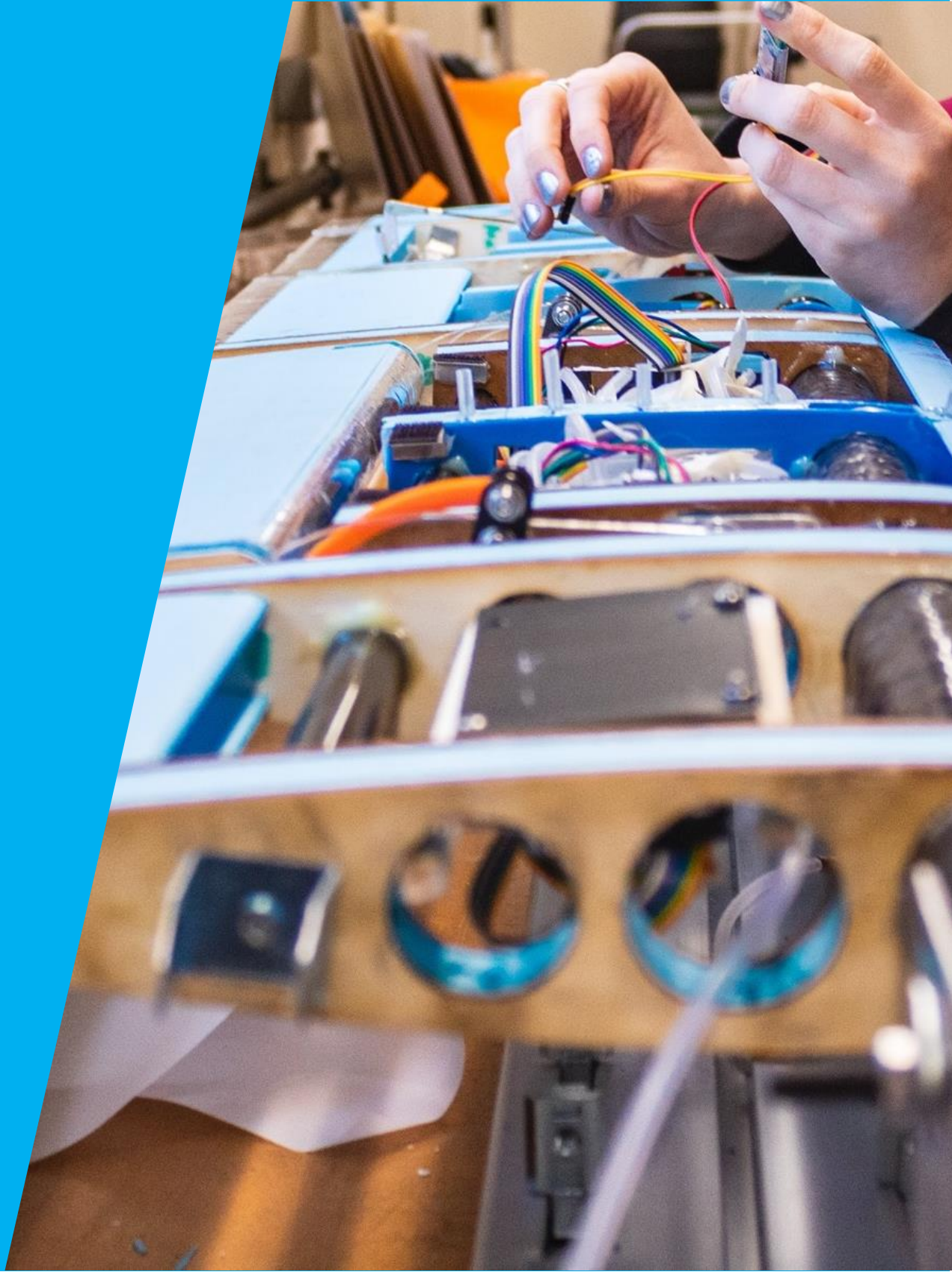


AVDASI2 Project

CADE20005
Student Handbook
2024/2025

University of BRISTOL

People put themselves in difficult situations in lots of different areas. What you count on is people taking every precaution. The aerospace industry is unique in this aspect because a thousandths-of-an-inch mistake can cause spectacular failures.

Mae Jemison

Honour is what no man can give you, and none can take away. Honour* is a man's gift to himself.*

Adapted from ‘Rob Roy’, 1995

*i.e. Professional integrity

The challenge of leadership is to be strong, but not rude; be kind, but not weak; be bold, but not a bully; be thoughtful, but not lazy; be humble, but not timid; be proud, but not arrogant; have humor, but without folly.

Jim Rohn on leadership

Flying might not be all plain sailing, but the fun of it is worth the price.

Amelia Earhart

Issue 01 - 06/09/2024 Issued by Mark Graham.

Issue 02 - 11/09/2024 Issued by Mark Graham. Project plan updated with latest timings for Phase 1.

1 Contents

2 Introduction

Hi and welcome to AVDASI2. This document is your student handbook and contains a range of important information intended to help you master this challenging and unique unit. All students should read the complete handbook at the start of the unit, as the information within will help you to perform well as an individual and as a team during the year.

The handbook may be updated throughout the year as we release new information and where we make changes to the unit.

The handbook does not contain everything the things you need to know about the unit however, and there are many other important documents, either on our Blackboard page or on our Microsoft Teams Pages, that you need to be aware of and read in full.

We hope you enjoy the unit and wish you the best of luck!

Mark Graham

Unit Director

3 Key unit definitions and terminology

Company *Companies* are formed from *divisions*. A company will be responsible for assembling and testing the complete UAV. Between the *team* and *company* level will be other structures such as *divisions*.

Division *Divisions* consist of *Port wing*, *Starboard wing*, *Fuselage* and *Avionics*. Divisions sit between the Team and Company. Your company may also elect to create sub-divisions to support your administrative processes.

