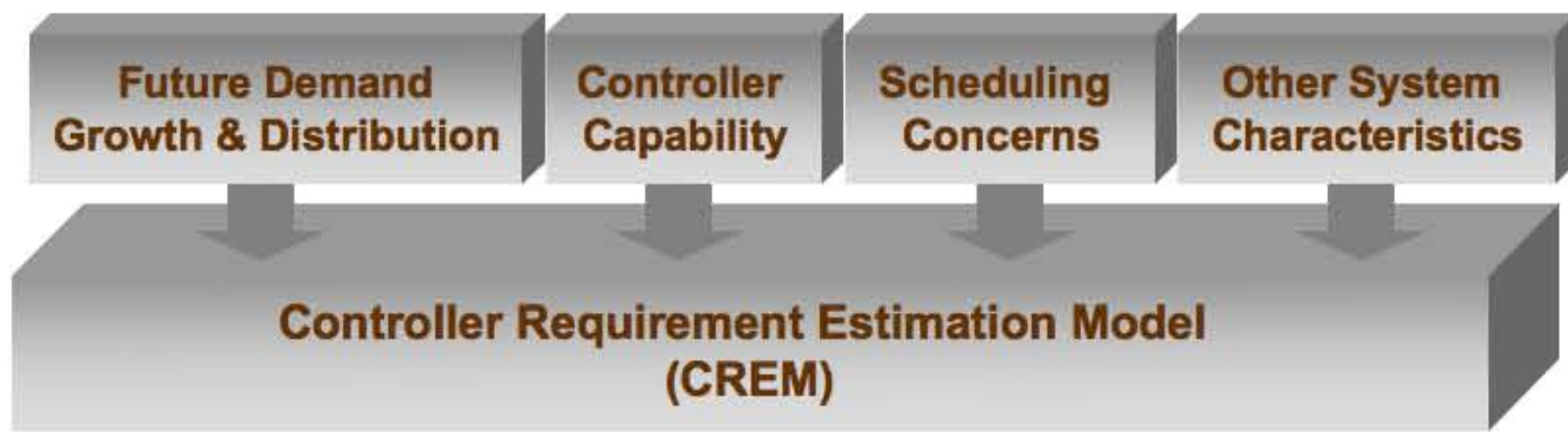


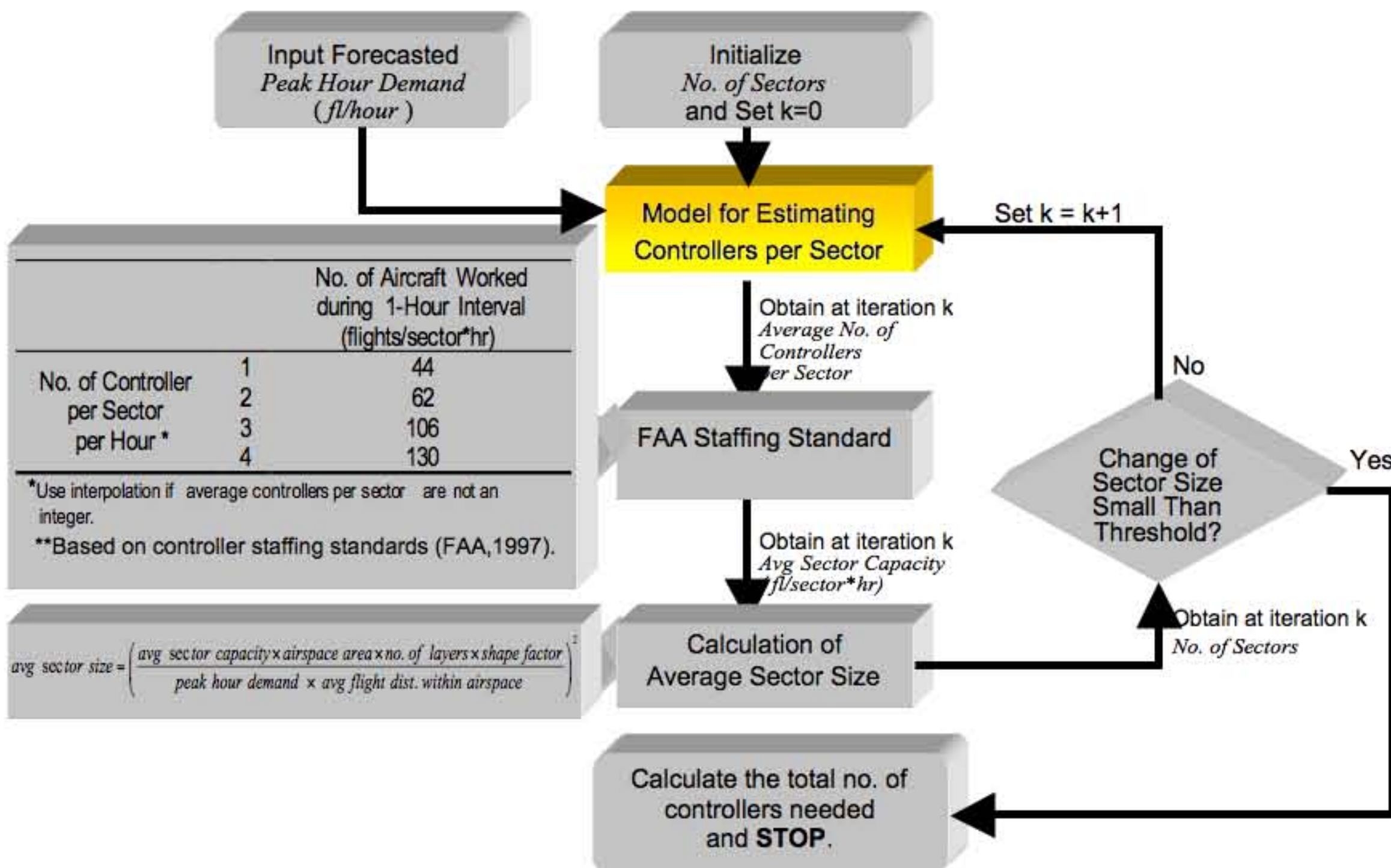
The Needs for Knowing Controller Requirements

- ❑ The average compensation package of an air traffic controller in 2005 exceeded \$166,000.
- ❑ Controller labor cost increased from \$82.98 per flight in FY1998 to \$137.81 per flight in FY2006.
- ❑ In response to future attrition of controllers and rising demand for air travel, more than 15,000 controllers will be hired and trained over the next decade.

