Overview of the Airline Planning Process

Dr. Peter Belobaba
Presented by Alex Heiter

Istanbul Technical University
Air Transportation Management
M.Sc. Program

Network, Fleet and Schedule
Strategic Planning
Module 6: 29 March 2016

Lecture Outline

- **Basic Airline Profit Model**
  - Fundamental Strategies to Improve Profitability
- **Airline Planning Decisions**
  - Fleet Planning
  - Route Evaluation
  - Schedule Development
  - Pricing and Revenue Management
  - Operations Control
- **Airline Organizational Structure**

Basic Airline Profit Model

Operating Profit = Revenues - Operating Expense

Operating Profit = RPK x Yield - ASK x Unit Cost

- **Use of individual terms in this profit equation to measure airline success can be misleading:**
  - High Yield is not desirable if ALF is too low; in general, Yield is a poor indicator of airline profitability
  - Low Unit Cost is of little value if Revenues are weak
  - Even ALF on its own tells us little about profitability, as high ALF could be the result of extremely low fares (yields)
- **Profit maximizing strategy is to increase revenues, decrease costs, but the above terms are interrelated.**

Strategies to Increase Revenues

- **Increase Traffic Carried (RPKs):**
  - Reduce fares (average yields) to stimulate traffic, but revenue impact depends on demand elasticity
