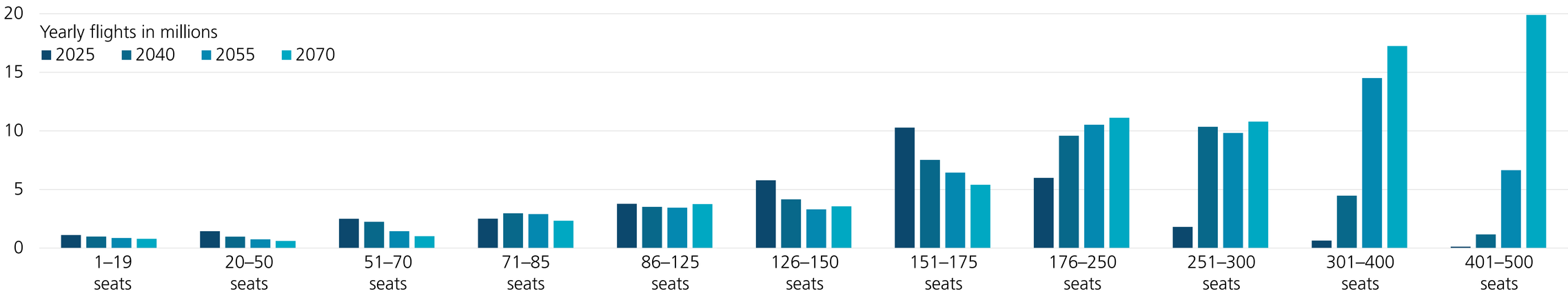


**Figure 3: Number of yearly flights per seat category for the years 2025, 2040, 2055 and 2070.**

**Contact**
Markus Kühlen
Institute of Air Transport
markus.kuehlen@dlr.de

**Contact**
Dr. Fabian Baier
Institute of Air Transport
fabian.baier@dlr.de

**Publications:**
- Gelhausen et al. (2025) Results from the ATS-Level Assessment of the Clean Sky 2 Technology Evaluator. Aerospace, 12(3)
- Kühlen et al. (2022) An explanatory approach to modeling the fleet assignment in the global air transportation system. CEAS Aeronautical Journal, 14(1):255–269