



International Workshop On The Assessment of Socio-economic Benefits of Meteorological and Hydrological Services



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*Socio-economic Benefits of Malaysian
Meteorological Services in Aviation*

Nanjing, China
21-29 November 2009

Country Description

Malaysia

- Location:
Between latitude 2° & 7° N off Equator
Malaysia consists of 13 states
- Population
25.27 million
- Total Land Mass
329,750 square km



COUNTRY DESCRIPTION



Culture

- Malaysia consists of multi racial society with majority of them are Malays, Chinese & Indians
- and also other indigenous groups

- Multiculturalism has not only made Malaysia a gastronomical paradise it has also made Malaysia home to hundreds of colorful festivals

Weather

- Tropical climate with warm & humid weather all year round
- Annual rainfall: 2000-2500mm
- Temperature: 15°C-25°C

Meteorological Services for Aviation

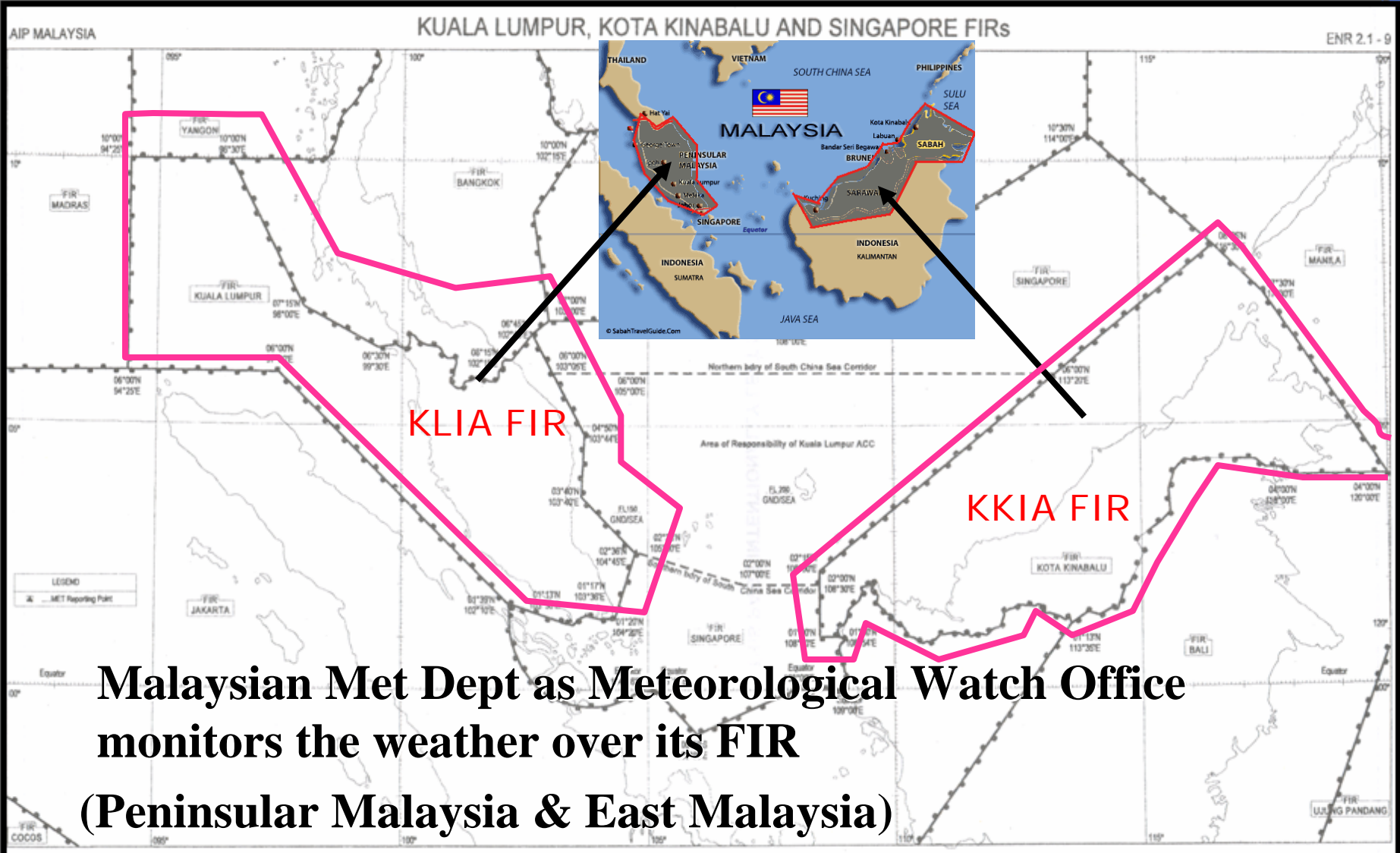
We are providing the following Meteorological Services for aviation purposes:

