PENGENALAN KEPADA KOMPONEN LAPANGAN TERBANG

Ir Lee Sheau Feng
Bhg Pangkalan Udara, CKIP

INTRODUCTION TO AERODROME

AERODROME

According to the International Civil Aviation Organization (ICAO) an aerodrome is

"A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft."

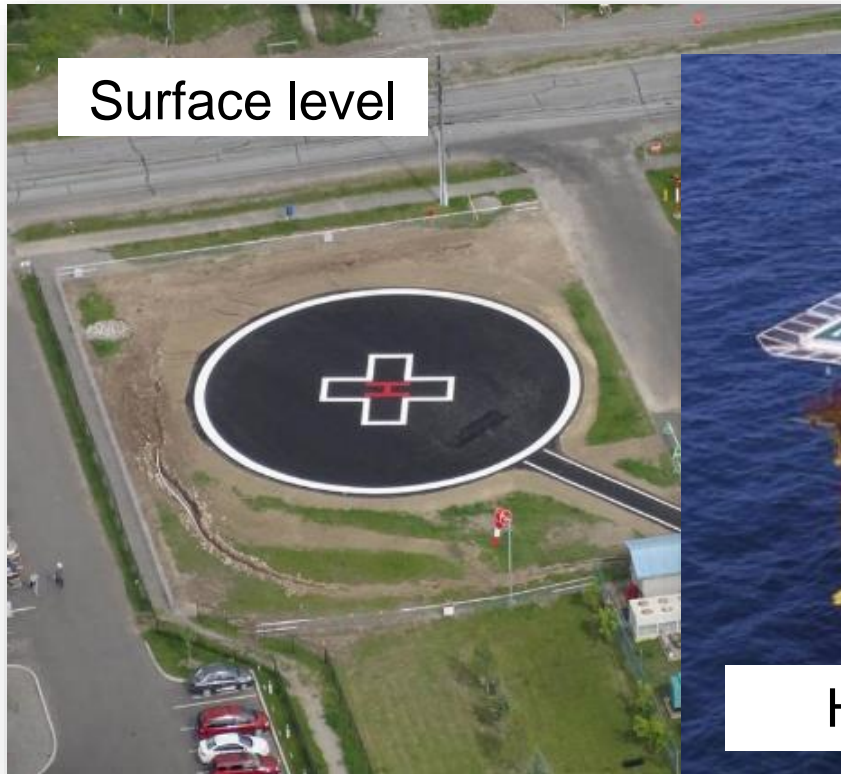# AERODROME

- An aerodrome or airdrome is a location from which aircraft flight operations take place, regardless of whether they involve air cargo, passengers, or neither

- Aerodromes include small general aviation airfields, large commercial airports, and military airbases

- A water aerodrome is an area of open water used regularly by seaplanes or amphibious aircraft for landing and taking off

AIRPORT

- An airport is an aerodrome with facilities for flights to take off and land.

- Have facilities to store and maintain aircraft, and a control tower.

- Consists of a landing area, which comprises an aerially accessible open space including at least one operationally active surface such as a runway for a plane to take off, and often includes adjacent utility buildings such as control towers, hangars and terminals.

- Larger airports may have fixed-base operator services, aprons, taxiways, air traffic control centres, passenger facilities such as restaurants and lounges, and emergency services.

HELIPORT

An airport with a heliport for rotorcraft but no runway is called a heliport.

Surface level

Helideck

Elevated

AIR BASE

- A military air base (air base) is an aerodrome used by a military force for the operation of military aircraft.

- An air base typically has some facilities similar to a civilian airport— for example air traffic control and firefighting.

- Some air bases have revetments, hardened aircraft shelters, or even underground hangars, to protect aircraft from enemy attack.

AIR BASE

- Full military air base
  - Gong Kedak Air Base (Base Su-30MKMs)
  - Butterworth Air Base (Base FA18 Hornets)

- Air base sharing with civilian (ATC by RMAF)
  - Kuantan Airport (Base MiG-29s and Hawks)
  - Labuan Airport

- Civilian airports sharing with air base (ATC by CAAM)
  - Subang Airport
  - Kuching Airport
  - Alor Setar Airport (Air Force Academy)

Military

Military

Butterworth Air Base

Civilian

Military

Subang Airport

STOLport

- A **STOLport** is an airport designed with STOL (Short Take-Off and Landing) operations in mind, usually for an aircraft class of its weight and size

- Only accepted certain types of aircraft, often only smaller propeller aircraft, often with limits on the amount of fuel that can be taken

- According to the International Civil Aviation Organization (ICAO) a STOLport is "Unique airports designed to serve airplanes that have exceptional short-field performance capabilities".

STOLport

Aircraft : DHC 6

Long Akah STOLport

Long Akah STOLport

700m

12

AIR STRIP

An airstrip is a small aerodrome that consists only of a runway with perhaps fueling equipment. They are generally in remote locations.

Pulau Layang-Layang

LIST OF MALAYSIAN CIVILIAN AERODROMES

- Malaysia has
  - six international airports
  - 16 domestic
  - 18 airport aerodrome (*short take off landing ports* -STOLports)

List Of International Airports

Kuala Lumpur International Airport(KLIA)

Langkawi International Airport

Kuching International Airport

Penang International Airport

Kota Kinabalu International Airport

Senai International Airport

List of Airports in Malaysia

City served	State	ICAO	IATA	Airport name
Alor Setar	Kedah	WMKA	AOR	Sultan Abdul Halim Airport[4] / RMAF Alor Setar
Hulu Selangor	Selangor	WMBR		Bernam River Airfield[5]
Butterworth	Penang	WMKB	BWH	RMAF Butterworth[6]
Bayan Lepas	Penang	WMKP	PEN	Penang International Airport[7]
Gong Kedak	Terengganu / Kelantan	WMGK		RMAF Gong Kedak[8]
Ipoh	Perak	WMKI	IPH	Sultan Azlan Shah Airport[9]
Teluk Intan	Perak	WMAJ		Jendarata Airport[1]
Kerteh	Terengganu	WMKE	KTE	Kerteh Airport[1]
Kluang	Johor	WMAP		Kluang Airport[10]
Kota Bharu	Kelantan	WMKC	KBR	Sultan Ismail Petra Airport[11] / RAF Kota Bharu
Kuala Terengganu	Terengganu	WMKN	TGG	Sultan Mahmud Airport[12]
Kuantan	Pahang	WMKD	KUA	Sultan Haji Ahmad Shah Airport[13] / RMAF Kuantan
Langkawi	Kedah	WMKL	LGK	Langkawi International Airport[14]
Batu Berendam	Melaka	WMKM	MKZ	Melaka International Airport[15]
Mersing	Johor	WMAU	MEP	Mersing Airport[1]
Pangkor Island	Perak	WMPA	PKG	Pangkor Airport[1]
Redang Island	Terengganu	WMPR	RDN	Redang Airport[16]
Senai	Johor	WMKJ	JHB	Senai International Airport[17]
Sepang	Selangor	WMKK	KUL	Kuala Lumpur International Airport[18]

List of Airports in Malaysia

City served	State	ICAO	IATA	Airport name
Sitiawan	Perak	WMBA	SWY	Sitiawan Airport[1]
Subang	Selangor	WMSA	SZB	Sultan Abdul Aziz Shah Airport[19] / RMAF Subang
Taiping	Perak	WMBI	TPG	Taiping Airport[1] (Tekah Airport)
Tioman Island	Pahang	WMBT	TOD	Tioman Airport[21]
Ba'kelalan	Sarawak	WBGQ	BKM	Ba'kelalan Airport[1]
Bario	Sarawak	WBGZ	BBN	Bario Airport[1]
Belaga	Sarawak	WBGC	BLG	Belaga Airport[1]
Bintulu	Sarawak	WBGB	BTU	Bintulu Airport[22]
Kapit	Sarawak	WBGP	KPI	Kapit Airport[1]
Keningau	Sabah	WBKG	KGU	Keningau Airport[1]
Kota Kinabalu	Sabah	WBKK	BKI	Kota Kinabalu International Airport[23]
Kuching	Sarawak	WBGG	KCH	Kuching International Airport[24] / RMAF Kuching
Kudat	Sabah	WBKT	KUD	Kudat Airport[1]
Labuan	Labuan Federal Territory	WBKL	LBU	Labuan Airport[25] / RMAF Labuan
Lahad Datu	Sabah	WBKD	LDU	Lahad Datu Airport[26]
Lawas	Sarawak	WBGW	LWY	Lawas Airport[1]
Layang Layang Atoll	Sabah		LAC	Layang Layang Airport
Limbang	Sarawak	WBGJ	LMN	Limbang Airport[27]
Long Akah	Sarawak	WBGL	LKH	Long Akah Airport[1]

List of Airports in Malaysia

City served	State	ICAO	IATA	Airport name
Long Banga	Sarawak	/	LBP	Long Banga Airport[1]
Long Geng	Sarawak	WBGE	/	Long Geng Airport[28]
Long Lellang	Sarawak	WBGF	LGL	Long Lellang Airport[1]
Long Pasia	Sabah	WBKN	GSA	Long Pasia Airport[1]
Long Semado	Sarawak	WBGD	LSM	Long Semado Airport[1]
Long Seridan	Sarawak	WBGI	ODN	Long Seridan Airport[1]
Long Sukang	Sarawak	WBGU	LSU	Long Sukang Airport[29]
Marudi	Sarawak	WBGM	MUR	Marudi Airport[1]
Miri	Sarawak	WBGR	MYY	Miri Airport[30]
Mukah	Sarawak	WBGK	MKM	Mukah Airport[1]
Mulu	Sarawak	WBMU	MZV	Mulu Airport[1]
Pamol	Sabah	WBKP	PAY	Hutan Bakau Pamol Airport
Ranau	Sabah	WBKR	RNU	Ranau Airport
Sahabat	Sabah	WBKH	SXS	Sahabat Airport
Sandakan	Sabah	WBKS	SDK	Sandakan Airport[31]
Sematan	Sarawak	WBGN	BSE	Sematan Airport[32]
Semporna	Sabah	WBKA	SMM	Semporna Airport[1]
Sepulot	Sabah	WBKO	SPE	Sepulot Airport
Sibu	Sarawak	WBGS	SBW	Sibu Airport[33]
Sri Aman	Sarawak	WBGY	SGG	Simanggang Airport

List of Airports in Malaysia

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Marudi	Sarawak	WBGM	MUR	Marudi Airport[1]
Miri	Sarawak	WBGR	MYY	Miri Airport[30]
Mukah	Sarawak	WBGK	MKM	Mukah Airport[1]
Mulu	Sarawak	WBMU	MZV	Mulu Airport[1]
Pamol	Sabah	WBKP	PAY	Hutan Bakau Pamol Airport
Ranau	Sabah	WBKR	RNU	Ranau Airport
Sahabat	Sabah	WBKH	SXS	Sahabat Airport
Sandakan	Sabah	WBKS	SDK	Sandakan Airport[31]
Sematan	Sarawak	WBGN	BSE	Sematan Airport[32]
Semporna	Sabah	WBKA	SMM	Semporna Airport[1]
Sepulot	Sabah	WBKO	SPE	Sepulot Airport
Sibu	Sarawak	WBGS	SBW	Sibu Airport[33]
Sri Aman	Sarawak	WBGY	SGG	Simanggang Airport

AERODROME GOVERNING ORGANIZATION

International Civil Aviation Organization (ICAO)

- A UN specialized agency, established in 1944 to manage the administration and governance of the Convention on International Civil Aviation (Chicago Convention)

- The Convention's 193 Member States and industry groups work to reach consensus on international civil aviation Standards and Recommended Practices (SARPs) and policies in support of a safe, efficient, secure, economically sustainable and environmentally responsible civil aviation sector

- The ICAO codes for airport have 4 characters with the first (USA) or first two (most of the rest of the world) describing the region, and the last two unique to the airport there e.g WMKK, WBGR, WBKK

Convention on International Civil Aviation (Chicago Convention), 7 December 1944

- Established the International Civil Aviation Organization (ICAO),

- Establishes rules of airspace, aircraft registration and safety, security, and sustainability, and details the rights of the signatories in relation to air travel.

- Revised eight times (in 1959, 1963, 1969, 1975, 1980, 1997, 2000 and 2006)

- Supported by 19 Annexes that contain *Standards and Recommended Practices (SARPs)*

- Only applicable to civil aviation

LIST OF ANNEXES

Annex 1	Personnel Licensing
Annex 2	Rules of the Air
Annex 3	Meteorological Service for International Air Navigation
Annex 4	Aeronautical Charts
Annex 5	Units of Measurement to be Used in Air and Ground Operations
Annex 6	Operation of Aircraft
Annex 7	Aircraft Nationality and Registration Marks
Annex 8	Airworthiness of Aircraft
Annex 9	Facilitation
Annex 10	Aeronautical Telecommunications
Annex 11	Air Traffic Services
Annex 12	Search and Rescue
Annex 13	Aircraft Accident and Incident Investigation
Annex 14	Aerodromes
Annex 15	Aeronautical Information Services
Annex 16	Environmental Protection
Annex 17	Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference
Annex 18	The Safe Transport of Dangerous Goods by Air
Annex 19	Safety Management

Convention on International Civil Aviation (Chicago Convention) – Notable articles

- *Article 1*: Every state has complete and exclusive sovereignty over airspace above its territory.

- *Article 3 bis*: Every State must refrain from resorting to the use of weapons against civil aircraft in flight.

- *Article 6*: (Scheduled air services) No scheduled international air service may be operated over or into the territory of a contracting State, except with the special permission or other authorization of that State.

- *Article 10*: (Landing at customs airports): The state can require that landing to be at a designated customs airport and similarly departure from the territory can be required to be from a designated customs airport.

Convention on International Civil Aviation (Chicago Convention)

- *Article 12*: Each state shall keep its own rules of the air as uniform as possible with those established under the convention, the duty to ensure compliance with these rules rests with the contracting state.

- *Article 13*: (Entry and Clearance Regulations) A state's laws and regulations regarding the admission and departure of passengers, crew or cargo from aircraft shall be complied with on arrival, upon departure and whilst within the territory of that state.

- *Article 16*: The authorities of each state shall have the right to search the aircraft of other states on landing or departure, without unreasonable delay.

International Air Transport Association (IATA)

- The International Air Transport Association (IATA) is the trade association for the world's airlines, representing some 265 airlines or 83% of total air traffic

- is a trade association that focusses on making air traffic businesses safe, secure, reliable and efficient

- The IATA codes are 3-letter codes e.g, KUL, MYY, BKI

ICAO vs IATA Coding System

AirAsia.com Boarding Pass

Xin Hao Chee

Flight No.	Depart	
AK 5365	Penang (PEN)	17:10
Gate	Arrive	
	Kuala Lumpur LCCT (KUL)	18:00
Seat No.	Booking No.	Seq No.
15A	L4Z1YF	4

SSR

KLIA LCC Terminal / Domestic travel in Thailand and Indonesia : Guest without check-in luggage, please proceed to your Departure Gate for **travel document check and verification.**
All Other Stations : Guest without check-in luggage, please proceed to the Travel Document Checkcounter before proceeding to your Departure Gate.

