

Introduction:

"Scientists **discover** the world that exists; engineers **create** the world that never was." (Theodore von Kármán in Mackay, 1991). Modern engineers design products, processes, and systems by incorporating appropriate technologies to meet the needs of society. Despite the fact that contemporary aeronautical programmes are designed to meet the AHEP (Accreditation of Higher Education Programmes) learning outcomes and are accredited by relevant professional bodies. Industrial representatives, such as Boeing company express that aeronautical engineering education needs to give greater emphasises on practical skills such as system-building. Aligning with the university's new strategy **Empowering University**, this action research project brings a new perspective to develop new sustainability skills and competencies for our aeronautical students by conceiving, designing, implementing, and operating (**CDIO**) (Crawley et al., 2007, Crawley, 2001) future Unmanned Aerial Vehicles (UAVs).

Aims:

Implement the **CDIO** framework in the aeronautical engineering program and create a learning environment that,

- Enhances deeper learning of fundamentals in aircraft design;
- Promotes practical skills in aircraft design project within an enterprise and society context;
- Educates students for sustainable development in Aerospace sector.

Methodology:

- 4 UG students and 2 Master's students took part to apply the **CDIO** approach for their final year projects.
- The projects simulate the process of a startup company, e.g., marketing issues, technical and business.
- Students are encouraged to disseminate novel ideas to industry stakeholders, external/internal funding bodies for potential commercialization.

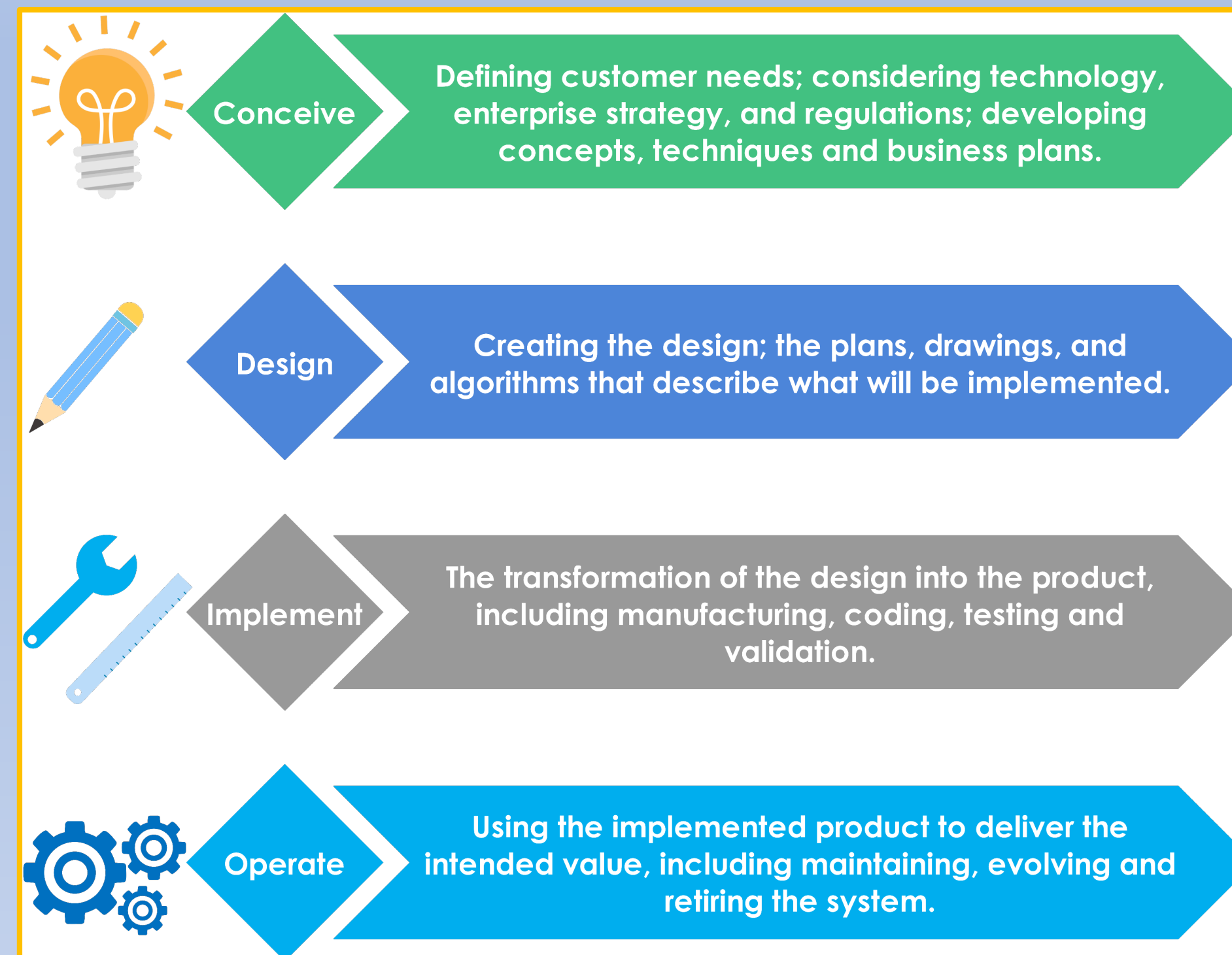


Figure 1. CDIO (Conceive, Design, Implement and Operate) initiative framework.

