IPRO 317

Ethanol Ultra-light Aircraft

IIT Fall 2002

Sponsored by

IIT Faculty Advisor: Prof. Francisco Ruiz

With thanks to Larry Garick, Brandon Klein, and Cushing Air Field

Team Members

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Team Organizations

- Division of Tasks:
  - Documentation
  - Website
  - PowerPoint Presentation
  - Poster Presentation
  - Final Report
- All members responsible for assembling the parts for the aircraft.

Overview

- Introduction
- History
- Objectives
- Goals Achieved
- Conclusion
- Questions

Introduction

- What is an Ethanol Ultra-light aircraft?
  - Size
  - Capacity
  - Flying speed, range and altitude
- Aircraft mechanisms
  - Engine
  - Control mechanisms

Aircraft Specifications

- Model – Quicksilver MX II
- Wing Span – 32 ft 7 in
- Wing Area – 180 sq ft
- Height – 9 ft 1 in
- Length – 18 ft ½ in
- Empty weight – 325 lbs
- Max takeoff weight – 750 lbs
- Fuel capacity – 6 gals
- Max level speed, at sea level – 55 mph
- Take off distance, ground roll – 102 ft
- Estimated cost - $12,000

History

- In 1996, Propane Vehicle Challenge sponsored by Chrysler Corporation
- Students participated in Ethanol vehicle challenges sponsored by GM and US and Canadian Dept. of energy
- In 2001, Ethanol Powered Ultra-light Aircraft IPRO developed as testing ground for the engine.
- Aircraft successfully converted to run on ethanol by May 2002 at Cushing Field in Newark, IL.

Objectives

- Learn how to fly the Quicksilver ethanol ultra-light aircraft developed by previous IPRO teams
- Order new wing and new parts
- Install new safety enhancements to the aircraft such as
  - Rudder reconfiguration
  - Ailerons operation for better stability against the wind
  - Adding new set of sails with the desired color scheme
- Replace the engine and test run the aircraft running on E85 fuel (Ethanol)
- Modify the aircraft to meet FAA regulations
- Promote and publicize the aircraft

Learning to Fly

- Flying and Landing standards and procedures
- Maneuvering an aircraft
  - Fully Manual
- Required skills and standards to fly
  - Flying License
  - Flying with a Flight Instructor
- Safety and Precautions
  - Strictly under FAA regulations

New parts purchased for Quicksilver MXII

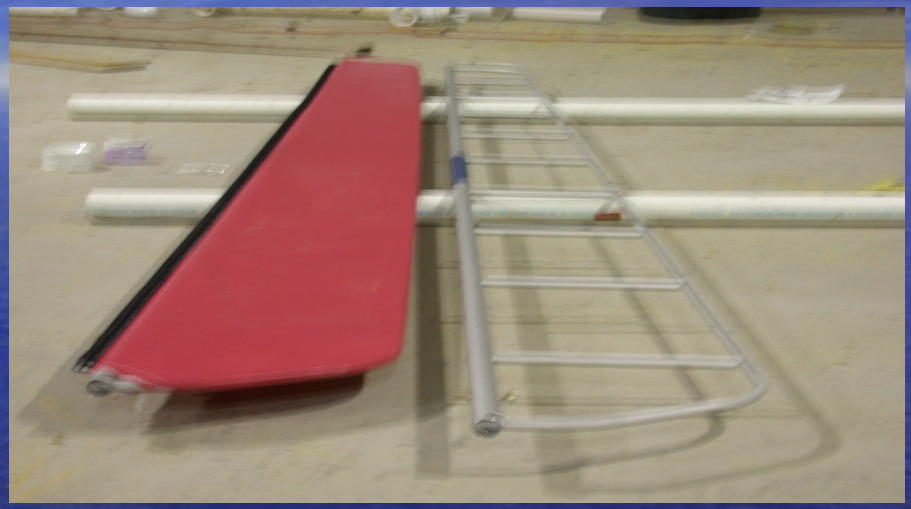
- New E85 fuel engine
- New set of sails
- Rudder
- Ailerons
- Total cost - $7000

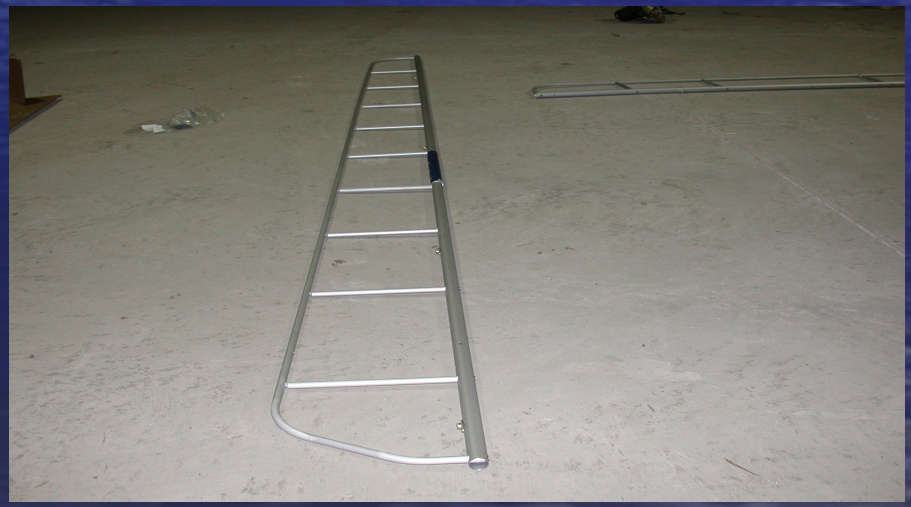
Tasks completed in chronological order

- Rudder tail assembly removed from rear empennage – 10/06/02
- Rudder and elevator resurfacing – 10/20/02
- Wing detachment from Trike – 11/02/02
- Ailerons assembled – 11/26/02
- Aileron surfacing cover and horn attachment – 11/30/02
- Service inspection done after every task

Aileron Assembly

- Left and Right Aileron frames
  - Assembled 9 aileron struts per aileron frame and inserted into place
  - Attached the I.B. and O.B. training edges to the leading edge
- ✓ Assembled aileron structures inspected – appeared firm and sturdy





Future Goals

- Modify the pedals to control rudder and the sticks to control ailerons and elevator
- Assemble the new engine
- Test and run the new E85 fuel engine
- Qualify for FAA regulations
- Test fly the aircraft and obtain flying certification

Conclusion

- Further modifications need to be done
- Parts arrived late - in the middle of the semester
- Too much time spent on ordering and getting new parts
- GOOD NEWS!! – the project will be continued to finish what was started
- Aircraft will be ready to leave the ground by next year
- COMING UP SOON!! – IPRO 317 to be an Ultra-light flying club to be managed by AIAA IIT chapter next year

Any Questions?

Please visit the website for further details:

http://www.iit.edu/~ipro317/f02