Anadolu University
Faculty of Aeronautics and Astronautics

2013 DBF KASIF 3
AIRCRAFT DESIGN & LEARNING OUTCOMES

Ahmet ERMEYDAN Gökhan DURMUŞ

Presentation Overview

- AIAA **D**esign/**B**uild/**F**ly
- DBF Mission & Design Summary
- Kasif 3 Aircraft Design & Final Configuration
- Learning Outcomes
  - Vecihi (2009)
  - Turkuaz (2010)
  - Kasif (2011)
  - Kasif 2 (2012)
  - Kasif 3 (2013)

AIAA Design/Build/Fly

- American Institute of Aeronautics and Astronautics (AIAA) have been organizing Design/Build/Fly (DBF) competition since 1996.
- International nature of this competition enables challenges between universities.
- Student teams design, fabricate, and demonstrate the flight capabilities of an unmanned, electric powered, radio controlled aircraft.
- Design requirements and performance objective are updated for each new contest year.
- The goal is to design a competitive aircraft for new year rules.

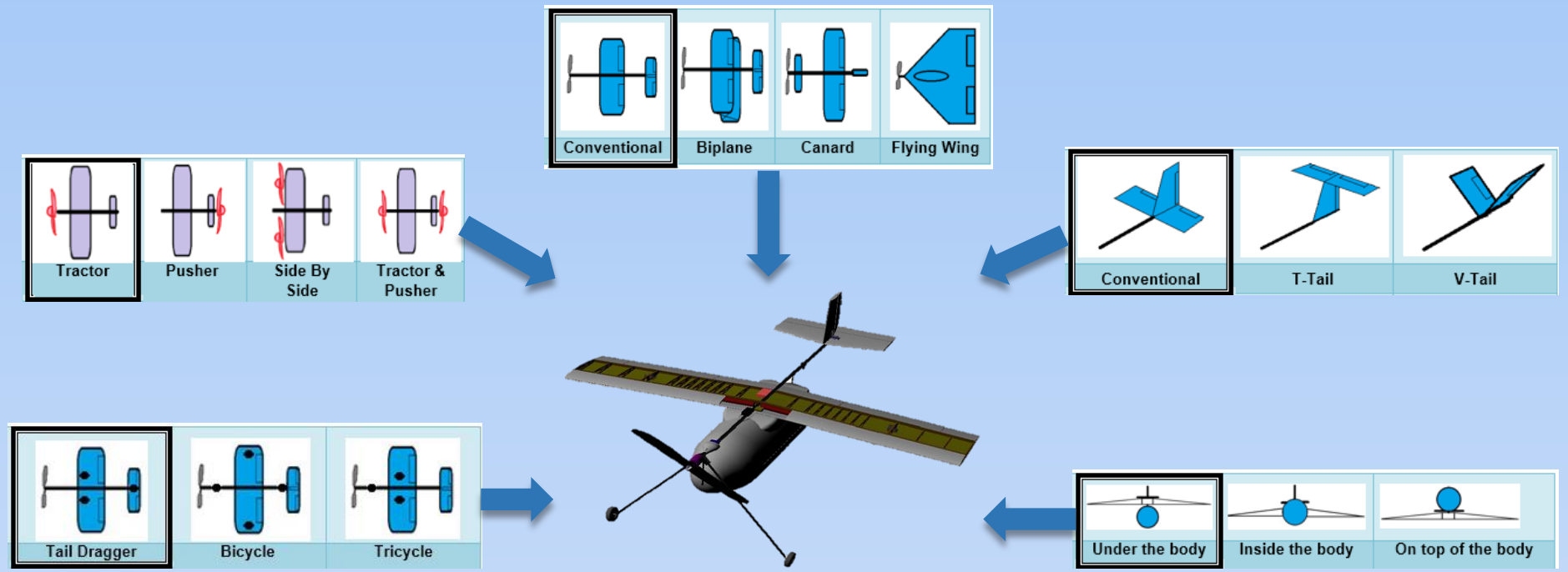
2013 DBF Mission Summary

- Mission 1: Short Takeoff
  - Aircraft must complete as many laps as possible for a duration of 4 minutes.
- Mission 2: Stealth Mission
  - Aircraft must complete three laps with internal stores including Estes 002445 Mini-Max rockets which are 0.25 lb (113 gr) each.
- Mission 3: Strike Mission
  - Aircraft must complete 3 laps as fast as possible with mixed-stores which will be randomly chosen by rolling dice.

Design Summary

- Aircraft Design
  - Primary object is to design an aircraft which maximizes competition score.
- Design Phases
  - Conceptual
  - Preliminary
  - Detail

Kaşif 3 Conceptual Design



Preliminary & Detail Design

- Goal is to minimize the weight of the selected design in both phases.
- Wing airfoil was determined to be HN380 due to its low drag characteristics.
- Elite 1500 battery was selected because of high energy density to weight ratio.
- Hacker A20-20L motor was preferred since it provided desired thrust with 10 cell pack besides its light weight.
- 10x5 propeller gave efficient performance with Hacker motor.

Final Aircraft Configuration

Learning Outcomes

- Vecihi is the first team entering the contest by Anadolu University.
- Boxed model aircraft was lost during cargo transfer in connecting flight from Istanbul to Tucson, Arizona.
- This caused late participation in the contest with a delay of one day.
- **Always check your cargo in a connecting flight.**
- **Be in the contest location a couple of days ago for surprises.**

KAGIF

Learning Outcomes

Learning Outcomes

- The following year a new team gathered, Turkuaz.
- Main problem the team met was the interconnection between fuselage and tail.
- Tail connection was not rigid enough to remain stable over flight.

Learning Outcomes

Learning Outcomes

- A new competition required a new team, Kasif.
- The team suffered primarily from thrust reducing during flight, which was noticed two weeks before the competition.

- Although new ESC was replaced, the problem continued.
- There was no time to test new motor when it arrived.

Learning Outcomes

Learning Outcomes

- Kasif 2 with fresh members continued to exist in the competition.
- A lighter aircraft was manufactured in the contest day since the aircraft produced before was not so competitive.
- A new problem was appeared; interconnection between wing and fuselage was so weak that it could not have passed inspection.
- Therefore structure was reinforced, leading to negative angle of incidence.
- **Do not modify aircraft in the way that damages design during repair.**

Learning Outcomes

- The contest was cancelled because of tornado.
- **Some events cannot be prevented.**

Learning Outcomes

- Kaşif 3 is the last DBF team of Anadolu University.
- The team improved itself when it comes to structure.
- While Turkuaz Team had been using whole balsa rib in wing construction,
- Kaşif 3 team was utilizing balsa-foam hybrid solution.
- **There is no need to build unnecessarily strong structure.**

Learning Outcomes

- Deadlines in a milestone chart must be strictly applied since it can cause a fault which cannot be compensated.
- Design report was e-mailed 3 minutes late, wasting 6 months of work.
- **Never leave design report to the last moment.**

Learning Outcomes

THANK YOU FOR YOUR PATIENCE