Graphite Goose Our expression for the UAV main structural framework (main spars and joints) to be tested in Teaching Block 1.

Team A *team* is nominally formed of 5-8 students. You work in your team throughout the unit to carry out many functions, tasks and assessments.

Specialism As in a real company/project, team members will have specialist knowledge/skills/experience that they develop. Team members will elect to take 1 or more specialisms and will attend specialist teaching streams for those specialisms.

Sub-assembly Each team is assigned responsibility for a particular UAV sub-assembly. The team is responsible for the design, manufacture and testing of their sub-assembly, as well as the integration of the sub-assembly into the overall UAV design.

4 Unit information

4.1. Unit Description

In this unit, students will work in *teams, divisions* and *companies* to design, manufacture, test and analyse a fixed wing uncrewed aerial vehicle (UAV). This unit is uniquely challenging and the UAV will be entirely the product of your own creativity, teamwork and effort.

All students should enjoy taking part in this unit, but at times, students may experience the stress that comes from undertaking an exercise of this complexity & magnitude. All the unit's staff are here to work in partnership with you from the beginning, so you should be confident in approaching us for support or feeding back to us about any opportunities for improvement you see.

One of the core aims of the unit is to deliver an authentic engineering experience, along with high levels of student independence and autonomy over how they manage themselves, their team and their company. The project also has additional challenges, even beyond what might be experienced in industry, as we must also conduct assessments and ensure these assessments are rewarding, fair and reliable.

The intended learning outcomes of the unit state that, on completion of the unit the student will be able to:

1. carry out the design, build and test of a functioning major UAV assembly as part of a team, using applicable interdisciplinary concepts and methods;
2. work as a member of a team, employing appropriate project management and planning tools to create, monitor and deliver a project plan;
3. utilise introspective and reflective methods to identify opportunities for enhanced individual and team performance in future projects;
4. discuss key health and safety responsibilities for engineers; and using recognised risk management tools create risk assessments to analyse a variety of project risks;
5. communicate technical information via written documents and presentations; and utilise feedback given to establish improvements in successive presentations.

As you can see, in comparison to most engineering units, there is a high level of focus on working as a team and on the professional skills needed to plan and deliver a project, rather than a strong focus on teaching you large quantities of technical theory.

One of the other major differences with most units is that a large proportion of the taught content is delivered in *specialist teaching streams.* The details of specialist teaching streams are later.

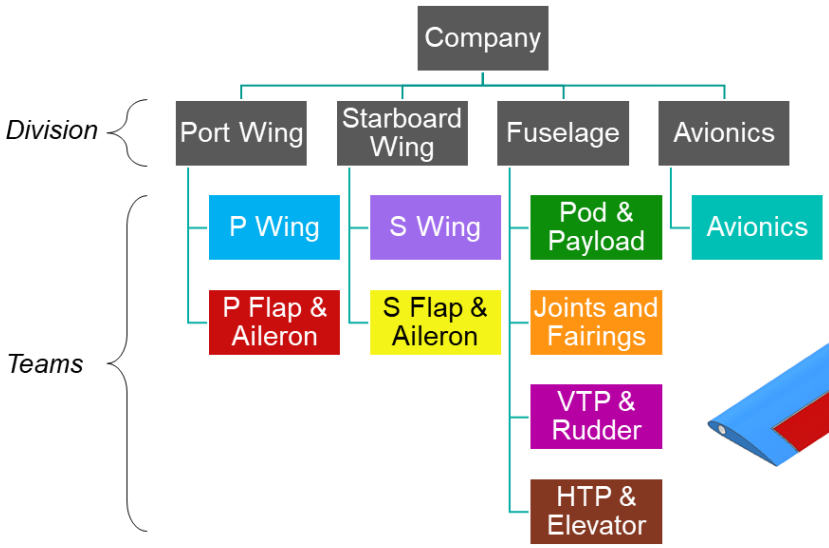
The main outputs from students in this unit will include, but are not limited to:

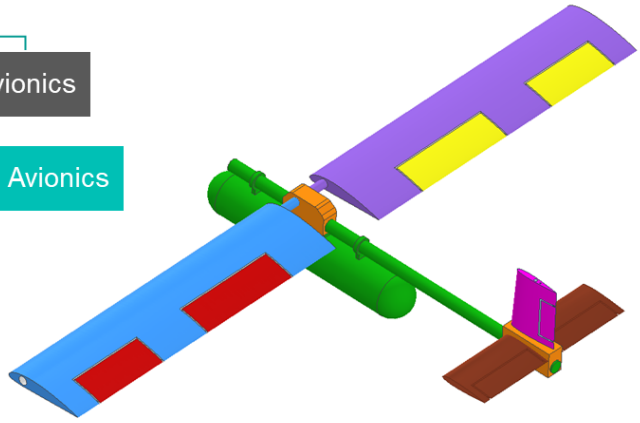
- Designs
- Presentations
- Written reports and analysis
- Manufacturing activity
- Peer Reviews
- A working UAV
- Physical testing
- Project plans
- Requirements management documentation
- Risk management documentation
- Quality reports

4.2. So how does the unit work?

The 2024-25 cohort will be split into 3 *companies 'Company A', 'Company B' and 'Company C'* (until you come up with a better names!). Each company is responsible for designing, producing and testing a UAV.

Each company is subdivided into 4 *divisions* (Port wing, Starboard Wing, Fuselage & Avionics) which are further subdivided into *teams.*





UAV sub-assemblies

Teams are composed of typically 5-8 students. Most of the work, and assessment, takes place within the team level, but teams must also work together to design, build and test the final UAV. Students also carry out an Individual Reflective assessment. Assessment details are given in the document entitled *Deliverables Document*, which you should read in full as early as possible once you start the unit.

Teams will be *design responsible* for a specific sub-assembly of the UAV. The scope of responsibilities of each team are outlined in the *Design Responsibility Matrix* and *Team Workpackages* documents, which are also on Blackboard.