- ❖ continuous Meteorological Information and forecast for airline operators, Air Traffic Management Service (ATMS), Airport Operation Centre (AOC) and Search and Rescue (SAR) operations
- ❖ full meteorological documentation and briefing for all international & domestic flights out of the airport, & brief the clients about the weather whenever necessary
- ❖ Terminal Aerodrome Forecast (TAFOR) at six hour intervals and valid for 24 hours for all airport.
- ❖ Aerodrome warnings of significant meteorological parameters crucial for aircraft safety whenever necessary
- ❖ SIGMET (Significant Meteorological Events) warning for our Flight Information Region (FIR) for specific meteorological parameters crucial for the safety of the flight operation

Meteorological Services for Aviation

- ❖ Monitor thoroughly the weather that lies within our FIR to ensure safety of aviation operation
- ❖ Tropical storm, volcanic ash and radioactive emergency advisories and warnings
- ❖ Forecast for area QNH for our FIR
- ❖ Provide continuous information about the latest up to date and real time meteorological data for a safe take off and landing purposes of all aircraft

Flight Information Region (FIR) Of Malaysia



Malaysian Met Dept as Meteorological Watch Office monitors the weather over its FIR (Peninsular Malaysia & East Malaysia)

Products

**METAR WMKK 080400Z 16008KT 9999
FEW018 BKN280 30/25 Q1009 NOSIG=**

**METAR (Routine Aviation Report)
SPECI (Special Weather Report)**

**TAF WMKK 080300Z 0806/0906 14008KT 9999
FEW017CB BKN280 TEMPO 0807/0811 4000
TSRA FEW015CB SCT018=**

**TAFOR (Aerodrome
Forecast)**



TAKEOFF CONDITIONS
ISSUED BY MALAYSIAN METEOROLOGICAL OFFICE KLIA
ON 182200 UTC AUGUST 2003

DAY/HOUR (UTC)	WIND DIR/SPEED (DEGREES/KNOTS)	AIR TEMP (DEG CELCIUS)	DEWPOINT (DEG CELCIUS)	QNH (hPA)
182300	16005			
182400	16005	27	25	1009
190100	16005	28	25	1010
190200	16005	29	25	1011
190300	16005	30	25	1010
190400	16005	30	25	1010

**FORECAST TAKE OFF
DATA**

SIGMET

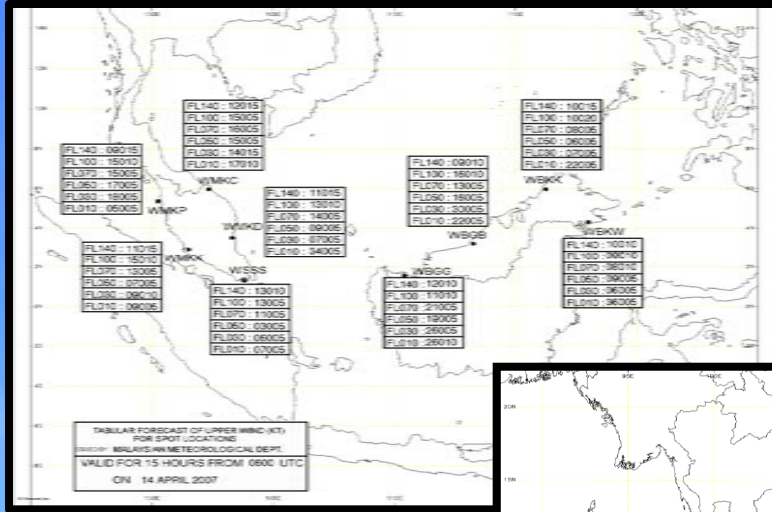
**WSMS31 WMKK 091345
WMFC SIGMET 02 VALID 091345/091745 WMKK
WMFC KUALA LUMPUR FIR EMBD CB/TS OBS S OF
N0558 BTN E09909 AND E10046 FCST STNR INTST NC=**