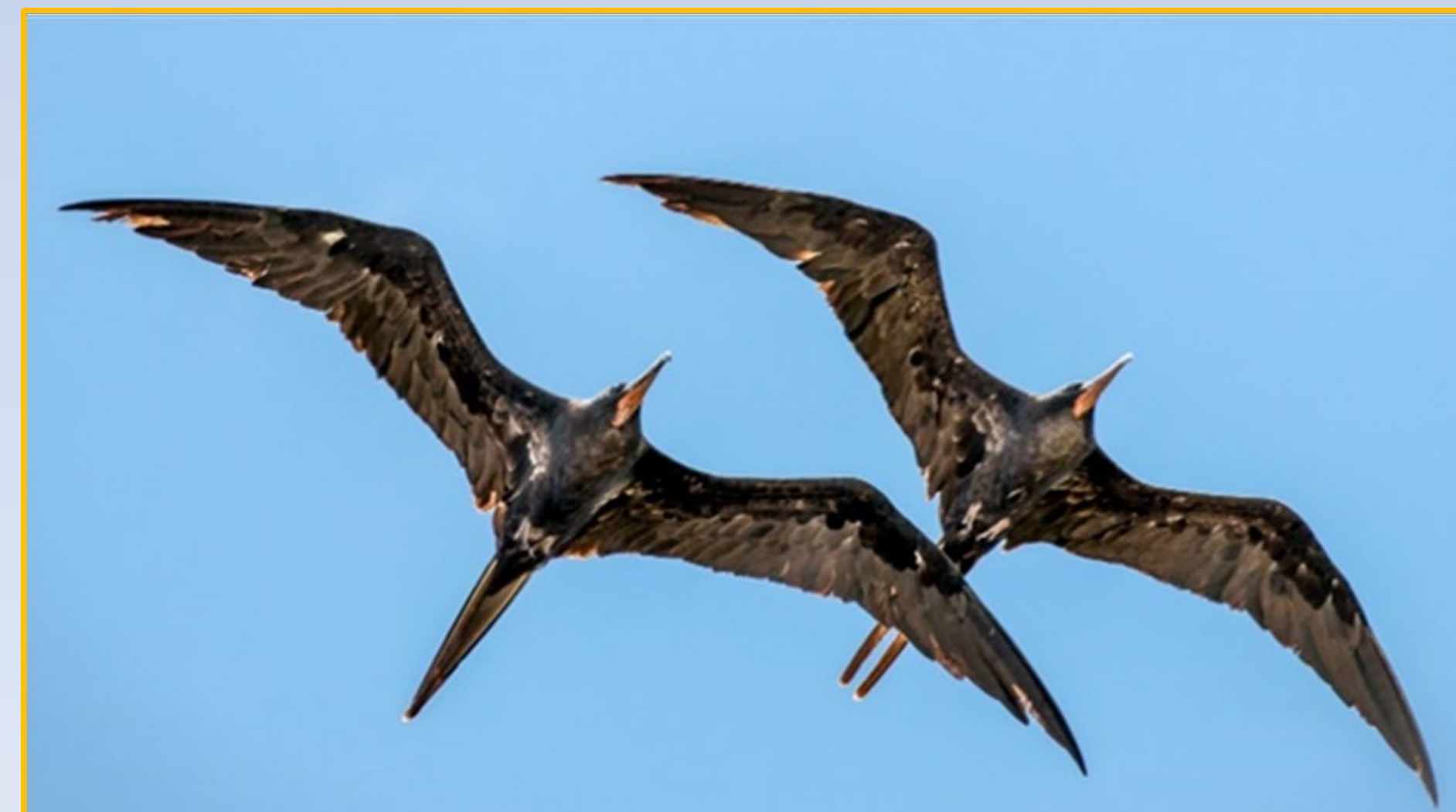


Figure 2. Engineer the nature for sustainable development: a 3D printed morphing wing prototype. The morphing wing concept presents great potential to improve aerodynamic efficiency of future fuel-efficient civil aircraft.