The technical knowledge needed to develop the sub-assemblies differs between teams, so members of the team will attend a different set of specialist teaching streams. When teaching is identified as *specialist* it means that not all students on the unit need to attend that teaching. Conversely teaching identified as *Core* requires the attendance of everyone on the unit.

The specialist teaching streams are:

- Aerodynamics
- Avionics
- Design
- Mechanisms
- Project Management
- Structures

It should be noted that the amount of specialist teaching (i.e. lecture/study hours) is not equivalent between the streams and varies throughout the teaching weeks/blocks.

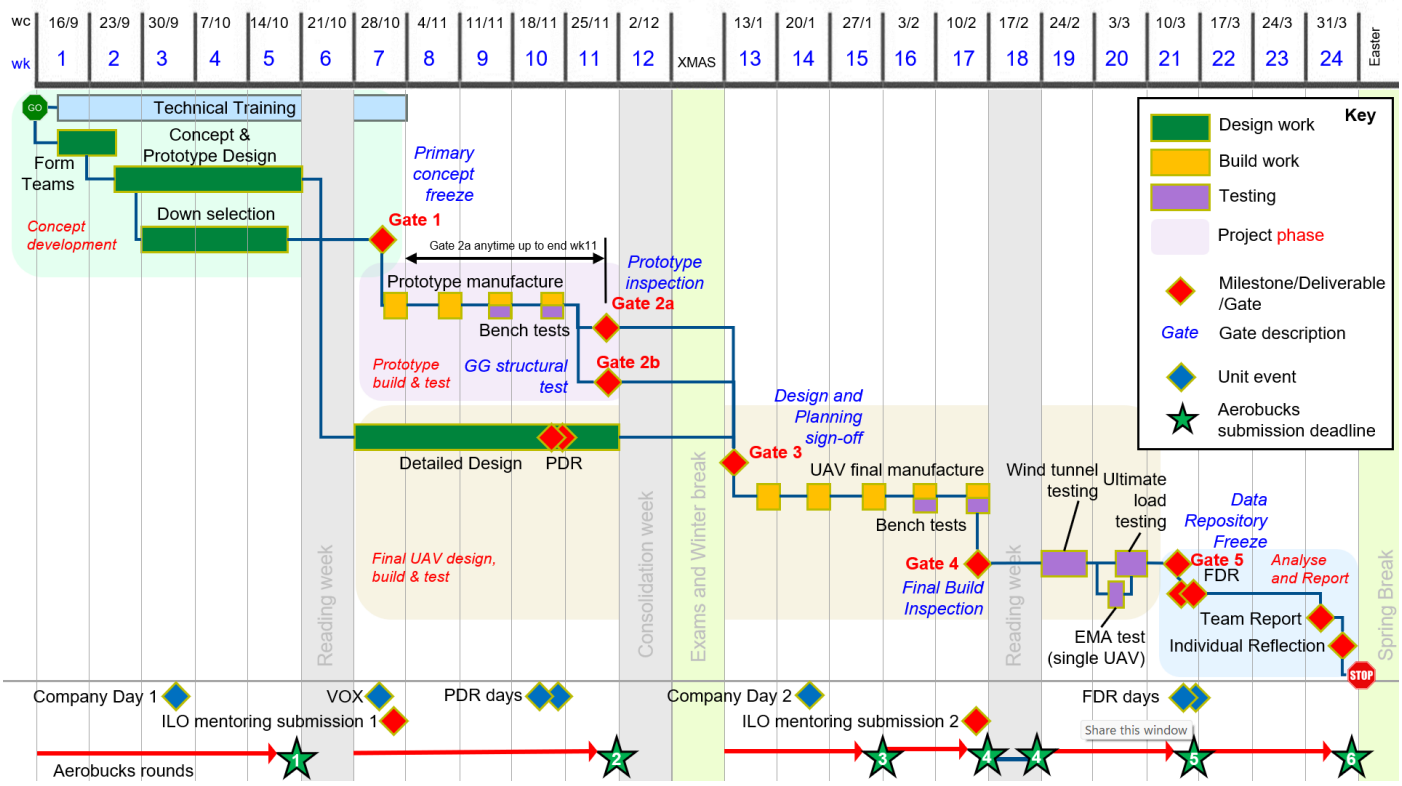
In teaching week 1 students will be assembled into their team and the team will be assigned responsibility for a sub-assembly. Team members will need to decide the roles that they will take in the team. These roles help to define what specialist teaching sessions the team members should attend, as well as the functions that they perform in the team.

Additionally, a number of division-level and company-level roles need to be assigned so that the company can begin to operate effectively.

Teams will work to develop designs for their sub-assemblies. These designs will then be integrated into the UAV (at the division and company level). Teams will work within the company to complete the UAV build and then manage the test activity. Finally, teams will report on the sub-assembly and UAV performance in the *A1 Final Design Review* (presentation) and *A2 Team Technical Report* (written report).

4.3. What are the core activities in the AVDASI2 project?

This section gives an overview of the *design, build and test plan*[1] for the unit. Important activities and milestones will be introduced, but only in as much detail as is required to gain a general understanding. Further unit details will be available on Blackboard and via the weekly lectures and workshops. The plan will likely be subject to change, but we advise you to read the details below so you know where you are headed.



Outline plan for 2024-25 AVDASI2. This is not a live plan – a copy of the current live plan can be found on the unit's Microsoft teams site here.

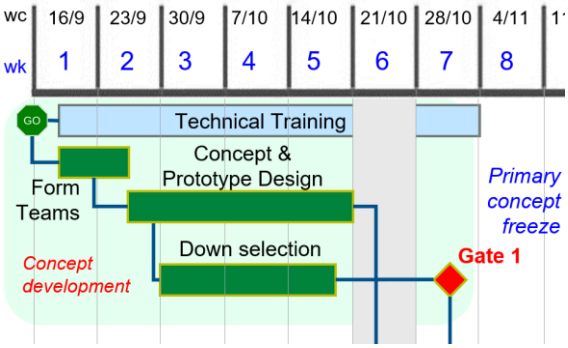
[1] A project plan is *a* view of the future – it is not *the* future - things can change!