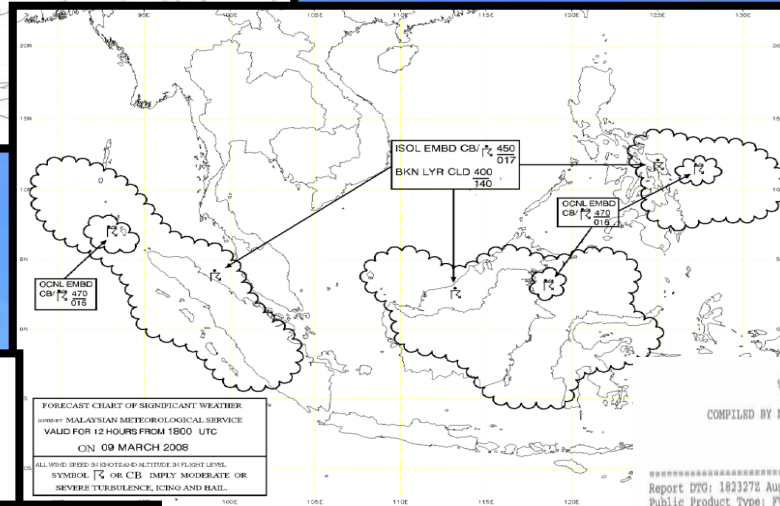
**AD Warning
(Aerodrome Warning)**

**WOMS31 WMKK 160915
WMKM AD WRNG 1 VALID 160915/161115
EMBD CB/TS OBS WI 20NM RAD OF WMKM AD MOD TO SEV TSRA IS
EXPECTED WITH VIS LESS THAN 3000M AND GUSTS UP TO 15KT=**

Products



SPOTWIND (Upper Air Wind)



SIGCHART (Significant Weather Chart)

TROPICAL CYCLONE / TYPHOON WARNING
COMPILED BY MALAYSIAN METEOROLOGICAL OFFICE KLIA
AT 070330 UTC SEPTEMBER 2004

WIPRZ PFM 070300Z
H0110/080400M/AN00PACHE0000N PEARL HARBOR H1/JTWC//
DIR//TROPICAL CYCLONE WARNING//
MSG# 1//
TROPICAL STORM 23W (SABIRA) WARNING NR 010
02 ACTIVE TROPICAL CYCLONES IN NORTHWESTPAC
MAX SUSTAINED WINDS BASED ON ONE-MINUTE AVERAGE

WARNING POSITION:
070300Z --- HEAR 21.487 139.083
MOVEMENT EAST SIX HOURS = 340 DEGREES AT 08 KTS
POSITION ACCURATE TO WITHIN 040 NM
POSITION BASED ON CENTER LOCATED BY SATELLITE
PRESIDING WIND DISTRIBUTION: KT GUSTS 045 KT
MAX SUSTAINED WINDS 050 KT
RADIUS OF 034 KT WINDS = 060 NM NORTHEAST QUADRANT
070 NM SOUTHWEST QUADRANT
080 NM SOUTHWEST QUADRANT
060 NM NORTHWEST QUADRANT

NEAREST POSIT: 21.487 139.083

FORECASTS:
13 HR, VALID AT:
071800Z --- 22.483 138.264
MAX SUSTAINED WINDS = 045 KT, GUSTS 050 KT
RADIUS OF 034 KT WINDS = 070 NM SOUTHWEST QUADRANT
070 NM SOUTHWEST QUADRANT
055 NM NORTHWEST QUADRANT

VECTOR TO 24 HR POSIT: 330 DEG/ 12 KTS

21 HR, VALID AT:
080000Z --- 24.585 138.888
MAX SUSTAINED WINDS = 030 KT, GUSTS 040 KT
VECTOR TO 36 HR POSIT: 330 DEG/ 13 KTS

