

SAULT COLLEGE
of Applied Arts and Technology
Sault Ste. Marie

COURSE OUTLINE

METEOROLOGY

AVT 110-6

revised February 5, 1981

METEOROLOGY

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TEXTS:

Weather Ways - Cat. # T56-464 - Information Canada

From the Ground Up - Sandy A.F. MacDonald - Aviation Publishers Ltd.

Weather - Forecasting and Observing Guide Handout - DND - CFP 295

Aeronautical Information Publication (AIP) - Canada

STUDY & REFERENCE GUIDES:

Supplement to Weather Ways - DND - CFP 266

Weather - Forecasting and Observing Guide - DND - CFP 295

Aviation Weather - AC 00-6A New Edition - Dept. of Transportation - FAA

Aviation Weather Services - AC 00-45/APR - Dept. of Transportation - FAA

Pilot's Handbook of Weather - Guerny & Skiera - Aero Publisher Inc.

Examination Guide for Commercial Pilots - Continental Aeroqraphics INC.

METEOROLOGY

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GENERAL OBJECTIVES:

The objective of this course is to re-enforce and add to Aviation students' knowledge of weather (meteorology) to enable them to interpret and utilize intelligently the weather information provided by the meteorological service in planning and conducting aircraft operations.

Topic No.	Periods	Topic Description	Reference
1,2,3	1	Atmosphere Clouds Pressure	Weather Ways - CH 2,3,4 From the Ground Up Pg. 60-64 Supplement to Weather Ways CH 2,3,4
4,5	1	Winds Moisture and Temperature	Weather Ways - CH 5,6 From the Ground Up Pg. 64-67 Supplement to Weather Ways CH 5,6
6,7	1	Stability and Instability Air Masses	Weather Ways - CH 7,8 From the Ground Up Pg. 66-69 Supplement to Weather Ways CH 7, 8
8	1	The Structure of Fronts	Weather Ways - CH 9 Supplement to Weather Ways CH 9
TEST	1	Test on review work covered to date	
9	1	Weather at the Cold Front	Weather Ways - CH 10 Supplement to Weather Ways CH 10
10	1	Weather at the Warm Front	Weather Ways - CH 11 Supplement to Weather Ways CH 11
11,12	1	Weather at Trowals and Upper Fronts Cloud, Precipitation and Fog	Weather Ways - CH 12,13 Supplement to Weather Ways CH 12,13
12,13	1	Clouds, Precipitation & Fog Visibility	Weather Ways - CH 13,14 Supplement to Weather Ways CH 13,14
14,15	1	Ice Accretion Thunderstorms	Weather Ways - CH 15,16 Supplement to Weather Ways CH 15,16
16,17,18	1	Turbulence Precipitation Static Mountain Waves	Weather Ways - CH 17,18,19 Supplement to Weather Ways CH 17,18,19
TEST	1	Mid Term Examination	A.I.P. Canada - MET

Topic No.	Periods	Topic Description	Reference
19	5	Weather Observations & Reports	A.I.P. Canada - MET Weather-Forecasting & Observing Guide
TEST	1	Pre-Commercial Test on all material covered to date	
20	2	The Upper Troposphere and Lower Stratosphere	Supplement to Weather Ways CH 20 - Handout
21	2	Weather in North America	Supplement to Weather Ways CH 21 - Handout
22	1	Weather for Light Aircraft	Supplement to Weather Ways CH 22 - Handout
23	1	FINAL EXAMINATION	

SPECIFIC OBJECTIVES

1. Atmosphere

The student is required to know:

- (a) the significance of atmospheric models
- (b) extent of the atmosphere
- (c) composition of the atmosphere
- (d) properties of the atmosphere
- (e) divisions of the atmosphere
- (f) details of the ICAO atmosphere

2. Clouds

The student is required to know:

- (a) the International Cloud Classification
- (b) appearance of the main cloud forms
- (c) direct and indirect significance of each cloud form to aviation

3. Pressure

The student is required to know:

- (a) the definition of "pressure" as applied to the atmosphere
- (b) the meaning of the terms "station pressure , sea level pressure, and altimeter setting"
- (c) the nature of the horizontal pressure differences at a given time
- (d) the meaning of "pressure gradient"
- (e) the nature of pressure changes at a station over a period of time
- (f) the meaning of "pressure level" and the cause of variations in the altitude of pressure levels
- (g) how pressure altimeters work and the nature of their errors owing to pressure and temperature variations
- (h) how to identify and interpret pressure information provided on surface and upper air maps

4. Wind

The student is required to know:

- (a) the meaning of "wind direction" and the terms "veering and backing" as applied to changes in wind direction
- (b) the nature of the forces which cause and effect the direction and speed of the motion
- (c) the relationship between the MSL pressure patterns and the lower level winds
- (d) the main situations in which the surface wind does not conform to the MSL pressure systems
- (e) the nature of wind at higher levels

- (f) the relationship between winds as observed in flight and altimeter errors
- (g) how to identify and interpret wind information depicted on surface and upper air maps