  - For revenues to increase, price cut must generate disproportionate increase in total demand (i.e., “elastic demand”)
  - Alternatively, frequency or service quality can be increased to attract passengers, but both actions also increase operating costs
- **Increase Fares (Yields):**
  - Economic theory tells us any price increase will lead to an inevitable traffic decrease, but a price increase can still be revenue positive if demand is “inelastic” (i.e., percent decrease in passengers is lower than percent increase in price).

Strategies to Reduce Costs

- **Reduce Unit Costs (Cost per ASK):**
  - Reduce service quality, but too many cuts can affect consumers' view of the airline's product, leading to a reduced RPKs and market share
  - Increase ASKs by flying more flights and larger airplanes, which can lower unit costs but lead to higher <u>total</u> operating costs and lower load factors
- **Reduce Airline Output (Decrease ASKs):**
  - Cutting back on number of flights will reduce total operating costs, but lower frequencies lead to market share losses (lower RPKs)
  - Reduced frequencies and/or use of smaller aircraft can result in higher unit costs, as fixed costs are spread over fewer ASKs.

Airline Planning Decisions

1. FLEET PLANNING**: What aircraft to acquire/retire, when and how many?**

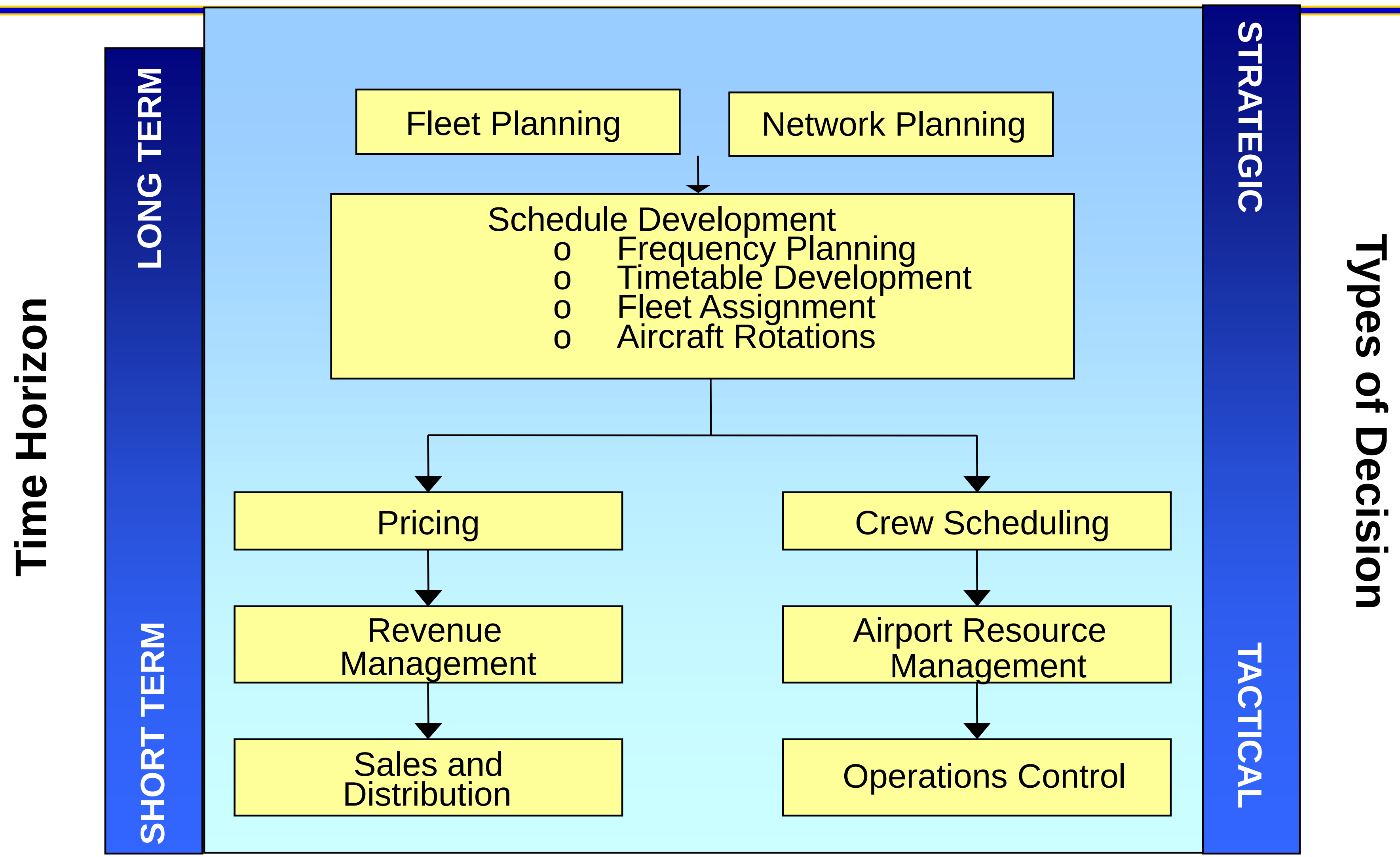
2. ROUTE EVALUATION**: What route structure to operate and city-pairs to be served?**

