There is an aircraft carrier USS Nemesis with helicopters, fighters and reconnaissance aircraft. The crew consists of sailors, captains, deck-hands and people in upper management - Lieutenant, Executing Officer and Commander-In-Chief. There are two distinct types of fighters FN-15 and FN-A10. Both are the naval versions of their ground counterparts F-15 and A-10. However, the ship also has the provisions to land F-22, F-14 and F-16’s on its deck. The space on the deck is limited along with the space on the garage. It can store a total of 58 ‘points’ worth of aircraft based on their weight, height and wingspan ratio. Helicopters and Fighters of all kinds assume 3 ‘points’ worth of space (helicopters have higher because of non-bendable rotor blades). Recon crafts have 8 ‘points’ because of their weight. However due to weight restrictions, the Nemesis can only have up to 3 recon aircrafts at any given time on it.

Flight control crew consisting of the upper management and captains control the take-off and landings of the aircraft. No aircraft can do that without explicitly receiving a signal to do the required task from the flight control. At any given time the runway can be used only for 1 take off and landing. During landing however, there is a special requirement of not having any other aircraft on upper deck.

The aircrafts - both choppers and fighters can have multiple formations of payload of bombs, missiles and guns fitted according to their specifications and restrictions.

Design an object oriented software system for the above condition. Also, ensure persistence using storing and restoring mechanisms. List all your assumptions and explain them where necessary in order to attain success.
What we are looking for here in terms of solution is trying to catch the obvious mistake in terms of not concentrating on the hidden or implicit requirements. For example if the students miss out on the class for the Pilots, or fail to account for them in their assumptions, that’s a good point for loosing grades in terms of assumptions. List of assumptions is extremely important in the case of the flight control also as the crew is a large crew and one has to do a little bit of a research or assume that the ‘go’ from which member of the crew would actually constitute for the ok to take off or land.

Since the armed forces are strict on chain of command, it would be important for students to denote that in their solutions using UML. Not having the proper means of communications (i.e. deck-hand communicating with Commander-In-Chief) would be events for loosing points.

In terms of system disaster and recovery, the sequence of putting the data and pulling the data would be really important. Redundancy and mis-use of space on the database can be ignored for the purpose of the class. However, if the programmers have displayed atleast 2NF form, they are to get extra credit of 5%. However, the sequence of data writing would be of grave importance and would determine the grade for this part of the exam.

Since the goal of the exam is to test the analytical and implementation of design skills of the student, there’s no wrong or right answer (completely). The total of points would be based on the assumptions, implementation based on the assumptions and the system disaster and recovery efforts.