36 HR, VALID AT:
080000Z --- 27.283 135.382
MAX SUSTAINED WINDS = 035 KT, GUSTS 045 KT
VECTOR TO 48 HR POSIT: 340 DEG/ 11 KTS

RETURNED OFFLOW:
48 HR, VALID AT:
080000Z --- 29.283 134.583
MAX SUSTAINED WINDS = 035 KT, GUSTS 045 KT
VECTOR TO 72 HR POSIT: 350 DEG/ 11 KTS

72 HR, VALID AT:
080000Z --- 32.283 133.784
MAX SUSTAINED WINDS = 035 KT, GUSTS 045 KT
MOVEMENT AS A SIGNIFICANT TROPICAL CYCLONE
DISCONTINUED AS SIGNIF. 015 UNLV 15 KTS

LONG RANGE OFFLOW:
NOTE: -SPRINKS FOR TRACK HAVE AVERAGED NEAR 250
KNOTS, -SPRINKS FOR TRACK HAVE AVERAGED NEAR 5... AND FOR INFERN
HEAR 20 KT EACH DAY.

26 HR, VALID AT:
080000Z --- 30.283 135.485
MAX SUSTAINED WINDS = 030 KT, GUSTS 030 KT
DISCONTINUED AS A SIGNIFICANT TROPICAL CYCLONE OVER WATER

REMARKS:
070300Z POSITION NEAR 21.780 138.880
TROPICAL STORM (TS) 23W (SABIRA) LOCATED APPROXIMATELY 820 NM
SOUTH OF TOKYO, JAPAN. HAS TRACKED NORTH-NORTHEASTWARD AT 08 KNOTS
OVER THE PAST 06 HOURS. THE WARNING POSITION IS BASED ON 021300Z



Tropical Cyclone Advisory

VOLCANIC ASH ADVISORY
COMPILED BY MALAYSIAN METEOROLOGICAL OFFICE KLIA
AT 182330 UTC AUGUST 2003

Report DTG: 182327Z Aug 03
Public Product Type: FVAU04

VOLCANIC ASH ADVISORY
ISSUED: 20030818/2327Z
VANC: DARWIN
VOLCANO: MERAPI 0608-01
LOCATION: N0142E12752
AREA: HALMAHERA, INDONESIA
SUBMIT ELEVATION: 1087M/3567FT
ADVISORY NUMBER: 2003/39
INFORMATION SOURCE: NOAA 15
ERUPTION COLOUR CODE: NIL
ERUPTION DETAILS: ASH PLUM TO FL140 EXTENDING 70NM W OF SUMMIT ON
NOAA 15 18/2243Z IMAGE

OBS ASH DATE/TIME: 18/2243Z
OBS ASH CLOUD: SPC/P140 N0142E12752 N0225E12700 N0155E12650
N0142E12752 MOV W 18KT
PCST ASH CLD +6 HR: 19/0500Z SPC/P140 N0142E12752 N0225E12650
N0155E12640 N0142E12752
PCST ASH CLD +12 HR: NO PCST
PCST ASH CLD +18 HR: NO PCST
NEXT ADVISORY: NO LATER THAN 20030819/0500Z
REMARKS: PLUME EXPECTED TO DISSIPATE OVR THE NEXT 6HRS
DARWIN VAAC.