AIP MALAYSIA

Flight Date

AD 2-WMKK-1-1
10 NOV 2016

WMKK AD 2.1 AERODROME LOCATION INDICATOR AND NAME

WMKK - KL INTERNATIONAL / SEPANG

WMKK AD 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRATIVE DATA

1	ARP coordinates and site at AD	024436N 1014153E Site: RWY 14R threshold centerline
2	Direction and distance from (city)	Bearing 180°/43KM from Kuala Lumpur.
3	Elevation/Reference temperature	21.15M (70FT) / 32° C
4	Geoid undulation at AD ELEV PSN	-1.548M
5	MAG VAR/Annual change	0° West (2016) / 0.009° decreasing
6	AD operator, address, telephone, telefax, e-mail address, AFS and website address	Operator: Malaysia Airports Berhad Malaysia Airports (Sepang) Sdn. Bhd. KL International Airport 64000 KLIA Selangor Darul Ehsan. TEL:+603 - 87769106 Telefax:+603 - 89265012

AIP KLIA

KEY AIRPORT PLAYERS IN MALAYSIA

MOT

Principal policy maker for aviation industry in Malaysia

G2G negotiations for bilateral rights

MAVCOM

Economic regulator, overseeing commercial and economic matters

Independent adviser to Ministry of Transport on economic matters pertaining to civil aviation

CAAM

Technical regulator, overseeing safety maintenance and security

AIRPORT OPERATORS IN MALAYSIA

STAKEHOLDERS IN MALAYSIA

AERODROME CLASSIFICATION

AERODROME REFERENCE CODE

Table 1-1. Aerodrome reference code
(see 1.6.2 to 1.6.4)

Code element 1	
Code number	Aeroplane reference field length
1	Less than 800 m
2	800 m up to but not including 1 200 m
3	1 200 m up to but not including 1 800 m
4	1 800 m and over

Code element 2	
Code letter	Wingspan
A	Up to but not including 15 m
B	15 m up to but not including 24 m
C	24 m up to but not including 36 m
D	36 m up to but not including 52 m
E	52 m up to but not including 65 m
F	65 m up to but not including 80 m

Note.— Guidance on planning for aeroplanes with wingspans greater than 80 m is given in the Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

AERODROME REFERENCE CODE

- **Aeroplane Reference Field Length**
  - the minimum **field length** required for take-off at maximum certificated take-off mass, at sea level, in International Standard Atmosphere conditions in still air and with zero runway slope as documented in the **Aircraft Flight** Manual (AFM) or equivalent document
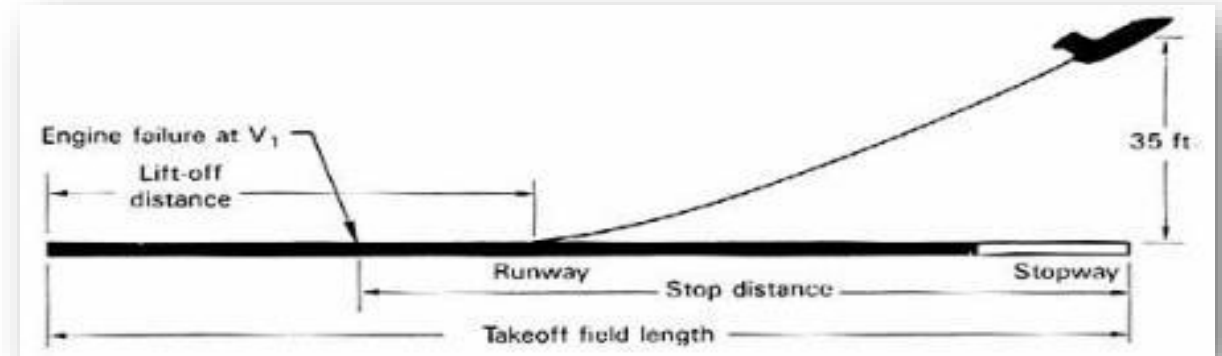
- **Wingspan**

EXAMPLES OF AIRCRAFT WITH AEROPLANE CLASSIFICATION NUMBER AND LETTER

Source : Aerodrome Design Manual Part 1 Runways

Aircraft Make	Model	Code	Aeroplane reference field length (m)	Wing span (m)	Outer main gear wheel span (m)
McDonnell Douglas	DC9-50	4C	2 451	28.5	5.9
	MD81	4C	2 290	32.9	6.2
	MD82	4C	2 280	32.9	6.2
	MD83	4C	2 470	32.9	6.2
	MD87	4C	2 260	32.9	6.2
	MD88	4C	2 470	32.9	6.2
Airbus	A300B4-200	4D	2 727	44.8	11.1
	A300-600R	4D	2 279	44.8	11.1
	A310-300	4D	2 350	43.9	11.0
Boeing	B707-300	4D	3 088	44.4	7.9
	B707-400	4D	3 277	44.4	7.9
	B720	4D	1 981	39.9	7.5
	B757-200	4D	1 980	38.1	8.6

No.	Aircraft type	Code Element 1		Code 2		Aerodr. reference code
		Aeroplane reference field length, m	Code No.	Wing span, m	Code letter	
1.	DHC 6 (Twin Otter MasWing)	695		19.8		
2.	A320-200	2480		33.9		
3.	B737-800	2090		34.3		
4.	B747-400	2890		64.9		

Exercise Aerodrome Reference Code

No.	Aircraft type	Code Element 1		Code 2		Aerodr. reference code
		Aeroplane reference field length, m	Code No.	Wing span, m	Code letter	
2.	Airbus A400M	980		42.4		
3.	Lockheed C130	1093		40.4		
4.	Casa CN 235	745		25.0		

Exercise Aerodrome Reference Code

COMPONENTS OF AN AERODROME

Components Of An Aerodrome

Subang Airport

Terminal

Control Tower

Runway

AFRS (Bomba)

Apron

Connecting Taxiway

Parallel Taxiway

Components Of An Aerodrome

Runway

7 · 8 · 9 10

1 3 4 · 5 6

27
60

2

13

11

12

Taxiway

Hangars

Apron

Aircraft Stands

15

Ramp

14 H

Freight

Maintenance

Parking

Terminal

16

Tower

Fuel Depot

General Aviation Terminal

Parking Deck

17 18

Railway Station

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Asphalt			
Concrete			
Facilities			

1 Runway Lighting   10 Stopway
2 De-Icing-Area   11 Holding Position
3 Pre-Threshold   12 Edge Marking
4 PAPI   13 High-Speed Twy
5 Runway Designator   14 Helicopter Stand
6 Center Line   15 Fire Station
7 Touchdown Zone   16 Airline Service
8 Aiming Point   17 Bus Stop
9 Threshold   18 Taxi Stands

KL INTERNATIONAL AIRPORT

Rwy 1
Twy
Apron
Control Tower
Kuala Lumpur International Airport
Terminal
Kuala Lumpur Int'l Airport
EGR
Hangars
AFRS / Bomba
Twy
Rwy 2
Terminal
Control Tower
Apron
AFRS / Bomba
Twy
Rwy 3

Image © 2016 DigitalGlobe
© 2016 Google
Google Earth

RUNWAY

- According to ICAO, a runway is a "defined rectangular area on a land aerodrome prepared for the landing and takeoff of aircraft

- Runways are named by a number between 01 and 36

- Runway 27 points west (270°) and runway 36 points to the north (360° rather than 0°)
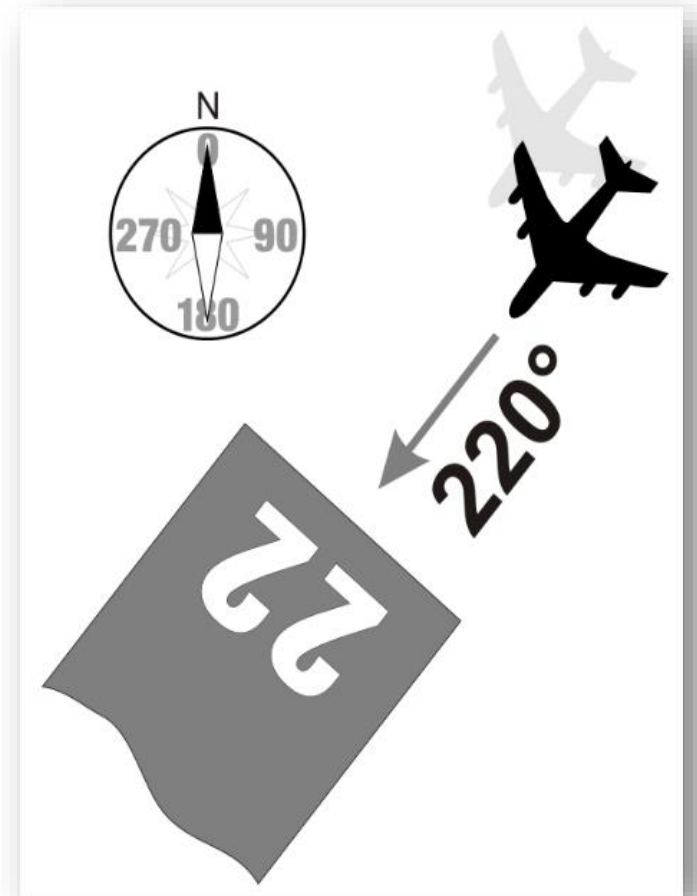
RUNWAY

- A runway can normally be used in both directions, and is named for each direction separately: e.g., "runway 33" in one direction is "runway 15" when used in the other. The two numbers usually differ by 18 (= 180°)

- If there is more than one runway pointing in the same direction (parallel runways), each runway is identified by appending Left (L), Center (C) and Right (R) to the number to identify its position (when facing its direction)

NOMINAL RUNWAY LENGTH

A380	3800 x 60 m (plus shoulder = 75m)	4F
B747	3800 x 45 m	4D
B777 / A330	2745 x 45 m	4E
B737 / A320	2500 x 45 m	4C
Fokker / ATR	1500 x 30 m	3C
Dash 7 and Below	1100 x 30 m	

TYPES OF RUNWAY

- Visual runways
  - Usually do not have markings except threshold and centerline

- Non-precision instrument runways
  - Small to medium size airport
  - Provide horizontal position guidance to planes on instrument approach

- Precision instrument runways
  - Medium to large size airport
  - Provide horizontal and vertical guidance for instrument approaches

RUNWAY MARKINGS

- Runway markings are WHITE
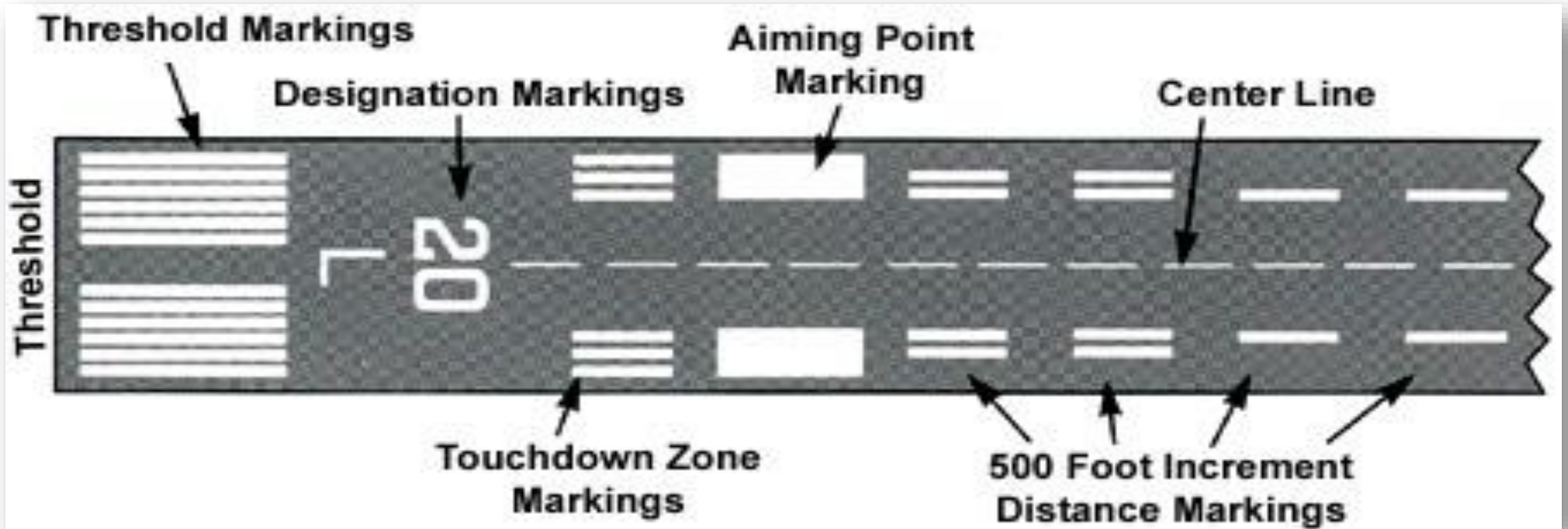
RUNWAY MARKINGS

Blastpad
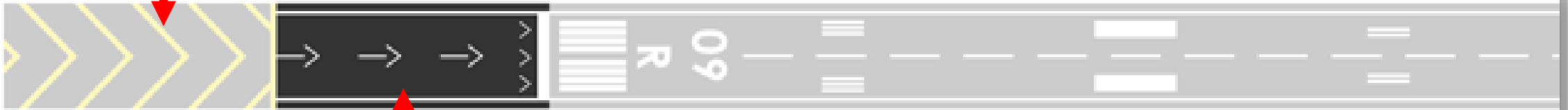
Displaced Threshold

RUNWAY MARKINGS

- Blastpad
  - Often constructed just before the start of a runway where jet blast produced by large planes during the takeoff roll could otherwise erode the ground and eventually damage the runway
  - Not as strong as the main paved surface of the runway and are marked with yellow chevrons.
  - Planes are not allowed to taxi, take off or land on blast pads, except in an emergency.

- Displaced Threshold
  - May be used for taxiing and landing rollout, but not for touchdown
  - Exists because obstacles just before the runway, runway strength, or noise restrictions may make the beginning section of runway unsuitable for landings

TAXIWAY

- A taxiway is a path for aircraft at an airport connecting runways with aprons, hangars, terminals and other facilities. They mostly have a hard surface such as asphalt or concrete, although smaller general aviation airports sometimes use gravel or grass.

- Busy airports typically construct high-speed or rapid-exit taxiways to allow aircraft to leave the runway at higher speeds. This allows the aircraft to vacate the runway quicker, permitting another to land or take off in a shorter interval of time.