The AVDASI2 project is split into 4 phases and runs over 24 teaching weeks from September 2024 to April 2025. The 4 project phases are:

1. Concept development
2. Prototype build & test
3. Final UAV design, build and test
4. Analyse and report

A brief description of the key activities and milestones shown on the plan above will now be detailed below.

4.3.1. Concept development phase



Form teams

Team are assigned responsibility for a sub-assembly. Team members assign themselves roles within the team and begin attending the specialist teaching associated with those roles. The team develops its working practices and meets regularly. The team starts to interface with the division/company and the company develops a structure and some administrative processes. Team forming doesn't stop at the end of this period – teams continue to develop throughout the unit.

Concept and prototype design

During this design phase you are creating concept & prototype designs for your sub-assembly. In many cases the design will be informed by the specialist teaching you receive; however it is expected that you operate independently and creatively. Waiting for staff to strongly direct you to a design solution is a poor approach and it is much more effective for your team to forge ahead and design a prototype as soon as possible. In the case of teams designing components for the *Graphite Goose* test, some the parts (i.e. the main spars) will need to be the final article, as there is no opportunity to remanufacture these parts.

Teams will produce the necessary drawings and documentation to allow them, with the guidance of technical staff, to manufacture a working prototype. At this point the *Design Specialists* will not have received all of their drafting training, so drawings might be of limited quality. The exception to this will be teams that are responsible for designing and building the Graphite Goose. The GG structure will be used in the final UAV, so the design and drawing quality must be sufficient to achieve a good result.

To design any part of the UAV, you will need to know what functions the UAV (and your sub-assembly) must fulfil, and those functions are fully described within the *Requirements Specification* document, to be found on Blackboard. **Your team should read the *Requirements Specification* in full and identify all specifications that are impacted by your sub-assembly.** A good design process should include *Requirements Management*, which in its simplest form is a register listing the relevant product requirements along with a status summary of how close/likely you are to achieving those individual requirements (a red, orange, green traffic light system often works very well). You will receive a template for the requirements management document which you can adapt to meet your needs.

Down selection

Teams are required to demonstrate a Divergent-Convergent design process and formal down selection for a specific technical area within their sub-assembly. This means generating discrete design concepts and then down-selecting them to a single solution (which will be part, but not all, of your final sub-assembly design). The parts of the design where we expect a formal down selection will be described to you in the *Team Workpackages* document. You will then discuss the down selection in the summative *A1 FDR* presentation and in the *A2 Team Technical Report*.

A note about Gates

Gates are used as part of the project management process within most technology development companies. Gates are used as check-points throughout the project to check/measure/assess the product development maturity (as well as the business case and market opportunity). On AVDASI2 we use gates to:

1. Check that the development of the product meets certain criteria (quality, maturity, documentation, safety etc.)
2. Provide insight into the development of the team/division/company and its processes
3. Act as an early warning system for low performance (Gates are there to protect the project team)
4. Provide a point at which elements of the assessment coursework can be locked-in/finished. The intention here is to spread the work throughout the year and reduce the pressure (& risk) towards the end of the unit.

The gates contain a mixture of formative and summative work. When the work for a gate is missing or late, this will impact the team negatively, as the end date of the project doesn't move even if you let the gates slip. In some cases this will also adversely affect your summative result as the content of the gate is then not available to be included as part of your summative submissions.

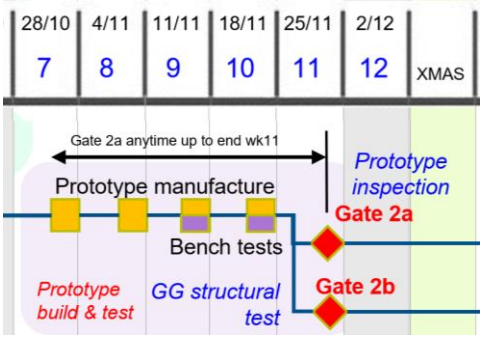
Primary concept freeze (Gate 1)

The down-selection process must be completed by this point, and this then locks-in some of the key design choices for your sub-assembly (and UAV). At this point other aspects of the design might still be quite open however. You will also present your initial concepts along with the down-selection evidence at the PDR. At Gate 1 you will be expected to make a formative submission of a short document. This will consist of no more than a few pages/slides explaining the down-selection process and the key features of the design as it stands. Details of what you submit at Gate 1 (and other gates) will be provided in a separate document on Blackboard. Missing Gate 1 or not submitting anything results in the following:

- You are pushing more work into TB2 and towards your final assessments (the Gates are there to protect you and the project).
- You miss out on the opportunity for feedback on your work (we tell you what to change to get better marks!).
- You risk entering the next phase of the project with a weak or inappropriate design.

As well as submitting details of your down-selection, your team is also required to submit the first release of your project risk assessment.

4.3.2. Prototype build & test phase



During this phase each team are required to design, build and test prototypes[2]. This serves the following purposes:

- Demonstrating a minimum level of manufacturing competence (and helping you to accrue the minimum lab hours required for TB1)
- Identifying high risks in the manufacture or function of key parts of your sub-assembly
- Developing the team's teamwork ability in the lab and observing the engagement level of team members
- Producing the *Graphite Goose* for structural testing at Gate 2b.

The scope of the prototype(s) to be built will be described in the Team Workpackages document.

The Graphite Goose (GG) is the units colloquial name for the: Main wing Spar; Fuselage Spar, HTP main spar; and the corresponding connecting joints. The Graphite Goose will be structurally tested during this project phase, but unlike the other prototypes, **the GG parts will be utilised in the final build*** (so high quality is important!).

*The project does not contain enough time to re-manufacture the Graphite Goose main structure.

