

Aeronautical Engineering - Design, Manage & Make Project



The Can Challenge



Students

- Approx 100 Part A Aeronautical Engineering students
- Predominately secondary school leavers with no industrial experience
- Groups and teams are selected by tutor on the basis of known strengths and weaknesses and with a view to provide new groupings

- | | |
|-------------|--------------|
| 1 Durojaiye | 11 Bailey |
| Lau | Lowe |
| Gray | Greenfield |
| Dowds | Baison |
| Bemment | Dixon |
| 2 Callahan | 12 Hardy |
| Lake | Mcgrath |
| Song | Hedgecox |
| Patel | Drurey |
| Elliott | Morris |
| 3 Aizlewood | 13 Knight |
| Fong | Gashi |
| Goldson | Smith |
| Hargreaves | Newell |
| Neilan | Burton |
| 4 Barnard | 14 Sutcliffe |
| Frost | Hodson |
| Howroyd | Dodds |
| Denby | Beckett |
| Elroubi | Sinclair |
| 5 Boston | 15 Sungoo |
| Geeson | Fitzmaurice |
| Mills | Bowring |
| Hamshaw | Vickers |
| Chambers | White |
| 6 Bagnall | 16 Nunn |
| Martin | Cowling |
| Cuerden | Chand |
| Roseman | Guest |
| Edwards M | Hj Md Yusof |
| 7 Bamber | 17 Churchman |
| Kearsey | Haji Morsidi |
| Edwards G | Maudrell |
| Walton | Webb-Martin |
| Stimpson | Nash |
| 8 Ramji | 18 Sturdy |
| Lorenz | Cattell |
| Jeans | Shorthouse |
| Hope | Evans |
| Hollins | Coles |
| 9 Moosa | 19 Rashid |
| Booth | Plackett |
| Robinson | Brown A |
| Marshall | Goodyear |
| Cleal | |
| 10 Bennett | 20 Gibb |
| Bebington | Slator |
| Goodhead | Harris |
| Etheridge | Whittingham |
| Ward | Homer |

Aim

To integrate knowledge and skills from various Part A modules in an aeronautical design and make activity designed to develop, team work, management and communication skills

Objectives

- Working as a member of a team and given selected resources:
- Design, build and test fly a model aircraft.
- Prepare and present a team presentation.
- Prepare and submit a report on your project.
- Manage all phases of the project with regard to safety and productivity to meet prescribed targets

Resources

The resources available to produce your aircraft are detailed at Annex A. ***Read this carefully before you commence the design phase.***

Also note information in Annex D & E.

Assessment

The overall assessment will be based on the following aspects:

- Design approach, specification and drawing quality
- Manufacturing process and build quality
- Flight performance
- Project management
- Presentation and report

Programme

The project is based on a ten day profile. time allocation is as follows:

- | | |
|-----------------------|---------------|
| • Initial Briefing | Day 1 |
| • Design phase | Day 1.5 - 4.5 |
| • Design review | Day 3 |
| • Design presentation | Day 4.5 |
| • Build phase | Day 5 - 9 |
| • Flight Challenge | Day 9.5 |
| • Report hand in | Day 10 |

Constraints & Rules

The internal propulsion system as provided must be used

The payload is a drinks can (330ml) which may be cut and drilled but must retain original volume

No changes to the design specification after Day 4.5 unless agreed by your supervisor.

Only the supplied resources may be used in the design.

Mainplane must be semi-monocoque design

The plane must demonstrate the ability to glide before utilising the motor as a power source.



Targets

At the end of Day 1 (1600) each team must declare individual project responsibilities for each member for all activities in the project. *The form provided at Annex B is for this purpose.*

Day 3 design review in Keith Green Building law programme at Annex F

Design presentation on Day 4.5

Flight Challenge Day 9

Written Report Day 10.

- A design overview
- A personal critique

Team Presentation

At the design presentation each team will be expected to provide the following:

- Aircraft specification (All relevant data)
- A general arrangement drawing (GA) of your design A4 size produced on AutoCAD.
- Free hand sketches of necessary assembly and construction detail.
- In-board structural profile/layout drawings on AutoCAD
- Construction templates
- Parts list with cost and mass estimates.
- A verbal justification for your chosen design of 20 minutes duration, during which the use of visual aids and full team participation is expected.
- A detailed management plan of the build / test phase

Flight Challenge

On Day 9 a challenge flight contest will take place. The following rules apply:

- The aircraft may only be hand launched
- The aircraft flight will be timed from launch until touchdown in the landing site. The duration of each of the two flights will be logged. The winning team will have the longest total duration.



