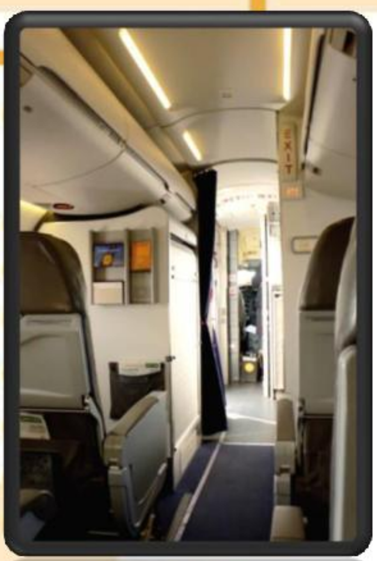
Air Transport



AIR TRANSPORTATION SYSTEM

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What is Air Transport?

Air transport includes moving passengers, and their personal belongings, from one location to another by plane. The cost of fuel, terrorist attacks and an economic recession are some, but not all, of the factors that have made the future of air transport uncertain.

The Airport

Even before boarding a plane, air transport can be frustrating and time consuming. The inconvenience of airport traffic, long lines, delays and low quality service has influenced many people to find alternative transportation.

Passenger Safety

Since the events of September 11, 2001 the need for airline security has become increasingly evident. A lack of air traffic controllers to supervise the skies and recent safety violations also threaten passenger safety. Some fear that the number of recent emergency landings and aircraft crashes represent an alarming trend.

Transport Concerns

In addition to unpleasant travel conditions, shortages of well-qualified pilots, aircraft engineers, and air traffic controllers contribute to challenges jeopardizing the future of air transport.

Unpleasant Travel

Challenges surrounding air transport include flight cancellations, delays, and boarding denials. Busy airports have become common sources of traveler chaos, discomfort, and misery.

"A la carte pricing"

To generate additional profit, more and more airlines have been engaging in "a la carte pricing," which is the process of charging passengers additional money for various "extras" that were previously included in the price of a ticket, such as for checked luggage, meals, pillow and blanket kits, and aisle or window seats.

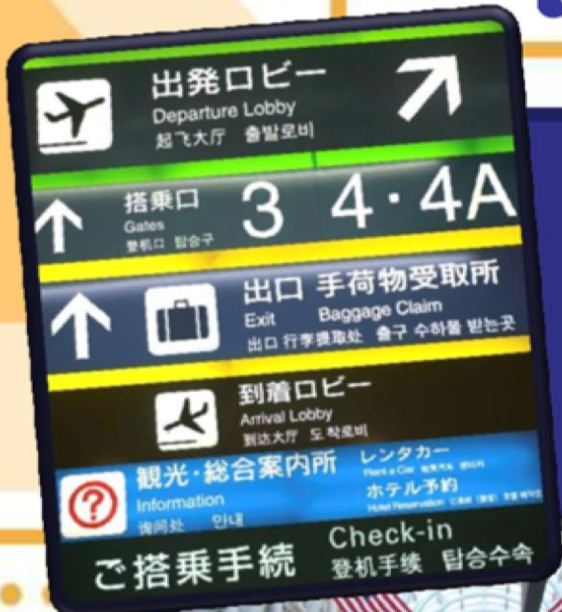
Environmental Impact

Low fuel efficiency and the resulting carbon emissions contribute to a deteriorating environment. The Airbus's large A380 is an example of a luxury plane that adds comfort and spaciousness at the expense of adding extra weight which compromises fuel efficiency.

The Entertainment Factor

Passengers on planes will soon be able to use their cell phones during flights, and in-flight entertainment will give them the ability to choose from thousands of on demand offerings which will include everything from movies to television programs to interactive games.

Global Impact



In an economy that is increasingly dependent on global communication, flight continues to play a huge role in connecting people around the world. The effects of air transport on the global economy are far reaching. As major airlines struggle to compete with budget airlines, how does it effect global travel?

Plastic Only, Please

Experts were correct in predicting airlines would take a "Cashless cabin," approach. Many airlines now only accept payment via credit /debit card from passengers who want to purchase movies, meals, drinks, and other onboard items.

The New Look of Air Transport

The air transport industry seems to be on the brink of change. From passenger safety to poor fuel emissions it is evident that new technology and developments are needed. The chaotic, unpleasant experience of air travel continues to be a top priority for struggling airlines

The Future of Air Transport?

Experts expect new, state of the art airplanes to accommodate passengers more comfortably, better fuel efficiency, quieter engines and soundproof cabins to be common. It is anticipated that planes will begin using Global Positioning System satellite signal technology. What else is needed to ensure the future of air transport?

The Geography of Transport for Travel and Tourism

Learning Objectives

1. Appreciate the close relationship between tourism and transport.
2. Understand the principles of spatial interaction between places and their importance to the geography of tourism.
3. Describe the four main physical elements of any transport system.
4. Identify the costs involved in running a transport system.
5. Describe the distinguishing features of the main transport modes and recognise their particular contributions to tourism.
6. Identify the Greenwich Meridian, the various time zones and the International Date Line and illustrate their importance for the traveller.
7. Outline the characteristics of each mode of transport for the different types of traveller.
8. Appreciate the environmental implications of different modes of transport.

for Travel and Tourism

- Introduction
- Principles of Interaction
- The Elements of Transport
- Transports Costs and Pricing
- Modes, Routes and Networks
- Air Transport
- World Pattern of Air Routes
- Deregulation
- Surface Transport

Introduction

- History of tourism and transport intertwined
- Access – vital link
- Important economic sector
- Often tourist transport is shared
- But a means to an end?

Principles of Interaction

- Complementary
- Intervening opportunities
- Friction of distance (transferability)

The Elements of Transport

- The way
- The terminal
- The carrying unit
- Motive power

Transport Costs and Pricing

- Social/environmental costs
- Private costs
  - Fixed – high
  - Variable – low
- Load factor
- Marginal cost principle
- Differential pricing

Modes, Routes and Networks

- Modes – each distinctive
- Routes – physical and economic conditions
- Networks – links and nodes

Table 5.2

Mode	Way	Carrying unit	Motive power	Advantages	Disadvantages	Significance for tourism
Road	Normally a surfaced road, although 'off road recreational vehicles' are not restricted	Car, bus, or coach. Low capacity for passengers	Petrol or diesel engine. Some use of electric vehicles	Door-to-door flexibility. Driver in total control of vehicle. Suited to short journeys	Way shared by other users leading to possible congestion	Door-to-door flexibility allows tourist to plan routes. Allows carriage of holiday equipment. Acts as a link between terminal and destination. Acts as mass transport for excursions in holiday areas
Rail	Permanent way, with rails	Passenger carriages. High passenger capacity	Diesel engines (diesel/electric or diesel/hydraulic). Also electric or steam locomotives	Sole user of the way allows flexible use of carrying units. Suited to medium or long journeys, and to densely populated urban areas. Non-polluting	High fixed costs	In mid-nineteenth century opened up areas previously inaccessible for tourism. Special carriages can be added for scenic viewing, etc. Trans-continental routes and scenic lines carry significant volume of tourist traffic
Air	Natural	Aircraft. High passenger capacity	Turbo-fan engines; turbo-prop or piston engine	Speed and range. Low fixed costs. Suited to long journeys	High fuel consumption and stringent safety regulations make air an expensive mode. High terminal costs	Speed and range opened up most parts of the world for tourism. Provided impetus for growth of mass international tourism
Sea	Natural	Ships. Can have a high degree of comfort. High passenger capacity	Diesel engine or steam turbine	Low initial investment. Suited to either long-distance or short ferry operations	Slow. High labour costs	Confined to cruising (where luxury and comfort can be provided) and ferry traffic

Air Transport

- Influential in international and domestic tourism
- Advantages – speed, capacity, direct line
- Disadvantages – terminals, price, fuel

Figure 5.1

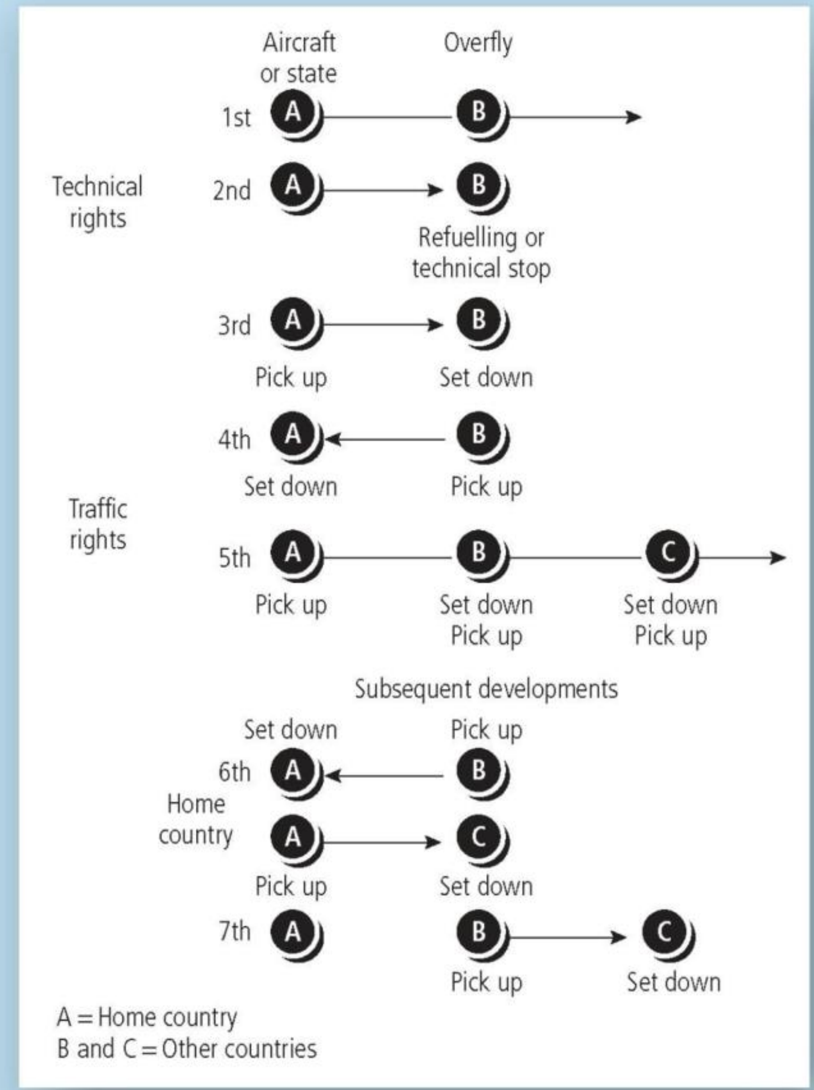
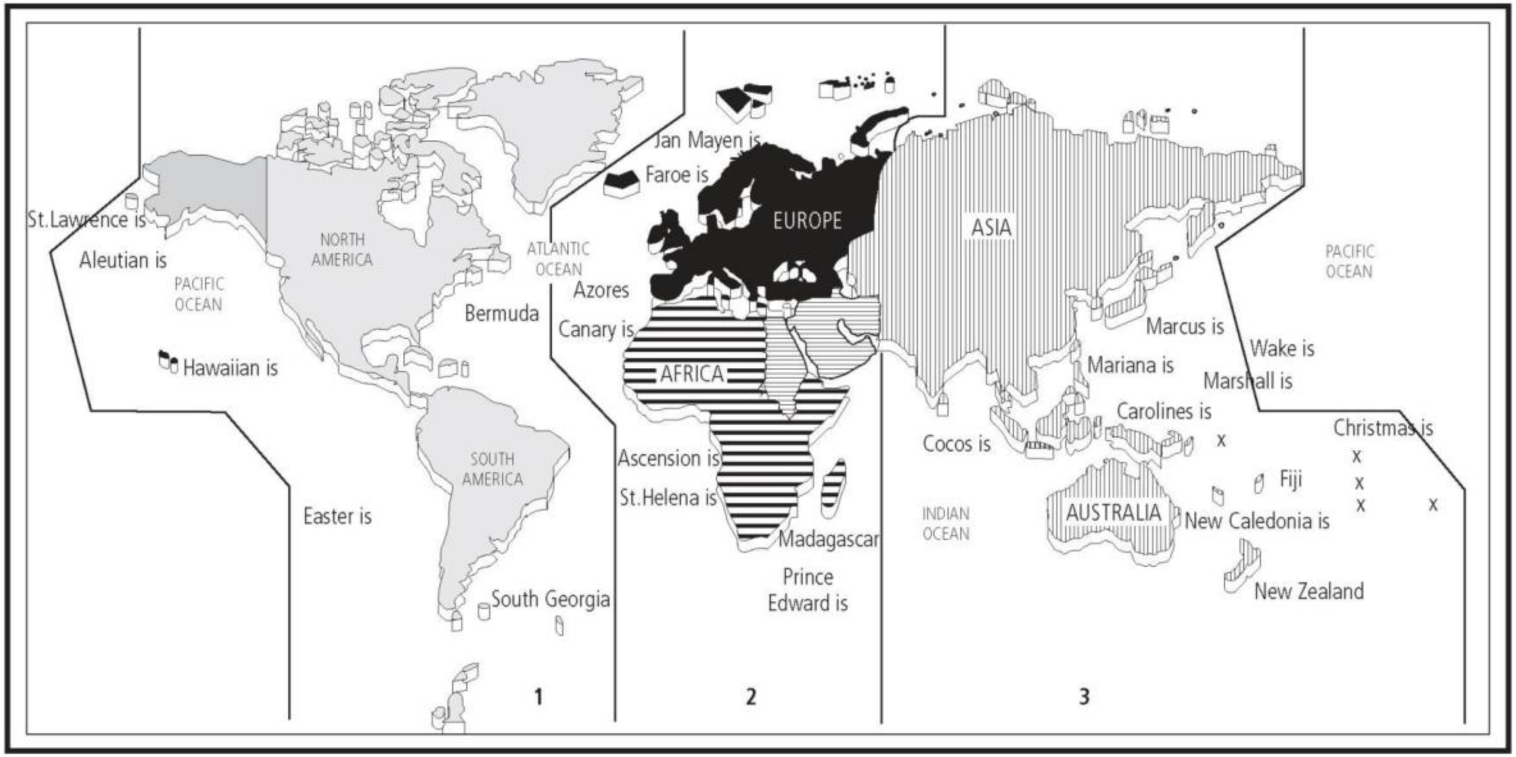

Aircraft
or state
Overfly
1st
A
B
Technical
rights
2nd
A
B
Refuelling or
technical stop
3rd
A
B
Pick up
Set down
4th
A
B
Set down
Pick up
Traffic
rights
5th
A
B
C
Pick up
Set down
Pick up
Set down
Pick up
Subsequent developments
Set down
Pick up
6th
A
B
Home
country
A
C
Pick up
Set down
7th
A
B
C
Pick up
Set down
A = Home country
B and C = Other countries

Figure 5.2



AREA 1	AREA 2	AREA 3
North, Central and South America and environs	Europe Middle East Africa	Far East, Australia, New Zealand and Pacific Islands.