Model Characteristics



CREM Framework

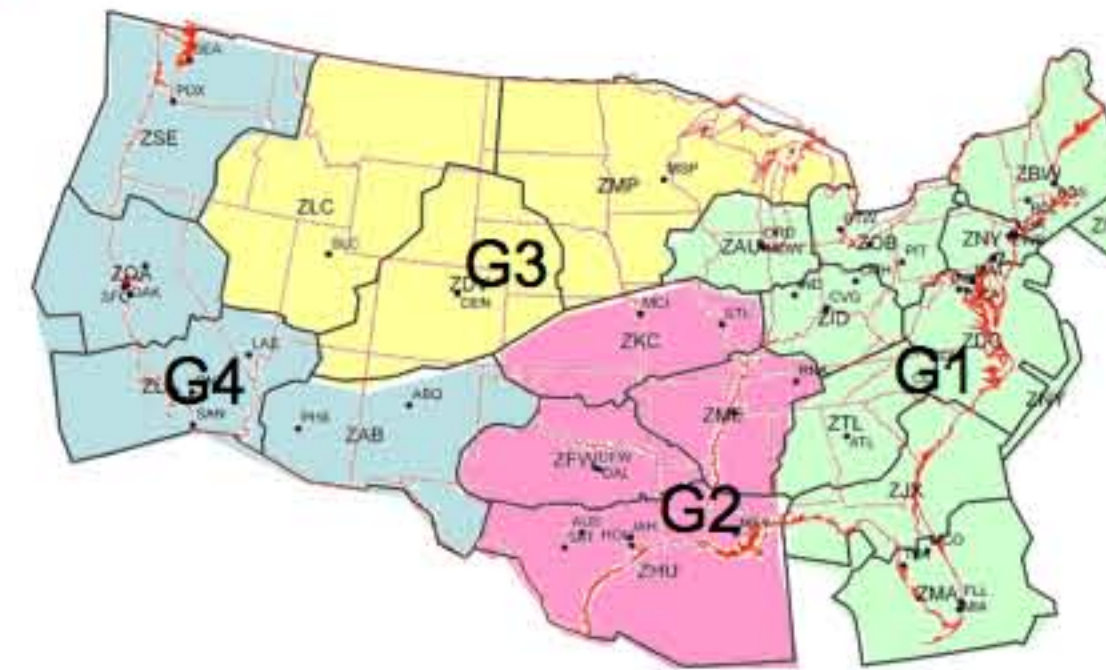


Motivations of Using Ordinal Regression

- ❑ Ordinal regression model may be suitable for predicting the probabilities of using 0, 1, 2 and 3+ controllers, given the sector traffic and other characteristics.

