Aviation Weather For Southern Africa

Gerhard Venter
Meteorologist (Ret)
Why another book on Weather

During my time as Aviation Forecaster I noticed that many pilots especially new pilots, do not understand the weather nor do they understand what the forecasters are trying to tell them.
This lead to frustration not only for the pilots but also the forecasters who could not understand why the pilots kept on phoning and asking the same questions. We, as forecasters, could see that the training that pilots received about the weather was not up to standard.
When pilots don’t understand the weather they are playing with their lives.

So when Kevin Storey contacted me in 2010 and asked me to write a book for the new pilots, I agreed and this is the result.
This book is there to help the pilots to understand the weather, the weather codes and also where to access the weather information.
I did the book in Microsoft Word. Drawings where done in Paint and Open Office Draw.

Some drawings where first done by hand and then scanned in and then with the help of Paint or Open Office Draw the wording was put in.
Contents of the Book

The book consist of 17 chapters 176 pages.

The 17 Chapters discuss the following:
Chapter 1: The Atmosphere

1.1 Composition
1.2 Vertical Structure
1.3 Troposphere
1.4 Stratosphere
1.5 Mesosphere
1.6 Thermosphere
1.7 Standard Atmosphere
Vertical structure of the atmosphere
Chapter 2: Temperature

2.1 Temperature Scales
2.2 Heat and Temperature
2.3 Temperature at and near the Earth Surface
2.4 Temperature of the Atmosphere
2.5 Adiabatic Processes
2.6 Stability and Instability
2.7 Inversions
The three differed laps rates
Chapter 3: Atmospheric Pressure

3.1 Isobars and Pressure systems
3.2 Some key concepts when speaking about atmospheric pressure
3.3 Variation of pressure with height
3.4 Altimetry
3.4.1 Altimeter Settings
3.5 Density Altitude
Variation of height in warm and cold air
Chapter 4: Wind

4.1 Convection
4.2 Pressure gradient force
4.3 Coriolis force
4.4 Friction
4.5 General circulation
4.6 Jet Streams
4.7 Local and small scale winds
4.8 Wind speed terms
Apparent deflective force due to the rotation of a horizontal platform
Chapter 5: Moisture and Precipitation

5.1.1 Water vapour
5.1.2 Relative humidity
5.1.3 Dew-point
5.1.4 Temperature – Dew-point spread
5.1.5 Condensation nuclei
5.1.6 Supercooled water
5.1.7 Dew and Frost
5.2 Precipitation
5.2.1 Precipitation types
Chapter 6: Clouds

6.1 Cloud description and Classification
6.1.1 Definitions of clouds
6.2 Cloud formation
6.3 Calculating Cumulus cloud base height
6.4 Wind change with height
6.5 Dissipation of cloud
Altocumulus Castellanus
Cirrocumulus
Chapter 7: Visibility, Mist and Fog

7.1 Runway Visual Range (RVR)
7.2 Slant visibility
7.3 Factors Affecting Visibility
7.4 Formation of Fog
7.5 Other dangers that fog brings
Slant visibility

- Flight Path
- Aerodrome clearly visible
- Aerodrome invisible
- Layer of fog, mist or thick haze.
Chapter 8: Icing

8.1 Supercooled water droplets
8.2 Types of icing
8.3 Effects of Airframe icing on performance
8.4 Carburettor icing
8.5 Severe Icing
8.6 Anti-Icing and De-icing Equipment
8.7 Avoiding Icing
Ice build-up in Carburettor
Chapter 9: Thunderstorms

9.1 Conditions favourable for the development of Thunderstorms
9.2 Types of Thunderstorms
9.3 The life cycle of a thunderstorm
9.4 Surface weather changes associated with thunderstorms
9.5 Flight hazards
9.6 Hints on thunderstorm flying
Roll cloud in front of a thunderstorm
Chapter 10: Air Masses and Fronts