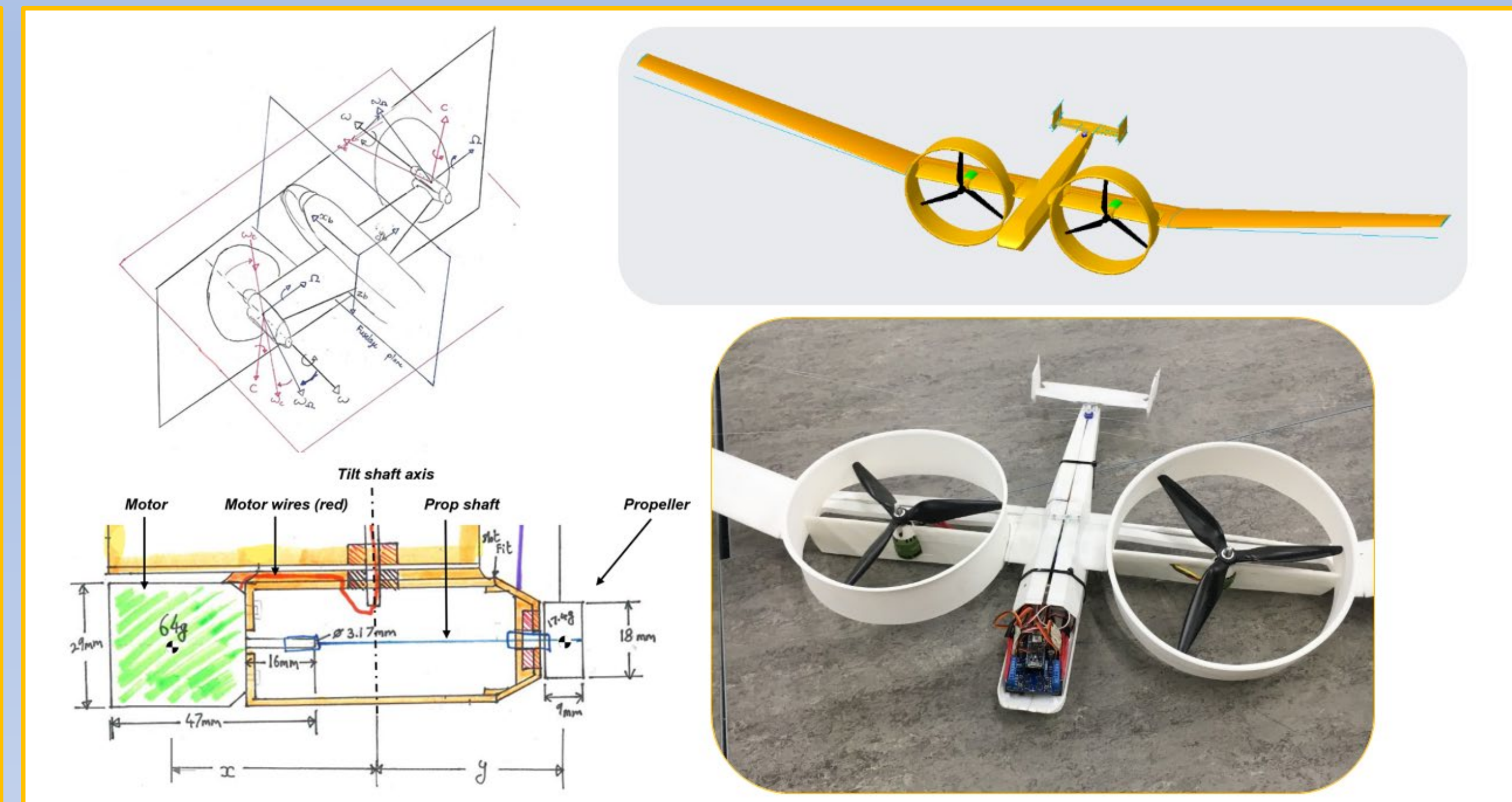


Figure 3. A vertical take-off and landing (VTOL) tiltrotor aircraft design. Hand drawings and 3D printed scale model of the complete aircraft.

Results:

- DMU AIP fund 2022/23 was awarded to future implement this innovative **CDIO** framework in the aeronautical program at CEM, and one UG student secured financial support from an aerospace company for potential commercialization of their design.
- Students were exposed to professional practice, whereby they need to excise the understanding of the fundamentals and build an aircraft for sustainable development. Figure 2 is a morphing wing design inspired by flying creatures for zero emission aviation.
- Students developed a range of interpersonal and professional skills, which enable them to make design decision by considering marketing, business, and social responsibility not just the technical aspects. Figure 3 is a tiltrotor aircraft design with VTOL capability .

Conclusion:

- Provide students an opportunity to rehearse the role as an effective aeronautical engineer for sustainable development.
- Familiarize students with the enterprise activities, such as marketing, business and social responsibility.

Future work:

- Register DMU as a member university in the Worldwide **CDIO** initiative.

References

- Crawley, E. et al. (2007) *Rethinking Engineering Education*. 1st Edn. Boston, MA: Springer.
Mackay, A. L. (1991) *A Dictionary of Scientific Quotations*. Routledge.
Crawley, E. F. (2001) *The CDIO Syllabus*. Available at: <http://www.cdio.org>.