3. SCHEDULE DEVELOPMENT**: How often, at what times and with which aircraft on each route?**

4. PRICING**: What products, fares and restrictions for each O-D market?**

5. REVENUE MANAGEMENT**: How many bookings to accept, by type of fare, to maximize revenue over the network?**

6. OPERATIONS CONTROL: **Implementing planned schedule of operations, given airport and air traffic control constraints.**

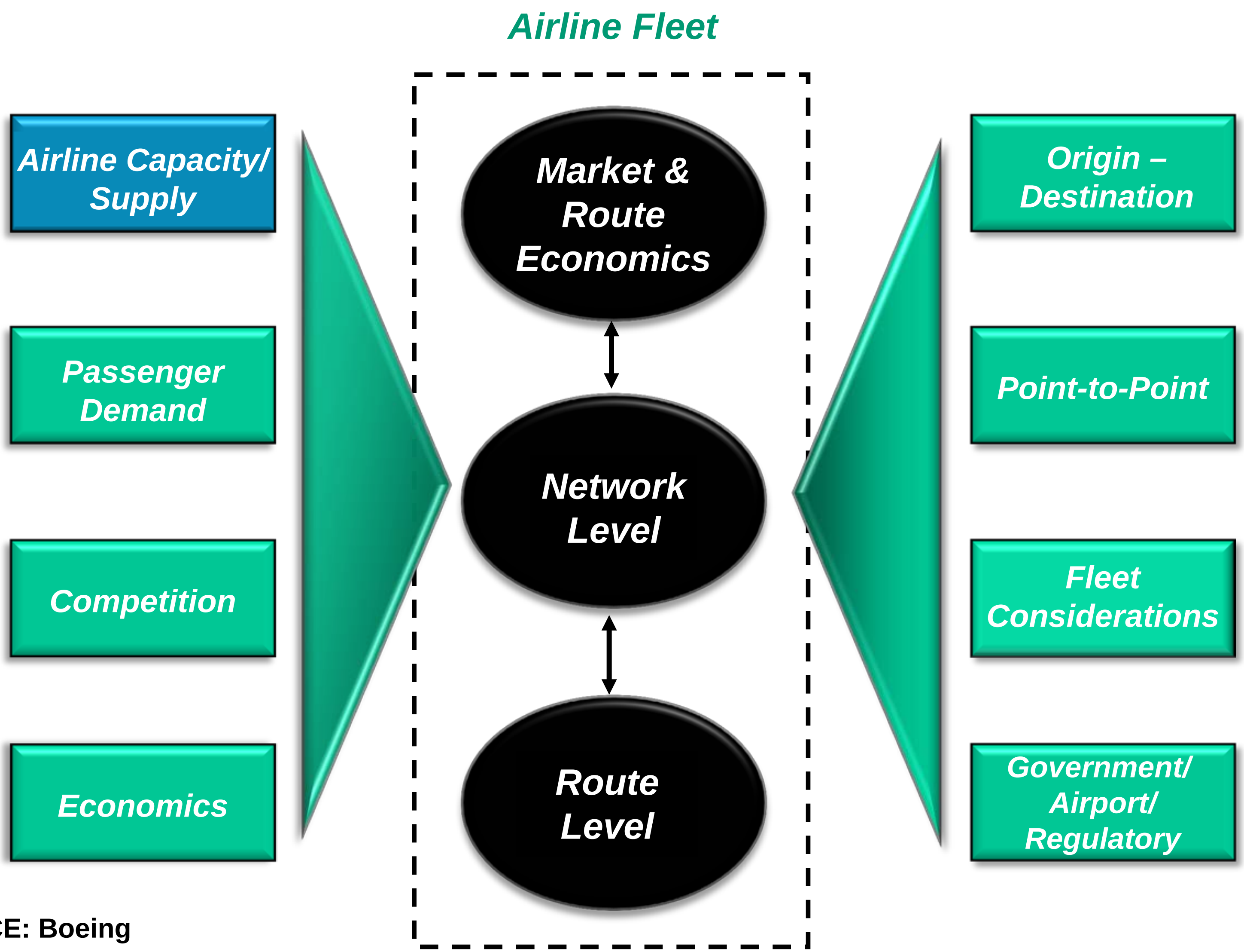


SOURCE: Prof. C. Barnhart, MIT

1. FLEET PLANNING

- **Fleet composition is long-term strategic decision and largest capital investment for an airline**
  - Affects financial position, operating costs, and especially the ability to serve specific routes.
- **Economics of fleet choice**
  - Lower operating costs vs. higher ownership costs of new aircraft
  - Lower trip costs of smaller aircraft vs. lower unit costs (CASK) and greater revenue generation of larger aircraft
- **Fleet evaluations depend on aggregate analysis**
  - Detailed network profitability models seldom used given tremendous uncertainty of future demand, costs, competition
  - "Top-down" economic and financial impacts evaluated with spreadsheets, NPV analysis and scenario-building