TYPES OF TAXIWAY

- Aircraft Stand Taxilane
  - A portion of an apron designated as a taxiway and intended to provide access to aircraft only

- Apron Taxiway
  - A portion of a taxiway system located on an apron and intended to provide a through taxi-route across the apron

- Rapid Exit Taxiway
  - Connected to a runway at an acute angle and designed to allow landing aeroplane turn off at higher speeds

TYPES OF TAXIWAY
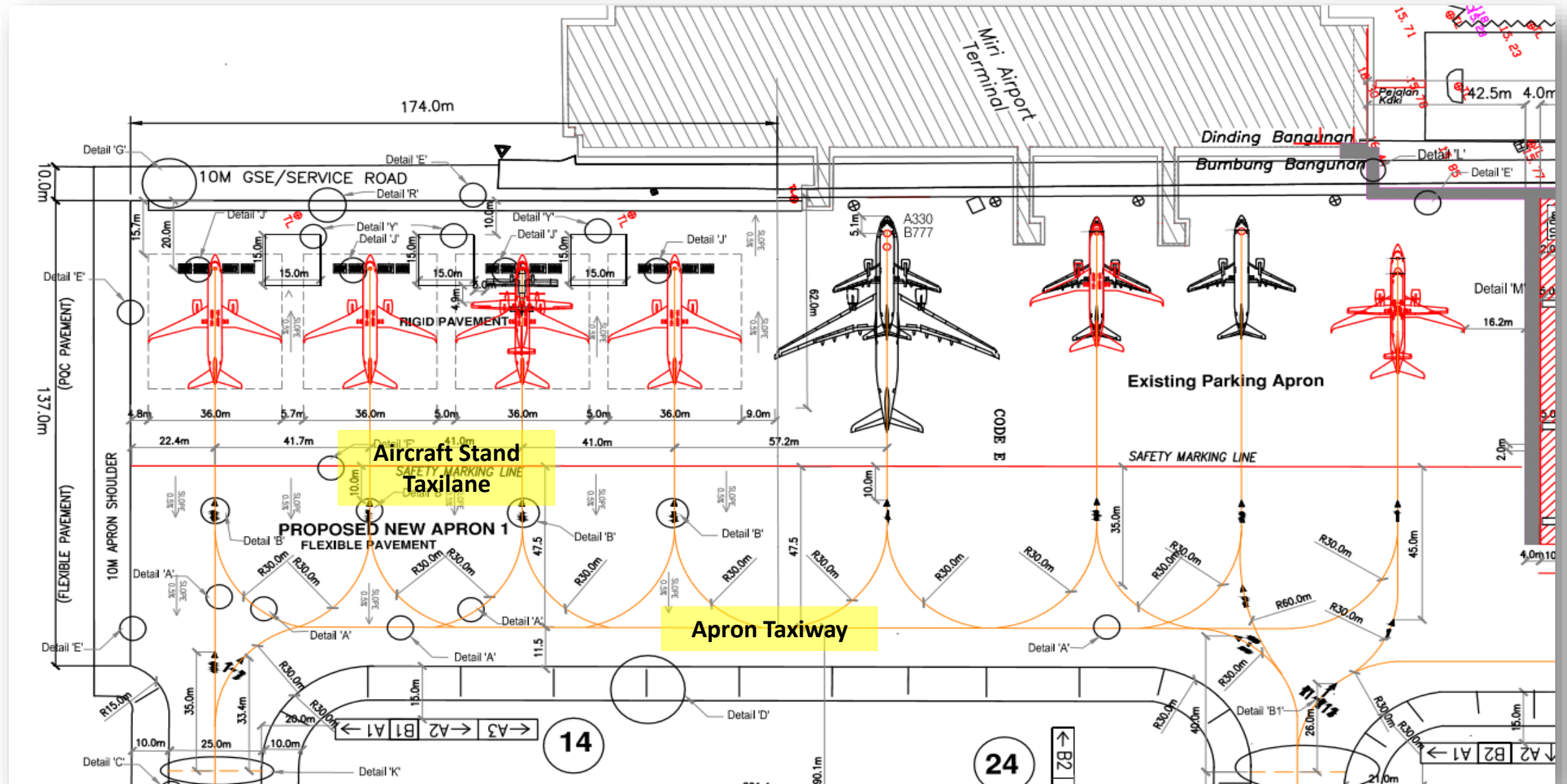
TAXIWAY MARKINGS

- All taxiway lines are YELLOW
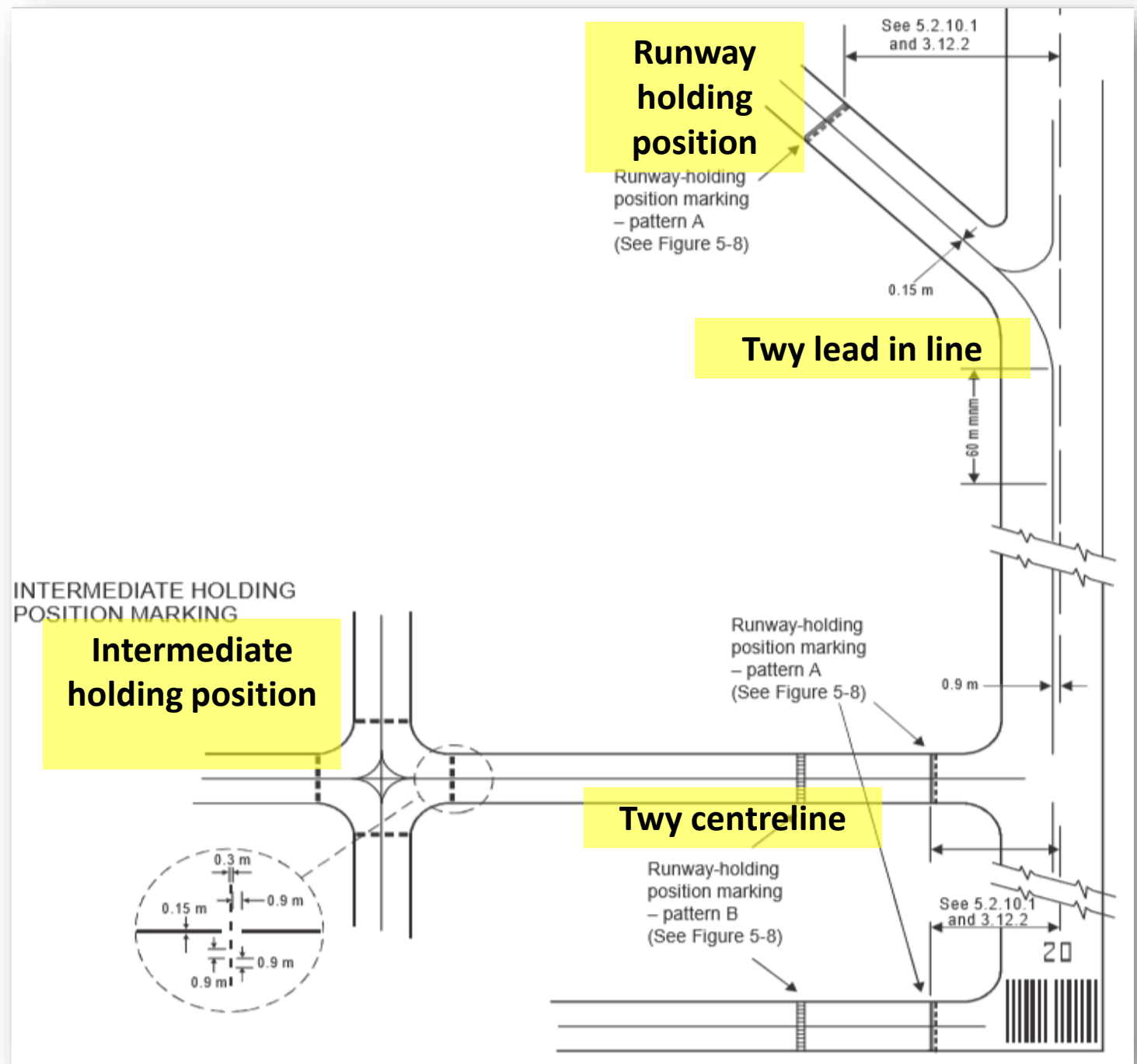
APRON

- The airport apron is the area of an airport where aircraft are parked, unloaded or loaded, refueled, or boarded.

- Although the use of the apron is covered by regulations, it is typically more accessible to users than the runway or taxiway.

- The apron is not usually open to the general public and a license may be required to gain access

APRON MARKINGS

TERMINAL

- An airport terminal is a building at an airport where passengers transfer between ground transportation and the facilities that allow them to board and disembark from aircraft.

- Within the terminal, passengers purchase tickets, transfer their luggage, and go through security.

- The terminals are the 'front door' to the Airport and serve as the public interface between the airside and landside elements.

TERMINAL CONFIGURATIONS

TERMINAL CONFIGURATIONS

SIMPLE

LINEAR — DTW | MUC

CONCOURSES — ATL | DWC | ICN | ORD

STANDARD

PIER — AMS | CTS | LAX

SATELLITE — GVA | CDG | MCO

www.robertaehnelt.de
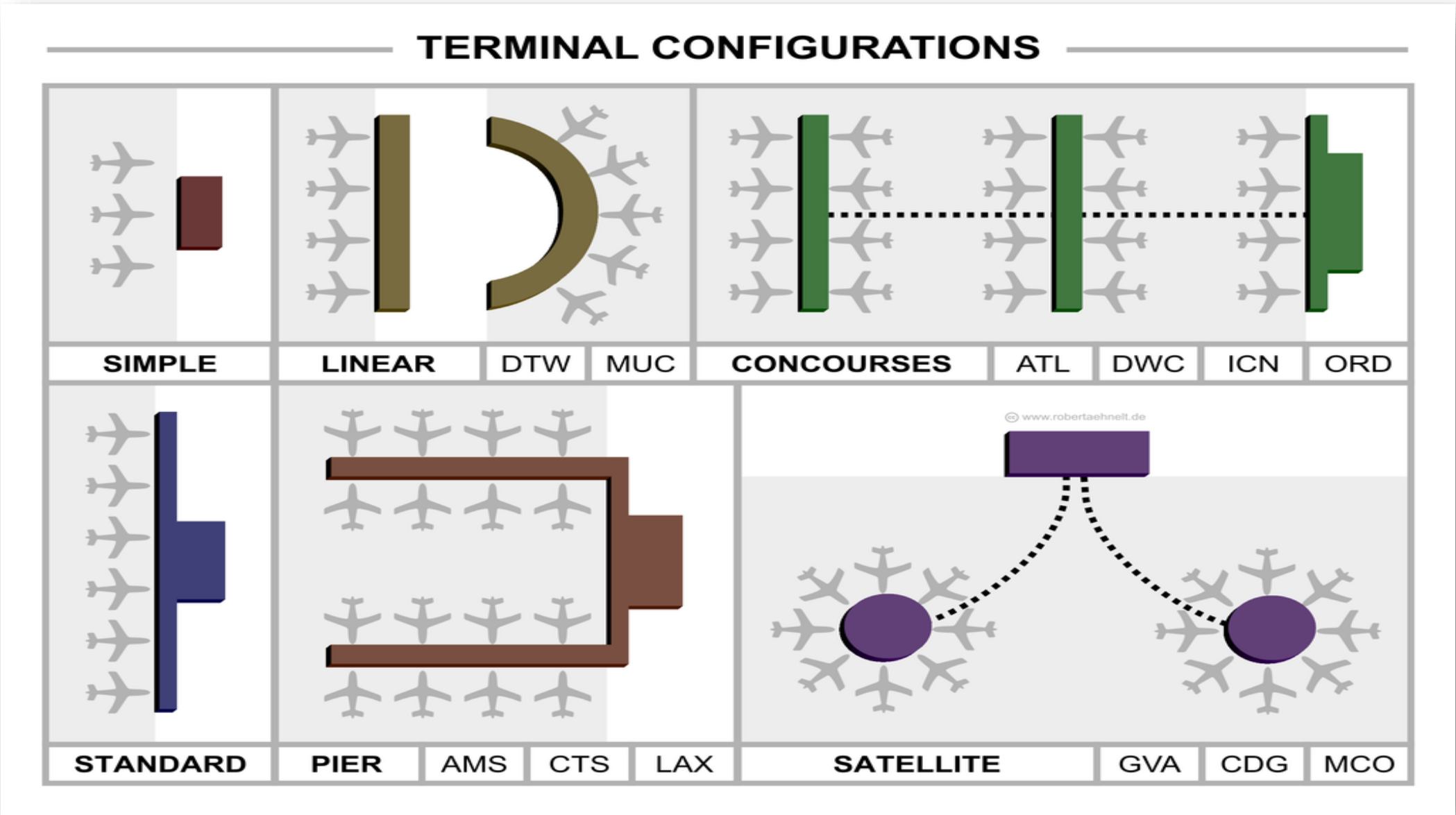
Terminal Type – Linear / Curve Linear

Simplest & Most straight-forward.
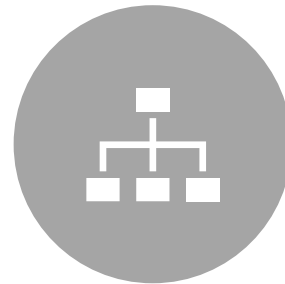
Simple organizational principles.
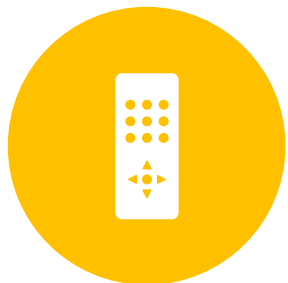
Consists of a single passenger processing area.
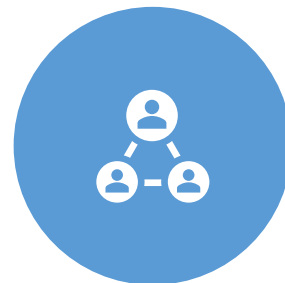
Centralized passenger processing.

Terminal Type – Linear / Curve Linear
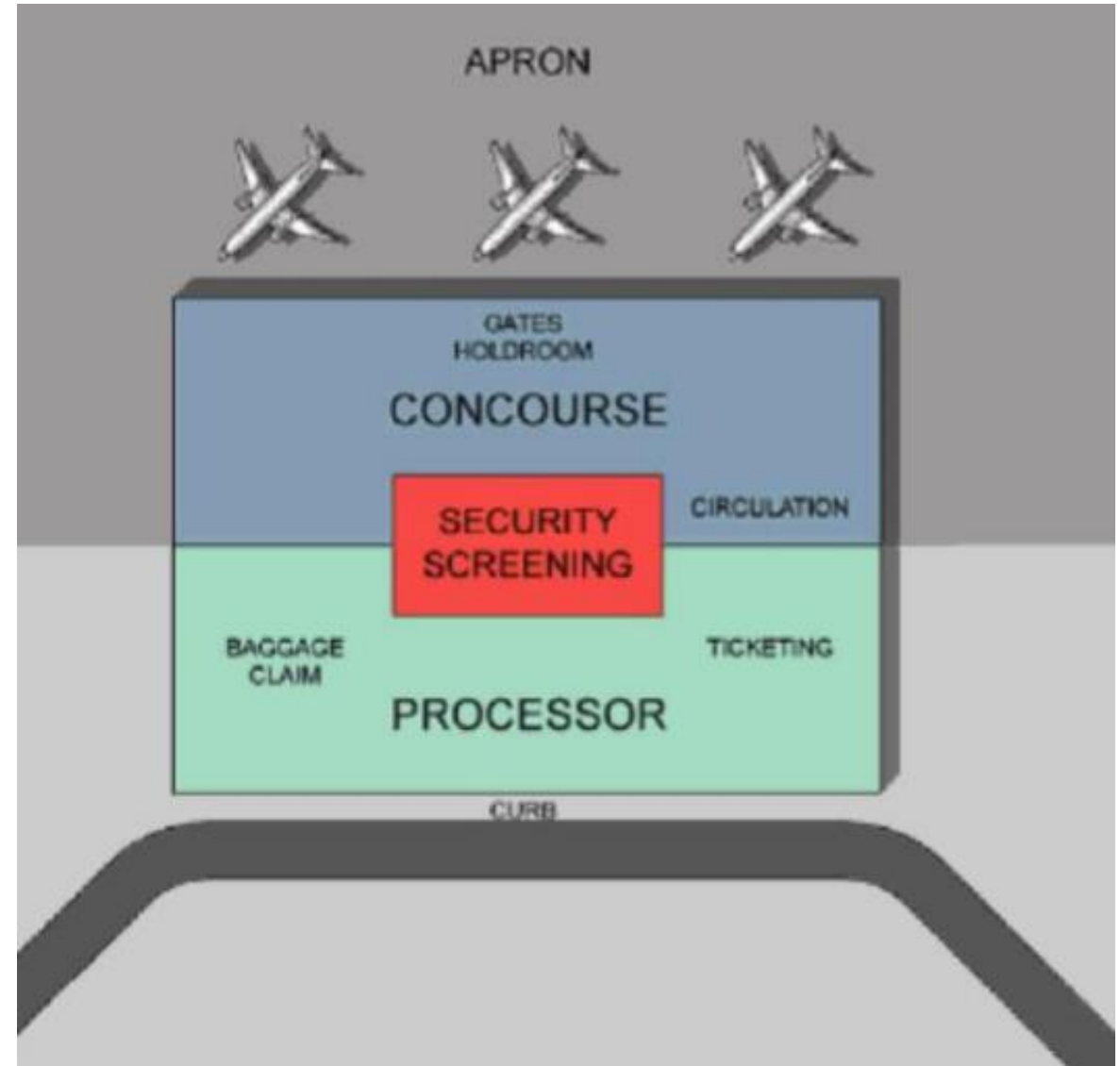
Terminal Type – Linear / Curve Linear

Ankara Esenboga Airport

Terminal Type – Pier / Finger

- Aircraft are parked on both side of a concourse.