World Pattern of Air Routes

- **Great circle routes**
- **Height**
- **BUT – routes vary by demand, regulation and availability of terminals**
- **'Freedoms of the Air' Chicago Convention 1944**
- **Deregulation of routes**
- **Location of airports**
- **Main Routes = Eastern USA, Europe, East Asia**

Deregulation

- Most countries deregulating their air transport systems – why regulate?
- Government involved due to tax, environment, planning, consumer protection
- Regulate via fares, route licenses
- Regulation distorts prices, markets and favours existing operators
- Both extremes are bad – monopoly or free competition

Surface Transport

- Road
  - Flexibility
  - Recreational tool; recreational vehicles (RVs)
- Rail
  - Energy efficient
  - Tourism products
- Sea
  - Ferries
  - Cruising

UNIT-2
AIRSPACE

AIRSPACE

Introduction

Most aviation professionals fail to consider airspace management in the same breath as the rest of aviation. It is a

- Ground-based,
- Almost Invisible,
- Component of the air transport system

Originally it was called air traffic control (ATC)

•ATC is still the preferred term with regard to the work that is conducted from airport control towers.

•This occupies a cab, a top the highest of an airport‘s buildings, and also requires an approach unit.

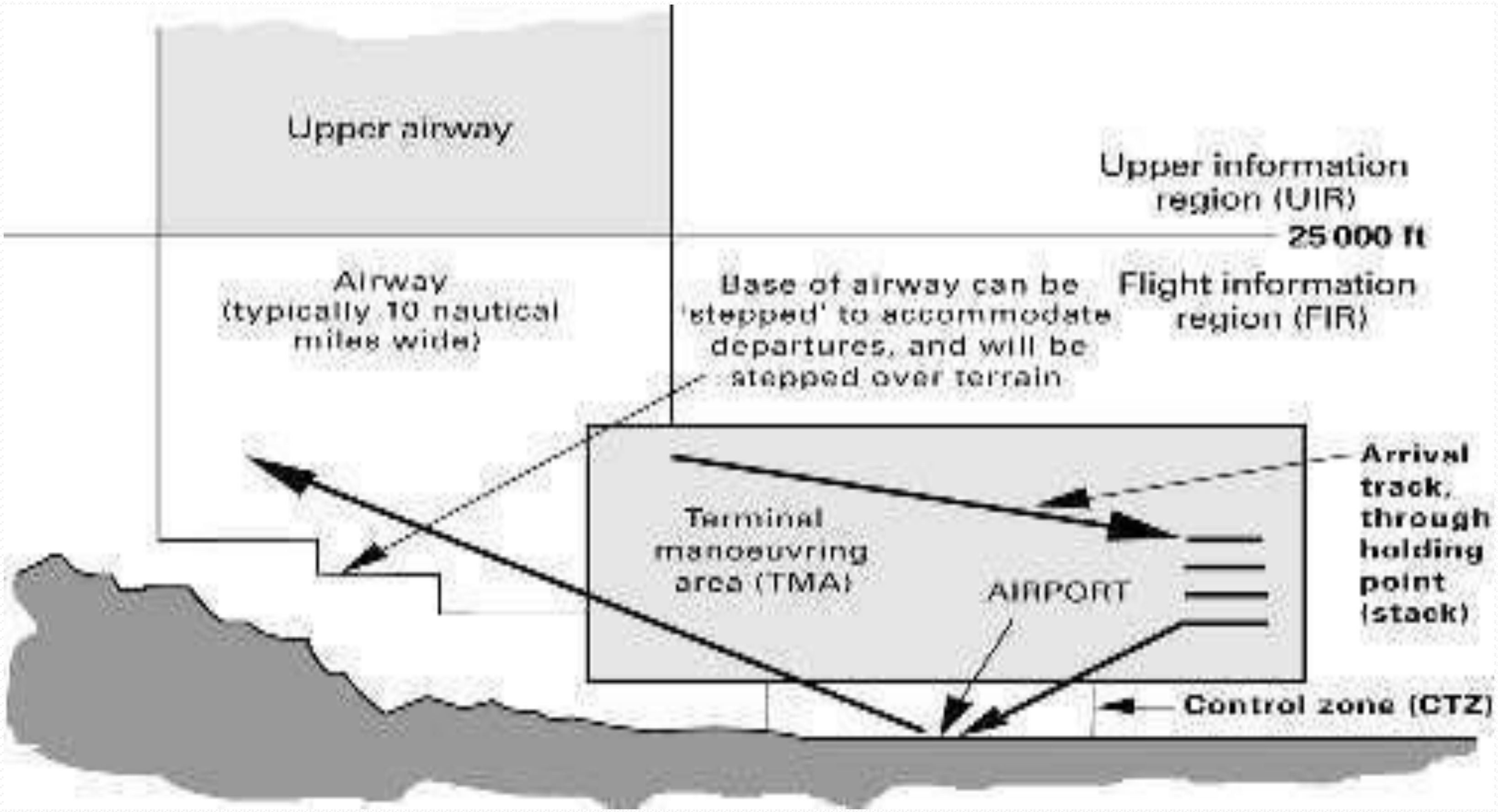
•This is usually a room where radar screens glow and where much of the strategic and tactical work that complements the activities in the control tower is conducted.

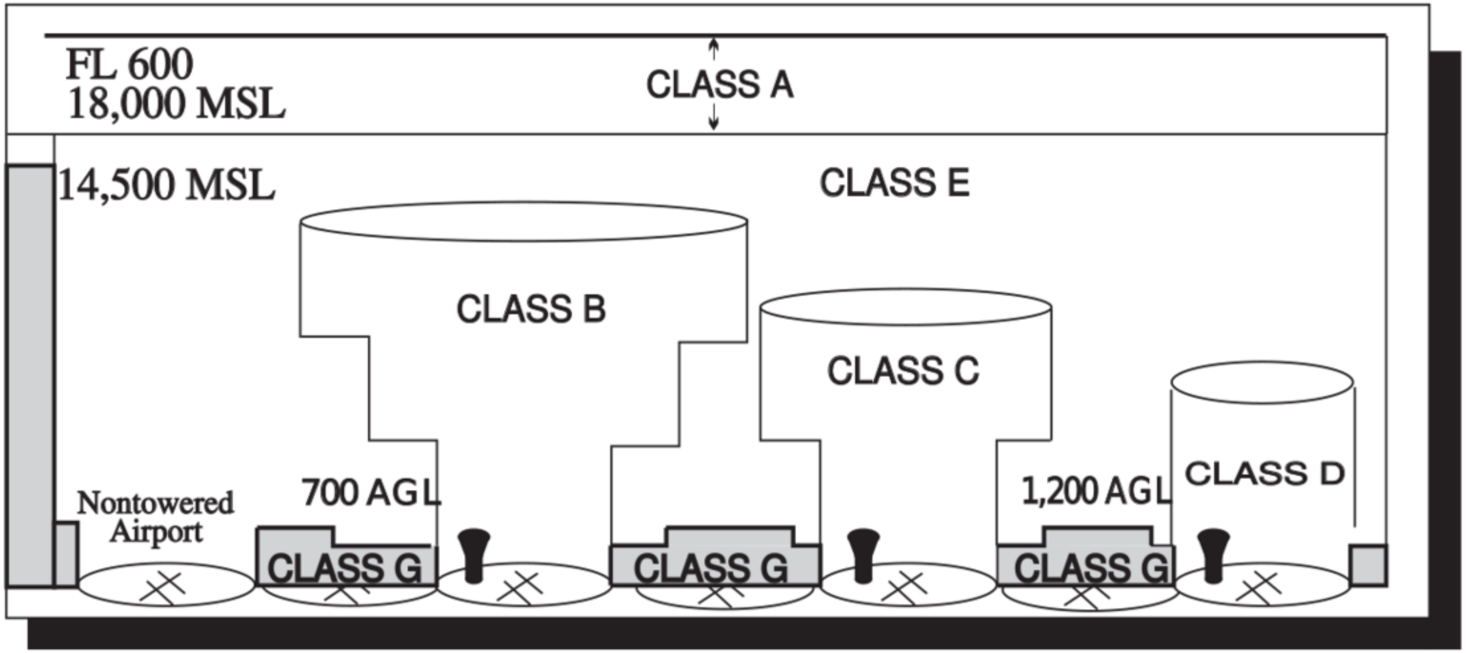
AIR TRAFFIC CONTROL CENTRES (ATCCS)

- ATC service providers have always had a high proportion of their staff located at ATCCs, ATC was set up as, and remains, a service industry.
- Its mandate is to utilise and police the skies, ensuring **safe, orderly and expeditious flow of traffic**
- **A**irspace depends on more information, the digital computer is used to help to digest and present that information with reduced ambiguity
- The computer is a decision- support tool
- ATC has evolved into the so called air -navigation service provider (ANSP) network

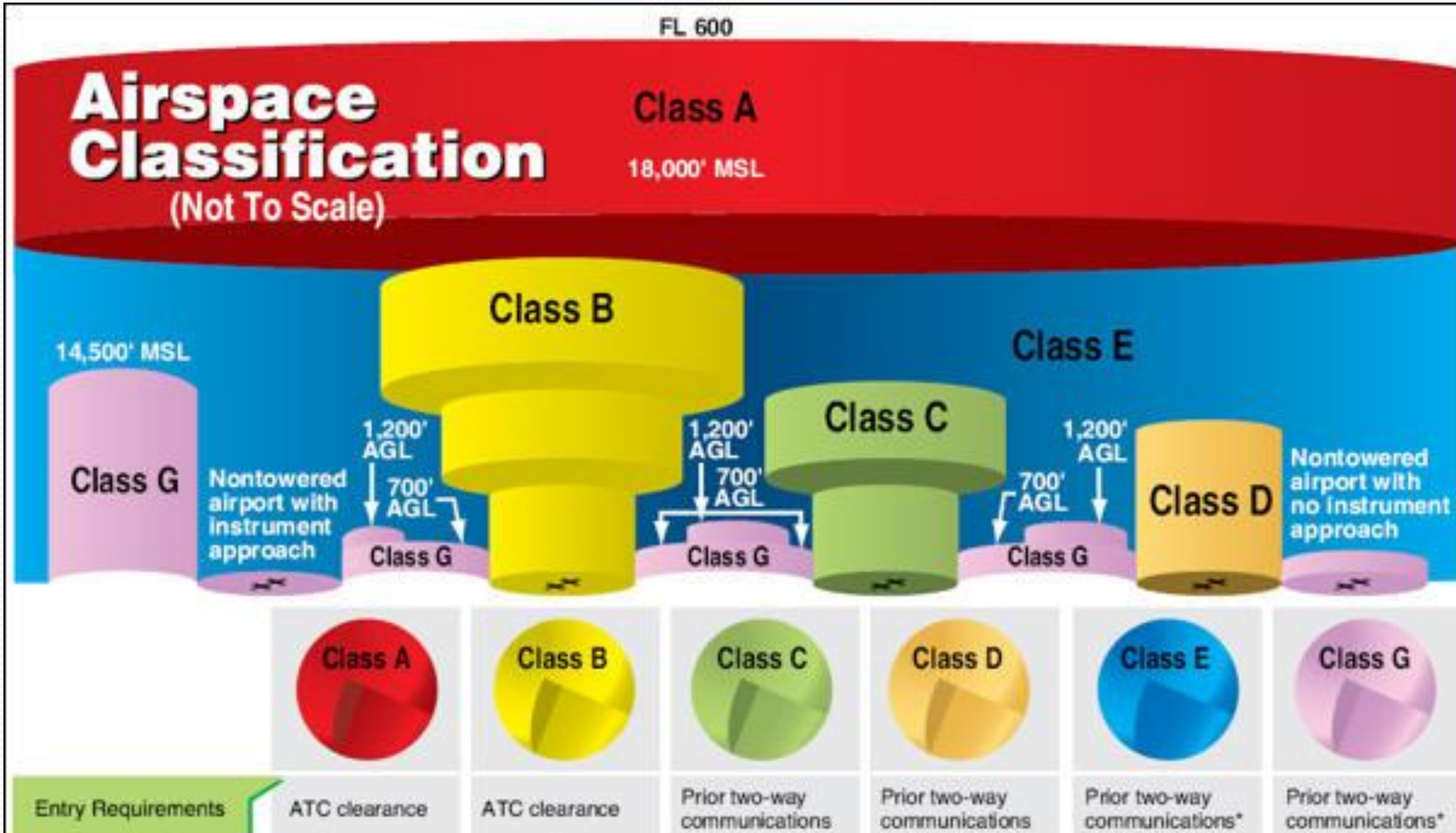
CATEGORIES OF AIRSPACE

There are seven categories defined in ICAO Annex 11, characterized as A through to G, with the highest level of service offered in Category A and the most basic service in Category G.


Upper airway
Upper information region (UIR)
25 000 ft
Airway (typically 10 nautical miles wide)
Base of airway can be 'stepped' to accommodate departures, and will be stepped over terrain
Flight information region (FIR)
Arrival track, through holding point (stack)
Terminal manoeuvring area (TMA)
AIRPORT
Control zone (CTZ)



MSL - mean sea level
AGL - above ground level
FL - flight level



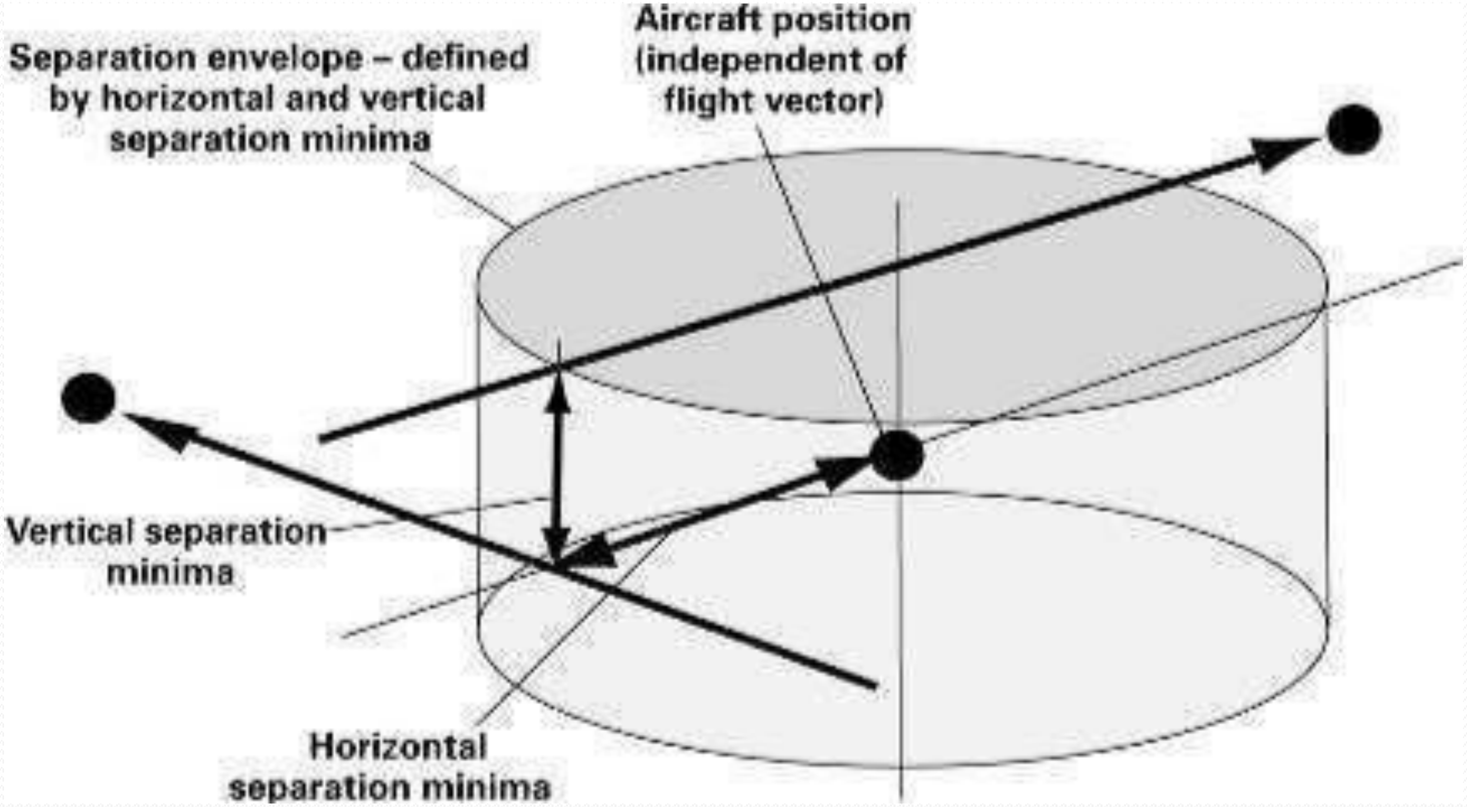
FL 600
Airspace Classification
(Not To Scale)
Class A
18,000' MSL
Class B
Class E
14,500' MSL
Class C
1,200' AGL
700' AGL
Class G
Nontowered airport with instrument approach
Class D
Nontowered airport with no instrument approach
Class G
Class G
Class G
Class A
Class B
Class C
Class D
Class E
Class G
Entry Requirements
ATC clearance
ATC clearance
Prior two-way communications
Prior two-way communications
Prior two-way communications*
Prior two-way communications*