Network & Fleet Planning Decisions Include a Wide Range of Factors

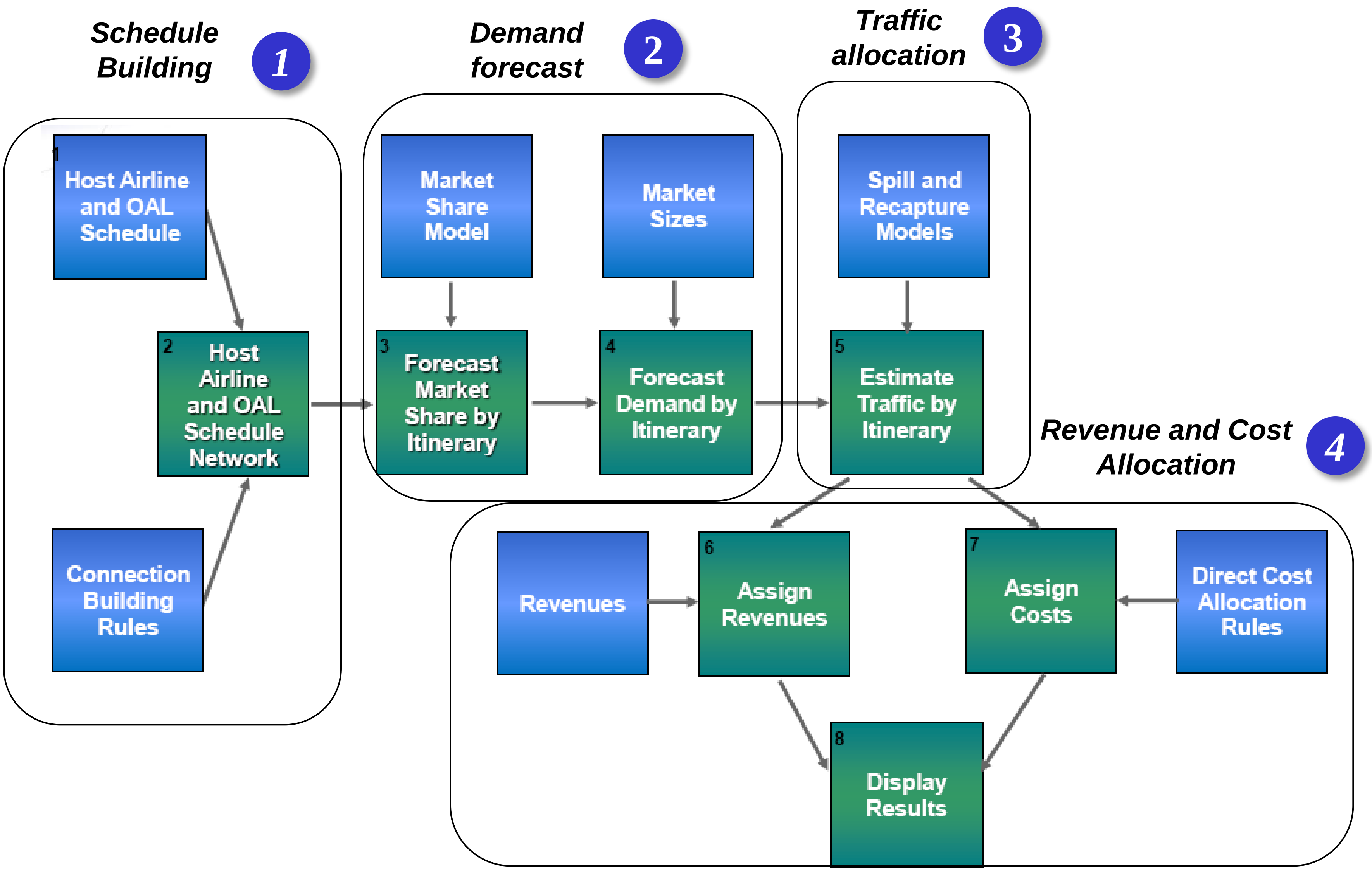


SOURCE: Boeing

2. ROUTE EVALUATION

- **Given a fleet, determination of routes to be flown**
  - Network structure (hub/spoke, point-to-point or hybrid)
- **Evaluation approach at a disaggregate (route) level:**
  - Demand, market share and revenue forecasts required for specific route, perhaps for multiple years into the future
  - Aircraft performance and operating cost characteristics
- **Route planning decision factors**
  - Availability of aircraft with adequate range and capacity – link to fleet plan and overall network strategy
  - Operational constraints and aircraft/crew rotation issues
  - Regulations, bilaterals, and limited airport slots
  - Opportunity cost of using aircraft on this route
  - Degree of competition and expected competitive response

Example: Airline "Profit Manager"



3. SCHEDULE DEVELOPMENT

- **Involves several interrelated decisions, which to date have not been fully integrated:**