- Aircraft usually arranged around the axis of the pier in a perpendicular.

- Passengers are usually processed at the simple terminal location and then routed down a "pier" where aircraft are parked in the "finger" slots or gates for boarding.

- This concept fully separates the passenger processing functions from the concourse activities.

- Compare to linear, this concept type increases passenger walking distances from the processing area.

- Compact arrangements of aircraft along the pier, allow efficient servicing of the aircraft, thus lowering the operating costs for the airlines

Terminal Type – Pier / Finger
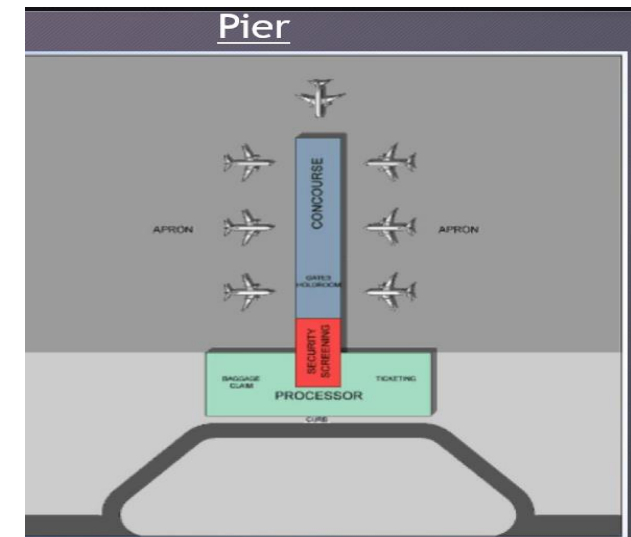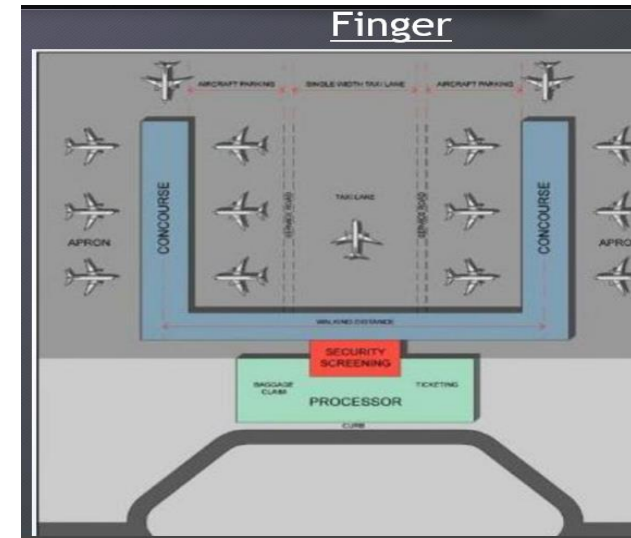
Finger

Pier

Terminal Type – Pier / Finger

Kansai International Airport

Terminal Type – Pier / Finger

KLIA2

Terminal Type – Transporter

Provides a complete separation of passenger facilities from those required to service and maintain the aircraft.

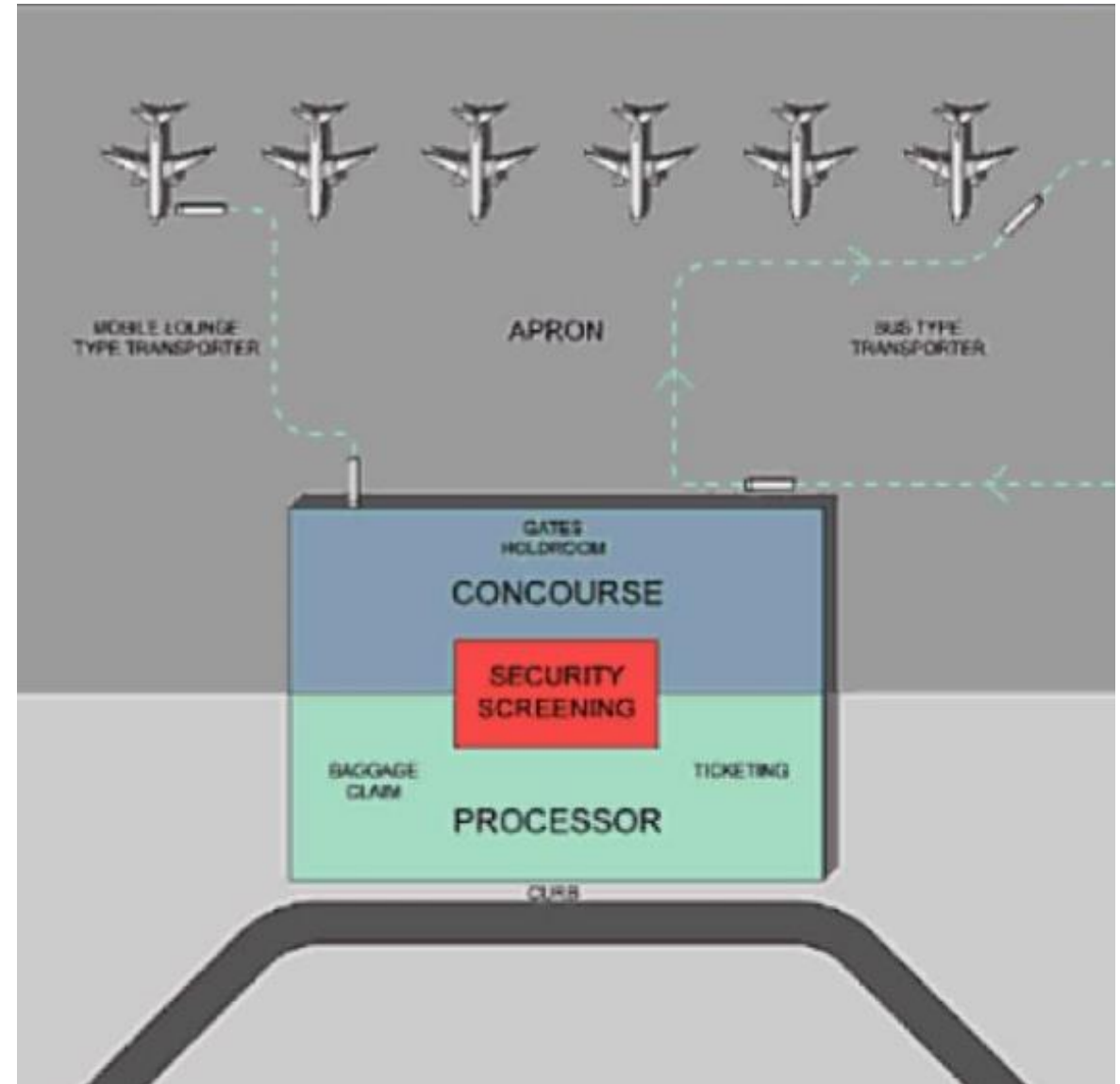Aircraft and aircraft servicing functions are remotely located from the terminal.

Passengers access the aircraft via the mobile lounges that leave from the terminal gates, go directly to the aircraft.

The use of buses that drop off the passengers adjacent to the aircraft on the apron.

Terminal Type – Transporter

Terminal Type – Transporter

Jeddah Airport

Terminal Type – Satellite

It is completely surrounded by aircraft.

Parked in a nose-in arrangement around the satellite.

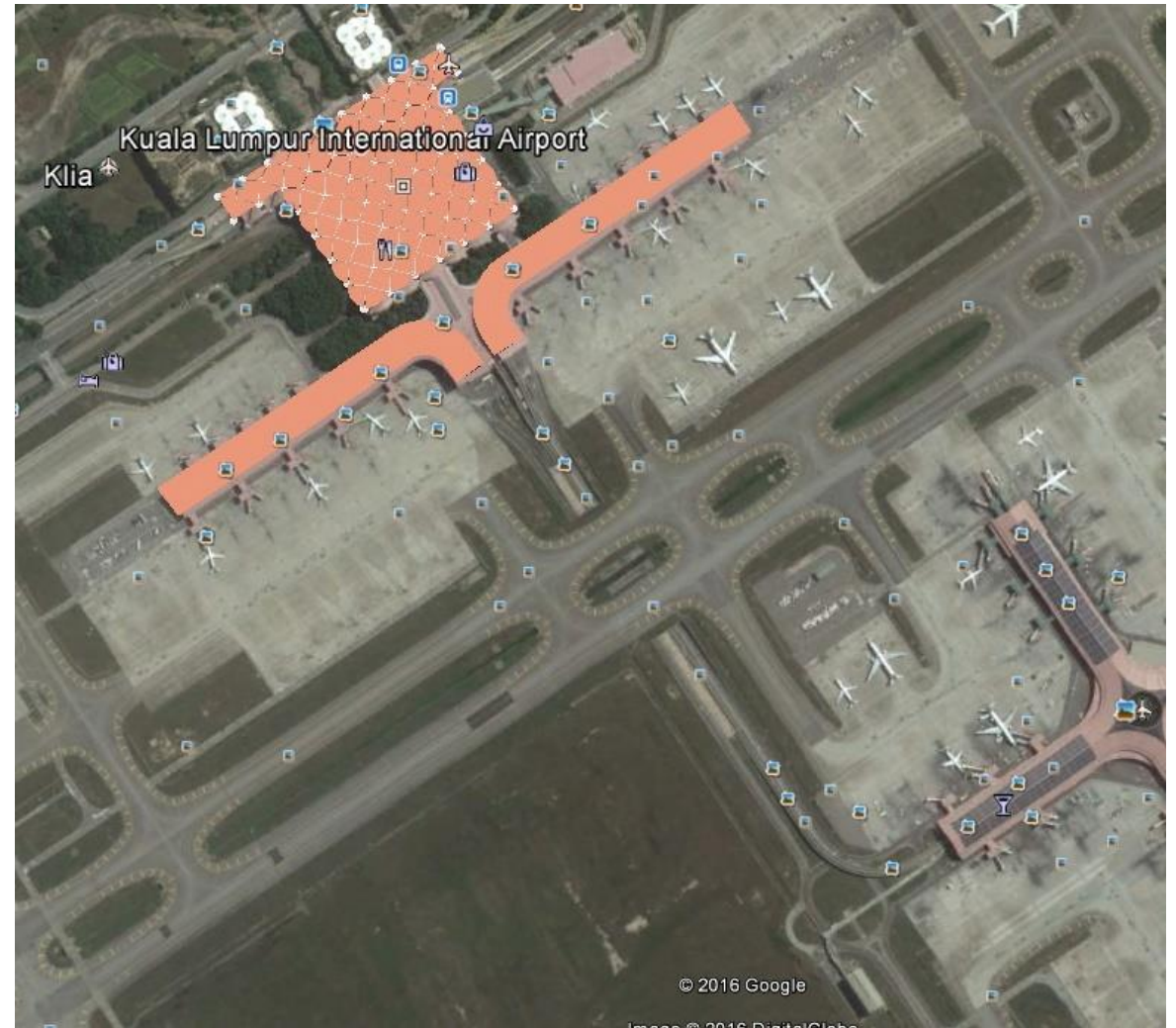Passenger processing is handled in a separate terminal facility.

Works well for heavy-activity airport with large percentage of connecting passengers.

Terminal Type – Satellite
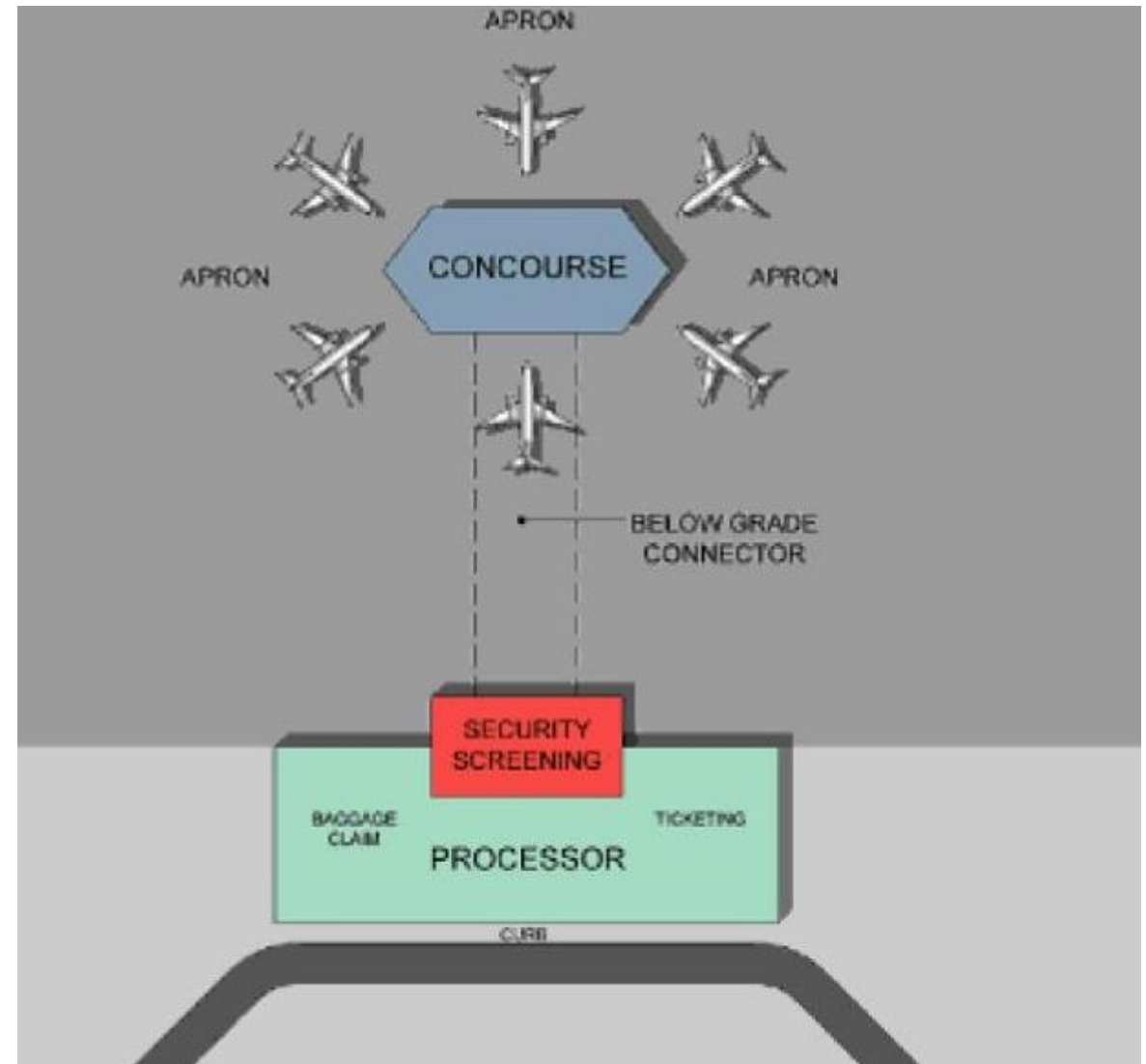
Terminal Type – Satellite

Terminal Types

No.	Terminal Concept	Advantages	Disadvantages
1.	Pier/Finger	• Economical to build • Efficient use of land • Centralized resources, economies of scale (human, facilities, amenities)	• Long walking distances • Limited expansion capability • Reduced aircraft circulation & manoeuvrability
2.	Linear	• Shortest walking distances • Simple construction • Lower baggage systems costs (conveying/sorting) using decentralized system	• Duplication of terminal facilities/amenities • Longer walking distances for transfer pax • Longer minimum connecting time
3.	Satellite	• Centralized resources (human, facilities and amenities) • Facilitates pax management	• Requires high technology, underground transportation system • High capital, maintenance & operating cost • Increases minimum connecting times
4.	Transporter	• Ease of aircraft manoeuvrability • Ease of expansion capability for aircraft stands • Simple and smaller central terminal • Cost savings	• Higher instances of pax delays • High capital, maintenance & operating costs • Increased minimum connecting times

CONTROL TOWER

A tall building at an airport from which the movements of air and airside traffic are controlled.