5. Moisture and Temperature

The student is required to know:

- (a) the scales used to express temperature
- (b) the importance of moisture in the air
- (c) how the atmosphere is heated
- (d) how the atmosphere is cooled
- (e) how cooling and heating the atmosphere affect weather

6. Stability and Instability

The student is required to know:

- (a) the meaning of "stability" and "instability"
- (b) the relationship between lapse rate and stability
- (c) modification of stability
- (d) characteristics of stable and unstable air
- (e) the main lifting processes which affect the atmosphere

7. Air Masses

The student is required to know:

- (a) the meaning of "air mass"
- (b) how the characteristic conditions of an air mass develop
- (c) how air masses are classified
- (d) factors which determine weather in an air mass
- (e) the main characteristics of the principal air masses which affect North America

8. The Structure of Fronts

The student is required to know:

- (a) the three dimensional arrangement of air masses
- (b) the types of fronts
- (c) the meaning of "Frontogenesis" and "Frontolysis"
- (d) the relationship between fronts and pressure distribution
- (e) the main stages in the life history of a frontal depression
- (f) the symbols and colours which identify fronts on the weather map
- (g) how to identify and interpret information relating to frontal depressions on the weather map

9. Weather at the Cold Front

The student is required to know:

- (a) the air mass structure at the cold front
- (b) the factors which determine weather at a cold front

- (c) the general nature of surface weather changes associated with a cold front
- (d) how to recognize cold frontal systems during flight
- (e) main problems associated with flight through cold fronts

10. Weather at the Warm Front

The student is required to know:

- (a) the air mass structure at the warm front
- (b) the factors which determine the weather at a warm front
- (c) the general nature of surface weather changes associated with a warm front
- (d) how to recognize warm frontal systems during flight
- (e) main problems associated with flight through warm fronts

11. Weather at Trowals and Upper Fronts

The student is required to know:

- (a) the air mass structure at the Trowal
- (b) the general nature of weather at occlusions, trowals and upper fronts

12. Clouds, Precipitation and Fog

The student is required to know:

- (a) the requirements for condensation
- (b) the meaning of "sublimation"
- (c) how clouds form
- (d) how precipitation develops, the relationship between turbulence and precipitation
- (e) how to identify different forms of precipitation
- (f) how fog forms, the principal types of fog and the characteristics of each
- (g) symbols and abbreviations used for cloud types, precipitation and fog

13. Visibility

The student is required to know:

- (a) the meaning of "visibility" as applied to surface and air observations
- (b) conditions that cause restricted visibility

14. Ice Accretion

The student is required to know:

- (a) the effects of icing on aircraft performance
- (b) details of icing as it occurs in clear air
- (c) how ice forms in cloud and precipitation
- (d) types of icing to be found in cloud and precipitation

- (e) icing intensity
- (f) details of engine icing
- (g) aircraft deicing and anti-icing systems
- (h) how icing affects helicopters

15. Thunderstorms

The student is required to know:

- (a) the requirements for thunderstorm development
- (b) the structure and development of a thunderstorm
- (c) types of thunderstorms
- (d) surface weather changes associated with thunderstorms
- (e) effects of thunderstorms on flight

16. Turbulence

The student is required to know:

- (a) the causes and effects of turbulence

17. Precipitation

The student is required to know:

- (a) weather conditions which favour precipitation static

18. Mountain Waves

The student is required to know:

- (a) the features of mountain waves
- (b) effects of mountain waves on aviation
- (c) the guiding rules for planning flights in mountain regions

19. Weather Observations and Reports

The student is required to know:

- (a) how to identify and interpret the significant features of surface and upper level weather charts
- (b) how to decode and interpret all information provided on hourly weather reports
- (c) how to decode and interpret all information provided in terminal forecasts
- (d) how to determine and interpret all information provided in area and regional forecasts
- (e) how to decode upper wind forecasts
- (f) how to interpolate forecast winds for specific altitudes and locations
- (g) how to apply intelligently all of the above information to flight operations

20. The Upper Troposphere and Lower Stratosphere

The student is required to know:

- (a) the general characteristics of the upper troposphere and lower stratosphere
- (b) temperature distribution in the troposphere
- (c) temperature distribution in the stratosphere
- (d) the wind field
- (e) the characteristics of jet streams
- (f) the characteristics and causes of clear air turbulence (CAT)
- (g) the causes and characteristics of condensation trails and high altitude cloud formations

21. Weather in North America

The student is required to know:

- (a) the geographical features of the continent and surface features of the adjoining oceans to determine the nature of weather in North America
- (b) the effects of mountains on weather
- (c) the effects of open water on weather
- (d) the effects of sloping plains on weather
- (e) upper level circulation patterns
- (f) winter weather features

22. Weather for Light Aircraft

The student is required to know:

- (a) the effects of air density on aircraft performance
- (b) the characteristics of air motion and its direct effect on low level flight
- (c) the effects of low cloud and restricted visibilities on flight in the lower levels
- (d) effects of icing on fixed wing aircraft
- (e) effects of icing on rotary wing aircraft