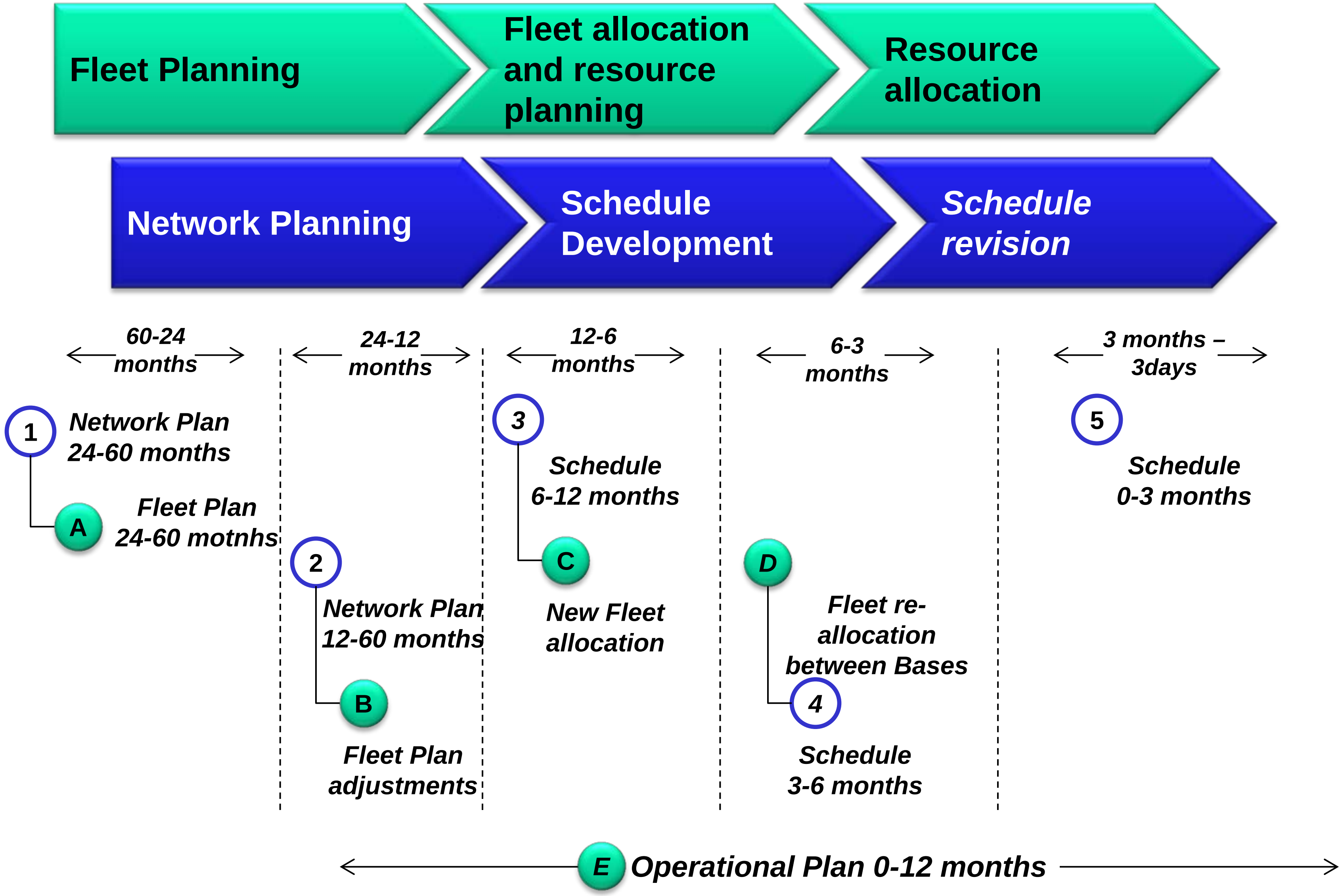
  Frequency Planning: Number of departures to be offered on each route, non-stop versus multi-stop

  Timetable Development: Flight departure and arrival times, including connections at airline hubs

  Fleet Assignment: Aircraft type for each flight, based on demand and operating cost estimates

  Aircraft Rotation Planning: Links consecutive flights to ensure balanced aircraft flows on the network.

Integrated Scheduling Planning Process: Key Decisions



4. PRICING DECISIONS

- **“Differential pricing” by airlines is universal:**
  - Different “fare products” within the coach cabin, with different restrictions, at different prices
  - Virtually every airline in the world offers multiple price points (even low-fare carriers with “simplified” fare structures)
- **“Pricing Decision Support Systems”**
  - Difficult to estimate price elasticity, willingness to pay, potential for stimulation and diversion
  - No practical tools for airlines to determine “optimal” prices
  - Primarily monitoring of competitive price changes
- **Dominant practice is still to *match* low fares to fill planes and retain market share**
  - Need to match exacerbated by web sites and search engines

BOS-IST Economy Class Fare Structure
Turkish Airlines, April 2015

Class	One Way Fare	Advance Purchase	Minimum Stay	Change Fee	Refunds	RT Required
Y	$1072	None	None	None	Yes	No
B	$934	None	None	None	Yes	No
M	$725	0/3 (TKT)	Sat Night	$135	No	Yes
H	$612	0/3 (TKT)	Sat Night	$135	No	Yes
S	$512	0/3 (TKT)	Sat Night	$135	No	Yes
E	$425	0/3 (TKT)	Sat Night	$135	No	Yes
Q	$350	0/3 (TKT)	Sat Night	$135	No	Yes
L	$238	0/3 (TKT)	Sat Night	$135	No	Yes

5. REVENUE MANAGEMENT

- **Seat inventory control to maximize revenues**
  - Given a scheduled flight, capacity and prices, how many bookings to accept by fare type
  - Objective is to maximize revenue -- fill each seat with highest possible revenue
- **Computerized RM systems based on demand forecasting and revenue optimization:**
  - Leg-based RM systems increase revenues by 4-6%
  - Network RM systems more sophisticated, add another 1-2%
- **Recent industry developments affect RM systems**
  - Fare simplification and “fare family” bundling require new approaches to forecasting and optimization
  - Alliance code-share traffic complicates both RM and distribution