Prototype manufacture & test

Teams will be able to attend their timetabled lab sessions in the M.003 & M.005 laboratories. During these times teams will manufacture their prototype designs and carry out bench-top tests to prove the designs functionality.

In the case of the GG (and any other sub-assemblies in the final UAV build) manufacturing resource can be pulled from other teams in the company to ensure that:

1. Company deadlines are achieved.
2. There is an equitable contribution to the build activity across the company.

Prototype inspection (Gate 2a)

At the end of *prototype manufacture & test* teams will demonstrate that their prototype meets a minimum level of quality by demonstrating the functionality in the laboratory. Staff will support you in defining the form and requirements of these bench tests and quality checks (with the exception of the Graphite Goose, which has a mandated test plan). A simple test and inspection plan should be written by the team and should be influenced by the relevant product requirements from the unit's *Requirements Specification* document.

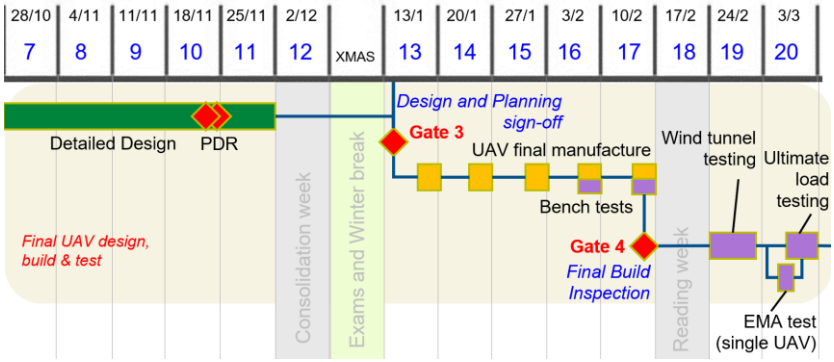
Failure to complete Gate 2a pushes risk into your final build and increases the pressure you will be under in Teaching Block 2.

[2] The term *prototype* may be slightly misleading here, as what you will build is not a full representation of the final sub-assembly, but is only a limited portion of the components or manufacturing processes. In some cases the prototype might also be the final components (i.e. main spars).

GG structural test (Gate 2b)

The Graphite Goose must be structurally tested to prove its capability for handling the loads that will be experienced in the wind tunnel (and the design loads according to the *Requirements Specification*). Nominated teams from the P Wing, S Wing and Fuselage divisions will be primarily responsible for the manufacture of the GG, however **all teams are required to analyse the GG structural performance in the *A2 Team Technical Report,* therefore it is mandated that at least 1 structural specialist from each team attends the GG testing.** If there is no representation from teams at the GG structural testing, you are at risk that your summative discussion of this topic is deficient.

4.3.3. Final UAV design, build & test phase



In this phase your team will complete the detailed design, planning and manufacture of your sub-assembly and your team will also work within the company to manufacture and deliver the complete UAV. The UAV will also be bench-tested (i.e. as separate wings, fuselage etc.) and tested within the Wind-tunnel and Ultimate Load Tests. You will work according to your own project plans, which you will later discuss in the your final summative assessments.

Detailed design

During this *detailed design* period teams will produce a: Bill of Material (BOM); CAD models; and drawings of their sub-assembly. This activity requires a great deal of coordination within the company to ensure everything fits together and to ensure that the design satisfies the *Requirements Specification*. Drawing templates will be provided and the team's design documentation will need to achieve a minimum quality level to be accepted by the company.

Designers will receive drawing training in TB1, prior to the completion of their detailed design.

For teams in the Avionics division, it is still expected that they submit drawings of their sub-assembly, but these will be of the sub-assembly electrical layout and of the electrical layout of the total UAV. Designers (within the avionics division) will also receive information on how to correctly layout electrical drawings and schematics.

PDR (Preliminary Design Review)

This is an important formative assessment, which consists of an in-person team presentation to unit staff. Full details of the PDR (and the PDR timetable) are contained within the *Deliverables Document*, which you can find on Blackboard.

Design and Planning sign-off (Gate 3)

Documentary outputs from this Gate are submitted as part of your A2 Team Technical Report. These documents cannot be altered**, so performance at this gate impacts later summative assessments**.

At this point, teams should have completed their detailed planning, detailed design and drafting activity and have released the designs to the company. This enables your team to begin manufacture immediately at the start of Teaching Block 2.

The format of the gate will be an in-person review with 1 of the unit's academics. During the review you will share your detailed design with the academic and they will ask questions about the design, exploring the design maturity and its quality (similar to a viva, but a viva of the design). The academic will populate a proforma and provide a mark. This proforma will then be attached to your A2 Team Technical Report and will constitute a portion of the marks from the report. One of the aims of this gate is to ensure that you are ready on-time with a mature design and you avoid putting the team (and company at risk) by entering TB2 without a design to build.

UAV final manufacture

During this critical period teams work to manufacture their sub-assemblies and the final UAV. It is expected that manufacturing resource can move/flow between teams to drive the shortest lead-times and to balance the workload across the teams. Teams who are not presently occupied with manufacturing tasks (perhaps because they are waiting for antecedent manufacturing work packages to be completed) should work with the companies Project Managers to see whether they can be re-deployed to help other teams.

Remember – if any team is allowed to fail it affects all teams, as the UAV cannot be tested on time or the UAV performs poorly when tested.

Final Build Inspection (Gate 4)

Documentary outputs from this Gate are submitted as part of your A2 Team Technical Report. These documents cannot be altered**, so performance at this gate impacts later summative assessments**.

At this gate an academic will inspect your UAV sub-assembly. The academic will make an assessment of the quality of the sub-assembly build and will give a resulting mark for the build inspection. This will be recorded on a proforma and the proforma will later be attached to your A2 Team Technical Report and will constitute a portion of the marks from the report.