SEPARATION MINIMA

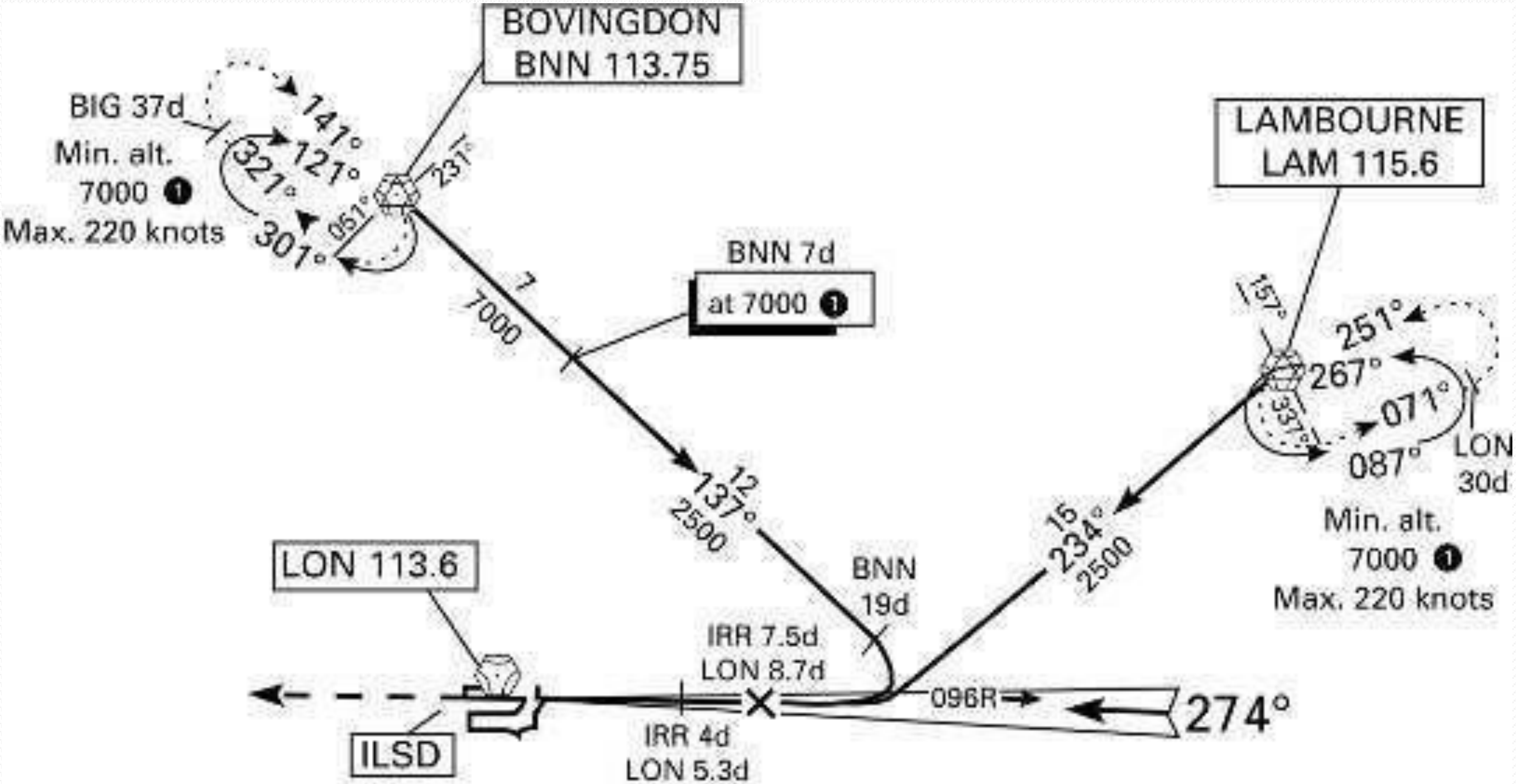
- The concept of separation minima is at the heart of ATC operations.

- The principle is intrinsically simple; there should be a minimum distance between two adjacent aircraft that will never be infringed.

- The minima are expressed as horizontal and vertical separation distances



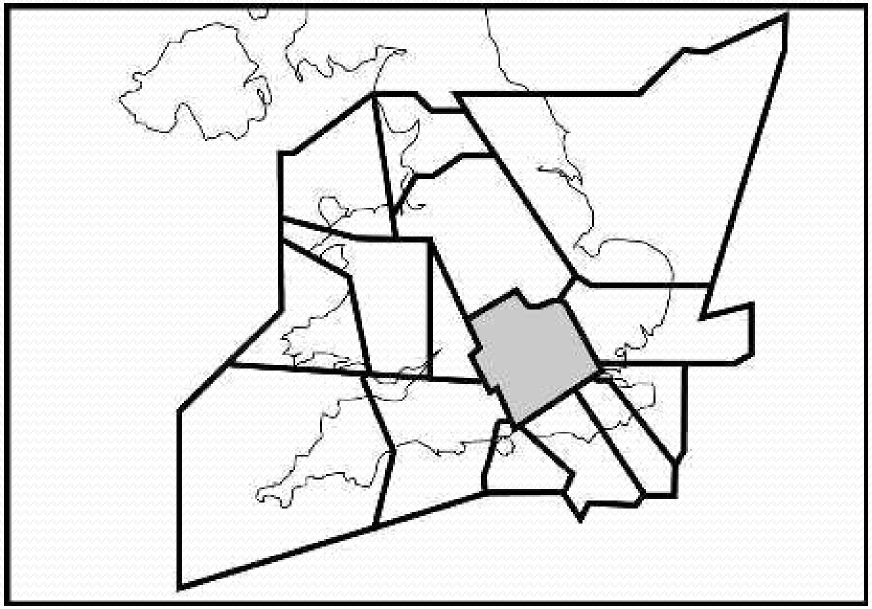
Separation envelope – defined by horizontal and vertical separation minima
Aircraft position (independent of flight vector)
Vertical separation minima
Horizontal separation minima



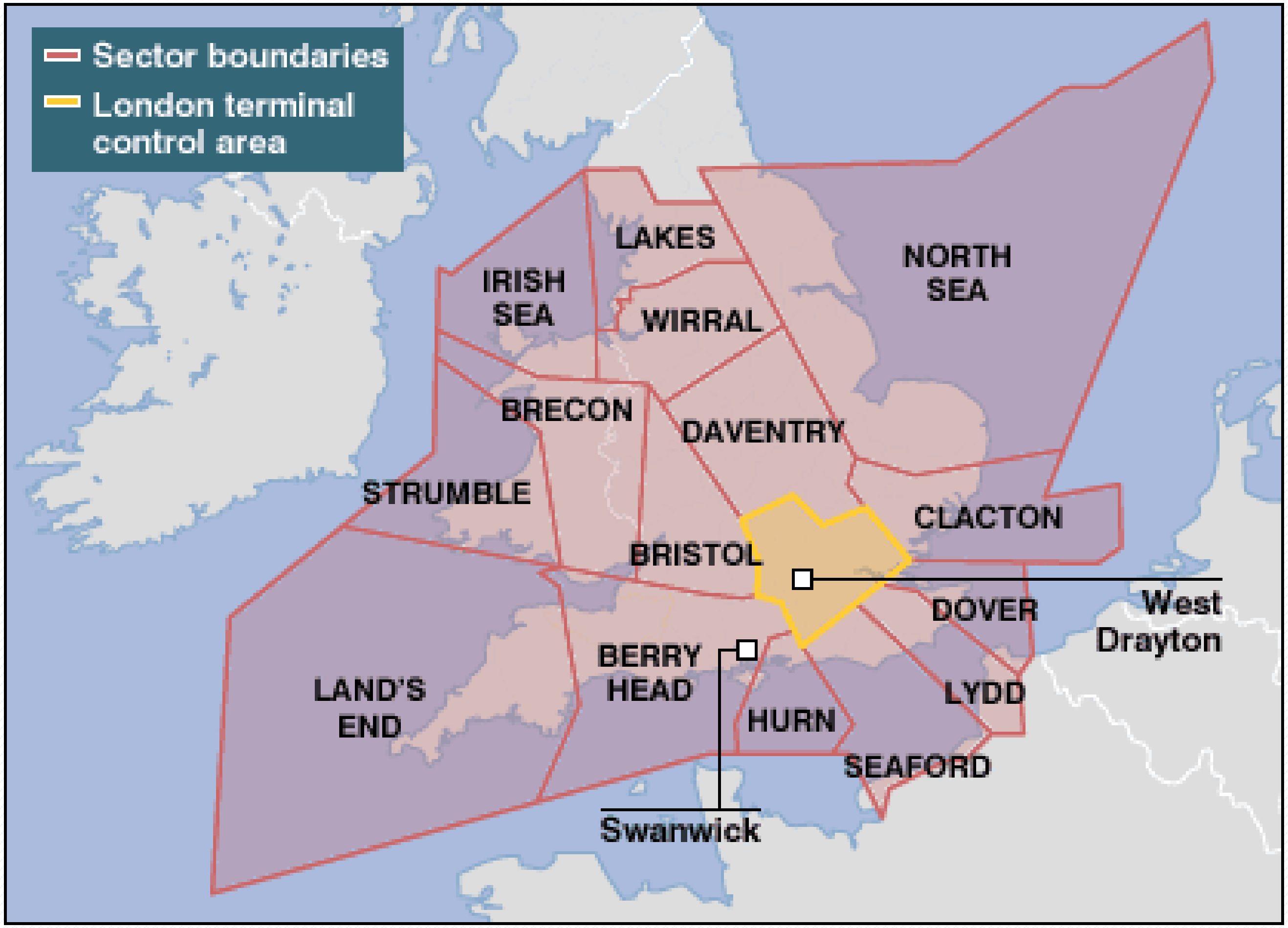
EXAMPLE AIRPORT STAR

AIRSPACE SECTORS

ATC is about vectoring aircraft, and because there is so much decision making involved it is a human based business, so the capacity of the human being to handle more and more aircraft simultaneously is a necessary limit on the capacity of ATC functions



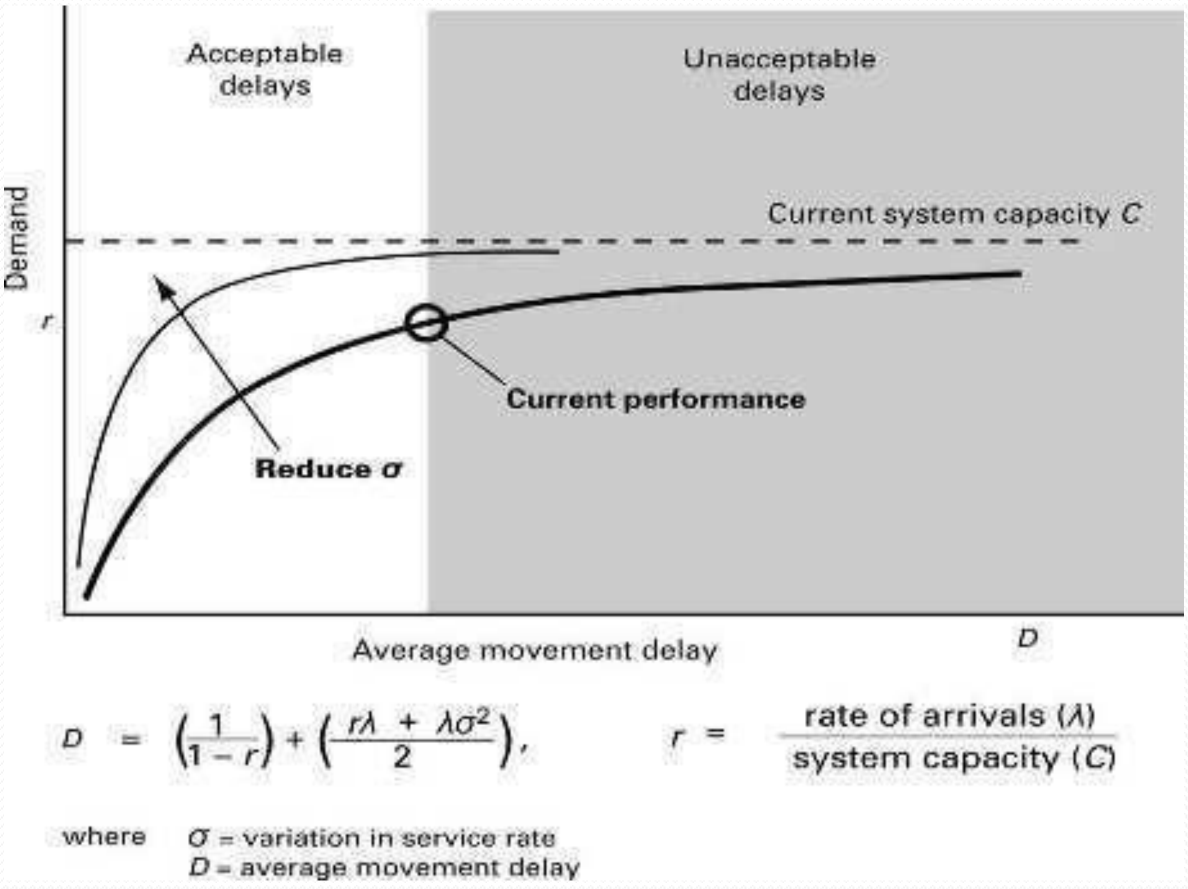
Airspace sectors



Sector boundaries
London terminal control area
LAKES
IRISH SEA
WIRRAL
NORTH SEA
BRECON
DAVENTRY
STRUMBLE
CLACTON
BRISTOL
West Drayton
DOVER
BERRY HEAD
LAND'S END
LYDD
HURN
SEAFORD
Swanwick

CAPACITY, DEMAND AND DELAY

- The most well-documented tool in the arsenal of ANSPs, when they come to justify choices that balance the desire for orderly and expeditious service within their area of responsibility, is illustrated in a traffic flow diagram, where delay, capacity and demand are all related
- If the demand was perfectly regular (implying that all aircraft were spaced evenly from one another), s = 0, and the delay curve would rise from the origin, proceed straight up the Y axis (i.e. no delay at any demand level) and, as demand reached the capacity level, the line would go horizontally to the right.
- This is a theoretical solution, not least because aircraft (indeed any set of vehicles or individuals in a system) operate at different speeds.