REMARKS: NIL=



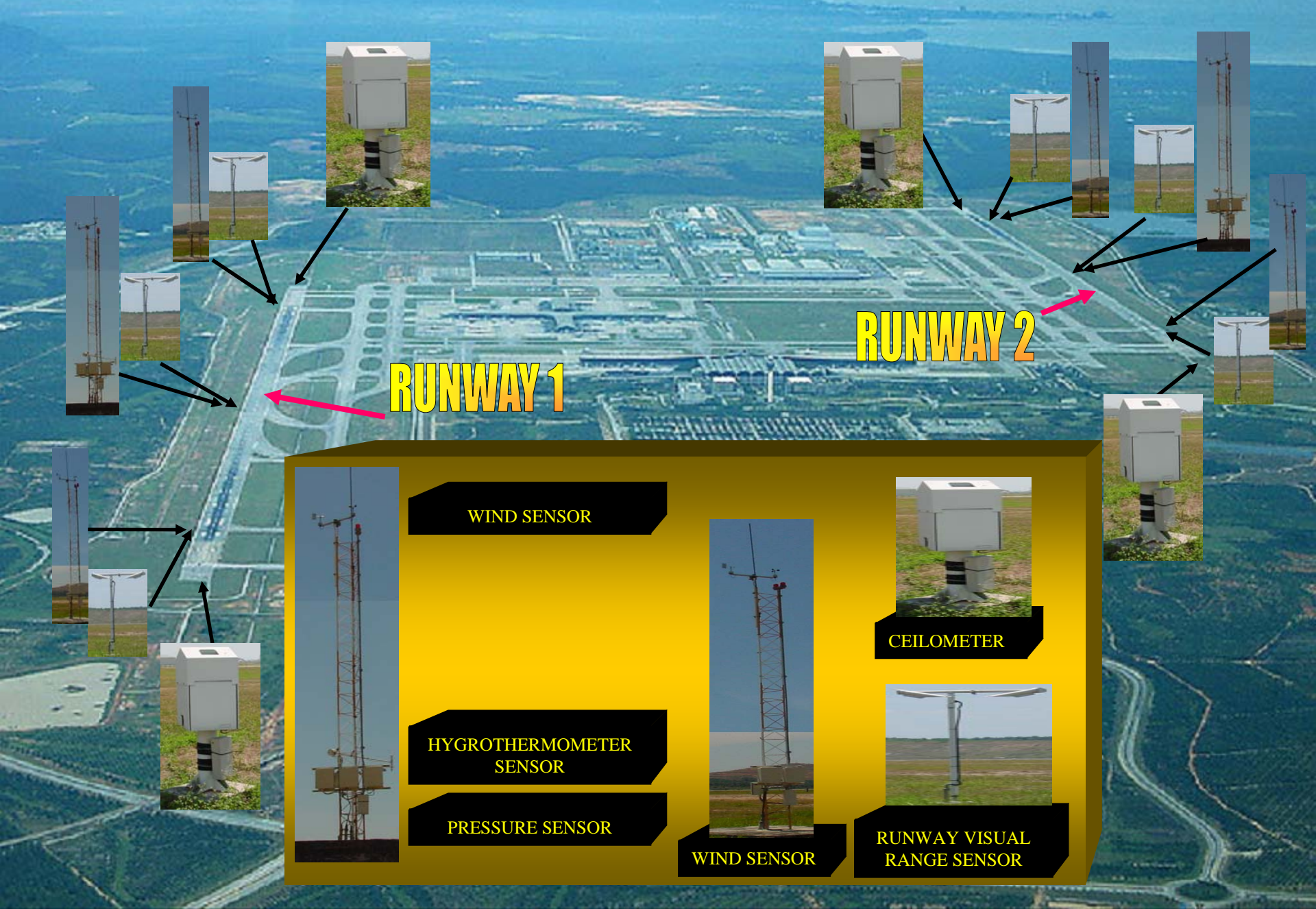
Volcanic Ash Advisory

System and Facilities

- The technology today has enabled us to provide better forecast and significant weather warnings.
- MMD has introduced certain facilities which are exclusive to KLIAMO such as ABT, TDR , WPS, PLWS, AWOS & AWS.



