CHYLA workshop

SOUTHAMPTON, 15 FEBRUARY 2023

TU Delft · Technische Universität Braunschweig · University of Southampton

CHYLA

CREDIBLE HYBRID ELECTRIC AIRCRAFT

Clean Sky 2

Workshop Agenda

Start	End	Duration	Topic
9:00	9:15	15	Welcome
9:15	9:30	15	Introduction to workshop and agenda
9:30	10:00	30	Keynote
10:00	10:30	30	Project synopsis, baseline designs
10:30	10:45	15	Coffee Break
10:45	11:30	45	Credibility-based MDO methodology
11:30	12:30	60	Sensitvity study and MDO study results
12:30	13:30	60	Lunch
13:30	14:15	45	Regional operative scenario
14:15	14:45	30	SIENA project
14:45	15:15	30	FUTPRINT50 project
15:15	15:30	15	Coffee Break
15:30	16:30	60	Open discussion on scalability/challenges/switching points of HEP applications
16:30	17:15	45	Discussion on FUTPRINT50 roadmap and connection to SIENA/CHYLA activities
17:15	17:30	15	Concluding remarks/end of workshop
19:00			Dinner

Feedback forms

- To collect feedback/comments/suggestions during presentations:
  - **Feedback forms**
  - Will be processed prior to open discussion in the afternoon & reviewed after meeting to support scalability assessment
  - Analog (distributed in the room)
  - Digitally:
    - https://forms.office.com/e/M5DtwVtyGM
    - short: http://tiny.cc/CHYLA
    - (link als on the bottom of the page, QR code in top right corner)

Open discussion

Scalability/challenges/switching points of HEP applications

CS-23 MTOM limits

- 19 or less pax: 8618kg (19000lbs)

- @270nmi (500km) design range

1. Hybrid, within limit?
2. Full-e, ~9 pax, within limit?
3. Full-e 19 seats > limit
4. Lower range?

Span limits/gate constraints

- Hybrid electric regional may exceed Type-C gate constraints

- Distributed LE propulsion may allow larger DoH for span-limited designs → added complexity
- TLAR will be adapted to keep complexity low (range, payload)
- Is Type-B gate limit of interest for HEP?
- REG at 36m span → relaxed runway length?

Credibility-based MDO

- Credibililty vs. Performance
- What is an acceptable level of credibility/risk?

- E.g. Piaggio E-STOL ~65% average credibility?

Operational challenges

1. Hydrogen handling
2. Battery charging facilities vs battery swapping
3. Airport infrastructure (storage facilities)
4. Charging time
5. Battery cycle life vs. Battery discharge rate
6. Battery handling
7. Gate constraints
8. Mass increase (runway, tire wear, etc)
9. Electricity demand

Requirements, Certification, Risks and Operational Challenges – Where do we stand?

OPERATIONAL CHALLENGES
- Charging time (and its effect on turnaround time)

AIRPORT CHALLENGES
- Additional space for battery storage
- Additional space for charging stations
- New equipment

CERTIFICATION SPECIFICATIONS

RISKS/HAZARDS
- Battery thermal runway
- Firefighting of infrastructures
- Ramp safety

OTHER
- Battery life
- Utilities requirements in terms of electricity demand
- Possibilty of parallelizing battery swapping and passenger (de-)boarding

Battery volume constraints

- LEDP can increase wingloading and relieve span constraint, but this may decrease available wing volume

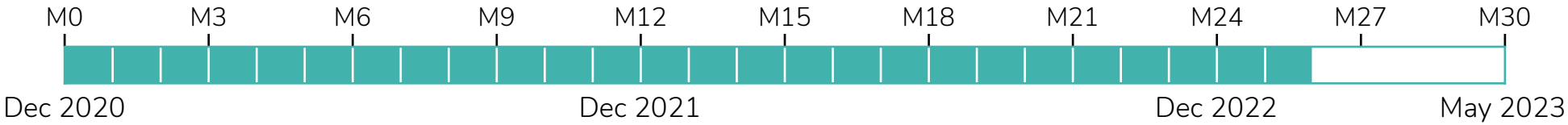
- Aspect ratio reduction? – aero/struc -/+
- Thickness increase? – aero/struc -/+
- Pods? – aero/struc -/-
- Fuselage mounted? – aero/struc ~/-
- Battery swapping? – ops/struc -/-

80x80m box

- Will hydrogen integration (combustion) for long range airlines revamp the double-deck aircraft design?

- 80m length may be violated and airports will adapt
- Business case for A380-type aircraft

Credible HYbrid eLectric Aircraft



Thank You

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