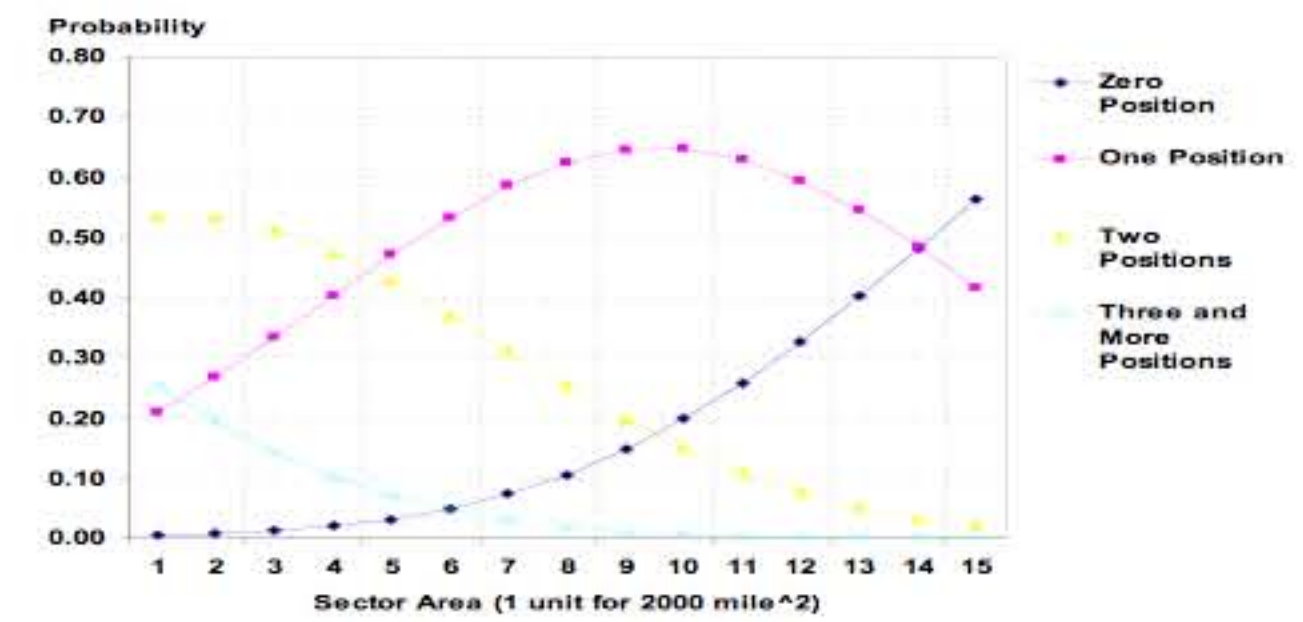
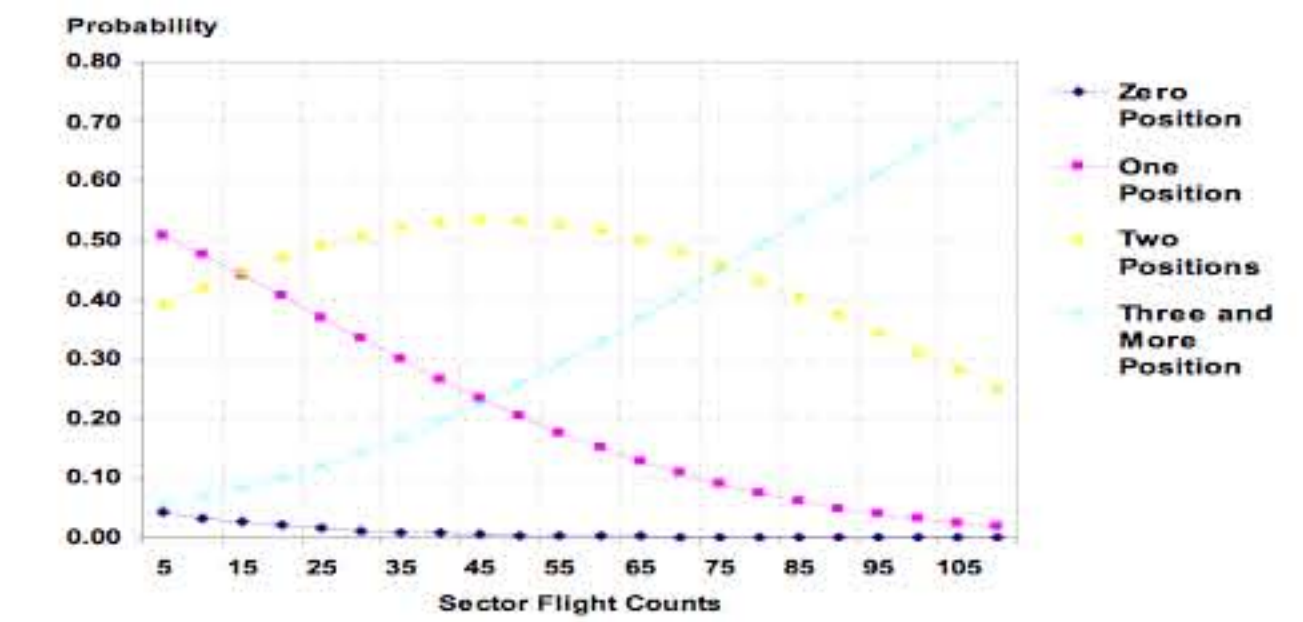
Application of Ordinal Regression

- ❑ 20 enroute centers in CONUS are grouped into four partitions, based on operational similarities.