RM Strategy Affects Yield, Load Factor Average Fare and Revenues

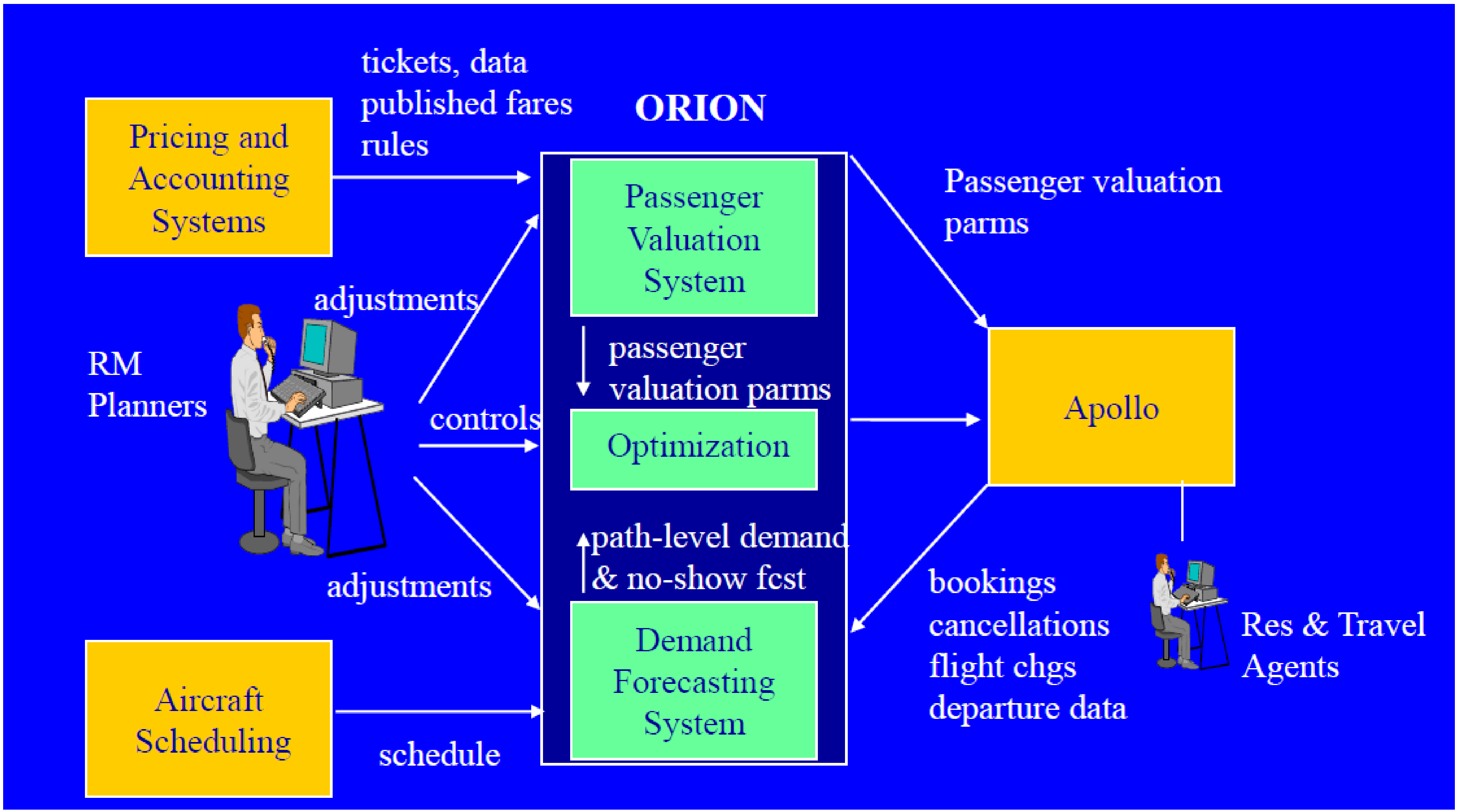
EXAMPLE: 3,380km FLIGHT LEG **CAPACITY = 200**

NUMBER OF SEATS SOLD:

FARE CLASS	AVERAGE REVENUE	YIELD EMPHASIS	LOAD FACTOR EMPHASIS	REVENUE EMPHASIS
Y	$420	20	10	17
B	$360	23	13	23
H	$230	22	14	19
V	$180	30	55	37
Q	$120	15	68	40

	YIELD EMPHASIS	LOAD FACTOR EMPHASIS	REVENUE EMPHASIS
TOTAL PASSENGERS	110	160	136
LOAD FACTOR	55%	**80%**	68%
TOTAL REVENUE	$28,940	$30,160	**$31,250**
AVERAGE FARE	$263	$189	$230
YIELD (CENTS/RPK)	**7.78**	5.59	6.80