AIRPORT FIRE AND RESCUE SERVICES (AFRS)

- AFRS is a special category of firefighting that involves the response, hazard mitigation, evacuation and possible rescue of passengers and crew of an aircraft involved in (typically) an airport ground emergency

- The level of protection provided at an aerodrome for rescue and fire fighting shall be appropriate to the aerodrome category determined

AIRPORT FIRE AND RESCUE SERVICES (AFRS)

- All rescue and fire fighting vehicles should normally be housed in a fire station

- Satellite fire stations should be provided whenever the response time cannot be achieved from a single fire station

- The fire station should be located so that the access for rescue and fire fighting vehicles into the runway area is direct and clear, requiring a minimum number of turns

AIRPORT FIRE AND RESCUE SERVICES (AFRS)

• The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding **two minutes** to any point of each operational runway, in optimum visibility and surface conditions.

• The operational objective of the rescue and fire fighting service should be to achieve a response time not exceeding **three minutes** to any other part of the movement area in optimum visibility and surface conditions.

Miri Airport

Senai Airport
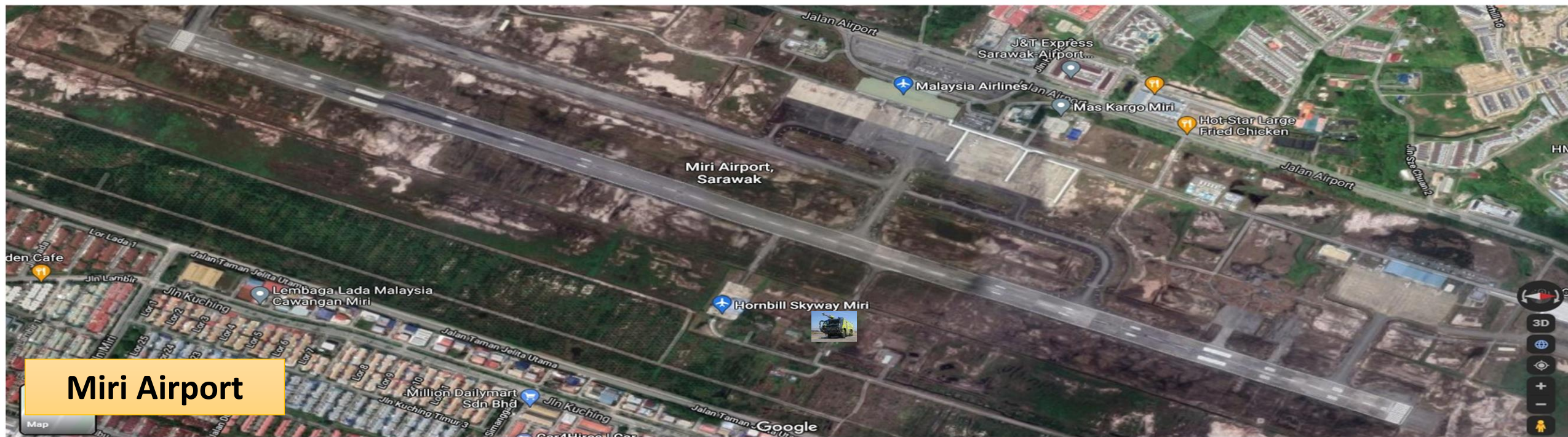
Hangar

- A hangar is a closed building structure to hold aircraft in protective storage

- Most hangars are built of metal, but other materials such as wood and concrete are also used

- Used for protection from the weather, protection from direct sunlight, maintenance, repair, manufacture, assembly and storage of aircraft on airfields

Hangar APMM Subang

125m clear span

120m clear span

Hangar A400M, Subang

Hangar MAS A380, KLIA

230m clear span

Engine Ground Run (EGR)

- Maintenance run-ups typically create a greater noise nuisance than actual takeoffs and are often scheduled at night.

- This can result in noise complaints from the community and creates a serious public relations problem for airport officials

Engine Ground Run (EGR)

- Every GRE project requires a customized approach due to the unique conditions and circumstances that exist at each airport and surrounding community.

- The process begins with a study that addresses site characteristics, meteorological factors, terrain details and aircraft specifications. This information becomes the core of the design and is carefully considered throughout the project

Engine Ground Run (EGR) A400M, Subang

Instrument Landing System (ILS)

- ILS is a radio navigation system that provides short-range guidance to aircraft to allow them to approach a runway at night or in bad weather.

- Guides the pilot during the approach and landing esp when visibility is limited and the pilot cannot see the airport and runway

- Provide an aircraft with a precision final approach

- To help the aircraft to a runway touchdown point

- Provide guidance to the runway both in the horizontal and vertical planes

- Increase safety

Guide Path Antenna

Localizer

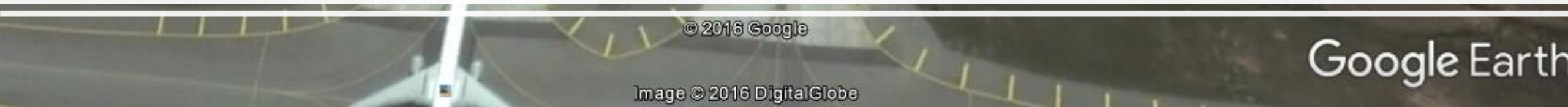# Instrument Landing System (ILS)

Instrument Landing System (ILS) LT Kuching

Localizer

Instrument Landing System (ILS) KLIA Rwy 1

Doppler VHF Omni Directional Range (DVOR)

- The DVOR is a radio navigation aid recommended by the ICAO and introduced internationally for short and medium range aircraft guidance

- Provides bearing information to approaching and en-route aircraft

- DVOR can be combined to form a DVOR/ DME station. Then an aircraft can determine its position by referring to the location of a single DVOR/DME station
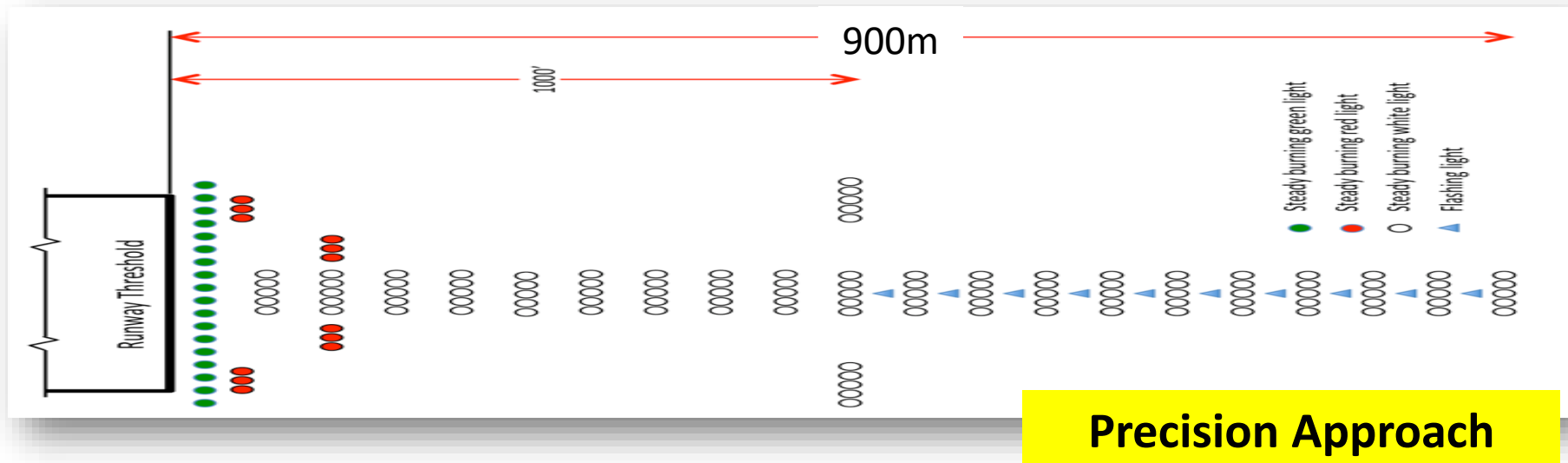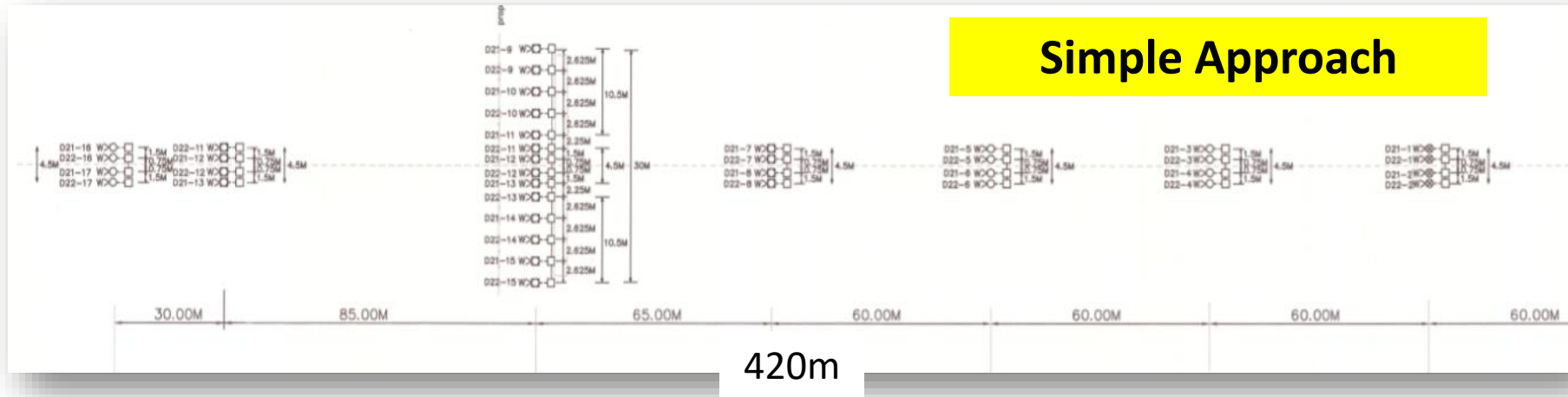
DVOR/DME

DVOR/ DME Station Miri Airport
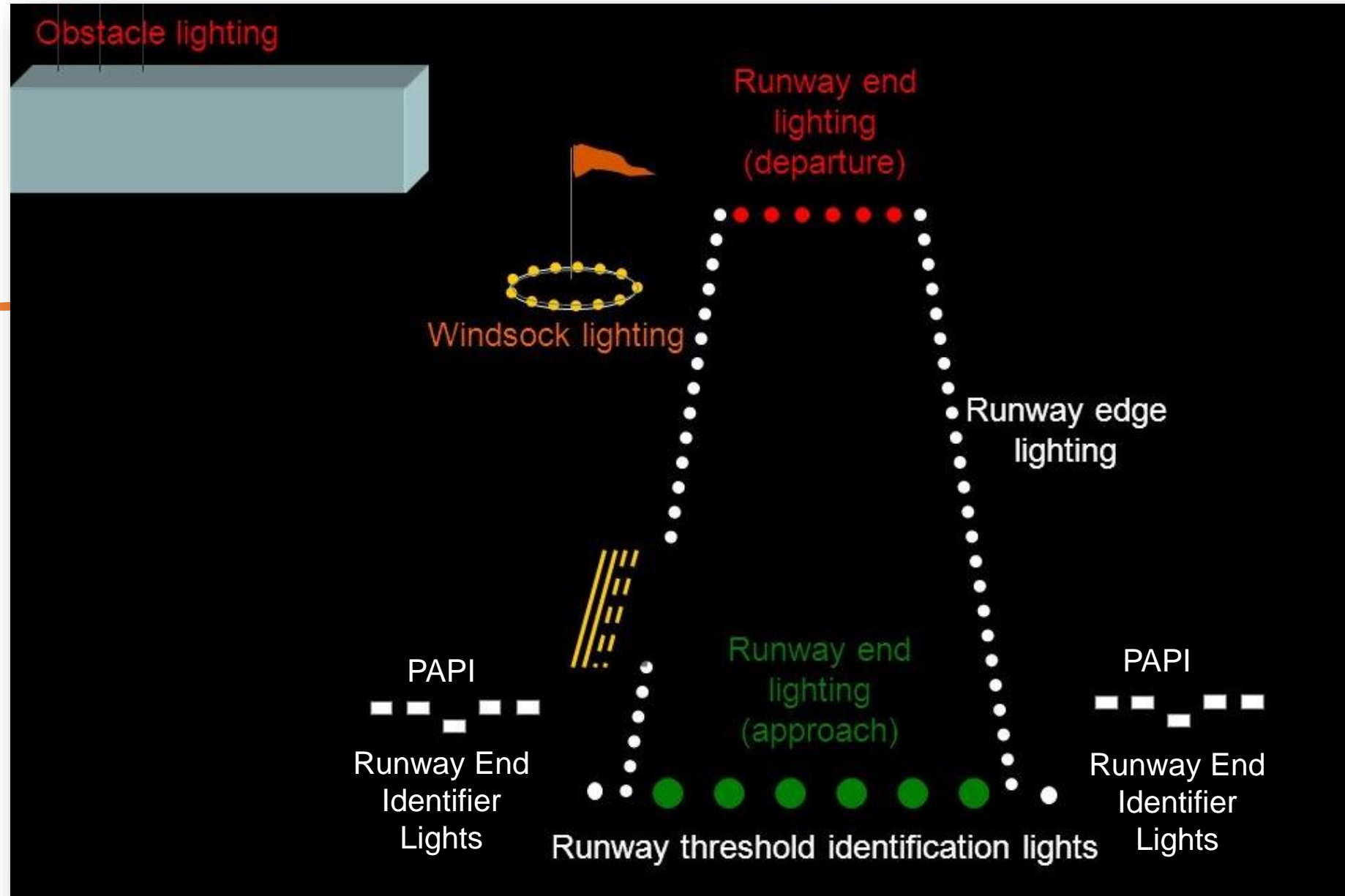
AGL - Runway Approach Lights

Simple Approach

420m

Precision Approach

Runway Threshold

900m

1000'

Steady burning green light
Steady burning red light
Steady burning white light
Flashing light

AGL - Runway Approach Lights

AGL | Runway Approach Lights

AGL - Runway

AGL – Runway

Runway End Identifier Lights (REIL)

- Provide rapid and positive identification of the approach end of a particular runway

- Unidirectional (facing approach direction) or omnidirectional pair of synchronized flashing lights installed at the runway threshold, one on each side.

AGL – Runway

Runway end lights

A pair of four lights on each side of the runway on precision instrument runways, these lights extend along the full width of the runway. These lights show green when viewed by approaching aircraft and red when seen from the runway.

AGL – Runway

Runway edge lights

White elevated lights that run the length of the runway on either side. On precision instrument runways, the edge-lighting becomes amber in the last 610 m of the runway, or last third of the runway, whichever is less.

AGL – Runway

Runway centerline lighting system (RCLS)

- Lights embedded into the surface of the runway at 15 m intervals along the runway centerline on some precision instrument runways.