Overview of KLIA AWOS Location at Runway 1&2



RUNWAY 1

RUNWAY 2

WIND SENSOR

CEILOMETER

**HYGROTHERMOMETER
SENSOR**

PRESSURE SENSOR

WIND SENSOR

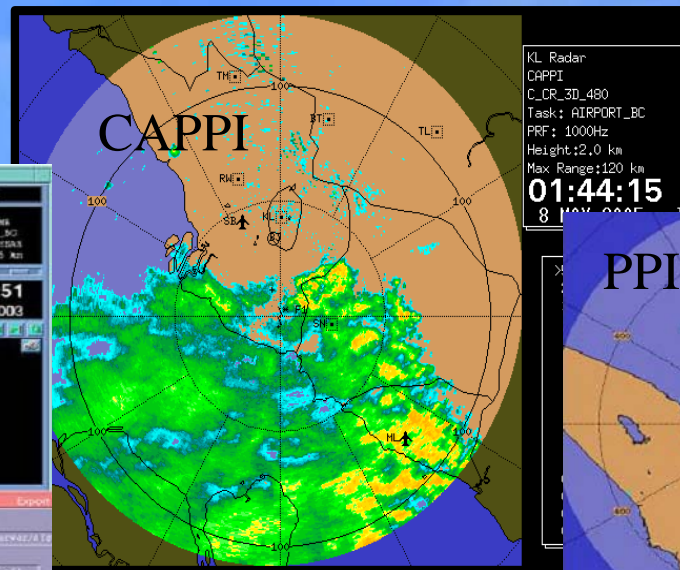
**RUNWAY VISUAL
RANGE SENSOR**

TERMINAL DOPPLER RADAR (TDR)

TDR provides precipitation intensity in terms of Rainfall Rate for CAPPI, PPI & Wind shear on KLIA Runway

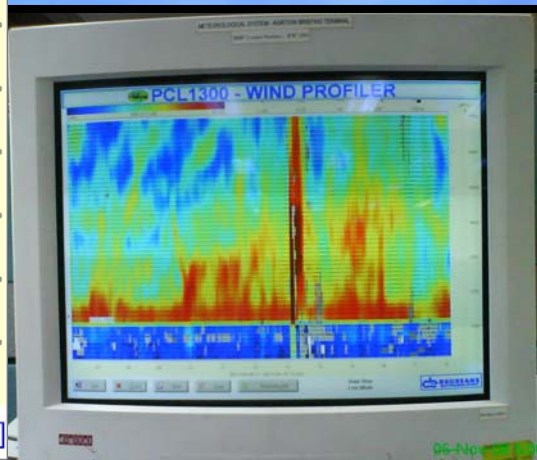
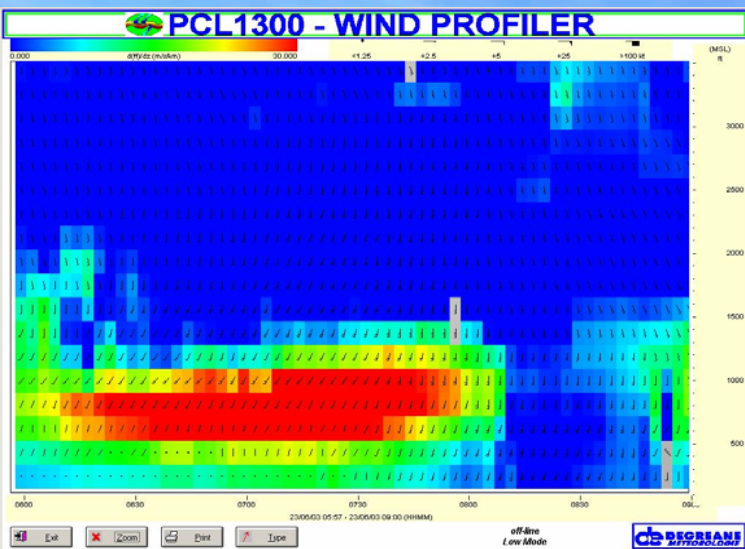
To detect

- Wind shear
- Microburst



WIND PROFILER SYSTEM (WPS)

- To measure vertical wind profile
- To detect :-
 - (a) Turbulence
 - (b) Wind Shear



PLWS (Precision Lightning Warning System)



- To detect lightning that occurs within the aerodrome



Automated Weather System (AWS)

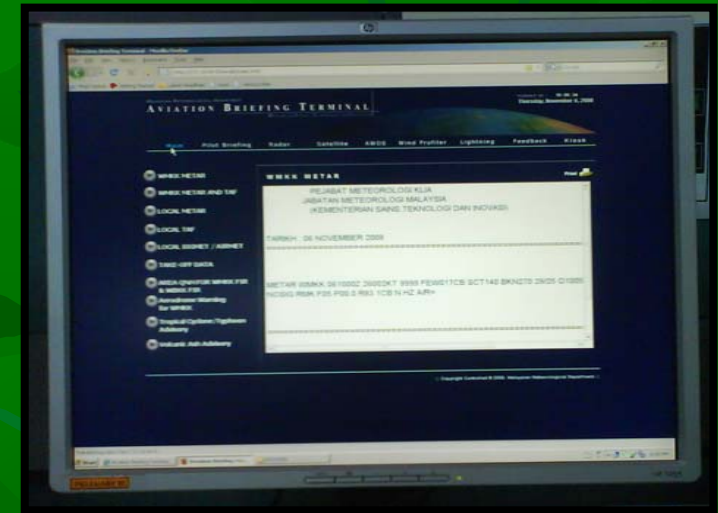
KLIA Met. Station

- This system provides meteorological data at every half hour interval
- These data such as wind speed and direction, precipitation, temperature, dew point, pressure are used to compute into METAR & SPECI report



