BUREAU OF BUSINESS AND ECONOMIC RESEARCH
SCHOOL OF BUSINESS AND ECONOMICS
UNIVERSITY OF MINNESOTA-DULUTH

WORKING PAPER NO. 87-10

PRELIMINARY ANALYSIS OF THE IMPACT OF AN AIRCRAFT MANUFACTURING FACILITY ON THE ECONOMY OF NORTHEAST MINNESOTA

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INTRODUCTION

This document summarizes the results from a preliminary simulation exercise utilizing IPASS, a user interactive large-scale simulation model developed for northeast Minnesota by Richard Lichty, Wilbur Maki, and others [2]. IPASS is a recursive model that links together nine potential modules. Table 1 lists these modules.

TABLE 1

THE ELEVEN BASIC MODULES OF IPASS

1. The Market Module
2. The Investment Module
3. The Demand Module
4. The Production Module
5. The Income Module
6. The Employment Module
7. The Labor Force Module
8. The Population Module
9. The Household Module
10. The Recreation Module
11. The Water Module

THE MARKET MODULE relates local IPASS information to the rest of the nation and includes such ratios as the proportion of national output accounted for by the reference region's industries.

THE INVESTMENT MODULE shows the capital to output requirements for each industry as well as the proportion of local supplying industries that help meet these requirements.

THE PRODUCTION MODULE is made up of the demand multipliers of an inverse matrix relating to the economic structure of the regional economy being analyzed.

THE DEMAND MODULE links final demand by government and by households to the production module.

THE INCOME MODULE relates the components of regional value added to the production module. Income elasticities of demand are related to appropriate components of value added to obtain the consumption element of the demand module.

THE EMPLOYMENT MODULE contains employment to output ratios. The regional employment requirements of simulated changes in output can be determined from this module. This module also states requirements in terms of occupation, earnings per worker, etc. The Employment Module relates the Production Model to the Labor Force model.

THE POPULATION MODULE contains data on births, deaths, and estimated migration levels. Migration is linked to the rest of IPASS through employment and labor force comparisons and through computations of unemployment rates. Unemployment in the region triggers out-migration; excess employment demanded (relative to supply) triggers in-migration.

THE HOUSEHOLD MODULE combines the employment, labor force, and population information into household categories. The housing stock and future housing requirements can be determined from this module.

THE RECREATION MODULE is currently being developed under funding from the Minnesota Sea Grant program. This module breaks out the recreation component of final demand for separate analysis.

THE WATER MODULE is currently being developed under funding from the Minnesota Legislative Commission on Minnesota's Resources and will relate water demand and supply to state and regional economic activity.

The outputs of one module serve as inputs for the others. All of the impact accounting, however, is in a pattern in which inputs and outputs are determined simultaneously. The recursive-modular approach forces consistency in forecasting; that is, the outputs of all modules must be consistent with projected levels of final demand.

There are over 100 variables and parameters in the IPASS system. The parameter values may be altered by the user to ask, "What happens if..." types of questions. The difference between a baseline run where all parameter values are held constant and a modified run where appropriate parameter changes are made represents the estimated impact levels from those specified changes.

PROCEDURE FOR THIS ANALYSIS

As mentioned earlier, this represents a preliminary analysis of the impacts from the introduction of an aircraft production facility in the region. This analysis simply increased the regional market share (the share of the rest of the United States's production accounted for by exports from northeast Minnesota) for sector 49, Other Transportation Manufacturing. The run modified by this market share increase was compared with a baseline run to establish the impacts.

This analysis is called preliminary for the following reasons: (1) No account was taken of the construction of the aircraft producing facility, (2) no account was taken of the anticipated changes in labor productivity due to increases in skills in the labor force as production actually takes place, (3) no account was taken of the "phase in" nature of the production (fewer planes produced in earlier years with increases in production over future years), (4) no account was taken in the baseline for changes in the regional economy that are known to be occurring (such as the Lake Superior Paper facility currently being constructed), and 5) no account was taken for additional employment in this industry that might result from agreements with engine producing companies.

The year 1990 was chosen to absorb all of the impacts. Not that all production will be on line in that year or that this would be the only year of impact. A one-time impact statement was desired, preliminary reports show that a facility could be on line by that time, and so the year was chosen.

Impacts are reported in 1977 and 1986 dollars (when dollar figures are appropriate). All impacts are stated in terms of changes in three categories due to the aircraft production assumed to be taking place: (1) Gross Output (total intermediate and final goods production from each firm), (2) Value Added (the sum of employee earnings, rents, interest, and profits), and (3) employment.

Making such a simulation run using IPASS is somewhat different than simply applying multipliers to new exogeneous activity. Since the modules interact in a number of ways in addition to their interaction with the Production Module, the results are more complicated than simple multiplier application would indicate. This should be understood when attempting to interpret the results of the simulation.

THE RESULTS

Table 2 summarizes the results from the simulation exercise.

TABLE 2

FULL OPERATION BEGINNING IN THE YEAR 1990

Area of Impact	Change in Output (000's)	Change in Value Added (000's)	Change in Employment (#)
Transportation Manufacturing	$157,477 (1977 dollars)	$50,900 (1977 dollars)	1,073
	$230,000 (1986 dollars)	$74,314 (1986 dollars)	###
Regional Economy	$395,267 (1977 dollars)	$170,163 (1977 dollars)	2,360
	$577,090 (1986 dollars)	$248,438 (1986 dollars)	###

As can be seen from Table 2, the impacts are substantial, even when no account is taken of plant construction, growth possibilities, increases in labor

productivity, etc. The total impact from such a plant amounts to one-half billion dollars. The total impact on employment (including the 1,000 or so employees in the plant itself) is in excess of 2,000 individuals.

The value added impact is also substantial. Since portions of this impact result in consumer spending in the region, this significant result should present itself in increases in output and employment and income in sectors catering to local income; i.e., retail trade, services such as medical, business, legal, etc. While not shown in Table 2, these are indeed the sectors realizing the greatest gains.

The remainder of the impacts can be noted from viewing Table 2 and will not be repeated here.

CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH

Much was left out of this analysis. However, the model is capable of being adjusted to analyze impacts from the construction phase of the plant, changes in worker productivity, the possibility of new phases for the plant's operations (new products, for example), etc. The baseline data also needs to be updated to reflect other changes taking place in the region, such as the new paper facility, so that a total picture of the growing strength of the regional economy can be analyzed.

Finally, it would be possible to construct input-output tables for the City of Duluth so that more localized impacts could be analyzed. These types of analyses are recommended for a more complete picture of what new facilities of this type might mean to our regional outlook.

REFERENCES

[1] Lichty, Richard W., Barbara Flannery, and Peter Stenberg, "SIMLAB User's Guide," UMD Bureau of Business and Economic Research Paper 82-11, July 1982.

[2] Olson, Doug, Con Schallau, and Wilbur Maki, "IPASS: An Interactive Policy Analysis Simulation System," United States Department of Agriculture, Pacific and Northwest Forest and Range Experiment Station, General Technical Report PNW-170, July 1984.

(RL#5:T3)