Flight Mechanics & Controls

At the Georgia Tech School of Aerospace Engineering, the Flight Mechanics and Control (FMC) group is addressing the most pressing challenges in the field, including the placement of unmanned aerial vehicles in domestic airspace, advanced airport automation, and aerial robots.

Flight mechanics and control deals with the body and brain of an aerospace system – whether that system is an aircraft, a spacecraft, an airport, or the air-traffic control system.

The "body" of a system consists of all the electrical and mechanical elements that define its dynamic tendencies – that is, its behaviors under the usual laws of physics. Flight mechanics is the science associated with understanding how aerospace bodies behave in the atmosphere and in outer space.

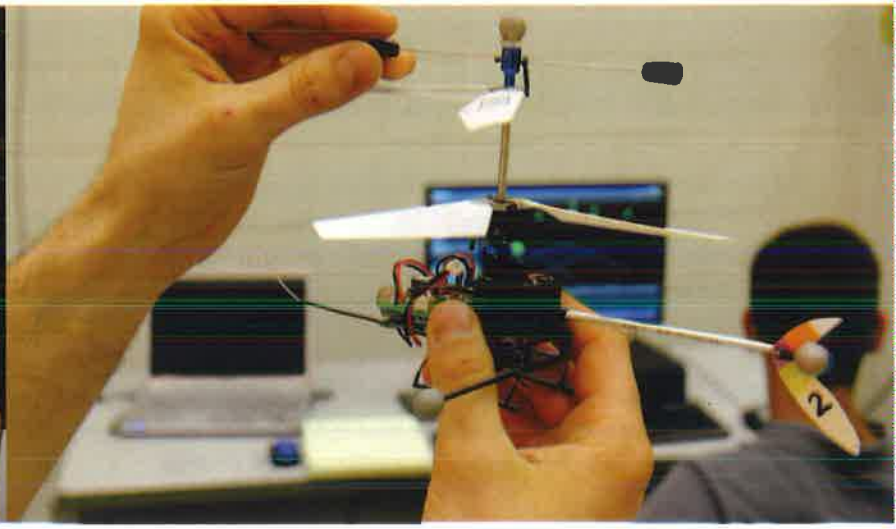
The "brain" of a system may consist of the actual human cognitive system, or computers, or a combination of both. The brain influences or "controls" the behavior of its body by receiving information about its state and desired behavior, and by synthesizing orders that are passed onto the body. A good design combines the proper understanding of the flight mechanics with effective design of decision procedures where computers and humans co-operate effectively.

Modeling and identification are the core disciplines that enable good understanding of system behavior. Common sense and mathematical techniques allow engineers and researchers to create sophisticated models of system behaviors.

Control and autonomy are the engineering disciplines that aim at designing real-time, computer- or human- based procedures that give a desired behavior to the system under study. Common examples include automotive cruise control systems, aircraft autopilots, and engine controls. In fact, almost all engineered systems today operate thanks to some kind of control system: hard disk drives, robotic surgery assistants, cars, trains and our electric supply system all rely on control algorithms. Advances in computing power have allowed engineers to extend basic functionalities to include the management of entire missions for unmanned helicopters and aircraft, space probes, or Mars rovers.

Modeling and control involve humans as well. Cognitive engineering is primarily concerned with understanding the behavior of humans in the context of tasks that require their presence. Several important aerospace systems cannot operate without humans: All passenger aircraft are flown by human pilots and guided to their destination without colliding with other aircraft by human air traffic controllers, sometimes assisted by computers.

Cognitive engineering recognizes that humans can be an important asset to aerospace systems, but requires domain-specific understanding to decide what and how information should be presented, and how computers and humans can harmoniously share important control and supervision responsibilities.



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