Georgia Institute of Technology
Office of Sponsored Program
OSP Amendment - Deliverable Schedule
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Sponsor: DAYJET CORPORATION/DELRAY BEACH, FL
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Contract #: 3 **Contract thru:** GTRC
Project Director(s):
Unit: ISYE **Initiation Date:** 01-DEC-2004
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Project Title: (TASK 3) JSC AIR TAXI

Note: Deliverables sorted on 'Due Date to Sponsor' column

Rev No (1)	Description of Deliver-able	Deliv Id No (2)	Period	Covered	Due Date to Sponsor (3)	Copies reqd	Date Mailed^	Sat^
0	MONTHLY PROGRES S REPORT	1	01-DEC-20 04	28-FEB-200 5	28-FEB-200 5	1		Y
0	MONTHLY PROGRES S REPORT	2	01-MAR-20 05	31-MAR-20 05	31-MAR-20 05	1		Y
0	MONTHLY PROGRES S REPORT	3	01-APR-20 05	30-APR-20 05	30-APR-20 05	1		Y
0	MONTHLY PROGRES S REPORT	4	01-MAY-20 05	31-MAY-20 05	31-MAY-20 05	1		Y
0	MONTHLY PROGRES S REPORT	5	01-JUN-200 5	30-JUN-200 5	30-JUN-200 5	1		Y
0	MONTHLY PROGRES S REPORT	6	01-JUL-200 5	31-JUL-200 5	31-JUL-200 5	1		Y
0	MONTHLY PROGRES S REPORT	7	01-AUG-20 05	31-AUG-20 05	31-AUG-20 05	1		Y
0	MONTHLY PROGRES S REPORT	8	01-SEP-20 05	30-SEP-20 05	30-SEP-20 05	1		Y
0	MONTHLY PROGRES S REPORT	9	01-OCT-20 05	31-OCT-20 05	31-OCT-20 05	1		Y
*2	FINAL RE-PORT	10	01-NOV-20 05	30-NOV-20 06	30-NOV-20 06	1	15-DEC-2006	

Total Count:10
* Satisfied

PLEASE NOTE:

1.An asterisk denotes this deliverable was changed or added by the mod.
2.The Deliverable Id No will remain associated with its originally assigned deliverable for the duration of the project.
Modifications to the project will no longer cause this number to be sequentially renumbered.
3.Blanks in the 'Due Date to Sponsor' indicate 'as appropriate' or 'as required'.
4.Blanks in 'Date Mailed' indicate that neither delivery nor notification of delivery has been accomplished through OSP/CSD.

Prepare reports in accordance with: MONTHLY PROGRESS REPORTS REQUIRED PER SECTION 3 OF THE BOA

Please review the schedule for accuracy and contact the CO if changes are necessary.

E-24-62F
#10

Final Report - DayJet - Third Task Order

Period covered: 12/1/05-11/30/06

Our efforts during this period have focused primarily on the overnight reoptimization problem and therefore will be discussed first.

The core technology consists of an optimization model (integer multi-commodity flow with side constraints) capable of solving small instances to optimality (up to about 10 planes and about 100 LODs) and a local search procedure that iteratively solves (using the optimization model) small instances extracted from a solution to a large instance (obtained by the DayJet heuristic).

Work on the optimization model has focused on effective use of flexible time discretization and powerful aggregation techniques. The chosen discretization impacts the size of the resulting optimization model and therefore the time required to solve it. There is a trade-off between the solvability and quality/accuracy of the solution. A careful analysis of this trade-off has resulted in a time flexible discretization that allows for more efficient solution of the problem. The aggregation techniques strengthen the linear programming relaxation of the model and may result in the removal of side constraints, which both result in more efficient solution of the problem. This work has not only resulted in our ability to solve (slightly) larger instances, but may be more importantly solve small instances faster, which is important for the local search.

To be able to obtain high quality solutions to very large instances (more than 300 planes and more than 3000 LODs) the local search strategy had to be improved. Instead of randomly selecting a subset of planes to be solved by the optimization model, the subset of planes has to be selected more intelligently. Several classes of metrics have been developed based on geometric concepts as well as temporal concepts. The use of these metrics has improved performance by a few percent. The main characteristic impacting the problems that can be solved to optimality is the number of LODs. Therefore, a different scheme was developed that reoptimizes more planes than before, but limits the flexibility of the LODs, i.e., certain LODs are not allowed to be reassigned to a different plane. This seems to be a powerful technique that needs further refinements. Extensive computational studies have increased our understanding of the performance of the local search and will allow for more careful tuning.

A complete branch-and-price algorithm has been implemented. Furthermore, the implementation has been parallelized to improve its efficiency. The key development in this area has been the development of a three level branching scheme. The three levels focus on departure times, jet classes, and request sequences. In addition, a Lagrangean bound has been incorporated to handle tailing off effects in the column generation. The code is stable and is now ready to be optimized for performance.

Finally, we have experimented with relaxation techniques to see if optimization can be used effectively to assist in accept/reject decisions. We have focused on developing technology to quickly establish infeasibility of a request. Even though this methodology is reasonably effective, it is not (yet) efficient enough to be used in a real-life environment. More research would be needed.

Computational experiments on large instances provided by DayJet 312 planes) have demonstrated the value of the technologies developed. The combined local search/optimization technology was able to reduce flying time of the DayJet solution by about 9 percent.