- White except the last 900 m : alternate white and red for next 600 m and red for last 300 m.
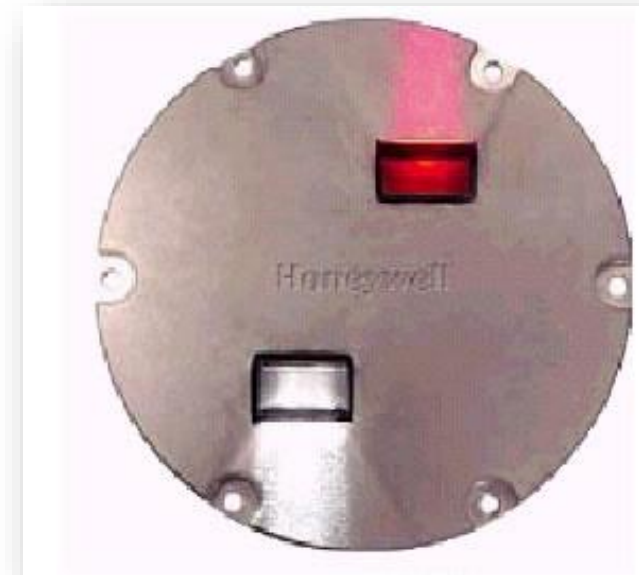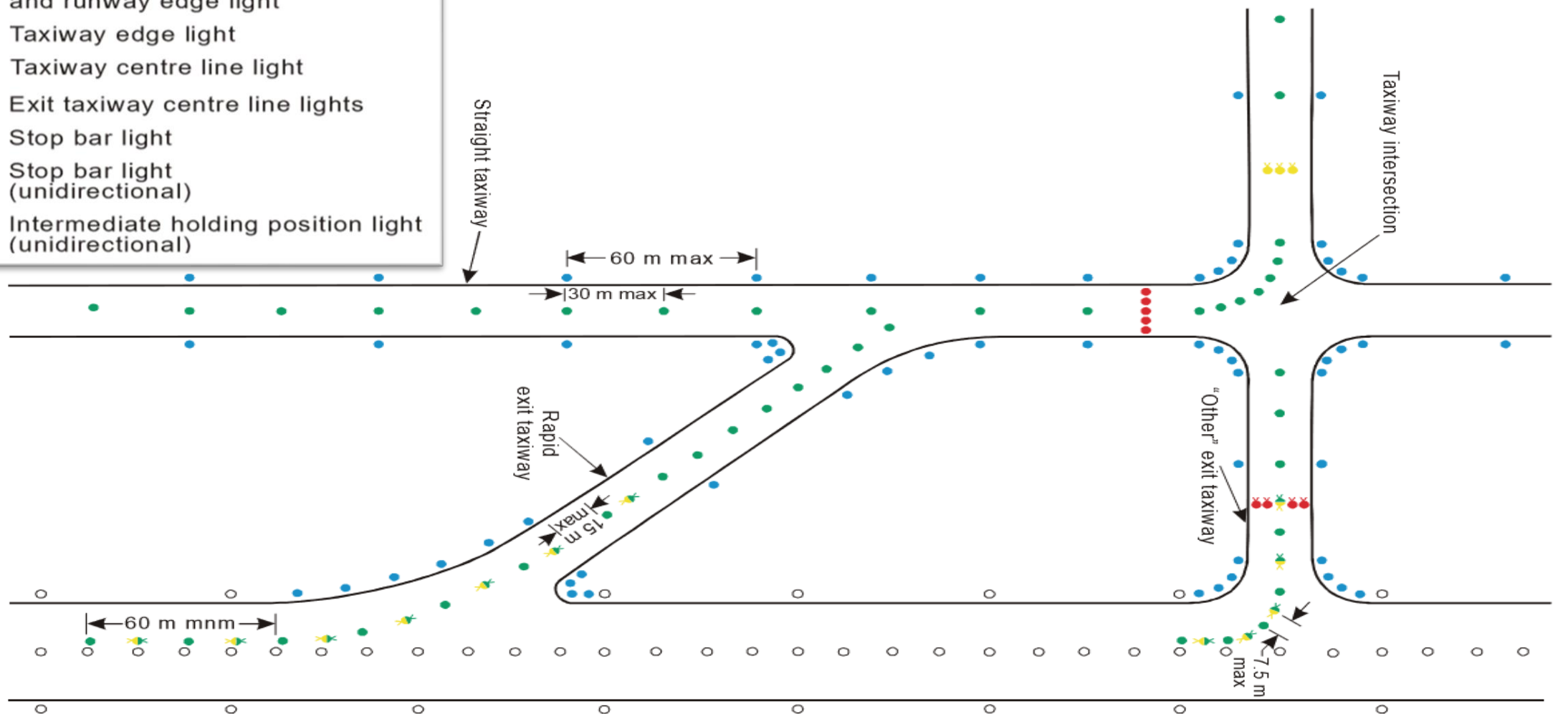
Precision Approach Path Indicator (PAPI)

- A visual aid that provides guidance information to help a pilot acquire and maintain the correct approach (in the vertical plane) to an airport or an aerodrome. It is generally located beside the runway approximately 300 meters beyond the landing threshold of the runway

- The ratio of white to red lights seen is dependent on the angle of approach to the runway. Above the designated glide slope a pilot will observe more white lights than red, at approaches below the ideal angle more red lights than white will be seen. For the optimum approach angle the ratio of white to red lights will remain equal throughout
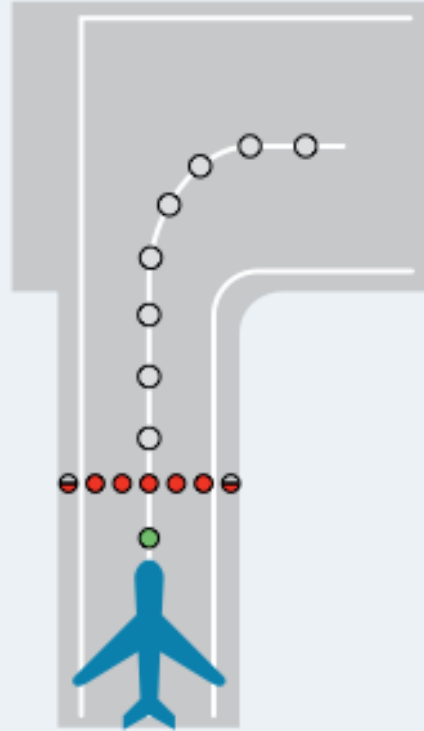
AGL - Taxiway

LEGEND

○ Runway centre line light and runway edge light
● Taxiway edge light
● Taxiway centre line light
✳ Exit taxiway centre line lights
● Stop bar light
● Stop bar light (unidirectional)
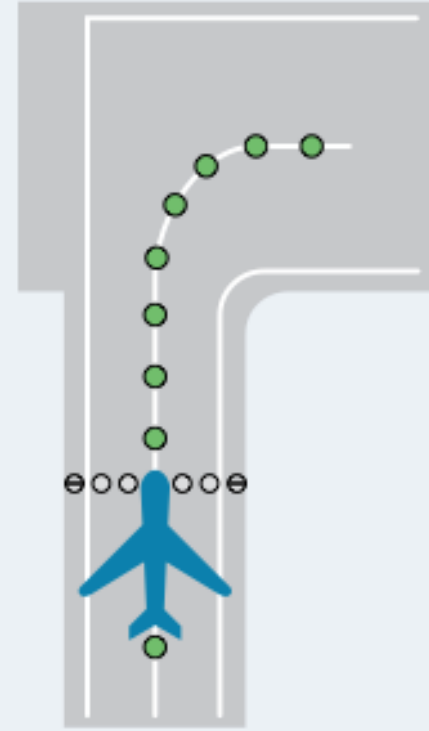✳ Intermediate holding position light (unidirectional)

Straight taxiway

Taxiway intersection

"Other" exit taxiway

Rapid exit taxiway

60 m max
30 m max
15 m max
60 m mnm
7.5 m max

AGL - Taxiway

Simple Sequence in Stop Bar Concept

Stop bar lights on Lead-on lights off	Stop bar lights off Lead-on lights on	Stop bar lights on Lead-on lights off
Aircraft stops and holds	Aircraft proceeds	Next aircraft stops and holds
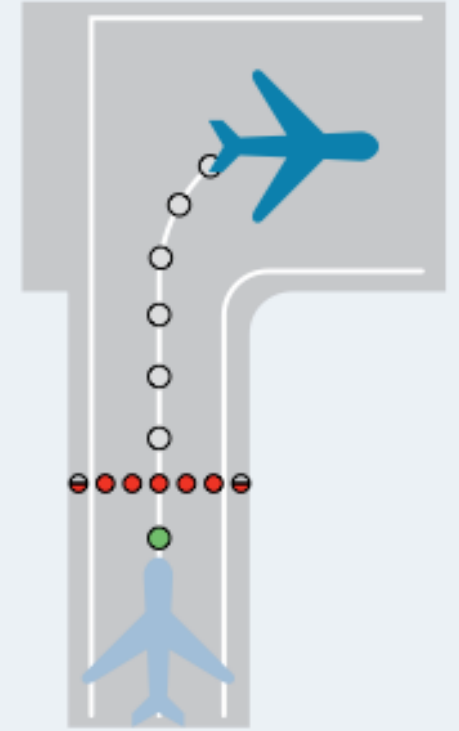
Note: Operated by air traffic control, stop bars are one element of an airport surface movement guidance and control system also used by vehicles.

Source: International Civil Aviation Organization

AGL - Taxiway

- Taxiway centerline lead-off lights

Installed along lead-off markings, alternate green and yellow lights embedded into the runway pavement. It starts with green light at about the runway centerline to the position of first centerline light beyond the Holding Position markings on the taxiway

- Taxiway centerline lead-on lights

Installed the same way as taxiway centerline lead-off Lights, but directing airplane traffic in the opposite direction.

AGL – Taxiway
Taxiway Edge Lights

- Used to outline the edges of taxiways during periods of darkness or restricted visibility conditions.

- These fixtures are elevated and emit blue light

AGL – Taxiway
Taxiway Centreline Lights

They are steady burning and emit green light located along the taxiway centerline

AGL – Taxiway Runway Guard Lights

- Either a pair of elevated flashing yellow lights installed on either side of the taxiway, or a row of in-pavement yellow lights installed across the entire taxiway, at the runway holding position marking at taxiway/runway intersections.

- Warn pilots or vehicles that they are about to enter the runway

AGL – Taxiway Stop Bar Lights

- A row of red, unidirectional, steady-burning in-pavement lights installed across the entire taxiway at the runway holding position, and elevated steady-burning red lights on each side used in low visibility conditions.

- A controlled stop bar is operated in conjunction with the taxiway centerline lead-on lights which extend from the stop bar toward the runway. Following the ATC clearance to proceed, the stop bar is turned off and the lead-on lights are turned on

MANDATORY INSTRUCTION SIGNS

- *Application*

- A mandatory instruction sign shall be provided to identify a location beyond which an aircraft taxiing or vehicle shall not proceed unless authorized by the aerodrome control tower.

- Mandatory instruction signs shall include runway designation signs, category I, II or III holding position signs, runway-holding position signs, road-holding position signs and NO ENTRY signs.

MANDATORY INSTRUCTION SIGNS

Figure 5-32. Examples of sign positions at taxiway/runway intersections
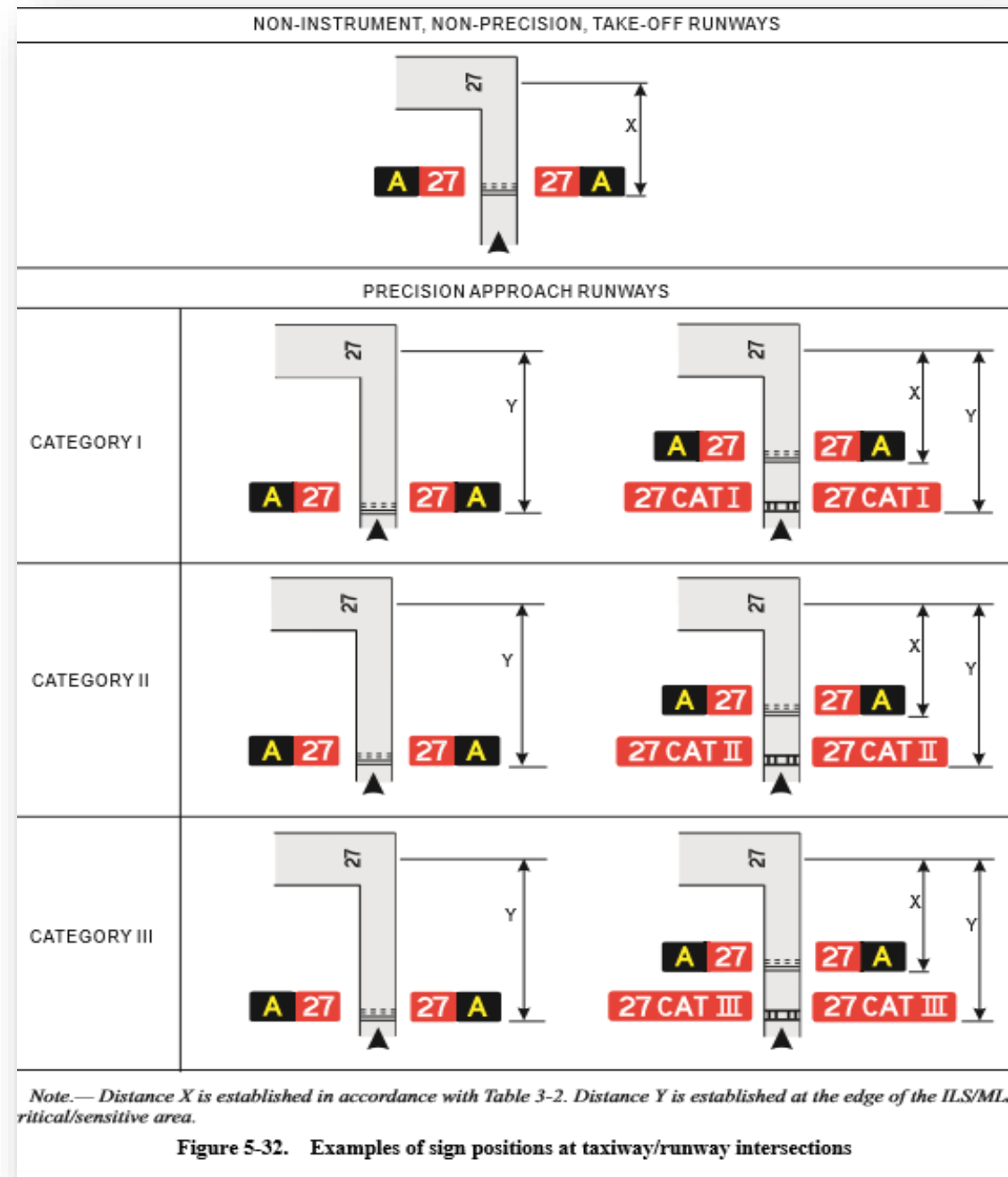
INFORMATION SIGNS

- An information sign other than a location sign shall consist of an inscription in black on a yellow background.