Capacity, demand and delay relationship

A BRIEF CHRONOLOGY OF AIR TRAFFIC CONTROL SYSTEM EVOLUTION

Stage 1: procedural ATC system

They require: that airc**raft file a flight plan a** declaration of all relevant flight intentions.

•A telecommunication system to distribute the flight plan to all relevant ATC units

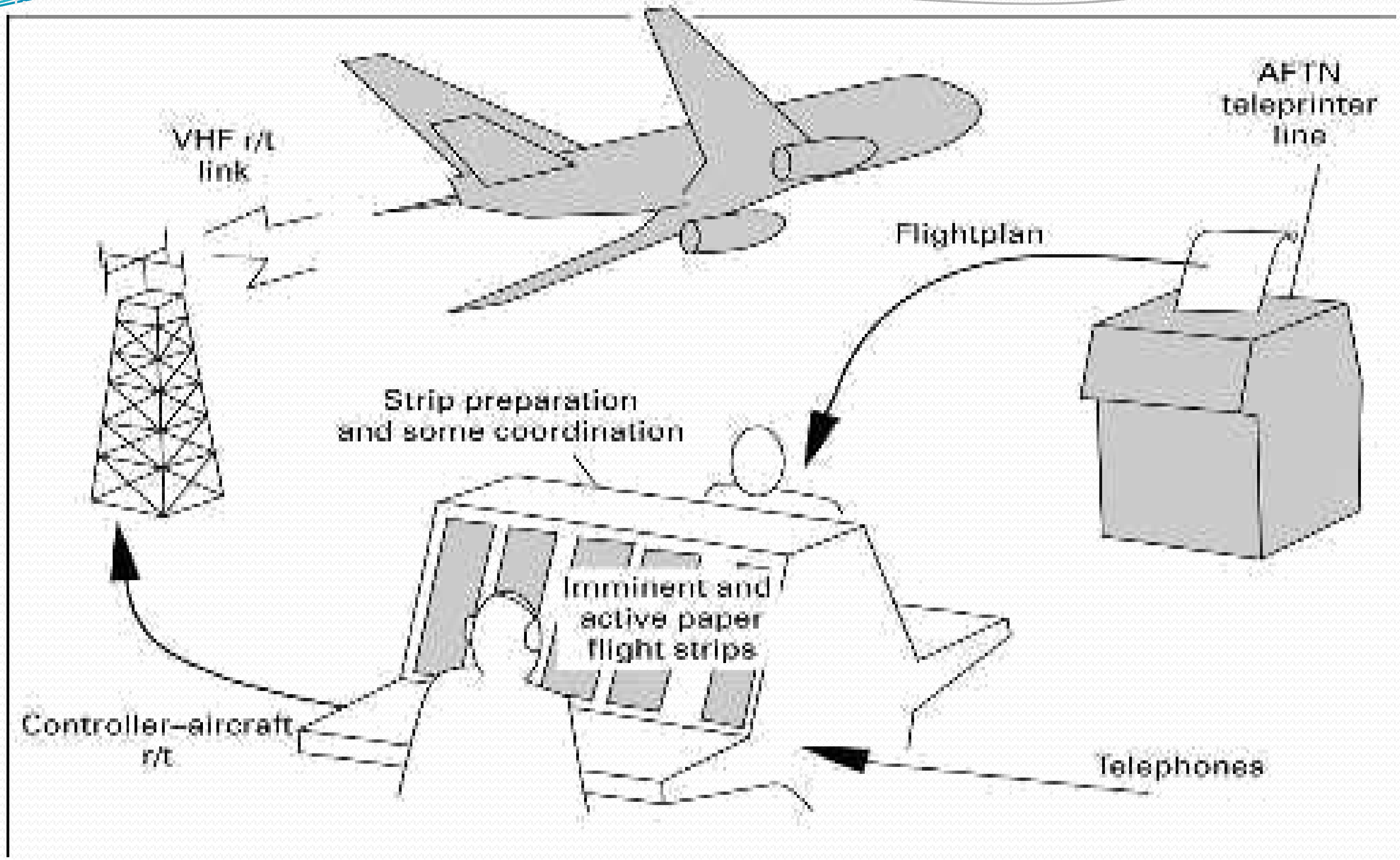
•Paper strips, at the ATC units, on to which flight details are written **reporting points‘ over which aircraft report their positions as they fly** their routes

•A radio system (invariable radio r/t) to communicate between aircrew and ATC units

Two issues to appreciate in the human interface **display and control**

▪**Display is** the function of presenting information in a way that is understandable to the person tasked to make decisions.

▪**Control** is the function whereby decisions having been made, the instructions can be issued.



Schematic diagram of a Stage 1 (procedural) ATC system

Stage 2: procedural ATC with radar assistance

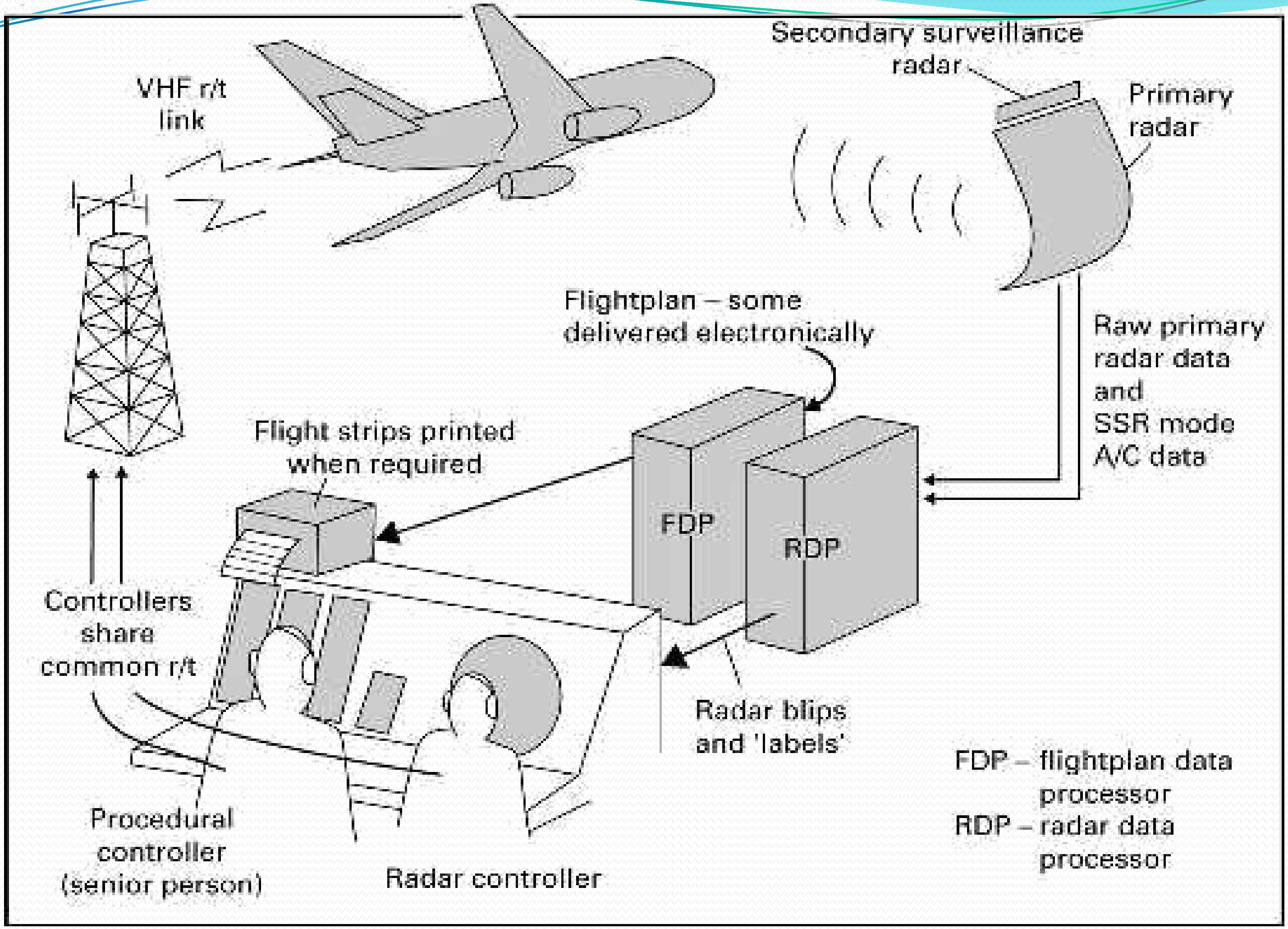
❖In the 1960s ATC began to use radar in earnest. Some radar applications had arrived after World War II, with surveillance approach radar (SAR) serving the aerodrome ATC units, **which developed the approach‘ function** using this system

❖The SAR radar was a short-range, relatively narrow field of-view and fast-rotating, radar

❖Long**-range area radars were located in strategic** positions

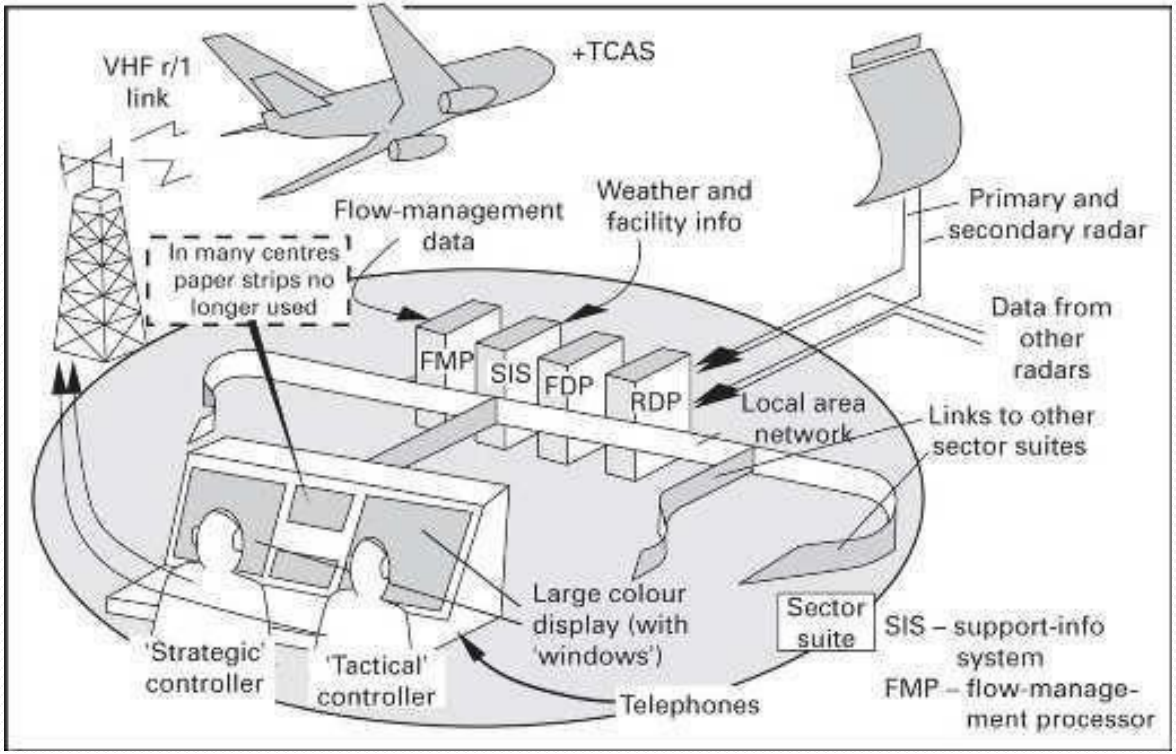
Stage 3: the first–generation 'automated' ATC system

- In the ATCC, radar and computers were combined, creating an installation that was a major leap forward in the way that radar provided real-time surveillance within the ATCC
- Two large computers were usually installed, and their functions were: The flight -data processor (FDP) collected the flight-plan data and kept an up-to-date log of aircraft call signs, the transponder code they were allocated and the route they would fly.



Schematic diagram of a first-**generation automated ATC system**

Stage 4: current generation radar and computer-based ATC systems



CATEGORY 1

- These are operations conducted when the cloud base is not less than 200 ft AAL and the RVR exceeds 600 m.

- These are decision height and visibility minima applicable to a competent aircrew conducting a visual or radar-assisted approach.

CATEGORY 2

- ✓These are operations conducted when the cloud base is not less than 100 ft AAL and the RVR exceeds 300 m.
- ✓These are decision height and visibility minima applicable to a competent aircrew conducting a visual or radar-assisted approach, with flight-director assistance, or a Category 2 cleared automatic flight control system.
- ✓A go-around (missed approach) can be instigated at down to 100 ft in height.

CATEGORY 3

These are operations conducted when the cloud base is below 100 ft AAL and the RVR is less than 300 m.

There are three weather minima subsets in this category:

Category 3a: 100 ft maximum cloud base/300 m maximum RVR

Category 3b: zero ft decision height/75 m maximum RVR

Category 3c: zero ft decision height and zero m RVR – total fog.

UNIT-III
AIRCRAFT

- In this chapter the airliner manufacturing commercial and technical viewpoints are combined, within contexts that allow them to be interrelated.

- There is a systemic approach, starting with a view of each airliner as a project and outlining the lifecycle-related issues that influence commercial cost and risk.

- The influence of requirements, borne of the demand for services and the need to be efficient, plus the requirements that reflect customer expectations are grouped under an effectiveness heading, and are shown to influence a manufacturer‘s choices too.

Introduction

- Aircraft are the most recognizable element of the air transport system.
- They are iconic within society and are, above all, the root of the solutions to any **of the industry's pollution problems.**
- **The** understanding needed of airliners is of their value in commercial and service terms.
- There is no easy way of changing the course along which aviation technology is orientated

COSTS

- Aircraft are considerably more expensive in terms of cost per unit of mass than simpler items. For example, an airliner will cost between 800 and 400 US$/kg (note that all prices will be quoted in US dollars).
- As an example of how expensive an airliner is, if a family car that took to the road at 1.5 tonne maximum and was sold at an equivalent scale it would cost in the order of $750 000

COSTS CONTINUATION..

- Banks and finance companies or, occasionally, airlines themselves finance the purchase of aircraft, and they must **expect an aircraft‘s capital cost to be** recovered during its operational life.

- As well as seeking to recover this initial cost, it has to be borne in mind that running and servicing an airliner incurs additional costs.

PROJECT CASH-FLOW

- Those manufacturers who have tried to break the mould with regard to the variables involved inevitably have been ruled out of the business.
- Boeing continues a long-standing name, but on the way has subsumed Douglas, and at times has owned and operated other companies that it has sold on again.
- Airbus in Europe evolved from a consortium of European manufacturers.