Supervision

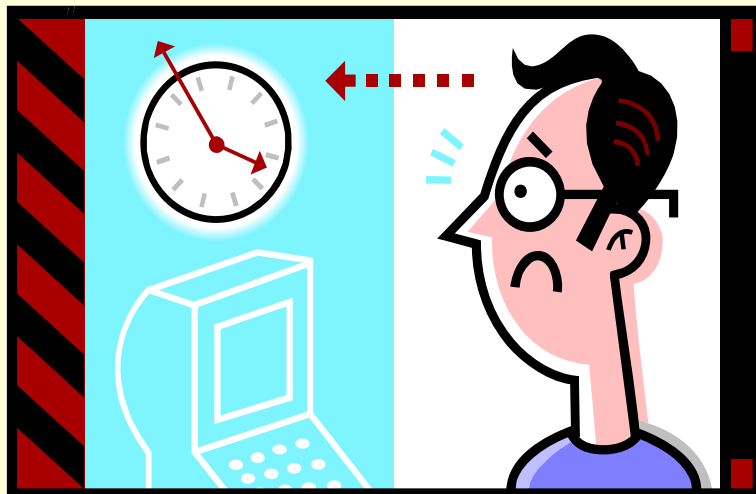
The following staff will supervise the project:

Group A	Teams 1 - 10	Goff Tearle
Group B	Teams 11-20	Mark Wood

Timetable

The key points are as follows:

- The normal working day is 0900 - 1700
- The design presentation will start at 1330
- All tools and equipment returned Day 9 at 1300
- The flight challenge will commence at 1400
- Hot debrief after the Challenge
- The build phase programme is at Annex C



Information

Some information is provided for each team. However there are a few books in the library (629-) and a number of web sites that may be of interest.

Rooms

The following rooms have been allocated for use during the project:

Programmed build activities in W011

engCETL Breakout rooms 1-4 booked 17th -27th Sept
Presentations

Group A - RT033

Group B - RT040

Flight Testing Flight testing is allowed on the Holywell rugby pitches from Day 8 onwards.
However sports activities take precedence. Keep well away from any sporting activities



Annex A - Resources.

Wood	Number of.	Cost
<i>Balsa</i>		
JP Mixed bundle	2	4p per cubic cm
<i>Ramin</i>		
6.0 dia* 455mm Dowel	2	5p per 10mm length
4.5 dia	1	4p
3.8 dia	2	3p

<i>Spruce</i>		
9.6*9.6*455mm	1	10p per 10mm length

<i>Ply</i>		
3.0mm*200*300mm		4p per mm ²

Other Materials	Cost
Tin Plate 0.2mm thick	£3 per square metre
Solafilm covering 1.5m*0.68m	£3.15 per square metre
Wood glue 1	10p per 5mm length
Epoxy adhesive	50 per 5mm length
Blue-Tack	80p per gram
Rubber bands	10p each
4 x (M2x16) screw sets-motor fixing	20p per set

Equipment

Lay up boards *2
Cutting Knives
Solafilm Irons
Board pins
Fabrication area hand tools and equipment

Annex B

Project - Team Member Responsibilities

Team No:

Design Phase Contact e-mail:

Phone:

Name	Responsibilities
1	
2	
3	
4	
5	

Note:

Detailed managerial responsibilities for all aspects of the project are required along with an organisational chart.

Annex C

Programmed Manufacturing Timetable

Day	Team	Time
5	1 - 5	0900 - 1200
	11 - 15	0900 - 1200
5	6 - 10	1330 - 1630
	16 - 20	1330 - 1630
6	6 - 10	0900 - 1200
	16 - 20	0900 - 1200
6	1 - 5	1330 - 1630
	11 - 15	1330 - 1630
7	1 - 5	0900 - 1200
	11 - 15	0900 - 1200
7	6 - 10	1330 - 1630
	16 - 20	1330 - 1630
8	6 - 10	0900 - 1200
	16 - 20	0900 - 1200
8	1 - 5	1330 - 1630
	11 - 15	1330 - 1630

Note

The times above are to allow the supervisors the opportunity to assess progress.