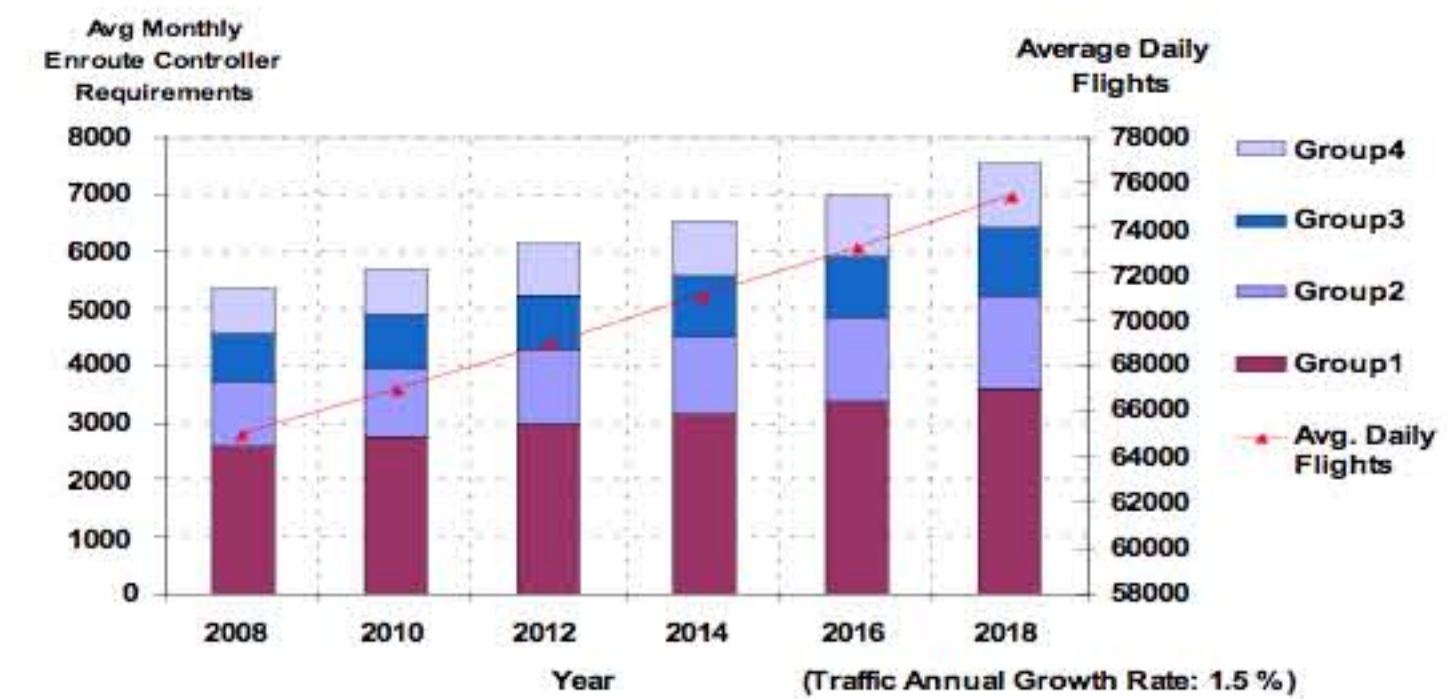
- ❑ Selected explanatory variables are:
 - ❖ **Flight Counts**: max number of flights in a 15-min period
 - ❖ **Sector Area**: in units of 2,000 mile²
 - ❖ **Sector Ceiling Altitude**: in units of 10,000 ft.
 - ❖ **Area*Altitude**: interaction term to better describe the relation between sector area and altitude.

Illustrations of Estimation Results



Forecasting Demand of Controllers

Parameter s	Group 1 (i=1)	Group 2 (i=2)	Group 3 (i=3)	Group 4 (i=4)
Avg. Daily IFR Flights	65,000	Avg. Daily IFR Flights at Y2008 with Annual Growth Rate of 1.5%		
Peak Hour Flights (i)	Avg. Hourly Flights * % Passing thru Group (i) * Peak Hour Factor (i)			
% Passing thru Group (i)	55%	30%	25%	30%
Peak Hour Factor (i)	1.3	1.3	1.3	1.3
Avg. Flight Distance (i)	390 miles	350 miles	440 miles	340 miles
Airspace Area (i)	1,259,121 mile ²	845,564 mile ²	1,070,122 mile ²	899,010 mile ²
Avg. No. of Layers (i)	1.6	1.6	1.6	1.6
Shape Factor	0.7	0.7	0.7	0.7
Shift Factor	2.5	2.5	2.5	2.5
Annual Staffing Factor	1.7626	1.7626	1.7626	1.7626



* Desired Staffing Range in FAA 2007 Workforce Plan is between 4,781 and 5,840.
** Actual On-Board Staffing as of 09/30/06 is 6,493.