Estimated current aircraft programme costs (Source: evaluations based on published data)

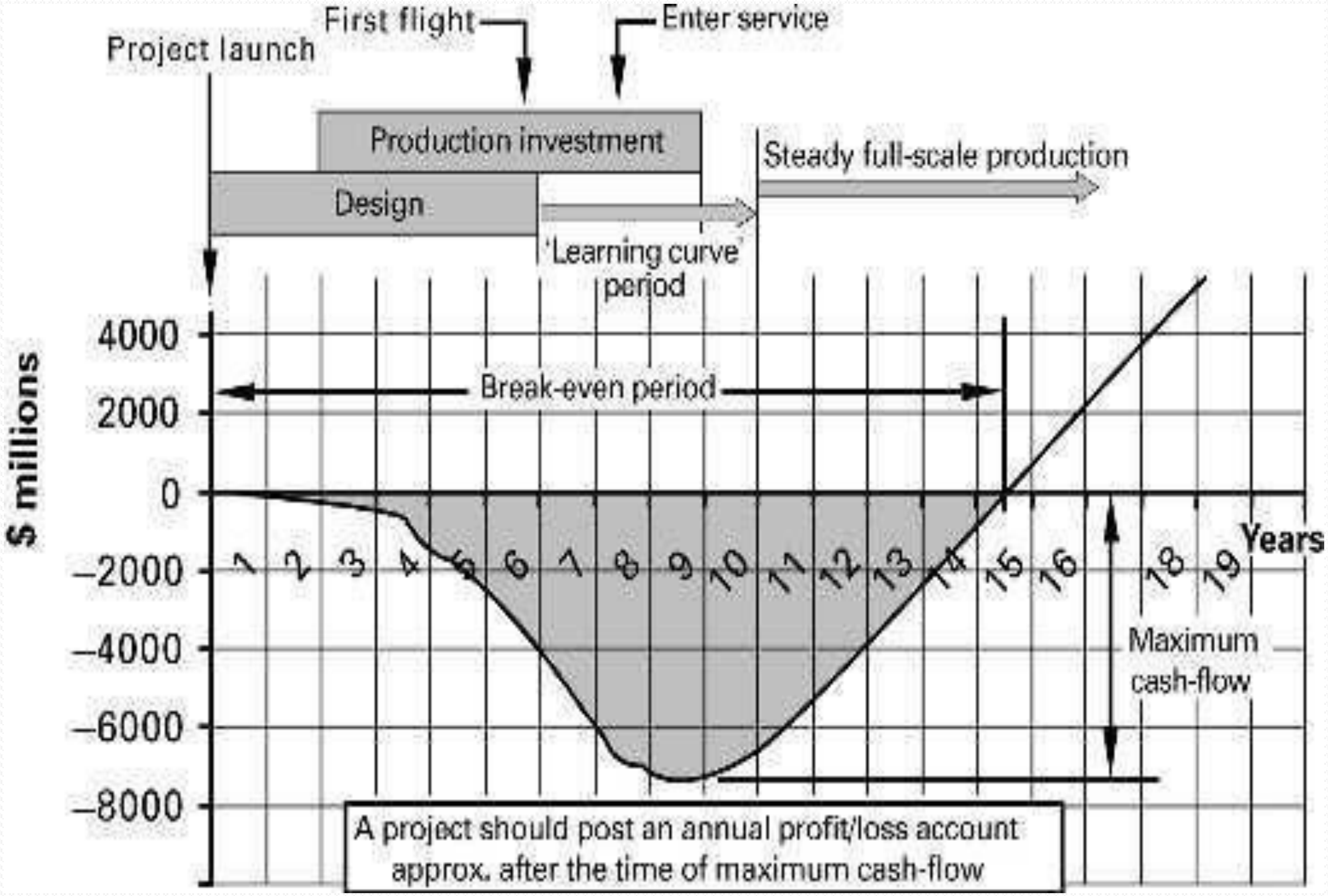
Project	Production rate (aircraft/year)	Maximum cash-flow ($ millions)	Break-even period (years)
EMB-170	48–72	1600–2000	16.5–17.5
Boeing 787-9	48–72	7500–10 000	16.5–17.5
Airbus A380	48	15 000	16.5–17.5

AN AIRCRAFT CASH-FLOW

- On the diagram the maximum cash-flow value and the break-even period are annotated. The data shown in Table 5.1 are illustrative.
- The range in cash-flow values is based on assuming different levels of subcontractor liability, or cost sharing.

- There are many hidden factors, perhaps subsidies that are unacknowledged, and pay rates from country to country can influence the costs greatly.
- In Brazil, where the EMB-170 has been developed, the labour costs are considerably less than in the USA or Europe, but the company relies on subcontractors that do face US and European costs,
- so while the illustrative estimates are good for comparison they may be wide of the real data.

AN AIRCRAFT PROGRAMME CASH-FLOW CURVE



AIRCRAFT PRICE

- The quoted prices for some leading aircraft types, at early 2006, are shown in Table.

- The range of data represents the price range for oldest and newest examples of each aircraft type, so where a type has been in production for many years the oldest aircraft, like used cars, are relatively much cheaper than new production examples.

- There are tales of aircraft being bought well below the published price, which buoys optimism

Compatibility with the operational infrastructure

- **The standards they use are the Federal Airworthiness** Requirements (FAR) in the USA and the Joint Airworthiness Requirements (JAR) in Europe. a complete test specimen

- airframe will have been used to validate a lot of assumptions in this regard. Its systems and components, from engines to light-bulbs, will have been shown to be able to meet the needs demanded by risk assessments of failure cases.

- Stemming from these rather esoteric studies many operating principles will have evolved, which will be the basis of the safety management system**(SMS) process content implied in the aircraft‘s type of certificate of airworthiness‘ (COA).**

Aircraft prices (April 2006) (Source: Airclaims)

Airbus	$ millions	Boeing	$ millions
A318-100	21.9–28.4	737-300	6.00–15.6
A319-100	18.9–34.9	737-800	28.75–42.75
A320-200	11.95–42.15	747-400	37.3–107.55
A330-200	57.4–88.7	757-200	7–28.55
A340-300	46.8–100.16	767-300ER	19.4–67.75
A340-500	89.9–115.4	777-200ER	85–112
A340-600	92.9–126.4	777-300ER	67.5–136.3

Operating costs: Operating costs are divided into two regimes.

•Direct costs.

•Indirect costs.

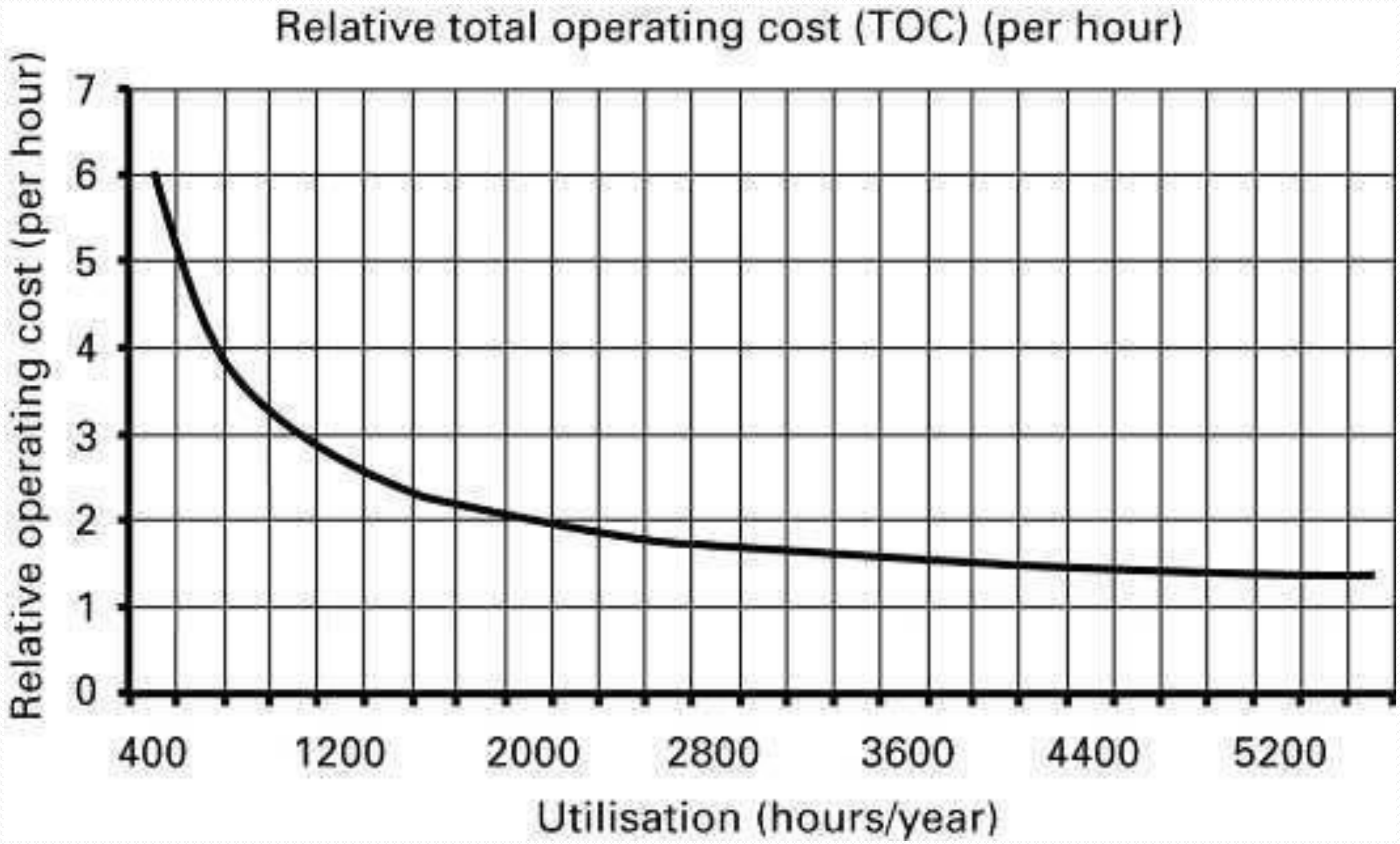
Direct costs are those incurred at the time of flight. They will include crew salaries (factored to including training, etc.), fuel, on-condition maintenance, airport and air navigation service charges, and so on.

Indirect costs are those incurred as a matter of ownership. The aircraft value, or the repayment lease if it is not fully owned, will be recovered as an annual repayment cost. Likewise there will be hull insurance, charges attributable to airline functions (administration, ticketing and reservation, building leases), and so on.

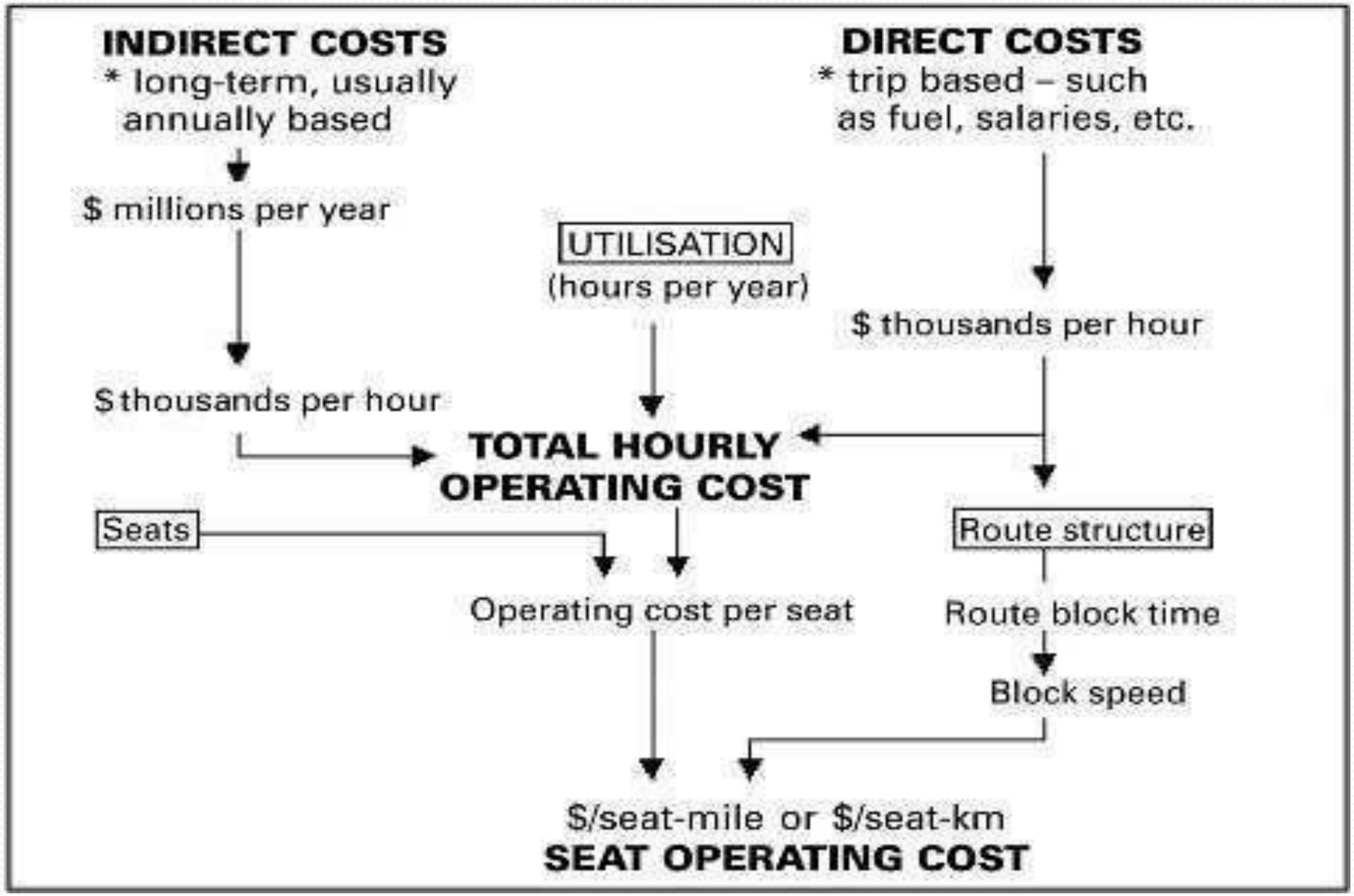
RELATIVE DIRECT AND INDIRECT OPERATING COSTS PER HOUR RELATED TO UTILIZATION

Utilization (h/year)	X_i	X_d	Total
400	10.0	1.0	11
500	8.0	1.0	9
667	6.0	1.0	7
1000	4.0	1.0	5
2000	2.0	1.0	3
4000	1.0	1.0	2
8000	0.5	1.0	1.5

RELATIVE TOTAL HOURLY OPERATING COSTS



COMPONENTS OF AIRCRAFT OPERATING COSTS.



