SEMINAR NOTICE

Department of Electrical and Systems Engineering

MODELING AERIAL REFUELING OPERATIONS

DISSERTATION DEFENSE
by

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Abstract: Aerial Refueling (AR) is the act of offloading fuel from one aircraft (the tanker) to another aircraft (the receiver) in mid flight. Meetings between tanker and receiver aircraft are referred to as AR events and are scheduled to: escort one or more receivers across a large body of water; refuel one or more receivers; or train receiver pilots, tanker pilots, and boom operators. In order to efficiently execute the Aerial Refueling Mission, the Air Mobility Command (AMC) of the United States Air Force (USAF) depends on computer models to help it make tanker basing decisions, plan tanker sorties, schedule aircraft, develop new organizational doctrines, and influence policy. We have worked on three projects that have helped AMC improve its modeling capabilities.

1. Since 1992, AMC has relied on a Tanker Basing/AR Demand Mismatch Index which aggregates tanker capacity and AR demand data into six regions. This index was criticized because there were large gradients along regional boundaries. Meanwhile tankers frequently cross regional boundaries to satisfy the demand for AR support. In response we developed a continuous function to score locations with respect to their proximity to demand as well as a continuous function to score locations with respect to both their demand for AR support ***and*** their isolation from existing tanker bases.
2. Currently Air Mobility simulation and optimization software packages depend on algorithms which iterate over three dimensional fuel flow tables to compute aircraft fuel consumption under changing flight conditions. When a high degree of fidelity is required, these algorithms use a large amount of memory and CPU time. We have modeled the rate of aircraft fuel consumption with respect to AC Gross Weight, Altitude and Airspeed. When implemented, this formula will decrease the amount of memory and CPU time needed to compute sortie fuel costs and cargo capacity values. We have also shown how this formula can be used in optimal control problems to find minimum costs flight plans.
3. We have worked on mathematical scheduling programs intended to help AMC evaluate the efficiency of current scheduling practices, verify basing decisions, and consider new scheduling policies.

DATE: Tuesday, April 27, 2010
TIME: 1:00 p.m.
PLACE: Bryan Hall, Room 305

Thesis advisor:
Dr. Ervin Rodin

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