10.1 Air Masses
10.2 Air Mass Modification
10.3 Stability
10.4 Fronts
10.5 Horizontal changes across a front
10.6 Types of Fronts
Frontal systems indicated on weather maps
Chapter 11: Depressions

11.1 Frontal Depressions
11.2 Other Low pressure systems or Vortices in the Atmosphere
11.2.1 Tropical cyclones
11.2.2 Tornadoes
11.2.3 Monsoon
11.2.4 Orographic Depression
11.2.5 Coastal Low
An established frontal depression
Chapter 12: Synoptic Maps

12.1 The Synoptic Code
12.1.1 Base of the Lowest Cloud
12.1.2 Wind plots
12.1.3 Present Weather
12.1.4 Past Weather Symbols
12.1.5 Temperature and dew-point
12.1.6 Pressure
12.1.7 Pressure Tendency
12.1.8 Visibility
Meanings of the elements of the station model

- Total amount of cloud (Sky completely covered)
- Cloud type: High - Cirrus
- Cloud type: Middle - Altocumulus
- Wind speed: 18 to 22 knots
- Direction of wind from the NW (315°)
- Temperature in Degrees Celsius
- Visibility (7km)
- Present weather (drizzle)
- Dewpoint in degrees Celsius
- Cloud type (fractostratus or fractocumulus)
- Height of cloud base (300 to 600ft)
- Part of sky covered by lowest cloud (six oktas)
- Barometric Pressure (1014.7hPa)
- Amount of barometric change in the past 3 hours in tenth of hPa
- Barometric tendency in past 3 hours (rising)
- Weather in past 6 hours (rain)
Chapter 13 Significant Weather and Wind Charts

13.1 Significant Weather Charts
13.1.1 Abbreviations used on Significant Weather Charts
13.1.2 Symbols for Significant Weather Charts
13.1.3 Examples of Significant Weather Charts

13.2 Wind charts
13.2.1 Block wind charts
13.2.2 Barb Wind Charts
Enlargement of a Barb Wind Chart
Chapter 14: Aerodrome Reports and Forecasts

14.1 Aviation Weather Report – METAR and SPECI
14.2 Aerodrome forecast – TAF
14.2.1 Identification Groups
14.2.2 Explanation of some short codes used in METAR and TAF codes
14.3 Sigmet
14.4 Airmet
Explanation of an AIRMENT

Example:
FAJS AIRMET B2 VALID 100630/100900 FAJS- FAJA JOHANNESBURG FIR ISOL TS OBS OVER SW LIMPOPO & CENT MPUMALANGA MOV E=

The second AIRMET message issued for the Johannesburg flight information region by the O R Tambo International airport meteorological watch office since 0001 UCT; the message is valid from 0630 UCT to 0900 UCT on the 10th of the month; isolated thunderstorms observed over the South-Western Limpopo province as well as the central Mpumalanga province and the storms are moving east.
Chapter 15: Soaring Weather

15.1 Convective Lift
15.2 Thermal size and strength
15.2.1 Diurnal Variation of Thermals
15.2.2 Factors influencing thermals
15.2.3 Cloud Streets
15.2.4 Convergence
15.2.5 Ridge Lift
15.2.6 Meteorological Factors
15.2.7 Wave lift
15.2.8 Thunderstorms
15.2.9 Strong winds and wind shear
15.3 Using local knowledge
Air moving over mountain causing mountain waves
Chapter 16: Climate

16.1 Classification of Climates
16.2 Southern Africa Climate
16.3 Aviation and Climate
Chapter 17 Weather Information Gathering

17.1 Newspapers and Television
17.2 Via Telephone
17.3 Internet
17.4 Aerosport
How to use a SIGWX chart
Example of wind and moisture chart

Source: SAWS aviation web

Position: 30S 30E
Thank you

THE END
My contact information

E-Mail: gerhardv@telkomsa.net
Cell: 084 8179200
Home phone: 039 681 3507