Aviation Briefing Terminal (ABT)

- Aviation Briefing Terminal (ABT) are set at crucial essential location surrounding KLIA where it could be accessed by pilots, airport operators and airlines to obtain relevant information & meteorological products compiled through Total Airport Management System (TAMS)
- It could also be accessed through the web with KLIA Met Office's consent

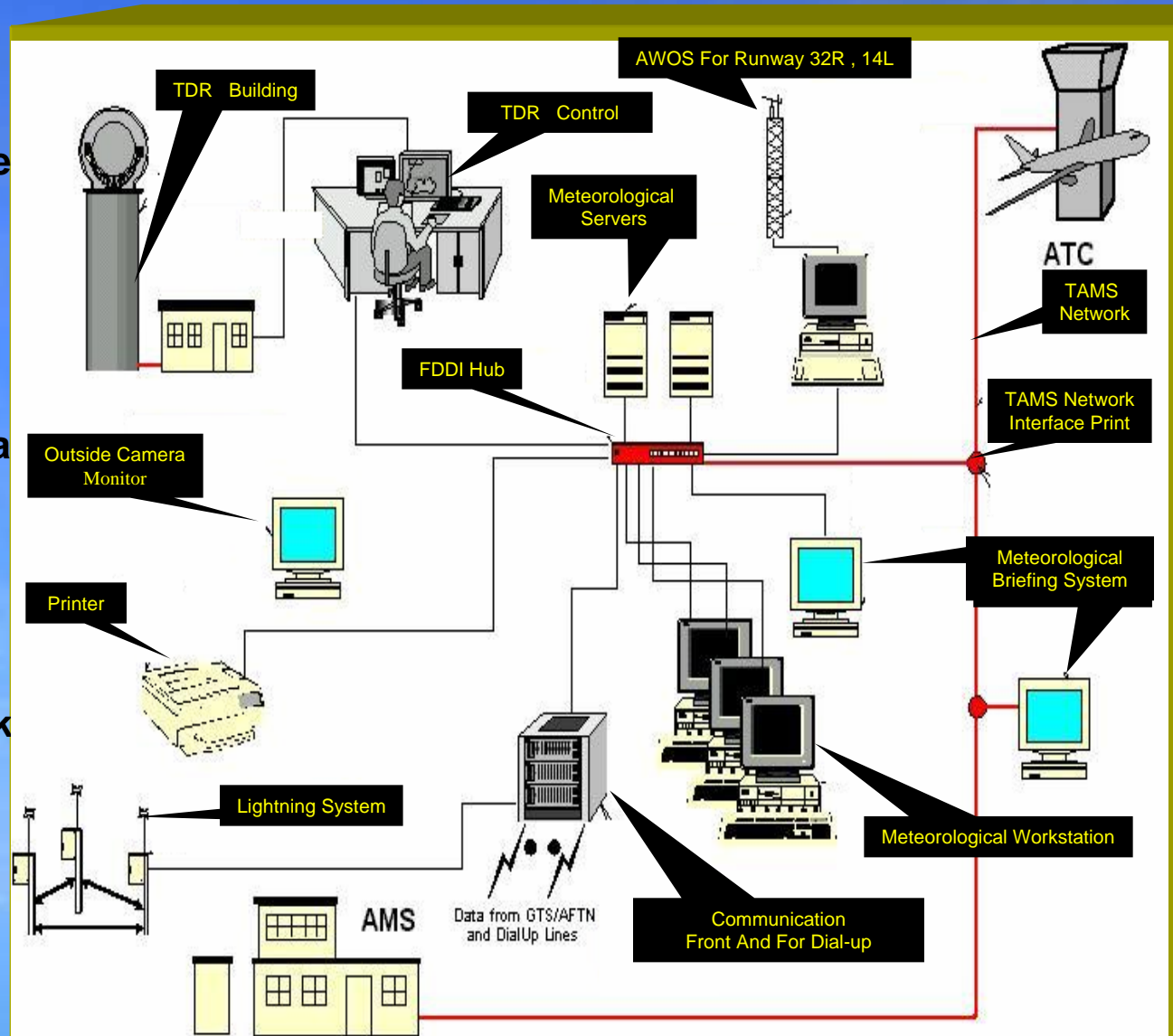


Meteorological Data Processing System (MDPS)

Meteorological Data Processing System (MDPS) - main system used in KLIA Met Office

Function

- i. Collect, Process, Analyze & Integrate all data & products
- ii. Data & met info are received through Global Telecommunication System (GTS), Aeronautical Fixed Telecommunication Network (AFTN) & Weather Radar Network to produce & display them
- iii. Disseminate all info & products through Total Airport Management System (TAMS) to be accessed by users & clients



KLIA Meteorological Office



ROYAL MALAYSIAN AIR FORCE

OUR CLIENTS



AIRLINES & FLYING ACADEMIES



DEPARTMENT OF CIVIL AVIATION (DCA)



PETRONAS "FUEL FARM" OPERATOR



"TRACK TRANSIT SYSTEM" OPERATORS



F1 CIRCUIT, SEPANG

SOCIOECONOMIC BENEFITS OF AVIATION SECTOR

Aviation sector drives economic and social progress

- ❖ **It connects people, countries and cultures**
- ❖ **It provides access to global markets**
- ❖ **It forges link between developed and developing nations**
- ❖ **It generates trade and tourism**
- ❖ **Serve as the only means of transportation to remote areas**

Socio-economic benefits of Meteorological Services in Aviation

Aviation directly benefited from precise forecasts and early warnings. Main benefits and impacts of Met information in Aviation ;

- ❖ **enhanced public / military / global aviation safety**
- ❖ **enhanced the efficiency of aviation operations**
- ❖ **Saving in Fuel**
- ❖ **Saving passenger times (reducing wait times on runways)**
- ❖ **Saving materials, properties and working times**
(e.g airport maintenances)
- ❖ **Avoidance of sudden severe and hazardous weather events**