Teams are encouraged to continue work outside these times to meet targets.

Boards and team equipment may be taken away but remain the responsibility of the team should loss occur.

Sanding operations are totally prohibited in W011
Please ensure you clean up your work area after use

Annex D

Aircraft Electric Power System Information

General Data

Electric Motor type KP 02	
Weight including propeller/battery pack	68 gm
Battery Pack 3*110 mAh cells	3.6 v
Propeller diameter & pitch	6 x 3
Spinner depth	25 mm
Propeller rotation viewed from front	Anticlock
Max RPM with supplied propeller	4000
Suggested maximum model weight	280gm
Cost including propeller/battery pack	£20-50

Charging

Available kit

K&P Field Charger & K&P mains Charger

Procedure

Charge up field charger using mains charger. **Max charge time 4 hours**

Use field charger to charge battery pack via jack plug switch/connector.

The supplied jack plug acts as a motor switch and charging connector.

Always insert jack plug into motor power pack before connecting field charger.

When jack plug is removed motor will run.

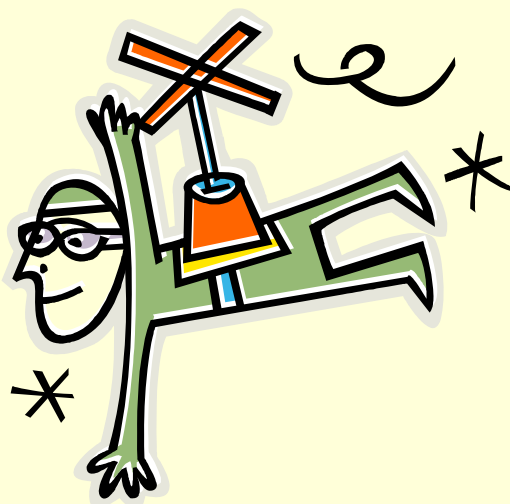
Always disconnect lead from field charger first.

Typical charge/run times

Charge	Run at Power	Stop
30secs	10secs	30secs
1 min	25 secs	45 secs
2 min	35 secs	65 secs

Gradually increase charge time relative to aircraft performance.

Do not exceed 2 mins charge time



Annex E

Safety

- It is the responsibility of each team to ensure that a risk assessment is conducted to enable a safe working environment
- Points to note:
- Craft knife blades are extremely sharp
- Running propellers are hazardous
- Check all mains powered electrical equipment before use for defects
- Only fly the aircraft in safe areas away from people and buildings.
- Ensure all electrical equipment is turned off after use

Equipment

- Each team will be issued with tools and equipment to allow manufacture. It is the responsibility of each team to safeguard these items during the project. Any losses will be recovered from the team.
- **Motor/ Battery Pack Dimensions** (excluding propeller)

Annex F

- Day 3 - Design Review
- Aim:
- To enable supervising staff the opportunity to assess the progress and technical proficiency of the team performance during the initial design phase. Teams will be expected to describe concept options and explain rationale for design selection

• Time	Breakout Room	Team
• 0930	1	1
•	2	2
•	3	3
•	4	4
• 0950	1	5
•	2	6
•	3	7
•	4	8
• 1020	1	9
•	2	10
•	3	11
•	4	12
• 1100	1	13
•	2	14
•	3	15
•	4	16
• 1120	1	17
•	2	18
•	3	19
•	4	20

Assessment

Part A - Aeronautical Engineering

Design & Make Block

Marking Scheme

Team

Name

Activity (6/3) (4/2) (2/1)

Design Overview

Supporting Graphics

Performance Review

Presentation

Manufacturing

Management

Report

Individual Critique

Remarks:

Note

Marks/Grade range

A* 48

A 40

B 32

C 24

D 16

E 8

F 1-7



Evaluation

- For the last two years the design and make activity has been evaluated from a pedagogical viewpoint by Dr Sue Morón-García engCETL
- This has resulted in a number of changes being introduced

Development

- Introduced powered flight option in 2006 as the result of a teaching award
- Introduced peer assessment using WEBPA 2007
- Integrated into a core module
and programmed as term activity 2008
- Will be seeking industrial sponsorship for 2008

Any Questions