### VEHICLES ROADMAP

**DRIVERS**

- **Reduce Cost**: non-recurring cost, recurring cost, operating cost, disruption cost, disposal cost
- **Improve Energy Efficiency**: aerodynamic efficiency, weight, propulsion system efficiency, operational impact, parasitic losses
- **Protect the Environment**: climate impact, local air quality impact, noise, ground contamination, sustainability of manufacturing, materials impact
- **Meet Operational Needs & Flexibility**: performance, payload, availability, operational limitation impact
- **Enhance Passenger Experience**: passenger comfort, service quality, ticket cost
- **Improve Safety**: certification basis, tolerance to human error, verifiability, predictability, intrusion tolerance, environmental tolerance, risk of harm to staff in the manufacturing and operational environments

**ENVIRONMENT**

| **CO2** (emissions per passenger kilometre, 2000 baseline) | 75% reduction by 2050 |
| **NOx** (emissions per passenger kilometre, 2000 baseline) | 90% reduction by 2050 |
| **Perceived noise** (aircraft level based, 2000 baseline) | 65% reduction by 2050 |
| **Aircraft movements emission-free when taxiing**: Aircraft designed and manufactured to be recyclable |
| **Net zero carbon emissions** for urban and sub-regional air vehicles |

**COST**

- **Certification cost (2000 baseline)**: 50% reduction by 2050

**SAFETY**

- Fewer than **one accident per ten million** commercial aircraft flights by 2050

### TECHNOLOGY PRIORITIES (TRL 6)

#### WHOLE AIRCRAFT DESIGN AND ANALYSIS CAPABILITY

- Conceptual design for non-standard architecture e.g., high aspect ratio wings and non-conventional STOL/VTOL
- Propeller integration for multiple propellers in various configurations with augmented lift
- Modelling in-flight geometry changes e.g., folding wing tips
- Faster, more connected, streamlined flight physics/aerodynamics capability
- Noise modelling for novel architectures/propulsion and new environments
- Well-to-wake emissions modelling for all energy sources
- Digital twin modelling for full aircraft and energy source lifecycle

#### FUTURE SUSTAINABLE COMMERCIAL AIRCRAFT

- Development of sustainable drop-in fuels
- Hybrid electric aircraft demonstrators
- Noise management technologies
- UHBR engines
- High aspect ratio wings
- Laminar flow wings
- Single pilot operations (cargo)
- Single pilot operations (passenger)

#### SUSTAINABLE AIR VEHICLES FOR URBAN AND REGIONAL MARKETS

- Fuel cell aircraft demonstrators
- Noise management technologies
- Hybrid electric aircraft demonstrators
- All-electric aircraft demonstrators
- Autonomous sense-and-avoid
- Laminar flow wings
- VTOL/STOL demonstrators
- Distributed propulsion and augmented lift
- Full autonomous capability

### TARGET (EIS)

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