### Title and Subtitle
Artificial Intelligence Methodologies in Air Transportation Network Routing and Scheduling

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### Abstract
The reason for submitting a single final report for two projects is that the graduate and undergraduate students who were supported by the second of these projects, actually worked on the subject matter of the first one. This project has been an ongoing one, in collaboration with the personnel from HQ/AMC/XPY at Scott AFB. The various joint projects undertaken are presented and discussed at frequent periodic meetings between the personnel of HQ/AMC/XPY and members of the Center for Optimization and Semantic Control at Washington University.
FINAL PROJECT REPORT

Submitted to
Air Force Office of Scientific Research
Building 410, Bolling AFB, DC 20332

By

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In connection with
Grant AFOSR F49620-96-1-0151

ARTIFICIAL INTELLIGENCE METHODOLOGIES IN AIR TRANSPORTATION NETWORK ROUTING AND SCHEDULING

AND

Grant AFOSR F49620-96-1-0218

GRADUATE AND UNDERGRADUATE STUDIES IN OPTIMIZING AIR TRANSPORT SCHEDULING AND ROUTING

April 14, 2000
1. INTRODUCTION

This is a joint Final Report on the two projects:

ARTIFICIAL INTELLIGENCE METHODOLOGIES IN AIR TRANSPORTATION NETWORK ROUTING AND SCHEDULING,

And on

GRADUATE AND UNDERGRADUATE STUDIES IN OPTIMIZING AIR TRANSPORT SCHEDULING AND ROUTING

The reason for submitting a single final report for two projects is that the graduate and undergraduate students who were supported by the second of these projects, actually worked on the subject matter of the first one.

2. OBJECTIVES.

To support faculty, as well as graduate and undergraduate students, to develop improved methodologies for the scheduling and routing of military transport aircraft; and to do so in collaboration with personnel from Flight XPY at the USAF Air Mobility Command, Scott AFB, IL.

3. STATUS OF EFFORT.

This project has been an ongoing one, in collaboration with the personnel from HQ/AMC/XPY at Scott AFB. The various joint projects undertaken are presented and discussed at frequent periodic meeting between the personnel of HQ/AMC/XPY and members of the Center for Optimization and Semantic Control at Washington University. Reports of these discussions are regularly provided to AFOSR. To illustrate the type of work and results achieved, we are attaching to this report the copies of 2 projects, consisting of both their presentation and of their paper versions:

1. Simulation of Military Airfields
2. Implementation of NRMO to Study the Airlift Problem at AMC

3. ACCOMPLISHMENTS/NEW FINDINGS

Our principal accomplishments are embodied in doctoral dissertations and in published papers. Copies of all of these items are sent to the AFOSR as soon as they become available. In particular, we presented in this fashion three doctoral dissertations:
2. Rink, K. A.: Adaptation of Shortest Path Algorithms to Mobility Problems

4. PERSONNEL ASSOCIATED WITH THIS RESEARCH (during various periods)

Faculty:
Professors
Ervin Y. Rodin (PI)
S. Massoud Amin
Vaidyanathan Sundarapandian

Students:
Travis Cusick
Greg Grindey
Eugene Day
Sanghyun Kim
Zoran Nenadic
Andrea Serrani
Brandy Ruthsatz

Kathy Rink
Brian Russina
Yenming Chen
Ilker Tunay
Xinqiang Qi
Christine Stewart
Christiana Russ

Note: While each of the students above participated and contributed to the tasks of these grants, not all of them were supported. Several of them have been working on these projects as purely academic tasks.

5. PUBLICATIONS
Note: For all of the publications listed below:
Principal Author is the P.I., Ervin Y. Rodin

- "Routing Airlift Aircraft By The Double Sweep Algorithm", (with Rink et. al.), Mathematical and Computer Modelling 30, pages 133-147, 1999


• "Survey of Facial Results for the Traveling Salesman Polytope" (with K. Ruland), Mathematical and Computer Modelling Volume 27, Issue 8, pages 11-27, 1998

• "Application of Dynamic Neural Networks to Approximation and Control of Nonlinear Systems," (with Amin et al), Proc. of 1997 Automatic Control Conference, pp. 222-226, Albuquerque, NM, June 4-6, 1997


• Operations Research in Intelligent Transportation Systems - A Semantic Control Approach” (with Garcia et al.) accepted for publication in the International Transactions on OR Journal, to appear in 2000

6. INTERACTIONS/TRANSITIONS

Joint development with HQ/AMC at Scott AFB.