- A location sign shall consist of an inscription in yellow on a black background and where it is a stand-alone sign shall have a yellow border.
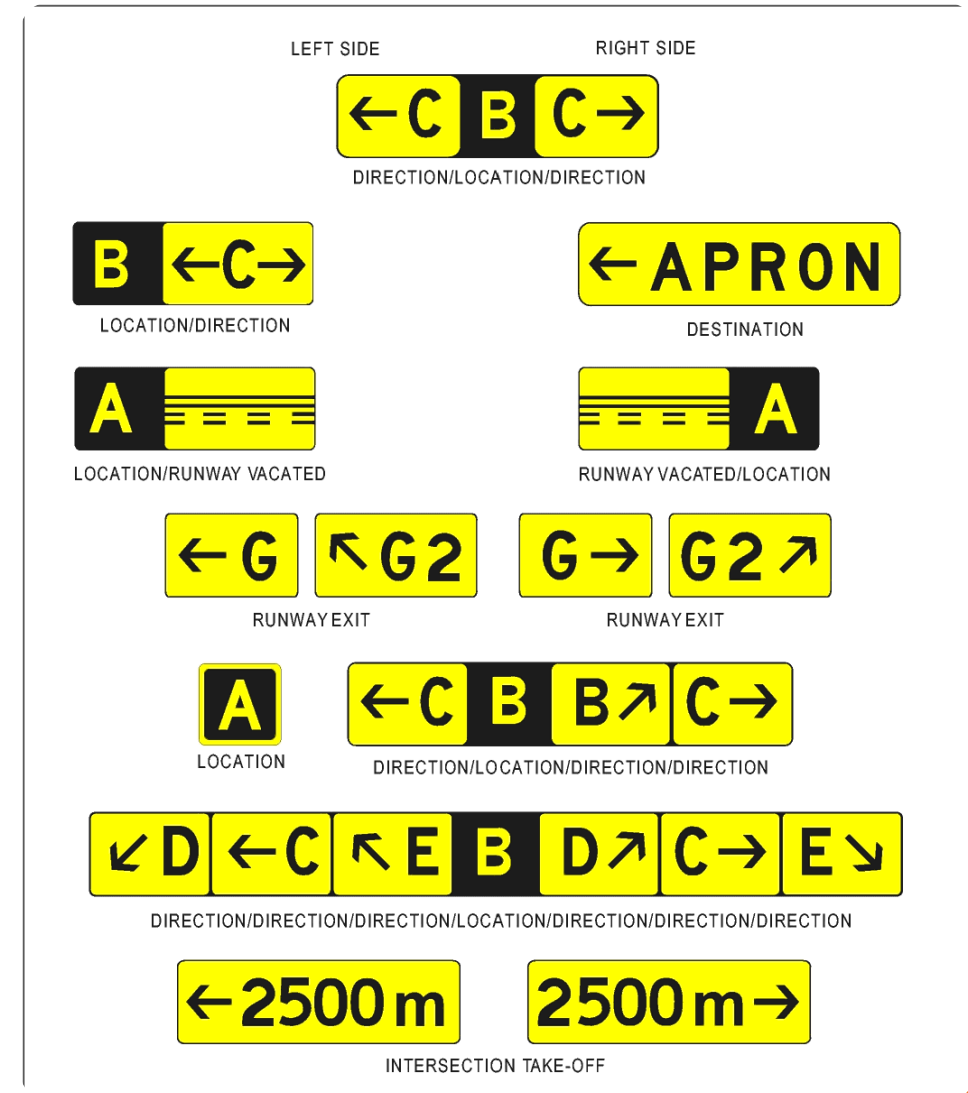
SIGNAGES

WIND DIRECTION INDICATOR

An aerodrome shall be equipped with at least one WDI

At least one WDI to be illuminated

Min 0.9m

Min 3.6m

AERODROME OPERATIONS

LANDSIDE

SECURITY

AIRSIDE

Airside

- Airside is generally the area beyond security and/or passport control. In other words, the area accessible only to airport staff and passengers holding valid boarding cards for imminent travel.

- May also be called the sterile area, as presumably everyone in the area has been security checked, a requirement given everyone has access to flights and aircraft.

- Airside area includes the duty free shops and often the lounges in most airports.

Landside

- The landside area is accessible to the general public, including those not traveling.

- Includes check-in and ticketing desks and is not considered a "secure" area in the same sense as the airside area.
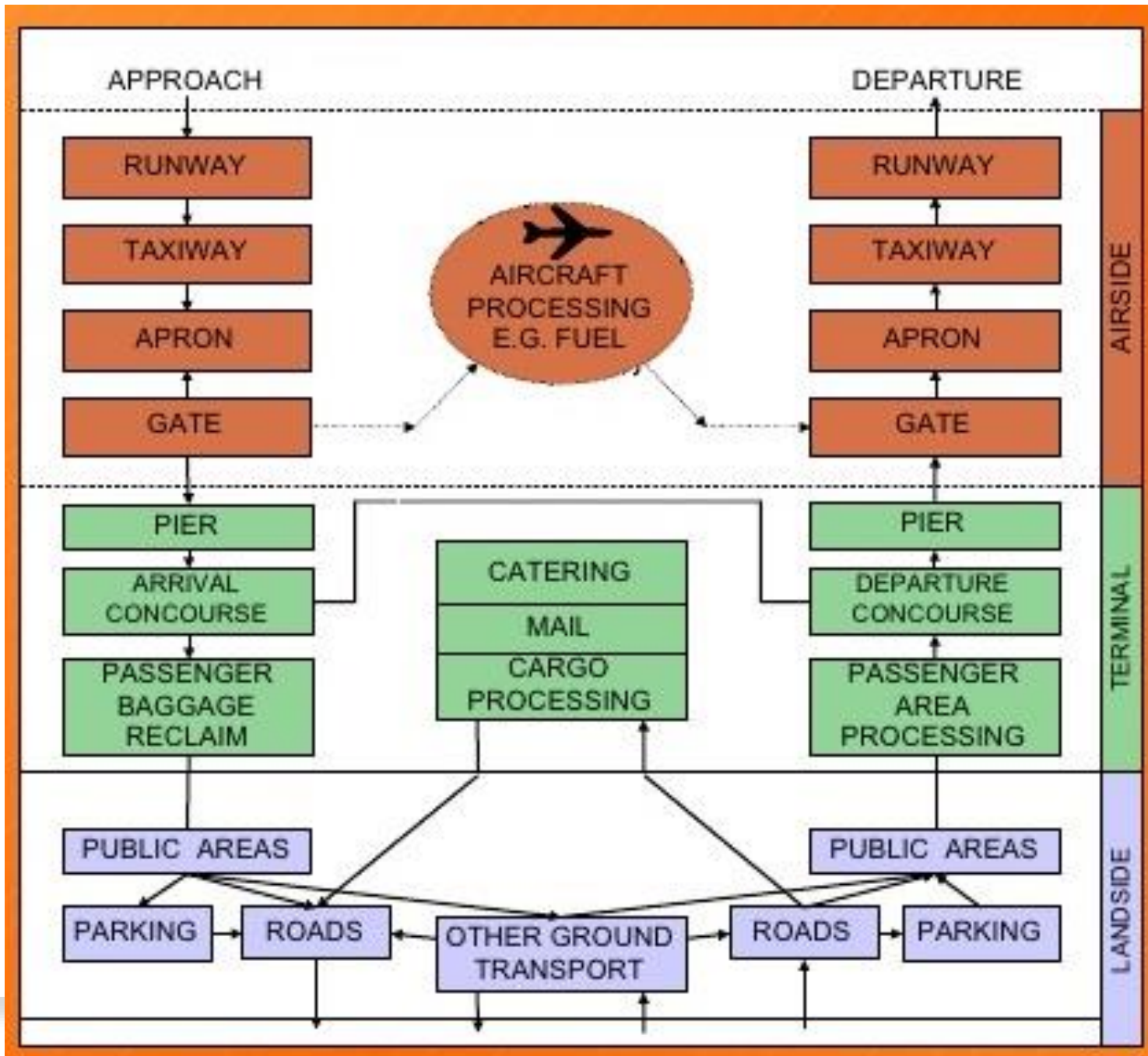
MAHB Airport Operations

Airside Operations Objectives

- Maintain a high level of airfield and apron safety as per ICAO standards

- Establish policies and procedures for safe airfield operations

- Promotion of safety awareness through training, licensing and Safety Campaign

- Enforce ramp safety policies and procedures

- Develop and implement the ground incident and accident reporting and investigation system

Airside Operations Objectives

- Carry out audits of airside operators

- Identify potential incident and accident conditions, evaluate and implement preventive measure

- Dissemination of apron incidents and accidents information

- Coordinating airside operations during emergencies

Airside Operations Key Activities

- Inspecting movement area

- Issuance of airside permit (Driving, vehicle permit etc.)

- Ground incidents and accidents investigation

- Safety escort or follow-me service

- Enforcement checks

- Work in progress coordination (WIP)

- Initiation of NOTAM

- Coordinations with airlines, government agencies etc.

- Wildlife hazard study

Inspecting Movement Area

- Foreign Object Damage (FOD)
  - Any object that is found in the maneuvering area that can endanger aircraft (Metal, paper, plastic sheets, boxes, parts, tools etc)
  - Engine ingestion on aircraft
  - Velocity impact of debris launched by jet blast into other aircraft, personnel and buildings
  - Can contribute to in-flight
  - engine failures

Inspecting Movement Area

- FOD prevention in KLIA
  - Apron sweeping program
  - Routing airfield inspection
  - Pavement inspection prior to each aircraft arrival/ departure
  - Training
  - Maintenance activities
  - Communication / coordination

Issuance of Airside Permits

Civil Aviation Act 1969

Ground Incidents/ Accidents Investigation

- 80% of ground accident in KLIA involves collision between vehicles/ equipment or facilities

- Apron accidents involving aircraft are caused by equipment used for passenger handling, aircraft loading and servicing

Safety Escort

- Provide safety escort for VVIP movements – vehicles on the aircraft maneuvering area

- Provide Follow-Me service to foreign aircraft

Enforcement Check

- Errant drivers or apron users for contravening the Civil Aviation Act
- Vehicles conditions and validity of the vehicle & driving permits
- Vandalism

Construction Safety

- Requirements for safety plan
- Define safety standard and safety specifications
- Follow-up on safety procedures
- Monitor day-to day practices
- Discuss specific concern with operator
- Safe movement of individual & vehicles
- Minimum disruption of activity

Construction Safety

- NOTAM initiation
- Restriction of aircraft/ vehicle activity
- Threshold displacement
- Temporary lighting/ marking
- Revise vehicle control procedures
- Equipment and material storage

Construction Safety

- Hazardous conditions
  - Excavation near runways, taxiways, apron
  - Construction material, earth mounds or stockpiles
  - Temporary structures
  - Obstacles in operational areas or approach zones

Construction Safety Examples

Wildlife Hazard Study
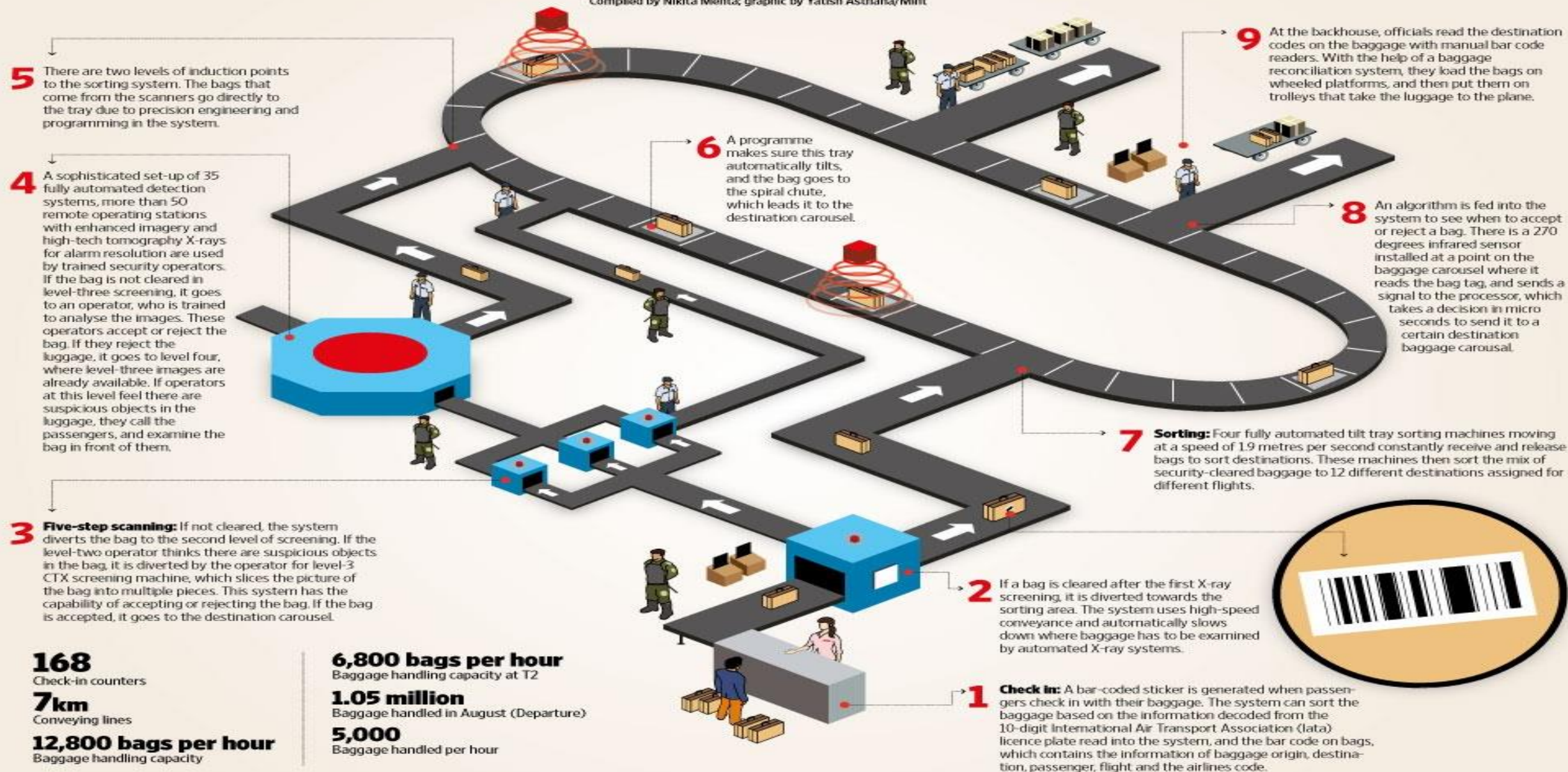
- Bird study
- Other Animal

HOW THE **BAGGAGE HANDLING** SYSTEM WORKS

Since starting commercial operations in 2010, the international terminal at Delhi airport has handled more than 89 million bags with only a 0.3% chance of a bag being lost in the system. What is the science behind these efficiency levels? Mint takes a look at how the baggage handling system (BHS), or the so-called mangle of steel at the Indira Gandhi International Airport Terminal 3, functions.

Compiled by Nikita Mehta; graphic by Yatish Asthana/Mint

5 There are two levels of induction points to the sorting system. The bags that come from the scanners go directly to the tray due to precision engineering and programming in the system.

9 At the backhouse, officials read the destination codes on the baggage with manual bar code readers. With the help of a baggage reconciliation system, they load the bags on wheeled platforms, and then put them on trolleys that take the luggage to the plane.

6 A programme makes sure this tray automatically tilts, and the bag goes to the spiral chute, which leads it to the destination carousel.

4 A sophisticated set-up of 35 fully automated detection systems, more than 50 remote operating stations with enhanced imagery and high-tech tomography X-rays for alarm resolution are used by trained security operators. If the bag is not cleared in level-three screening, it goes to an operator, who is trained to analyse the images. These operators accept or reject the bag. If they reject the luggage, it goes to level four, where level-three images are already available. If operators at this level feel there are suspicious objects in the luggage, they call the passengers, and examine the bag in front of them.

8 An algorithm is fed into the system to see when to accept or reject a bag. There is a 270 degrees infrared sensor installed at a point on the baggage carousel where it reads the bag tag, and sends a signal to the processor, which takes a decision in micro seconds to send it to a certain destination baggage carousal.

7 **Sorting:** Four fully automated tilt tray sorting machines moving at a speed of 1.9 metres per second constantly receive and release bags to sort destinations. These machines then sort the mix of security-cleared baggage to 12 different destinations assigned for different flights.

