

SMR 643: Synoptic Aviation Meteorology

Introduction

Synoptic aviation Meteorology is a core course offered to the student registered for Master of Science in Aviation Meteorology. The course deals with analysis interpretation and forecasting of weather systems for application in aviation operations. Weather information in aviation ensures efficient flight operations and aviation safety.

This course has been designed with the recognition that there is significant increase in air traffic over various regions in the past decade, demands for increasing consultations and new types of weather products by the airport management and air traffic management (ATM) stakeholders are increasing. Provision of added-value services to assist in decision-making and advance planning to mitigate the disruption of aviation operation due to unfavourable weather.

Course outline

Thermodynamic Analysis and application of thermodynamic diagrams. Structure and Dynamics of extra-tropical disturbances. Airmasses and fronts: quasi-geostrophic and frontogenesis, meso-scale organizations near fronts. Characteristics of tropical weather systems including: tropical cyclones, thunderstorms and thunderstorm-related phenomena, the monsoons, easterly and westerly waves. Regional weather patterns and their seasonal variations. Observing the atmosphere through estimation and instrument measurements: cloud observations and classification, visibility both horizontal and vertical, synoptic observations. Climatological flight planning including selection of aerodrome sites. Weather and aviation safety in regular operations, monitoring and exchange of weather phenomena relevant to aviation. Dissemination of Aeronautical Meteorological Information through the WMO (GTS) and ICAO (AFS, AFTN)

LABORATORY WORK

Laboratory work will involve

- use of thermodynamic diagram and related areas.
- Plotting of synoptic observations on charts to give the weather map.
- Interpretation of the weather map for aviation purposes.
- Use of Meteorological codes in aviation weather: Meteorological Aviation Report (METAR) and Aerodrome special meteorological report (SPECI), and TREND.

The course Objectives

The course is intended to enable the learner to:

1. Explain how the monitoring of the evolution of meteorological parameters and atmospheric systems is carried out
2. Prepare, display and interpret charts of various meteorological parameters
3. Describe the basic principles behind the various forecasting methods such as persistence, extrapolation, analogue, regression, probability and numerical weather prediction
4. Discuss how the various weather products are prepared and disseminated to pilots, airport management and air traffic management (ATM) stakeholders.
5. Describe the characteristics of the following circulation; mechanically forced, thermal induced, convective and non-convective.
6. Characterize clouds and precipitation using satellite and radar imagery.
7. Discuss how the observation of mesoscale systems such as thunderstorm, tornadoes and dryline is carried out
8. Describe the characteristics of tropical disturbances including tropical cyclones, easterly waves and westerly waves
9. Discuss the structure and dynamics of extra-tropical disturbances
10. Discuss the classification and the weather associated with the various airmasses
11. State the various types of fronts and the type of weather associated with each.