Wind tunnel testing

For the wind tunnel tests, each companies' UAV will be broken down into:

- Port Wing
- Starboard Wing
- Fuselage (which includes the empennage)

Across the 3 companies, this gives 9 separate wind-tunnel sessions. For the fuselage testing it might be necessary to have additional wind tunnel time to permit the iteration of the certain control functionalities. The wind-tunnel will need to take place throughout the week (i.e. some of the testing will have to be outside of timetabled AVDASI2 sessions).

It is expected that every student on the unit will attend (and be actively involved in) at least one wind tunnel test, and the test(s) to be attended should logically include the sub-assembly hardware of the team members attending. All teams need to perform aerodynamic analysis as part of the *A2 Team Technical Report* and a failure to be present for the wind tunnel testing will likely weaken your final analysis and discussion.

Teams/students shall arrive at the wind tunnel prepared for the test, with a good understanding of the test procedure and expected results. Instruction about experimental methods will be provided (via lectures and/or workshops) in advance of this phase to ensure students can extract maximum value from the test experience.

EMA test

We plan to include an Experimental Modal Analysis test within AVDASI2. The EMA test will be carried out on a single UAV and attendance at this test will be optional. The test is part of a learning enrichment activity that is intended to support/enrich your teaching within the Dynamics and Control of Linear Systems unit (CADE20002) which runs in teaching block 2. You will be able to observe and participate in the experimental methods as they are deployed on a real-world aerospace structure – your AVDASI2 UAV! More information will be provided about this activity as we approach the test.

Ultimate load testing

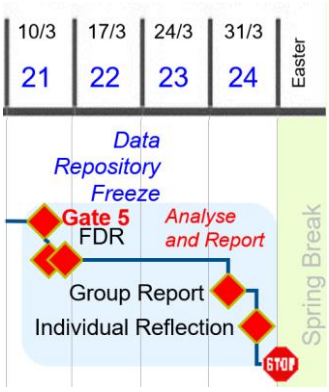
With the other testing and evaluation complete, the ultimate structural strength of the UAVs can be explored. This is a destructive test and will be orchestrated by unit and technical staff. Structural representatives from each team should be in attendance. The ultimate load testing will take place on 3 separate days and may need to take place outside of timetabled AVDASI2 sessions.

Company data repository freeze (Gate 5)

Each company will produce/populate a substantial data repository which includes all the data necessary to enable the UAV design-and-performance analysis necessary for the *A1 FDR* and *A2 Team Technical Report*. As this is an important milestone, the general requirements of the *Company Data Repository* will be detailed in the unit's *Deliverables Document.* Delayed freezing of the data repository will affect all Teams in the company and will reduce the time available to the teams to finish the *A1 FDR* and *A2 Team Technical Report*.

It should be noted that not all parts of the data repository are dependent on the wind tunnel and ultimate load tests being completed. Therefore, companies should work towards freezing sections of the repository earlier, to permit those parts of the final assessment to be prepared/completed as soon as is possible.

4.3.4. Analyse and report phase



A1 FDR, A2 Team Technical Report and A3 Individual Reflective Portfolio

These are the 3 summative assessments that together make up 100% of your marks for CADE20005. The assessment is very *back-end loaded*, and we intend to use the *Gates* to ensure that you complete a large portion of the assessment work throughout TB1 and TB2. Failure to satisfy the earlier gates will result in a very high workload at the end of the unit (at a time when you have many other submissions for other units).

Failing CADE20005 is significant, and it is not a unit that is generally feasible to retakes in the summer reassessment period, as the core ILO's are based on teamwork and delivering a physical UAV.

4.4. What other key features of project and unit should I know about?

4.4.1. The AVDASI2 Peer Review System

AVDASI2 features a peer review system, known as *Aerobucks.* At set points throughout the year team members will issue *Performance Related Pay* (Aerobucks) to other team members, based on their contributions to the team's goals. The Aerobucks that team members are awarded will influence the final marks the team members receive for the A1 FDR and A2 Team Technical Report. Detailed Instructions for the peer review system can be found in in the Aerobucks channel on the unit team site.

In addition to the formal peer review system, opportunities will be provided for students to provide formative feedback to each other a points throughout the unit.

4.4.2. Lab attendance monitoring

To ensure efficient use of the labs, and to monitor the lab attendance of students, a bespoke attendance monitoring system will be in place in the M.003 laboratory. This system will operate by swipe-in/swipe-out of a bespoke card terminal machine in the lab. Students should also make their own records of their lab attendance, helping you to ensure that you meet the minimum requirements. Details of the mandatory lab attendance requirements can be found in the *Deliverables Document* on Blackboard.

4.4.3. Industrial mentoring report

The submission of your *Industrial Mentoring Report* is administrated within CADE20005 AVDASI2. You will submit a first version of your report in teaching block 1 and also submit the final report as an appendix to your *A3 Individual Reflective Portfolio*. Full details and requirements of the submissions are contained within the *Deliverable Review* document on Blackboard.

4.4.4. Communicating with unit staff

The information below describes the intended channels/methods of communication between unit staff and students. Students can use this document to find out how they should contact unit staff and how they will receive communications from unit staff.

Communication protocol from unit staff to students

The table below describes the communications protocols that staff should follow when contacting students.

What?	Primary channel	Secondary channel
Important unit level information (all students)	Via a Blackboard announcement	Via a post to unit team
Information for specialists only	Via a post to the specialist channel on the unit team	via @mention of the specialist tag
Specific information for CoA, CoB or CoC	Via a post to the general channel on the company team	via @mention to the company on the unit channel
Info for (or discussion with) a single team	Via a post on the private team channel on the unit team	Email to team members

To an individual	Via an email (if private). Via a post on the private team channel otherwise.	Via a direct message on teams

Communications from students to unit staff

The table below describes the communications protocols that students should follow when contacting staff.