TYPICAL AIRCRAFT OPERATING COSTS (SOURCE: US FORM 41 REPORTS, 2005)

	Direct ($/h)	Indirect ($/month)	Utilisation (h/day)	Assumed seats	Flight cost ($)	$/seat cost	$/seat-km cost
747-400							
United	8697	298 916	12.1	400	76 863.7	190.41	0.029
Northwest	9155	588 846	12.6	400	85 507.6	213.77	0.033
777-200							
United	6568	95 618	12.0	330	54 672.8	165.67	0.026
Continental	6283	424 875	14.7	330	57 971.5	175.67	0.027

BALANCING EFFICIENCY AND EFFECTIVENESS

These two roles will be discussed **in conjunction, because it is the way that an airline uses the flexibility that** the designer offers that determines much about service qualities. These are:

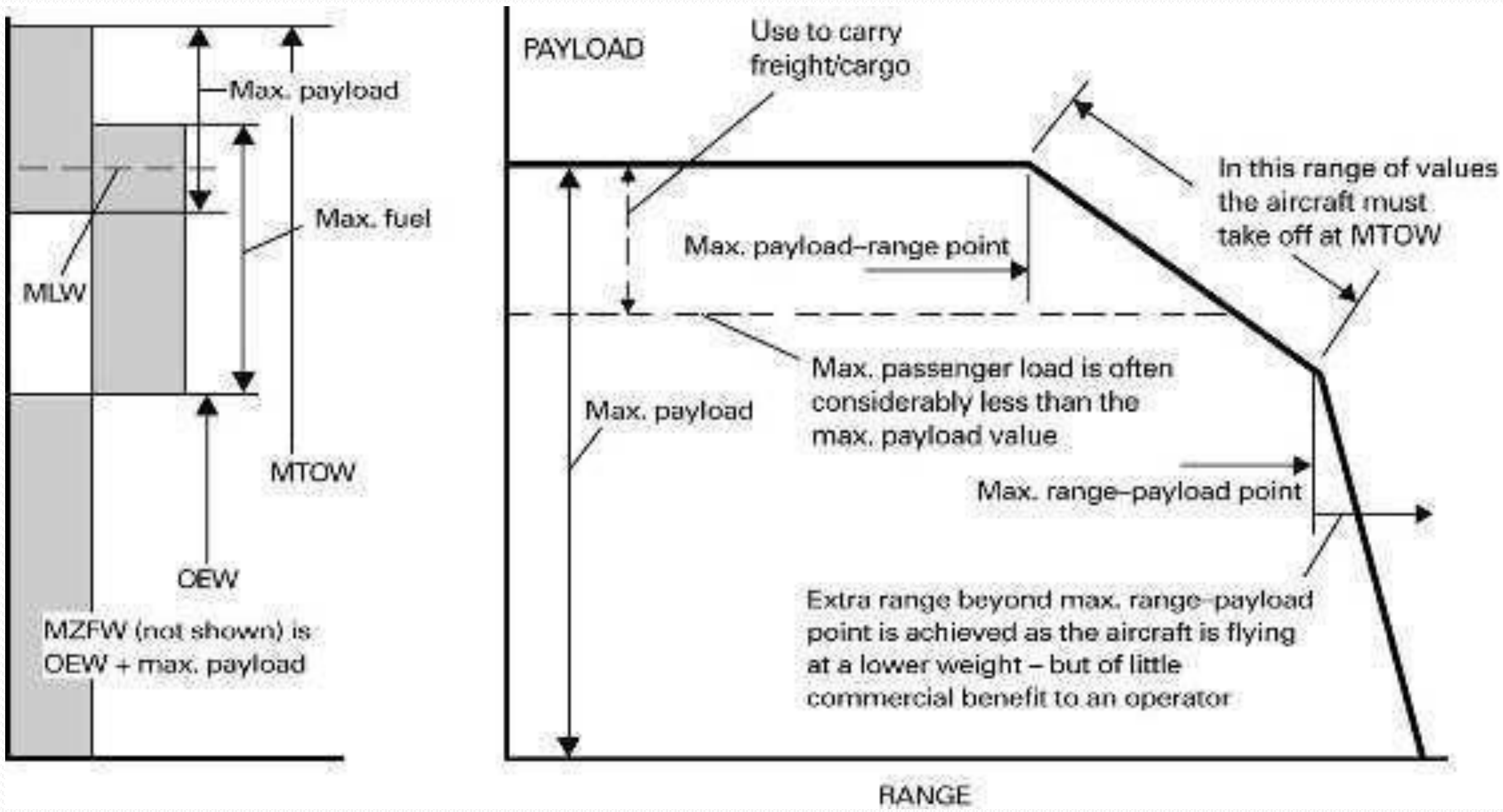
- payload range
- operating speed (and altitude)
- maximum allowable field length performance target operating cost

PAYLOAD–RANGE

The design is limited by the design

- **Maximum take-off weight (MTOW)** the maximum payload and the maximum fuel load. Because it is a statutory requirement, the MTOW can never be exceeded in operations. The other two mass values are interchangeable.
- A constant in all of this is the **operational empty weight (OEW),** being the weight of the aircraft prepared for service, but without passengers or fuel on board.

AIRCRAFT MASSES AND THE ASSOCIATED PAYLOAD–RANGEDIAGRAM.



The Aircraft Weights (Taken From A Generic Boeing Specification – There Are Differences In Service) Are:

OEW	145 149 kg (320 000 lb)
MTOW	347 814 kg (766 800 lb)
Maximum payload	63 956 kg (141 000 lb)
Maximum fuel	145 541 kg (320 863 lb)

There are four notable points on the payload range diagram:

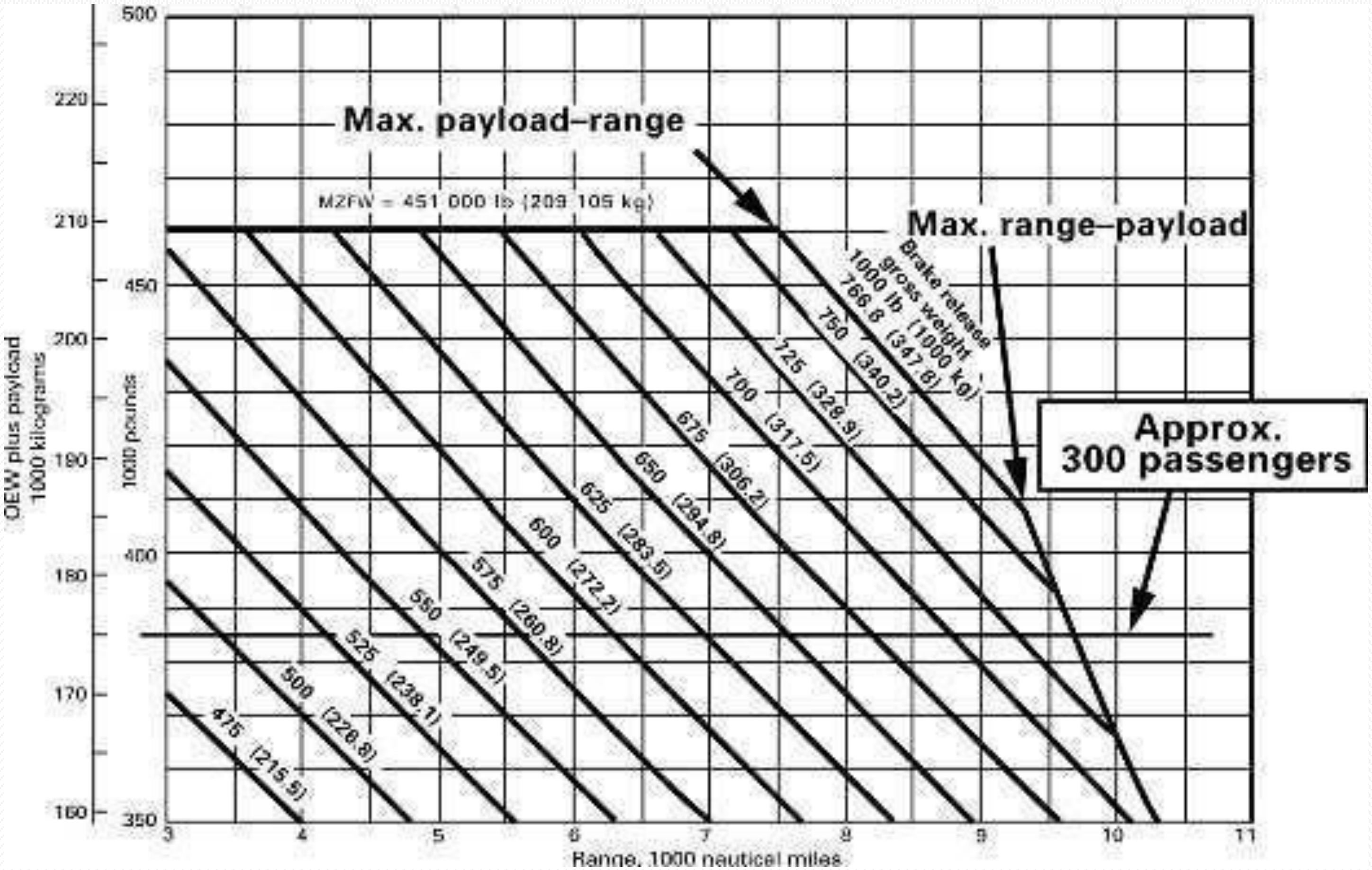
•Zero range payload (this is the maximum payload).

•Maximum payload–range (the greatest range that the maximum payload can be carried).

•Maximum range–payload (the maximum range with a maximum fuel load and taking off at the maximum take-off weight.

•Ferry range, the furthest that the aircraft can fly with no passengers. The second and third points are the most significant on the payload–range

PAYLOAD–RANGE DIAGRAM (BOEING 777-200LR) (SOURCE: BOEING)



FUELEFFICIENCY

The conversion of this performance to a measure of fuel efficiency requires prior knowledge of what operating conditions have been assumed. In the majority of payload–range assessments the aircraft is assumed to cruise in still air and to carry a nominal reserve of fuel.

Assuming the reserve is 8000 kg for the 777-200LR, there are two points where fuel usage can be evaluated. These are Maximum payload–range (63 956 kg–7500 nautical miles (13 900 km)):

fuel used	131 616 kg
Maximum range–payload	(41 164 kg–9700 nautical miles (17 980 km)):
fuel used	156 408 kg

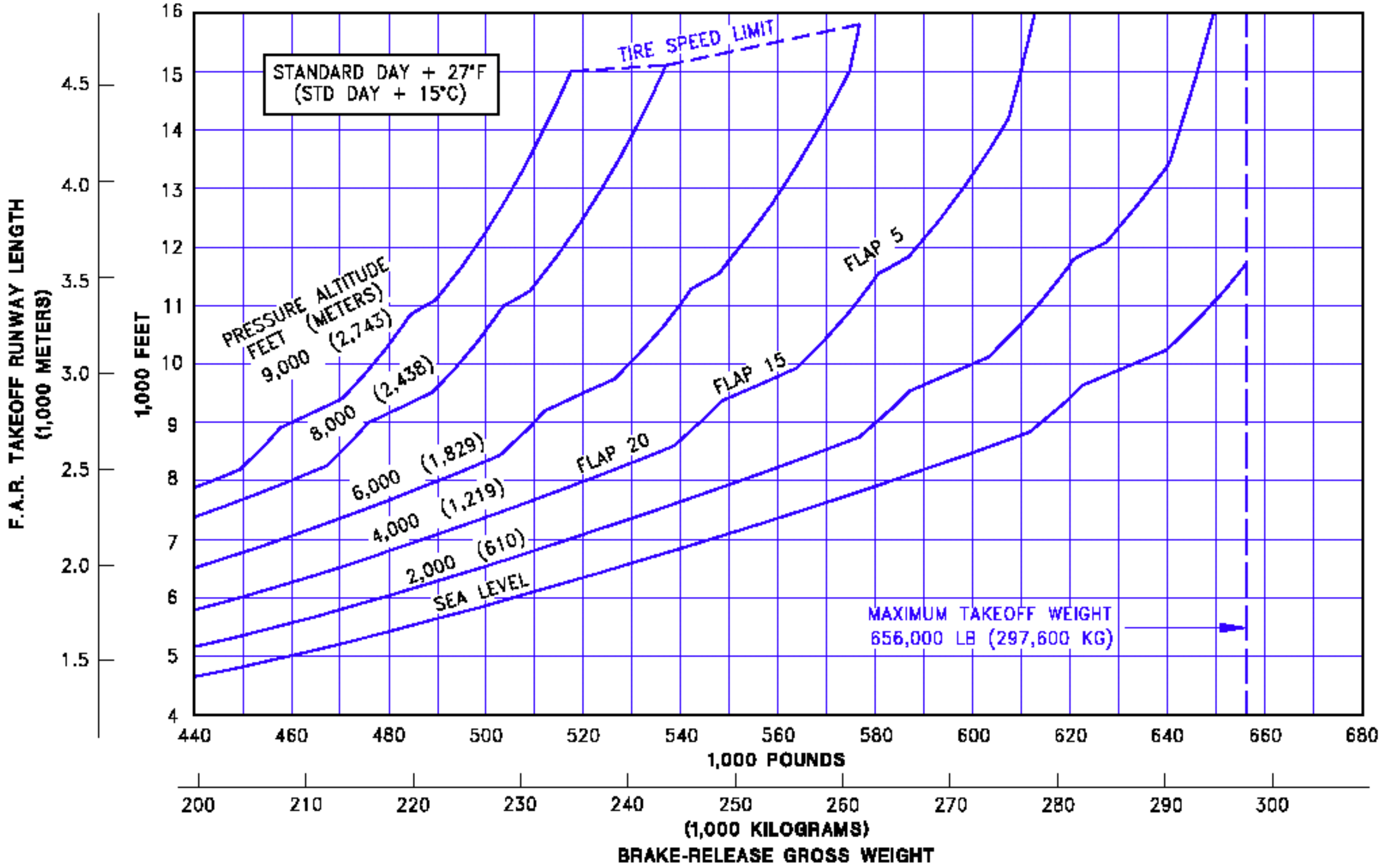
OPERATING SPEED AND ALTITUDE

Which is attributable to the develop The cruising speed of all jet airliners is about Mach 0.7 to 0.9 (410 to 527 knots TAS), with most concentrated in the lower half of this band. Some designers have attempted to offer speeds between 0.82 and 0.88 but the **aerodynamic performance is affected by increasing wave drag** of the supersonic shock wave that occurs at the speed of sound.

AIRCRAFT FIELD LENGTH PERFORMANCE

- Consideration of cruise performance has intimated a trade-off with field performance, but there is much more to this. In essence, the larger the wing, the slower the take-off and landing speeds, and thus the less length of runway is needed to accelerate on take-off and to decelerate on landing.