Example: Network RM System Components

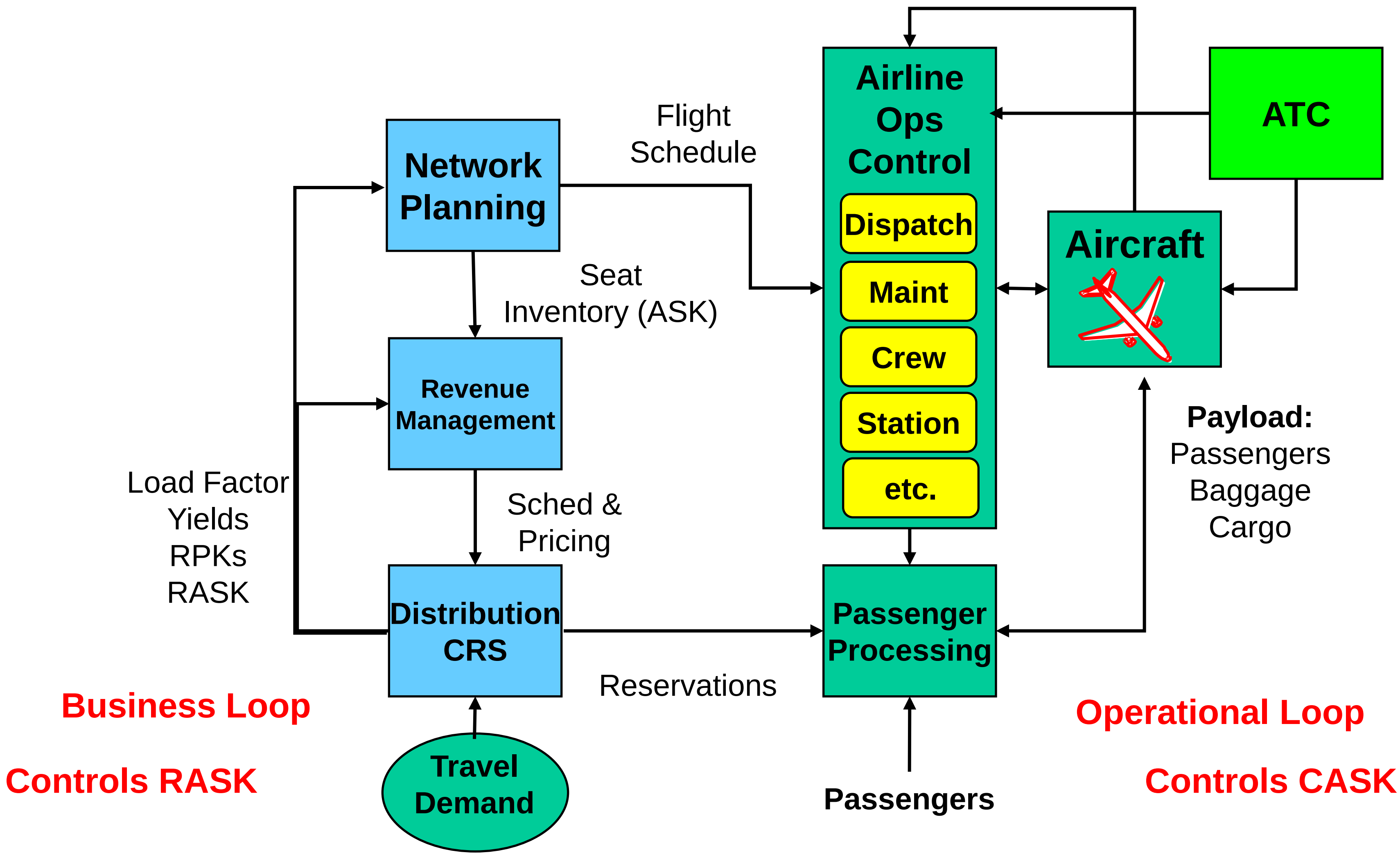


Source: United Airlines (1999)

