[redacted] Assignment 1

Students are to provide a complete system design report for a typical engineering problem. The report will detail all the components of the system required for functionality, as well as encompass the control sequence and design. More details of the assignment can be found below.

This assignment is worth **20%** of the total course marks **(200 marks).** Please clarify and state any assumptions with the course examiner.

You are to submit your report in **one PDF file only**! With a **maximum** page limit of 10 single sided pages (including figures/diagrams, but excluding appendices). Reports must be logically organised and formatted. Lack of paragraphs, hard to read sentences, un-commented diagrams will be penalised. Try to use diagrams where possible to aid your explanations.

FLYING CAR CRASH SAFETY SYSTEM

Background

Flying cars are quickly becoming a promising method of transport. Several countries around with world are already looking at deploying flying car trials. FlyCrash Safety Systems Company is looking to develop the latest state of the art car crash safety system for their flying vehicles. They have employed you to provide a system design report on an innovative safety system that will make sure flying cars can be adopted in the mainstream. They know of a number of different safety systems, many of which operate independently in normal cars. They believe by synergising such components with other new innovative systems, a new overall safety system can be created for flying cars.

Figure 1. Safety System Domains [Ref. https://www.123rf.com/]

Task

You as a Mechatronics expert are to design a safety system to maximally reduce the incidence or severity of flying car crashes. Figure 1 shows just a fraction of possible systems that aid in safety of the driver in a normal car, however, many of the flying cars will not require a driver to control the vehicle but an autonomous software system. You are to design a safety system for flying cars to provide maximal protection to the driver and its surroundings. It is best to pick only 2-3 different systems and show how they may interact with each other.

Design Consideration Steps – some recommended steps to follow.

1. **Identify the main issues that may contribute to flying car crashes.**
2. **Identify the different safety systems that could reduce flying car crashes and/or provide safety redundancy.**
    a. **Identify components of the safety system and control systems.**
3. **Concept design a safety system and identify how systems could synergise. (Use Block Diagrams!).**
4. **Determine the control systems and interactions between those chosen safety systems. Make sure systems do not counteract each other, etc. (Draw detailed block diagrams, identify all feedback loops.)**
5. **Determine the control architecture and sequences (serial or parallel) your complete safety system will take. Again, keep this at a high level.**

What is needed

1. Report of system (10 single sided pages max, including diagrams) containing:
    a. Aim of report - scope, requirements, and limitations.
    b. Design choice and justification – from the design consideration steps.
    c. Block diagrams of main system components/sensors and interactions, as well as details of those components, inputs and outputs, etc. to determine communication and interfacing requirements. Keep this at a high level.
    d. Global and local control system identification/architecture, and feedback loops using feedback diagrams.
    e. Overall system control architecture design and sequence of operation (flowcharts).
    f. Improvement analysis – what and how it differs from current technology. What are the foreseeable problems in the design?

Marking Criteria.

ID	Criteria	Mark out of 10	Weigh	Accomplished (High Distinction)	Developing (Distinction)	Developing (Credit)	Benchmark (Pass)
REPORT	Report Structure and Grammar		10%	Well structured and logical, easy to understand.	The work is clearly structured. Some logical issues.	The structure of the work is evident, but some systems are not well explained.	The work presented can be followed, but has no clear structure and the construction of

							sentences and links between the different parts are lacking.
DESIGN JUSTIF.	Design Choices and Justification		20%	Design choices are well justified using sound knowledge and research.	Design choices are justified using sound knowledge and research.	Design choices are evident, but lack information to back up choices.	Design choices are basic. There is a lack of evidence behind choices, and lack of reasoning.
BLOCK & CONTROL	Block Diagrams and Control System		30%	Block diagrams show all systems interaction well, all inputs and outputs are identified correctly. Control and feedback loops are identified.	Block diagrams show all systems interaction well, Some issues with missing non-critical information.	Block diagrams show most systems interaction. Some key with missing information but overall system function can be determined.	Block diagrams show some systems interaction. Some missing information and/or diagrams that make it unclear how the system works.
OVERALL	Overall System Design		30%	The concept systems is well researched and feasible. No conflicting systems. Sequence of operations are well specified.	The concept systems is sound and feasible. Minor issues only.	The concept systems looks to be sound and some feasibility issues. Some systems were not well designed/explained.	The concept systems looks to be sound. Some systems were not well designed or linked well together.
IMPROV.	Improvement and Reflection		10%	Student has reflected well on their design identifying critical flaws and possible issues, as well as the	Student has reflected on their design identifying critical flaws and possible issues.	Student has reflected on their design identifying some possible	Student has reflected briefly on their design, however, some of the reflection is disconnected

				advantages of their design.		issues.	from design choices.
	Total Marks		**200**	**Total Marks = Sum of All (Criteria MarksOutof10 * Weighting %) / 5.**			