TAKE-OFF PERFORMANCE CHART (BOEING 777-200LR) (SOURCE: BOEING)



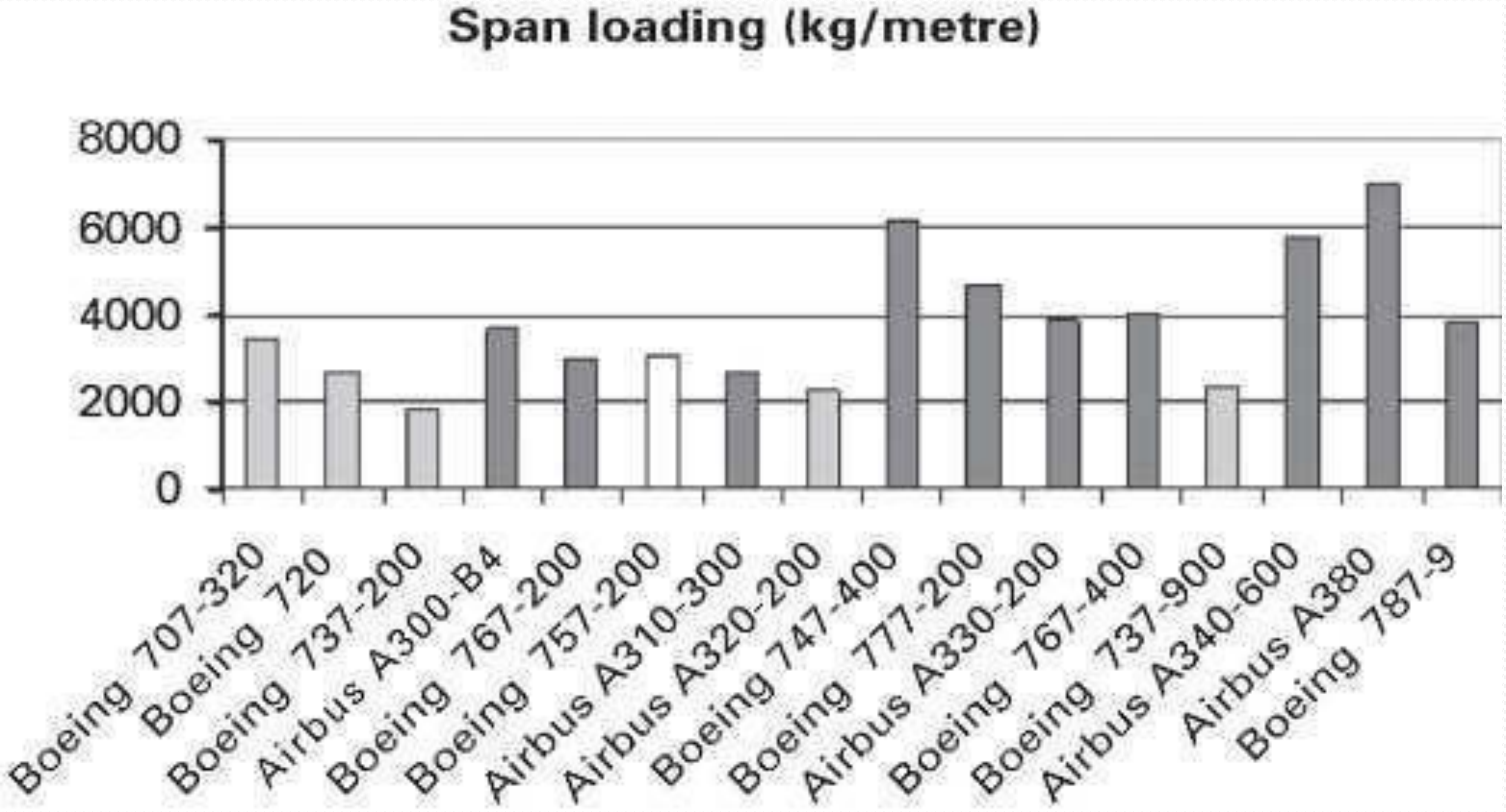
EFFECTIVENESS

- The way that airport stand dimension requirements have been allowed to play such a great influence with regard to the A380 design (it has am span, against a requirement that it should not exceed 80 m) is an indication that not all technical matters are assessed and decisions made solely on technical efficiency criteria.

WAKE-VORTICES

- A significant operational consideration is that wings create a swirl around each wing tip, called a tip-**vortex.**
- **This swirls inwards, causing a downwash‘** behind the aircraft. Sometimes the swirling flow is turbulent and so energy laden that any aircraft entering into this region of flow will face the possibility of being upset.
- This is called wake turbulence, and thus if the vortex strength is large enough to cause **the upset‘ of a following aircraft,** the separation between it and any following aircraft as they approach a runway has to be increased

SPAN-LOADING: COMPARING CATEGORIES OF HEAVY JETS



THE FLIGHT DECK

- The evolution of this part of airliners makes an interesting case study, not least because as systems have been made simpler to use, the crew size has diminished, and now almost all aircraft have a two-place flight deck for the captain and first officer. In the 1950s the long -range airliner had two pilots, a flight engineer, a radio operator and a navigator.
- These three additional crew members still have a place on a few older aircraft, but everything on the drawing board since the mid-1970s has had a two-place crew compartment.

THE MANUFACTURER'S OVERALL REMIT

- In terms of what they do, the foregoing sections have set out how the aircraft builder has two important in-house objectives:
- First to run a financially viable business
- Second to ensure that their product is compliant with the safety and operating rules set out by the operator's own regulatory authorities and the providers of airspace services in the regions of sky within which the aircraft will be used.
- Additionally there are technical objectives that must be addressed and result in an aircraft whose capabilities will meet user's expectations

TYPICAL OPERATING COSTS

✓The structure of operating costs and their dependence upon many operational variables has already been explored

✓ The actual cost on a particular flight will also be affected by such issues as the payload– range and runway length available.

✓If the payload–range is limited, by either airport elevation, runway length or air temperature, the operating cost will be affected in some way.

✓The dependence on the variables outlined will remain the same, but there will be limitations imposed by operations

Unit 4
AIRPORTS

Setting up an airport

- In all countries an airport needs a licence
- This will be issued by the local aviation regulatory body whose requirements will be based upon the standards and recommended practices (SARPs) of Annex 14 to the ICAO Chicago Convention.
- To license an airport the licensee has to state where it is provide physical details and in support of the latter will need to commission a geographical survey of the site and its environs.

- Building a massive airport beside a small township might also be reckless,
- Although if that township is on an island and tourism is its main source of income
- The airport might be the lifeline for the commercial prosperity of the township and the island overall.
- Usually large airports are near large cities or towns

Airport demand

- The forecasting of demand for passenger and cargo services from an airport
- The local demand will be considered first the larger the population that can access the airport in reasonable time
- Local prosperity is an additional factor to include in such evaluations with greater affluence in a society across business and leisure categories.
- Airports that are located in a convenient ‘hub’ location will sometimes find that ‘transfer’ passenger demand is considerable

AIRPORT SITING

- The airport being conveniently located
- A new airport will be located in close proximity or with easy access assured to population and where meteorological records show that there are suitable weather and climatic conditions.

Ideally the site should:

- **Allow** the runway(s) to be aligned to the prevailing wind direction(s)
- Be as obstacle-free as possible especially with regard to runway centerlines Should not be prone to low clouds
- Not be prone to fog – river basins where radiation fog often forms are susceptible.

- To decide which direction to align runways it is important to remember that aircraft must take off and land into wind.
- Best to know if there is a prevailing wind direction and to design the airport around a runway that will minimise the need for operations in a strong cross-wind as such operations are less conducive to safety
- If there are parallel runways they have a suffix for left (L), right (R) or centre (C) hence 27R is the right hand of a parallel set orientated 270°magnetic
- Because it can be used in either direction a runway orientated 240° will be at 60° in the opposite direction
- It will be referred to as runway 06/24

Runway characteristics

- The runway is the most critical airport element in that without it nothing else would sufficient
- With concentration then attached to runway capacity or the ability of a runway to accommodate a given number of movements in a declared period of time.

RUNWAY CHARACTERISTICS

- Runway length
- Runway declared distances

RUNWAY LENGTH

- Length can be such a critical requirement
- The runway should be able to handle all the anticipated demand.

RUNWAY DECLARED DISTANCES

- The runway paved length is not always the runway length that is used to assess operational capability.
- There are four specific runway length definitions called declared distances.

TAKE-OFF DISTANCE AVAILABLE

- The take-off distance available (TODA) must exceed the take-off distance required (TODR) for each operation
- The TODR is defined as: With all engines operating this is the distance required to accelerate to rotation speed and achieve a scheduled screen speed at a height of 35 ft (10 m) plus 15% of the total.
- With an engine failure at V1 the distance is not factored by 15%

TAKE-OFF RUN AVAILABLE

- The take-off run available (TORA) must exceed the aircraft take-off run required (TORR) for each operation.
- The TORR is defined as: With all engines running this is the distance required to unstick plus one third of the airborne distance between unstick and the screen height of 35 ft (10 m) plus 15% of the total.
- With an engine failure at V1 the requirement is similar but not factored by 15%.

ACCELERATE–STOP DISTANCE AVAILABLE

- The accelerate–stop distance available (ASDA) must exceed the accelerate– stop distance required (ASDR) for each operation.
- This is defined as: The distance required to accelerate on all engines to V1 at which an engine failure is assumed and then bring the aircraft to a halt.
- Some authorities permit the use of thrust reversers in establishing this distance but then add 10% to the stopping distance.

LANDING DISTANCE AVAILABLE

- The landing distance available (LDA) is usually less of a constraint than take-off.
- However a wet surface especially slush is a serious impediment to stopping.

AERODROME AREAS

- Additionally flat and clear areas around a runway are essential for operations at an airport.
- These can be within the aerodrome boundary and beyond it.
- **Runway strip**
- **Runway end safety areas**

- **Runway strip**
- The runway strip is a region around a runway which should be relatively flat and unobstructed.
- It protects an aircraft and its occupants in the case of running off the runway and eliminates obstacles that might be hazards if the aircraft deviated from the runway centreline during a go-around.
- Small installations that are deemed essential to safe aircraft operations are allowed within the strip (e.g. lights and signs) but they have to be frangible.

Runway end safety areas

- Runway end safety areas (RESAs) are regions beyond the runway strip in which it is assumed an overrunning aircraft will come to rest.
- In recent years the desirable length has been increased from 90 to 240 m.

OBSTACLE SAFEGUARDING

- Beyond the airport boundary obstacles can be relevant at up to 20 km from an airport and their impact on airport operations can be considerable.
- Figure shows the obstacle limitation surfaces (OLSs) that are defined for an airport runway.
- The application of these criteria is sometimes referred to as ‘aerodrome safeguarding’.

- An 8 m penetration of a 2.5% slope will lead to an 8 * 100/2.5 = 320 m displaced threshold.
- This will create a region of the paved runway that is unusable for declared landing distance. However it will still be usable when aircraft depart in the same direction.
- The way this kind of consideration affects declared distances is shown diagrammatically

RUNWAY CAPACITY

- The likely number of arrival and departure movements per hour that a runway can accommodate is crucial to determining how busy an airport can be either in its peak.
- Ultimate capacity is the maximum number of movements per hour that a runway can achieve.
- A representative runway occupancy time (ROT) for each category is determined and the separation standards used at the airport are evaluated.

Runway capacity

- Evaluating runway capacity
- Sustainable runway capacity

EVALUATING RUNWAY CAPACITY

- The runway occupancy time (ROT) of an arriving aircraft is determined for each category of aircraft type by combining the physical characteristics of the runway specifically length and position/configuration of entry and exit taxiways – with aircraft performance data.
- The ‘heavy’ category aircraft are segregated because they create sufficient wake turbulence to have a more severe approach spacing criterion applied to them.

- The landing distance required (LDR) for each aircraft type is the runway length required measured from the threshold to the point where the aircraft will stop.
- As the actual distribution is influenced by taxiway positions.
- A sample in Table 7.1 presents some observed ROT values between 38.5 and 72.3 seconds and an average ROT for the traffic category of 48.056 seconds.
- If the data in Table 7.2 referred to ‘medium’ aircraft and the ‘heavy’ aircraft average ROT was 61.312 seconds and the ‘small’ (turboprop)category ROT was 32.831 seconds.

- The ROT is heavily biased towards the value used for the medium category
- So far only the ROT of arriving aircraft has been considered.
- The evaluation of departing aircraft ROT values requires knowledge of access points an allowance for line-up and the roll-time from brakes-release to airborne.

- Tapph is the time taken by arriving aircraft to fly from the point where they are given clearance to land to crossing the runway threshold(assume 60 seconds).
- ROTapp is the runway occupancy time evaluated (use 45.69 seconds from the example).
- The departing aircraft is assumed to enter the runway after the arrival has passed its entry point (usually but not always, the threshold).
- Clearance to take-off follows soon after the arrival has vacated therunway (assume 5 seconds).

- ROTdep is the time taken for the aircraft to be airborne and to reach the point where the next arrival aircraft can be issued with a clearance to land (assume 36 seconds).
- The above sequence, if valid for the runway being assessed takes60+45.69+5+36=146.69 seconds.
- In one hour 3600/146.69=24.54 combined arrival/departure movements can be accommodated which is equivalent to 24.54 * 2=49.08 movements per hour.

- There are several operational issues that need to be studied before the above sequence is accepted. These include assessment of:
- Whether departing aircraft need to enter and backtrack the runway (and whether this time will be absorbed in the time taken by the arrival to pass its point of entry and leave the runway)
- whether Tapph will be larger when an arrival is following a previous arrival that was a ‘heavy’ aircraft
- whether an average ROTdep is acceptable just as ROTarr was averaged.

SUSTAINABLE RUNWAY CAPACITY

- The derivation of a sustainable capacity is often rigorously defined
- 16 extra movements per day on a runway or some 5000 movements per year.
- With income at around £10–20 per arriving passenger in the UK
- At an airport with an average of 120 passengers per movement this can affect the presumed annual revenue by as much as £6 million per annum.
- In many cases an airport will declare a sustainable capacity that is 90% of the ultimate and leave it simply at that.
- The reasoning is that this results in a traffic load that experience shows ATC can handle without excessive delays.

AIRFIELD LIGHTING

- Runways have runway and approach lights
- The approach lights are set along the extended centreline with cross-bars that decrease in width as the runway is approached.
- Lights are white and relatively directional.
- The threshold will be marked by a closely spaced row of green lights (shining up the approach) and red lights will show down the runway.
- The most common approach guidance lighting is the PAPI (precision approach path indicator)

APRONS

- The apron is the holding area where aircraft are parked for disembarking and embarking passengers.
- It has to provide sufficient parking to scope with peak demand.
- If the airport has ‘self-manoeuvring’ stands, aircraft will park at an angle(skewed or even parallel to the terminal frontage)
- The airport is saved the chore of providing tractors to conduct ‘push-back’ manoeuvres.
- Due to jet-blast hazards and as aircraft size increases and especially in countries with inclement weather terminal side aircraft are parked ‘nose-in’ and pushbacks are essential.

WAKE-VORTICES

- A significant operational consideration is that wings create a swirl around each wing tip called a tip-vortex.
- This swirls inwards causing a ‘downwash’ behind the aircraft. Sometimes the swirling flow is turbulent and so energy laden that any aircraft entering into this region of flow will face the possibility of being upset. This is called wake turbulence.

- Thus if the vortex strength is large enough to cause the ‘upset’ of a following aircraft
- The separation between it and any following aircraft as they approach a runway has to be increased.
- This can reduce the attainable runway capacity thus affecting the total amount of traffic that can be handled in busy periods at an airport

CABIN DIMENSIONS

- An airliner's fuselage is usually a tubular, streamlined, component that accommodates the crew and payload. It might also enclose fuel tanks and even have space devoted to stowage of the landing gear.
- There will be the flight deck, where the aircrew sit, the passenger cabin, with seats, galleys and toilets, baggage and freight holds, and small regions that are packed with electronic systems used to communicate or navigate the aircraft and perhaps to assist in its detection in surveillance systems
- The most important design consideration is the selection of a cross section. As aircraft cruise high in the stratosphere the air pressure within the passenger cabin has to be much higher than it is in the atmosphere.

- To accommodate the pressure differential at typical cruise altitudes) makes designers prefer a circular, or near-circular, cross-section.
- The ability to tailor seat configurations to meet different ratios of galley area per passenger, number of passengers per toilet, in-cabin baggage space per passenger, aisle width or total space per seat is not trivial for an airline that is trying to win the accolade of ‘best airline’ against their competitors.

FLIGHT DECK

- As systems have been made simpler to use, the crew size has diminished, and now almost all aircraft have a two-place flight deck for the captain and first officer.
- In the 1950s the long-range airliner had two pilots, a flight engineer, a radio operator and a navigator.
- These three additional crew members still have a place on a few older aircraft, but everything on the drawing board since the mid-1970s has had a two-place crew compartment

- Of the three crew members that have been automated out of existence, the flight engineer has been the most recent to go.
- In their day these crewmen nursed the aircraft's engines and monitored a myriad of systems, of which fuel, electrical and hydraulic systems were the most operationally important.

