Aeronautical Meteorology1

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1. Course Description

Condition of atmosphere is diverted and causes various weather phenomenon. Those phenomenon affect specs of aircrafts and flight plans` feasibility. Knowledge of weather is mandatory subject for not only planers and pilots, but also important for technicians.

In this lecture, students will learn the fundamental metrological topics, such as the atmospheric structure, air presser and causes of phenomenon like wind, cloud, fog, lightning, and rain. Obtain knowledge of weather charts and weather reports.

Mainly, this course is a lecture style, but practical training may be held as needed.

Please learn knowledge related to DP2.

2. Course Objectives

The objective is to understand the topics listed below:

(1) Necessity of weather knowledge in aeronautical service.

(2) Principals of various weather phenomenon, such as characteristics of atmosphere and wind including turbulences.

(3) Field of view, air masses, and fronts to grape weather phenomenon.

(4) The meaning and use of weather map and weather information like weather reports.

3. Grading Policy

This course is evaluated by the result of the exam (80%) and quizzes (20%).

The answer of each quiz will be explained.

4. Textbook and Reference

Textbook

Iwatsuki Hideaki   Kihon ga wakaru Book of Meteorology
   Syuwa system, ISBN 978-4-7980-5367-7

Reference

Yonejiro Yamagishi   Introduction to Meteorology   Ohmsha, ISBN 978-4-274-20989-5

Kimio Kato   Aviation and Weather ABC   ISBN 978-4-425-51094-8

Takeo Nishina   Aviation weather required for pilot   ISBN 978-4-425-51401-4

5. Requirements(Assignments)

Review assigned metrological vocabularies in notebooks, before each class.(1 hour)

Simple quizzes will be assigned in each class, for review in notebooks.(2 hours)

6. Note

Lecture is based on the high school level of physics (especially in thermology) and earth science. (especially, about weather). Mainly, this course is a lecture style but practical training may be held as needed.

7. Schedule

[1]   Aviation with Weather and Atmosphere:
          -Importance of meteorological knowledge for aeronautical service.
          -Structure of atmosphere.

[2]   Weather Information:
          Learn about
          -how to search weather condition.
          -how to analyze weather data
          -how to read metrological reports

[3]   Weather Chart:
          Learn how to read weather charts (surface weather chart and upper air chart)

[4]   Temperature and Air pressure:
          Learn about
          -vertical distribution and stratification in the atmosphere.
          -relation between altitude and air pressure.
          -pressure altitude.
          -pressure gradient.

[5]   Air Motion:
          Learn about
          -physical principles to produce wind.
          -effect of earth's rotation (centrifugal force and coriolis force).
          -variations of wind (geostrophic wind, gradient wind, cyclostrophic wind).

[6]   Laws of Motion:
          Learn about
          -Concept of air motion (advection, divergence, convergence), wind shear, and turbulence.

[7]   Cloud and Precipitation (1):
Learn about
-the kinds of clouds.
-cumulonimbus and effect to aircrafts.
-characteristics of vapor.
-moist air.
-weather phenomenon from the thermodynamic perspective.

[8]   Cloud and Precipitation (2):
Learn about
-stability of atmosphere.
-cloud formation.
-principals of precipitation such as raindrop.

[9]   Learn how to read METAR and TAF.

[10]   Terrestrial Weather:
Learn about
-atomistic border line.
-surface friction.
-fog and low layered cloud.
-effect of those phenomenon to visibility.

[11]   Emissions and Air Motion:
Learn about
-solar radiation.
-energy balance and air motion.
-air mass.
-jet stream.

[12]   Middle Latitude Air Mass:
Learn about
-front.
-cloud and precipitation next to low pressure.
-air masses and fronts around Japan.
Typhoon:
Learn about
-the structure and development of tropical cyclones, and developed typhoons.

[13]   Middle / Small Phenomenon:
Learn about
-enforced disturbance.
-middle and small weather phenomenon caused by unstable condition.

[14]   Forecast and Warning:
Learn about
-numerical weather prediction
-area forecasts / warnings / contrary weather forecast chars for aeronautical service.

[15]   Final Exam, Overview