3 **Five-step scanning:** If not cleared, the system diverts the bag to the second level of screening. If the level-two operator thinks there are suspicious objects in the bag, it is diverted by the operator for level-3 CTX screening machine, which slices the picture of the bag into multiple pieces. This system has the capability of accepting or rejecting the bag. If the bag is accepted, it goes to the destination carousel.

2 If a bag is cleared after the first X-ray screening, it is diverted towards the sorting area. The system uses high-speed conveyance and automatically slows down where baggage has to be examined by automated X-ray systems.

1 **Check in:** A bar-coded sticker is generated when passengers check in with their baggage. The system can sort the baggage based on the information decoded from the 10-digit International Air Transport Association (Iata) licence plate read into the system, and the bar code on bags, which contains the information of baggage origin, destination, passenger, flight and the airlines code.

168 Check-in counters

7km Conveying lines

12,800 bags per hour Baggage handling capacity

6,800 bags per hour Baggage handling capacity at T2

1.05 million Baggage handled in August (Departure)

5,000 Baggage handled per hour

Source: Delhi International Airport (P) Ltd

AERODROME DATA
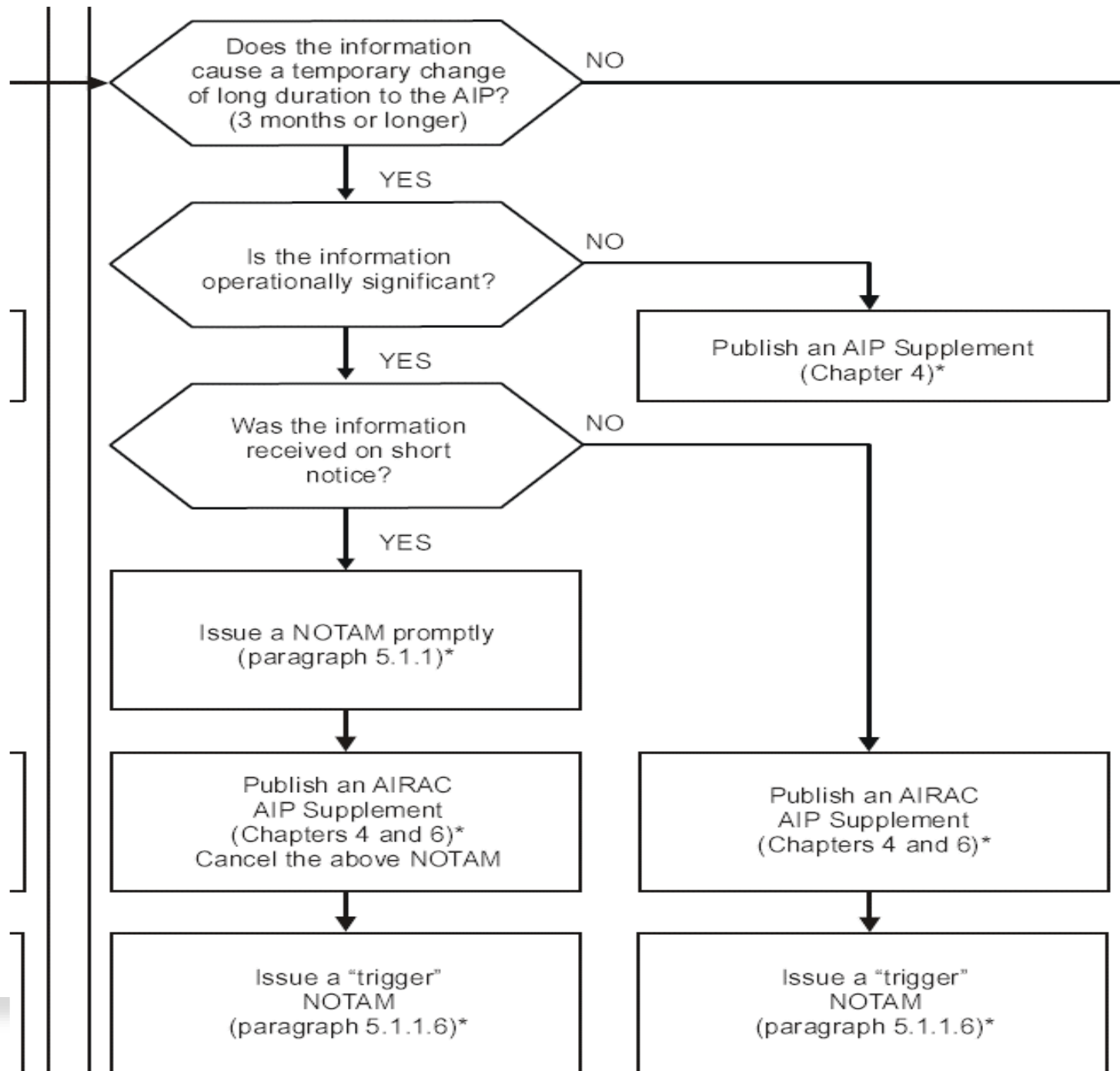
PERMANENT CHANGES e.g. apron expansion

LONG DURATION e.g. construction period

SHORT DURATION e.g. twy closure due to HDD works

PUBLICATION OF AIP SUPPLEMENT AND AIP AMENDMENTS

PUBLICATION OF AIP SUPPLEMENTS AND AIP AMENDMENTS TO AIP MALAYSIA FOR YEAR 2021

e pre-determined dates of the "Regulated System" for publication of aeronaut
plicable for 2021 are hereby notified for the information and guidance of all con

ch publication shall be issued by AIP Supplement and identified by the acronyr

Cycle Number	Latest Date For Information To Reach AIS	Publication Date Of AIP Supplement	Effective Da Of Implementati
12/20	10. 09.2020	24. 09.2020	05.11.2020
13/20	08. 10.2020	22. 10.2020	03.12.2020
14/20	05. 11. 2020	19. 11. 2020	31. 12. 2020
1/21	03. 12. 2020	17. 12. 2020	28. 01. 202
2/21	31. 12. 2020	14. 01. 2021	25. 02. 202
3/21	28. 01. 2021	11. 02. 2021	25. 03. 202
4/21	25. 02. 2021	11. 03. 2021	22. 04. 202
5/21	25. 03. 2021	08. 04. 2021	20. 05. 202
6/21	22. 04. 2021	06. 05. 2021	17. 06. 202
7/21	20. 05. 2021	03. 06. 2021	15. 07. 202
8/21	17. 06. 2021	01. 07. 2021	12. 08. 202
9/21	15. 07. 2021	29. 07. 2021	09. 09. 202
10/21	12. 08. 2021	26. 08. 2021	07. 10. 202
11/21	09. 09. 2021	23. 09. 2021	04. 11. 202
12/21	07. 10. 2021	21. 10. 2021	02. 12. 202

PUBLICATION OF AMENDMENTS TO AERONAUTICAL INFORMATION PUI MALAYSIA

The proposed amendment programme to the above publication for the year is hereby
information and guidance of all concerned.

Amendment Number	Latest Date For Information To Reach AIS	Publication Date
4/2020	27. 08. 2020	05. 11. 2020
1/2021	14. 01. 2021	25. 03. 2021
2/2021	11. 03. 2021	20. 05. 2021
3/2021	03. 06. 2021	12. 08. 2021
4/2021	26. 08. 2021	04. 11. 2021

This AIC cancels AIC 04/2019 dated 02 October 2019.

- END -

Lat	Lon
60°20,141'N	27°35,485'E
60°24,069'N	26°57,141'E
60°23,816'N	27°39,434'E
60°23,043'N	27°27,252'E
60°29,537'N	27°03,062'E
60°23,053'N	27°16,577'E
60°10,751'N	27°05,432'E
60°23,08'N	27°17,66'E
60°22,61'N	26°38,95'E
60°24,61'N	26°21,94'E

Common Reference System

Horizontal reference system:

- World Geodetic System - 1984 (WGS-84) shall be used as the horizontal (geodetic) reference system.

Vertical reference system

- Mean sea level (MSL) datum shall be used as the vertical reference system.
- e.g. Malaysia mean sea level is 3.624m above zero tide gauge

Temporal reference system

- The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system.
- UTC is 8 hours slower than Malaysian Time.

Left screen

eAIP Malaysia
See cover page for details.

History   EN
PDF

AMDT | SUPS | AICs | Notam Summary

Effective 25 MAR 2021
PART 1 - GENERAL (GEN)
GEN 0
GEN 1 NATIONAL REGULATIONS AND REQUIREMENTS
GEN 2 TABLES AND CODES
GEN 3 SERVICES
GEN 4 CHARGES FOR AERODROMES/HELIPORTS AND A
PART 2 - EN-ROUTE (ENR)
ENR 0
ENR 1 GENERAL RULES AND PROCEDURES
ENR 2 AIR TRAFFIC SERVICES AIRSPACE
ENR 3 ATS ROUTES
ENR 4 RADIO NAVIGATION AIDS/SYSTEMS
ENR 5 NAVIGATION WARNINGS
ENR 6 EN-ROUTE CHARTS
PART 3 - AERODROMES (AD)
AD 0
AD 1 AERODROMES - INTRODUCTION
AD 2 AERODROMES
AD 4 O

eAIP
MALAYSIA
Consult Notam for Latest Information
CIVIL AVIATION

CAAM

Information on this eAIP

Effective date: 25 MAR 2021
Publication date: 25 MAR 2021

Description

This eAIS package contains:

AIP AMDT 01/2021 (Complete AIP in PDF) (Size 210.1 MB)
AIP AMDT 01/2021 (Complete Amendment in PDF)

- New Circular 04/2020
- New Circular 01/2021
- New Supplement 15/2020
- New Supplement 18/2020
- New Supplement 19/2020
- New Supplement 01/2021
- New Supplement 02/2021
- New Supplement 03/2021
- New Supplement 04/2021
- New Supplement 05/2021
- New Supplement 06/2021
- New Supplement 07/2021
- New Supplement 08/2021
- New Supplement 09/2021
- New Supplement 10/2021
- New Supplement 11/2021
- New Supplement 12/2021
- New Supplement 13/2021
- New Supplement 14/2021
- New Supplement 15/2021
- New Supplement 16/2021

Right screen

CAAM   See cover page for details.

History   EN
PDF

AIP | AMDT | SUPs | AICs | NOTAM Summary

Effective 25 MAR 2021

- **PART 1 - GENERAL (GEN)**
+ GEN 0
+ GEN 1 NATIONAL REGULATIONS AND REQUIREMENTS
+ GEN 2 TABLES AND CODES
+ GEN 3 SERVICES
+ GEN 4 CHARGES FOR AERODROMES/HELIPORTS AND A
- **PART 2 - EN-ROUTE (ENR)**
+ ENR 0
+ ENR 1 GENERAL RULES AND PROCEDURES
+ ENR 2 AIR TRAFFIC SERVICES AIRSPACE
+ ENR 3 ATS ROUTES
+ ENR 4 RADIO NAVIGATION AIDS/SYSTEMS
+ ENR 5 NAVIGATION WARNINGS
  ENR 6 EN-ROUTE CHARTS
- **PART 3 - AERODROMES (AD)**
+ AD 0
+ AD 1 AERODROMES - INTRODUCTION
+ AD 2 AERODROMES
+ AD 4 OTHER AERODROMES

Info

Left screen (navigation menu):

+ ENR 4 RADIO NAVIGATION AIDS/SYSTEMS
+ ENR 5 NAVIGATION WARNINGS
ENR 6 EN-ROUTE CHARTS
- PART 3 - AERODROMES (AD)
+ AD 0
+ AD 1 AERODROMES - INTRODUCTION
- AD 2 AERODROMES
+ WMKA ALOR SETAR/SULTAN ABDUL HALIM
+ WMKB BUTTERWORTH
+ WMKC KOTA BHARU/SULTAN ISMAIL PETRA
+ WMKD KUANTAN AIRPORT
+ WMKE KERTEH
+ WMKI IPOH/IPOH SULTAN AZLAN SHAH
+ WMKJ JOHOR BAHRU/SENAI INTERNATIONAL
+ WMKK KL INTERNATIONAL / SEPANG
+ WMKL LANGKAWI INTERNATIONAL
+ WMKM MALACCA
+ WMKN KUALA TERENGGANU/SULTA
+ WMKP PENANG INTERNATIONAL A
+ WMSA SUBANG/SULTAN ABDUL AZ
+ WMBT PULAU TIOMAN
+ WMAP KLUANG
+ WMGK GONG KEDAK
+ WMPR PULAU REDANG
+ WMPA PULAU PANGKOR
+ WBGB BINTULU
+ WBGG KUCHING INTERNATIONAL
+ WBGR MIRI
+ WBGS SIBU
+ WBGJ LIMBANG
+ WBKD LAHAD DATU
+ WBKK KOTA KINABALU INTERNATIONAL
+ WBKL LABUAN

Right screen (aip.caam.gov.my/aip/eA):

WMKL — LANGKAWI INTERNATIONAL

WMKL AD 2.1 AERODROME LOCATION INDICATOR AND NAME

WMKL — LANGKAWI INTERNATIONAL

WMKL

AD 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRA

1	ARP coordinates and site at AD	062022N 0994401E Site: Between TWY B and TWY C (Approx. 153 M from RWY Centreline)
2	Direction and distance from city	Dist 13.5 KM, brg 284° from Dataran Lang,Kuah
3	Elevation/Reference temperature	5 M (16.26FT) / 31.89°C
4	Geoid undulation (ARP)	-15.957 M at AD ELEV PSN
5	MAG VAR/Annual change	0.28° W (2019) / 0°1'0" E decreasing
6	AD Administration, address, telephone, telefax, telex, AFS	Operator: Post: Malaysia Airport Sdn Bhd (MASB) Langkawi International Airport 07100 Padang Matsirat Langkawi Kedah Darul Aman Malaysia Tel: +604 - 9551311 Fax: +604 - 9551314 ATC Services: Post: Civil Aviation Authority Of Malaysia Langkawi International Airport 07100 Padang Matsirat Langkawi Kedah Darul Aman Malaysia. Tel: +604 - 9552191 Fax: +604 - 9552195 (Office) +604 - 9552193 (Tower) AFS: WMKLZTZX
7	Types of traffic permitted (IFR/VFR)	IFR / VFR
8	Remarks	NIL

WMKL AD 2.3 OPERATIONAL HOURS

1	AD Operator	22:00 - 15:00 UTC Daily
2	Customs and immigration	21:00 - 15:00 and on request
3	Health and sanitation	0000 - 0800
4	AIS Briefing Office	22:00 - 15:00
5	ATS Reporting Office (ARO)	
6	MET Briefing Office	H24
7	ATS	22:00 - 15:00
8	Fuelling	PETRONAS: 2200 - 1400 daily. Avbl on req after 1400 (Contact +60 4955 2001)

eAIP Malaysia
See cover page for details.

History 🇬🇧 EN

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| AIP | AMDT | SUPs | AIC | | |

Effective 021

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+ WMKE KERTEH
+ WMKI IPOH/IPOH SULTAN AZLAN SHAH
+ WMKJ JOHOR BAHRU/SENAI INTERNATIONAL
+ WMKK KL INTERNATIONAL / SEPANG
+ WMKL LANGKAWI INTERNATIONAL
+ WMKM MALACCA
+ WMKN KUALA TERENGGANU/SULTAN MAHMUD
+ WMKP PENANG INTERNATIONAL AIRPORT
+ WMSA SUBANG/SULTAN ABDUL AZIZ SHAH
+ WMBT PULAU TIOMAN

WBG

AD 2.2

1	ARP coord
2	Direction a
3	Elevation/
4	Geoid und
5	MAG VAR/
6	AD operato telefax, e-r website ac

QUESTIONS?