Unit-5

AIRLINES

- SETTING UP AN AIRLINE
- First an airline must have an owner or owners whose interest will be largely financial. Second an airline must decide where it will be based.
- In terms of regulatory oversight it is essential that an aircraft operator applies for a licence to operate in and around the area of jurisdiction of an aviation authority

MODERN AIRLINE OBJECTIVES

- Aircraft have always won over other modes of transport by offering a ‘faster way to travel to/from destinations.
- Payload expansion has also been a continual objective
- The bigger the aircraft the lower the average seat-km cost.

- Service effectiveness is an even more difficult issue to enumerate.
- Consider the way that the number of seats can be increased or decreased in an airliner’s cabin.
- The seating plan shown in Fig. 6.1 exemplifies a 380-seat three-class (12 first, 54 business and 314 tourist class) cabin plan for an Airbus A340-600.
- It is a configuration that would be suited to long-haul operations.

ROUTE SELECTION AND DEVELOPMENT

- In ‘deregulated’ countries the right to fly a route is entirely at the airline’s discretion, subject to there being capacity to handle the required movements at the departure and destination airports.

Airline service parameters such as

- Destinations,
- Frequency of service (flights/day or week),
- Capacity (seats/week or even seats/flight),
- Facilities offered (drinks and food, entertainment etc.)

- The huband-spoke route structures and are the most common route structures in use today.
- Variations on hub-and-spoke that are commonly encountered include the ‘round robin’.
- This is a service where there is an intermediate stop, such as a route from A to C via B. If B and C are relatively close the return trip might not be conducted back via B, but direct from C.
- In this case the aircraft flies from A to destination B, then from B to the new hub, then back to B and finally returns to A.
- All the crewing and maintenance resources might be at A and thus the new hub’s potential is tested with minimal additional capital or infrastructure investment. This is called a W-schedule.

- Route planning requires that suitable routes are selected, that the right aircraft type is selected and that a schedule is constructed that will provide the transfer passenger with convenient connections.
- Analysing Australian airportsusing a traffic model to generate expected demand for direct services between the airports shown and five other Australian airports (Adelaide,Brisbane, Hobart, Cairns and Darwin)
- The percentage attractiveness of hub services considering Perth (PER), Alice Springs (ASP), Melbourne (MEL) and Sydney (SYD),the apparent case for Alice Springs soon collapses.
- Maps are shown in Fig.6.3 and the traffic data are presented in Table 6.2.

Table 6.2 Statistics assisting in the selection of a preferred hub (the best results are indicated in bold)

Hub airport	ASP	PER	SYD	MEL
Route data (km)				
Average stage	1817	2882	1591	**1539**
Standard deviation	**365**	527	1026	961
Basic passenger data (passengers/week)				
Direct services	14 895	16 342	**28 583**	26 902
Maximum hubbing potential	26 055	7436	31 759	**34 458**
Combined passenger data (passengers/week)				
Direct + (100–70%)	30 264	16 342	46 825	**50 976**
Direct + (100–60%)	34 257	16 723	**54 656**	53 305
Direct + (100–50%)	36 369	16 723	55 881	**58 238**

- In terms of which airport accumulated the highest number of best results
- Melbourne seems to be the best airport but it would be a brave analyst that suggested that it has a clear advantage over Sydney. the two are very close indeed.
- Alice Spring meanwhile shows the expected advantage in terms of a low standard deviation and it picks up.

AIRLINE FLEET PLANNING

- Once the routes are recognised a key decision is getting the right aircraft for the job.

Among aspects that have to be considered are:

- The aircraft should be large enough to offer a reasonably competitive seat-km cost.
- However, it should not be too large as service frequency must be acceptable.
- It should be fast enough to offer a competitive block time. It must be able to fly the necessary range, with adequate payload using the runway(s) available in all likely weather conditions and at all service destinations.

- It must be comfortable enough to win passenger acclaim.

The aspects of aircraft and airline operational planning that determine the detail within these areas

- In most airline evaluations and because of competitive pressures, seat-km cost is the most influential selection parameter.
- The second most important parameter is usually payload–range.
- The rest are less important

ANNUAL UTILISATION AND AIRCRAFT SIZE

- In business traveller operations a daily out-and-back service is the minimum that customers will tolerate.
- If it falls below that frequency the passengers are likely to find an alternative route even if it is not direct.
- Thus the number of flights per week per service that are used in planning a fleet determines a lot.
- The load factor (percentage of seats filled) has been calculated on the assumption that demand will be unaffected by service frequency.

- The operating cost per seat will also be a function of the size of aircraft.
- For example, the larger aircraft (assuming it is as well utilised as a small aircraft) will offer more opportunity to sell seats at a lower price
- When seat requirements do not match frequency a common solution is to use different aircraft types – smaller aircraft on the ‘thinner’ routes so that a consistent frequency of service is maintained.

SEATING ARRANGEMENTS

In terms of seating aircraft can be categorised under two broad headings:

- **Wide-body** (or twin-aisle) and
- **Narrow-body** (or single-aisle)
- Single-aisle aircraft can have between two and six seats per row with the aisle near to the centre (maximum headroom) portion of the cabin cross-section.
- A six seats per row single-aisle layout will have three seats either side of the aisle.

- A wide-body aircraft they usually require that there are two aisles, and generally impose a limit at 10 seats per row.
- Multi-deck aircraft are subject to additional constraints.
- Seat size can vary greatly too.

Table 6.3 Surveyed range of seat pitch dimension on several airlines (Source: Business Traveller 2007)

Seat category	Sample	Min–max pitch (cm)	Average cm (in)
First	28	90–231	197.0 cm (77.6 in)
Business	126	86–198	140.8 cm (55.4 in)
Economy	159	76–94	81.5 cm (32.1 in)

- The data in Table 6.3 illustrate the great variation in seat pitch that can be experienced throughout a number of airlines surveyed.
- There is little reason here to delve into the relative values of having more or fewer toilets, or bigger or smaller galleys

INDIRECT OPERATING COSTS

- There are several airline ownership models, ranging from one where everything that is used is owned and where staff are employed to conduct everything ‘in-house’ (till 1960)
- To one that leases as much as possible and subcontracts as much labour as possible (now a days)
- By using subcontracted labour the airline has all the components more loosely federated and has a greater capability to redirect resources and thus to tailor expenditure and revenue.

- Some permanent employee positions are unavoidable.
- These include those associated with the airline’s operating licence an executive-level ‘board’ to conduct strategic management
- And individuals who will contribute to continuity of purpose at all stages below executives – ranging through middle management, supervisory and ‘production’ levels.

AIRCRAFT: BUY OR LEASE

- In the last few decades airlines to avoid the capital expenditure involved when aircraft are purchased directly by leasing their fleet from an intermediary leasing company.
- As aircraft are very expensive they lock money in assets.
- If the aircraft can be leased the lease costs can be repaid from revenue and the need to borrow capital will be reduced.
- This minimises capital investment and where assets are available it may allow alternative investment opportunities to be explored that will diversify and strengthen the airline.

- One reason why a leasing company can provide aircraft at relatively favourable terms is that they will bid for a larger quantity of production slots than most airlines and thus have a special relationship with the aircraft manufacturer.
- Large airlines sometimes lease part of a fleet and buy the remaining aircraft

REVENUE GENERATION

- Fares are not the sole source of revenue for an airline but this is the most significant income source
- The commercial specialists in an airline coordinate with route and fleet planners, determining the pattern of frequency of service, seats configuration, the impact of a lease/ purchase deal, etc
- A low-cost carrier might demand that a late-booking passenger pays over ten times the price for a seat as the early-booking passenger.

- On a ‘traditional’ carrier, as has been hinted already, the cabin might be divided into compartments and the price of the seats, while again not immune from a time-before-flight variation formula
- Access to seats at two different fares will always favour the lower fare so low fares are usually released early in the booking period and the price will increase as the date of operation approaches.

COMPUTERISED RESERVATION SYSTEMS

- In the 1950s and 1960s there was a tendency for all airlines that offered licensed air services to be members of the International Air Transport Association (IATA) and it was IATA that set the fares
- Fare structures came in for a major overhaul, however, when computerised reservation systems (CRS) were introduced by the major airlines in the late 1960s.

- A customer could enter a local shop (the airlines had their own booking offices in all major towns) and book a ticket through the airline clerk or telephone an enquiry
- Initially a variety of ticket options were used introducing terms that have characterised the changes that were occurring within the business.

These included:

- **Advanced-purchase excursion (Apex) tickets.** Basically this was to buy well in advance and get an economy ticket at discount. Airlines put very tight controls on ticket validity, but this still appealed to those on longhaul flights visiting friends and relations (VFR passengers).
- **Business class.** The full economy fare passengers objected to having discount passengers on the same seat rows, so the airlines introduced a better quality service. Modern business class equates to the old-time economy – modern economy is a lesser quality product

- By the mid-1980s there was a particularly serious operational complaint, which was that the CRS was often ‘biased’
- the presence of CRS has not been the most important issue, insofar as software-based processes have evolved on the back of the databases with the system

YIELD MANAGEMENT

- For every route there will be a yield target
- Yield managers must attract rather than deter customers so they try to maximise load factor.

Table 6.4 Hypothetical fare and seats demand relationship

Fare ($)	Seats sold
0	100
20	100
40	100
60	100
80	100
100	100
120	80
140	62
160	46
180	32
200	20
220	10
240	5
260	2
280	0

- Consider a hypothetical service operated by a 100-seat aircraft, where, with a single fare, the prognosis is that demand will follow the fare, as shown in Table 6.4.
- A zero fare operation might fill the aircraft, but revenue would be zero. Likewise, if the fare was very high, $280 shown, the situation is the same in terms of revenue because the demand is now zero.
- An airline can 'overbook' passengers meaning that they will issue a total number of tickets that exceeds the number of seats on the aircraft.
- This is policy and the resolution of overbooking is an operations issue.

INTEGRATING SERVICE QUALITY INTO THE REVENUE GENERATION PROCESS

- ‘overbooking’ to protect against ‘no-show’ and ‘go-show’ eventualities is tantamount to taking risk with customers.
- The yield management description has shown that these are often late-booking travellers, which means that they are the people that the airline depends on to make a profit.
- An average over a number of events. On 50% of occasions the load will be higher. If the average load factor is 60%

- The chances of a load reaching 100% is less likely than if the average passenger load factor was 70 or 80%.
- A technique is needed that will determine what proportion of passengers are likely to be turned away either on enquiry or at the gate.
- One technique that provides some useful insights into equivalent service quality related issues that have yet to emerge is a technique called ‘spill factor’ analysis.

The kind of issues that have to be tracked to ‘understand’ why demand varies are quoted to include:

- seasonal (winter/summer)
- daily (weekdays/weekends)
- time of day
- holiday

- Spill factor theory suggests that if the aircraft capacity (maximum number of passengers/flight) is C the expected load can be expressed in the following way:

$$\text{Expected load} = (\mu - C)\, F_0\, [(C - \mu)/\sigma] - \sigma\, f_0[(C - \mu)/\sigma] + C$$

where $f_0(x)$ and $F_0(x)$ are expressions from normal distribution probability

- It is also possible to use passenger spill data to estimate the cost/revenue benefits for an airline.
- The example in Table 6.8 assumes that the loss of one spilled passenger is $200 (route fare) and the extra operating cost of one added seat is $50

From the above analysis it can be concluded that:

- It is well worth adding 7 extra seats to the available capacity.
- It is not worth adding 14 or more seats.

Marketing the seats

- The concern in these notes is largely in planning as the mechanisms that will be used to sell seats (marketing)
- The airline will pursue a policy and planning stage that will reflect the way they will market the products or airline ‘brand’.
- Demand can be tailored by successful marketing policy and in yield management the impact of marketing initiatives can be monitored.
- Thus used to fine-tune the revenue-generation process.
- This is a concern that affects how a company manages the sale of a perishable commodity.

AIRLINE SCHEDULING

- The scheduling process is where many of the implications that stem
- The scheduler must ensure that each aircraft is allocated to perform the services planned.

The information needed is:

- Routes to be served
- Time-zone of each destination relative to the hub
- Number of flights/week per route
- Block time on each route
- Number of aircraft in fleet.

- The scheduler allocates each aircraft to each service taking into account:
- **Turnround time**: the minimum time needed to empty and refill an aircraft when it passes through an airport .
- Where aircraft will be overnight as not all will necessarily be at the hub on every night of the week .
- The time of the day when passengers will want to fly.

- The turnaround time is governed by logistical and aircraft servicing needs.
- Therefore the longer the preceding flight, the more likely it is that the aircraft will need more time to refuel, to clear rubbish from the cabin, to restock the galleys etc.
- With fast turnround bringing substantial benefits when it comes to agreeing airport charges.

- Some of the issues that human interference adjusts for are:
- Early departures and distributing aircraft in ‘departure waves’
- Late arrivals and distributing arrivals in ‘arrivals waves’
- Introducing the chance for aircraft to switch schedules or built-in ‘robustness’
- Ensuring that aircraft at the end of a day are where they start the next day.

EVALUATING SUCCESS

- Having navigated through an airline planning process that has considered route planning, fleet planning, yield management and fleet scheduling
- There should be enough evidence to be able to measure the airline’s likely performance

FINANCIAL VIABILITY

- This can be assessed in the simplest possible way by comparing revenue and expenditure over a given period of time.
- It is comforting if revenue exceeds expenditure
- The difference is profit before tax and any other hidden expenditures are taken into account

- The most common expression of financial performance associated with this viewpoint is the profit/loss statement.
- Most airlines will supply to their economic regulators a monthly profit/loss statement, which may be published several months in arrears and over a 12-month period to present an annual account

They will show for instance

- Seasonal variations, which might be most pronounced on ‘regional’ airlines
- Public/bank holiday variations, which might coincide with religious festivals
- Global influences, a downturn in economic performance, a natural or other disaster and similar events.
- Airlines often sit on large amounts of cash paid by customers in advance of flights

REGULATORY COMPLIANCE

- Safety compliance is largely an airline operation responsibility.
- The airline will have a licence and some of the named staff requirements and operating region limitations
- The named staff will have a responsibility to ensure compliance with crew flight-time limitations (FTLs), mandatory training requirements, an aircraft certificate of airworthiness and maintenance compliance, and other statutory articles

- Regulators also analyse mandatory occurrence reports (MORs) and in some countries they will be given access to databases that are run by organisations that do not have a regulatory mandate
- A good safety regulator will seek to solve issues in this manner rather than wait for serious incidents and then to invoke their most powerful mandate, of revoking the licence of an individual, a group of individuals or an organisation

EFFICIENT USE OF RESOURCES

- Aircraft annual utilisation is one with most airlines nowadays trying to get several thousands of flying hours per year from each of their aircraft.
- An airline will audit the utilisation of such facilities as the maintenance hangars, flighttraining simulators, specialist ramp equipment, and even the baggage bins and galley carts

EFFECTIVE SERVICE

- Effective service is about the attainment of corporate goals that focus on customer satisfaction.
- A passenger will be attracted back to an airline whose service has suited their needs
- Airlines that desire such wide success regularly have three-class cabins to attempt that, but some airlines use just one-seat configuration and tailor demand, capacity, time and price as carefully as possible