6. OPERATIONS CONTROL

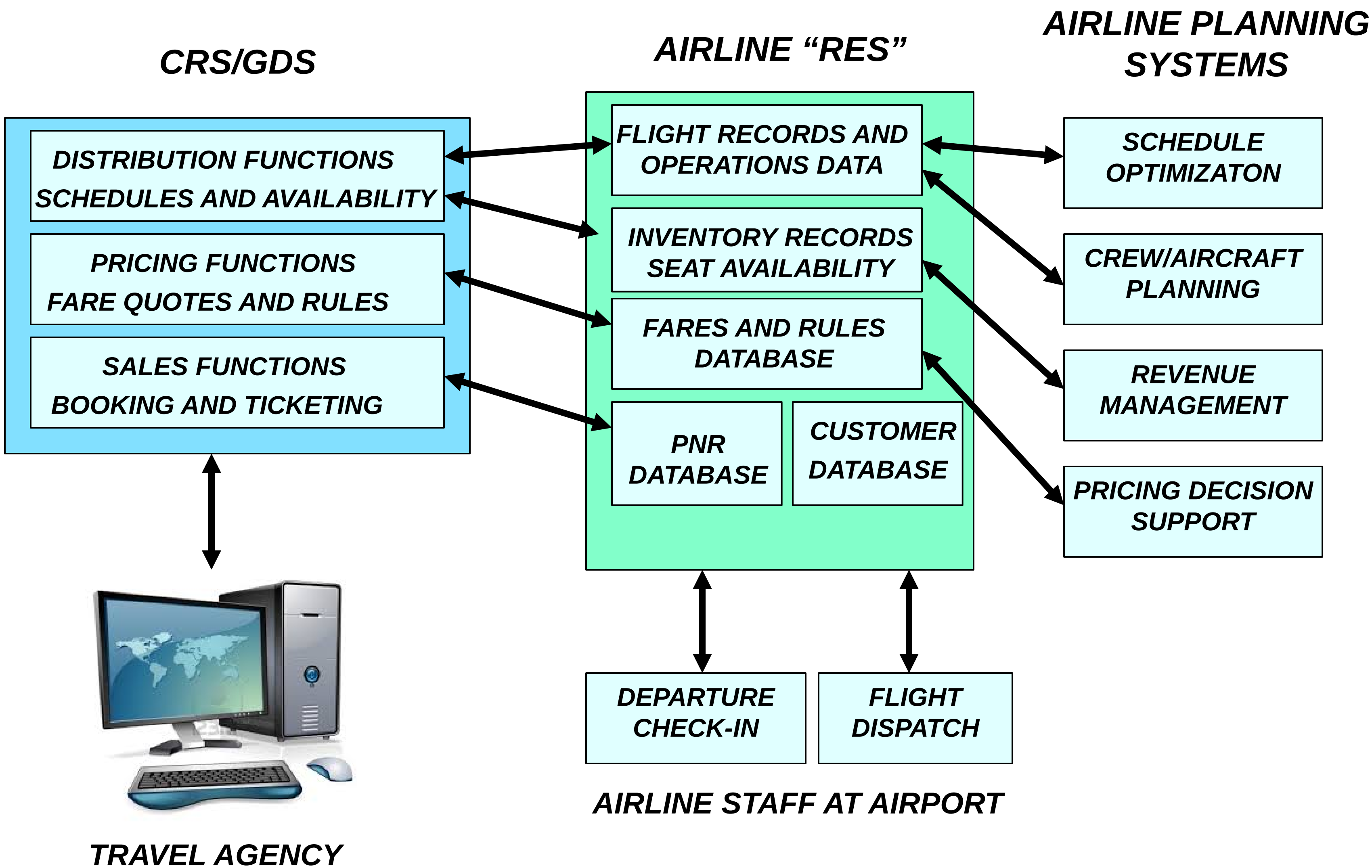
- **Coordinate the daily operations of the airline on a dynamic basis.**
- **Ensure completion of schedule plan within company goals for on-time performance and safety.**
- **Process passengers, baggage and cargo subject to numerous operational constraints:**
  - Limited number of gates, many with constraints on aircraft size
  - Airport flow limitations on taxiways and runways
  - Availability of airport and ground crew resources
  - Weather (both local and en route) as well as airport field conditions
  - Air traffic control (ATC) congestion and delays

Airline Planning and Operations



Source: Prof. John Hansman

IT Systems: Planning and Distribution



Integrated Airline Planning Models

- **Current practice is to perform scheduling, pricing and RM *sequentially.***
- **Integrated models would *jointly* optimize schedules, capacity, prices, and seat inventories:**
  - Better feedback from pricing and RM systems can affect optimal choice of schedule and aircraft
  - Better choice of schedule and capacity can reduce need for excessive discounting and "fare wars"
- **Joint optimization and planning is a big challenge:**
  - Research is still required to identify models that can capture dynamics and competitive behaviors
  - Organizational coordination within airlines and willingness to accept large-scale decision tool

Example: Airline Organizational Structure