Future & on-going Plan

KLIAMO has all the up to date facilities and shall maintain and upgrade the services from time to time in tandem with new developments in technology and in accordance with ICAO and WMO requirements. Therefore To improve our services and to deliver better products and meteorological information

- **Installation Of Wind Sensors & Runway Visual Range (RVR) System in all airports in Malaysia under the 9th Malaysian Plan**
 - i. **Already implemented in military and civil aviation airports in West Malaysia & currently on going in the East Malaysia**
 - i. **Could access the data display just like the AWOS display in KLIA runway through the web through KLIA Met Office's consent**
e.g. : <http://60.51.178.214:8088/home.php>
- **Upgrade conventional radar around airports in Malaysia to Doppler radar just like in KLIA**
- **Aircraft Meteorological Data Relay (AMDAR) to be implemented by 2009**
- **Focus on Short-term weather forecasts rather than long-term forecasts**

Benefit-Cost Analysis

- ❖ Estimates cost needed for modernization and upgrading the Aviation meteorology facilities, software and equipments and human development in Malaysia is about RM35 mil (5-10yr plan)

Based on other studies (as a guide line)

- ❖ Air Transport Association estimates that the direct cost to airlines of flight delays (either mechanical or weather induced-) exceeds US\$3.2 billion annually, in 2004 dollars (HayHurst, 2001).
- ❖ Aviation's global economic impact is estimated at US\$ 3.5 trillion (2007) 7.5% of world GDP

Conclusions & Recommendations

- ❖ The Availability and usability of Meteorological Information in Aviation should be Improved, communications technology should be developed and awareness about the Benefits and possibilities of Meteorological Information should be Increased
- ❖ The economic value of meteorological information tends to increase with quality, accuracy and timeliness of information
- ❖ Better Understanding between Met services and the users will help to deliver services more effective and efficient

THANK YOU