What?	Primary channel
Question about a Unit level topic	Post a question on the *Unit Q and A* channel on the unit team, but **only** if: 1. You have already read all relevant instructional documents on Blackboard. 2. You have already checked to see if your question is answered within the Q & A documents/chat on the relevant channel.
Question about a specialist topic	Post a question on the appropriate specialist channel on the unit team. Rules 1 + 2 from above apply.
Question for a particular staff member	Post the question in the relevant specialist channel on teams and **@mention** the staff member in the post so they receive a notification.
Question that is private or of a sensitive nature.	1. Email the UD directly *or* 2. Book an open-office session with the UD *or* 3. If the topic is urgent, email and then direct message the unit director on teams.

Open office drop-ins

During term time (not including reading weeks) the unit director will make available a weekly 1-hour open office session where any AVDASI2 student(s) or team can book a 20-min slot to talk directly to the Unit Director. Bookings will be managed via *Microsoft Bookings* and will be automatically added to the UD's and your calendar to minimise the administrative burden. Open office sessions are primarily face-to-face, but can be arranged as a MS Teams meeting, should that be required.

You may prefer to use these open office sessions, rather than email, as for many discussions an informal face-to-face meeting is just better than writing an email about what might be a difficult or complex topic.

Students will be given a link to the bookings page once term is underway.

Emailing the Unit Director

If you wish to email the Unit Director please use the unit mailbox at avdasi2@bristol.ac.uk. Access to this mailbox is restricted to senior unit staff only.

If your concern is of a very private nature, you can email the UD directly.

4.4.5. Roles within the team, division and company

This section describes the specialist and leadership roles present within the team, division and company.

Roles within the Team

A significant project like AVDASI2 can only be tackled by a team. Teams will break-down large/complex tasks into smaller/definable work packages and then assign those work packages to groups of specialists. That means that different people do different types of work in the project. Ideally the work that people carry out suits their interests, skills and knowledge, but this is not always possible.

One of the major risks of specialisation however is that the team stops working together on topics and the specialist takes the role of 'Lone Genius', hoarding work & specialist knowledge. This is a poor outcome and places the team at risk, as the visibility of the work being done is poor.

The table below describes common typical specialist roles that team members take in AVDASI2. The role definition is not rigid and some members will take combinations of role, which might change throughout the unit.

Role	**Description**
Aerodynamicist	Every team needs at least 2 members who are Aerodynamics specialists. The Aerodynamicists will attend the specialist teaching and will lead aerodynamic activity within the team. The Aerodynamics workload differs across the teams, however every team must discuss the UAVs Aerodynamic design and performance in the A1 FDR and A2 Team Technical Reports (so even in teams with little aerodynamic design responsibility still require Aerodynamicists). Aerodynamicists also play a key role in the planning of (and data collection during) the wind tunnel tests.
Avionics specialist	Every member of the 3 avionics teams (1 Avionics team in each company) needs to be an Avionics specialist and to attend the Avionics specialist teaching.
Designer	Every team needs at least 2 designers. Designers take a lead on developing the sub-assembly design in CAD. Designers also produce the Bill of Materials (BOM) and drawings for the Sub-assembly and UAV. Designers attend the specialist design teaching. **All members are responsible for the design of the Sub-assembly however (but the designer is providing the design skills/tools to realise the design).** Avionics teams will also have designers, but they will be responsible for documenting the electronics and wiring designs using different methods and software.
Mechanism specialist	Each team directly involved with mechanisms and/or actuators will need 2 Mechanism specialists (Theses teams are *P/S Flap & Aileron*, *VTP & Rudder*, *HTP & Elevator* and *Avionics*). The Mechanism specialists will attend the specialist teaching on Mechanisms and Actuators and will then provide the expertise for mechanism design and actuator selection within the team (and or division/company).
Project Manager	Each team has a Project Manager. The PM leads planning and management activity at the team level. The PM liaises with the other PMs and the company Programme Director to ensure that the team, division and company are fully integrated. Project Management topics will be reviewed in *Core* teaching and so the PMs do not need to attend specialist teaching for this role. The PM is the key contact between the unit staff and the team.
Structural specialist	Every team needs at least 2 members who are Structural specialists. The Structural specialists will attend the structural teaching and will lead structural activity within the team. The structural workload differs across the teams although every team must

	analyse and report on the UAVs structural design and performance in the A1 FDR and A2 Team Technical Reports, so even teams with little structural design responsibility still require Structural specialists. Structural specialists also play key roles in the Graphite Goose and Ultimate Structural Load tests.
Quality Engineer	Each team should have at least 1 Quality Engineer. The Quality Engineer(s) is/are responsible for: leading the Project Risk Assessment; leading the production of the Requirements Management Document; and for Quality assurance and Testing of the manufactured product. Quality topics will be reviewed in *Core* teaching and so the Quality Engineers do not need to attend specialist teaching for this role.
Other roles	If you determine that there are additional roles that need to be defined within your team, please create them! Ownership and accountability are key characteristics of high performing teams. Having everyone be responsible for everything is not a good idea!

The table below gives a very approximate estimate of the total overall workload of that specialism in the team over the complete unit. The individual workload depends on how many members are assigned to that specialism within the team. Keep it in mind that workload can be quite 'peaky' for some roles, especially near the final assessments.

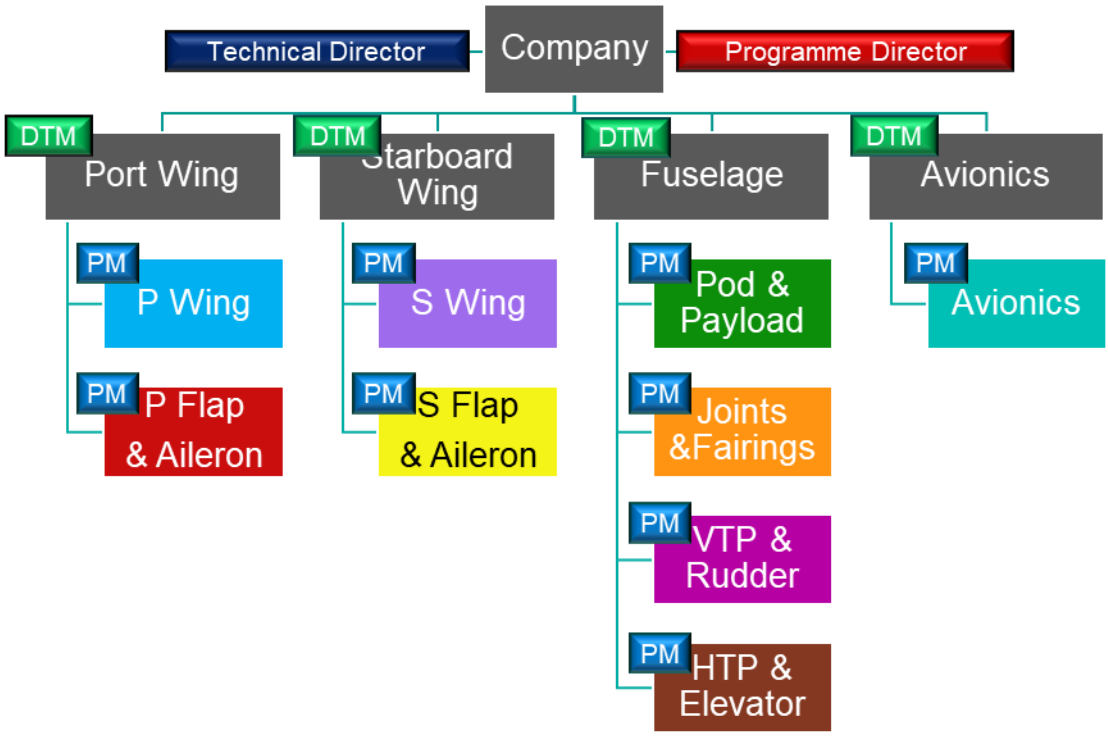
	Specialist work						
Very approximate estimate of the total workload in the team for the different specialist work	Aerodynamics	Avionics	Design	Mechanisms	Project Management	Structural	Quality
P Wing	High	-	High	-	High	High	Medium
P Flap & Aileron	Medium	-	High	Medium	High	Medium	Medium
S Wing	High	-	High	-	High	High	Medium
S Flap & Aileron	Medium	-	High	Medium	High	Medium	Medium
VTP & Rudder	High	-	High	Medium	High	Medium	Medium
HTP & Elevator	High	-	High	Medium	High	Medium	Medium
Pod & Payload	Low	-	High	-	High	High	Medium
Joints & Fairings	Medium	-	High	-	High	High	Medium
Avionics	Low	High	Medium	Low	High	Low	Medium

Divisional and Company level roles

If the divisional and company management is just left to grow purely organically or to be ad-hoc, then the company will likely underperform and will take a long time to self-organise. Therefore, the roles in the table below should be deployed in your company at the earliest opportunity. You can rotate the roles throughout the year if you want to (i.e. students might elect to take a role for one teaching block only).

Role	Description
Divisional Technical Manager	The *Divisional Technical Manager* is the technical lead for the division. The DTM ensures that the division is achieving the technical requirements and that the teams in the division are working together effectively to achieve a coherent technical solution. The DTM works with the other DTMs and the UAV *Technical Director* to realise the UAV level technical requirements.
Programme Director	The Programme Director coordinates the project management activity and project management systems across the company. The Programme Director works to ensure adherence to standard company operating procedures. The Programme Director is the key project management interface between the Company and the Unit Staff.
Technical Director	The Technical Director has technical oversite for the UAV project. The Technical Director ensures that the DTMs work together to deliver the UAV technical requirements. The Technical Director is the key technical interface between the Company and the Unit Staff. The Technical Director and Programme Director work together to ensure that the project and company are successful.

The division and company roles are a fantastic opportunity to develop leadership experience on a real project. Students taking these roles will be able to access additional support and coaching from the Unit Director, with the aim of helping them to develop their leadership approach and to resolve difficulties experienced in the company. This support might include group discussions (with other role holders) or 1:1 discussion with the UD.



COMPANY ORGANISATION CHART SHOWING THE KEY LEADERSHIP ROLES.

5 What to do if?

You will find it impossible to work effectively with a member / or members of the team you have been assigned to?

On this unit, team membership is assigned by unit staff and is not by student choice. This is for reasons of fairness and authenticity (to the business environment). If a student feels they cannot work with the team that they have been assigned to, and where there are strong reasons for that, the student should contact the Unit Director within the first week of the unit. Team membership changes are extremely difficult to sanction once the unit is underway.

You have any significant difficulties engaging with the unit?

There are many reasons why you might experience difficulties on a unit that is as complex and multidimensional as AVDASI2. Where you are struggling, talk to the Unit Director (or other academic staff) as early as possible. Leaving a concern or problem to later in the unit makes it harder to resolve and likely places you under further burden or stress.

Some students may find that the interpersonal demands of the unit (such as public speaking or working closely with colleagues under pressure) may place a burden on you that significantly reduces your performance. Talking to us early will make it more likely that we can find a solution that works for you, whilst still allowing you to robustly satisfy the unit's learning objectives.

You feel that you have observed (or experienced) unacceptable behaviour by other students (or staff) in the unit?

On AVDASI2 we expect high levels of professionalism, professional courtesy and respect (from students and ourselves).

If you feel that student or staff behaviour is unsatisfactory then please raise this with us at the earliest opportunity. We will take your concerns seriously, but we can't help if we don't know!

You have found out that you cannot attend one of your key formative or summative assessments?

Attendance at the *PDR* and *A1 FDR* is mandatory, however if you cannot attend please let us know as soon as possible. Please also let your team know, as the PDR and A1 FDR is important to them (but you may decide not to share your reasons).

End of document