UNITED STATES MARINE CORPS

LESSON PLAN

MEASURING PRESSURE

INTRODUCTION:

Gain Attention. Why is pressure measured?

2. Overview. Throughout this period of instruction you will learn about how pressure is measured using barometry and altimetry, as well as, what an altimeter setting is and how to calculate it.

3. Introduce Learning Objectives.

a. Terminal Learning Objective. With the aid of references, demonstrate a thorough understanding of the various pressure measurements and equipment that is used to obtain pressure readings.

b. Enabling Learning Objective(s). Without the aid of references, explain pressure measurements using barometry and altimetry.

4. Method/Media. This period of instruction will be taught using the lecture method with the aid of QMMCBT-001 "Introduction to the Dynamics of the Atmosphere".

5. Evaluation. You will not be evaluated. However, there will be a discussion at the end of this period of instruction, and an opportunity to ask questions.

TRANSITION. When watching meteorologist Dallas Rains on the local news at nine, have you ever wondered what he means when he says that your area is being dominated by high pressure or when it he says that the barometer reads 1020.2 millibars? What is considered high or low for pressure, what is a barometer and how do they work? By the end of this period of instruction you will be able to answer all these questions and more.

DEFINITIONS:

1. Barometer. An instrument used for measuring atmospheric pressure. There are two types of barometers commonly used in meteorology: the mercury barometer and the aneroid barometer.

a. Mercury barometer. A mercury barometer is a glass manometer, employing mercury in its vertical column, which is used to measure pressure.

b. Aneroid barometer. An aneroid barometer is used to detect atmospheric pressure. Aneroid barometer is constructed as following, an aneroid capsule is partially evacuated of gas and is restrained from collapsing by an external or internal spring; the deflection of the spring will be nearly proportional to the difference between the internal and external pressures. The

aneroid barometer is temperature compensated at a given pressure level by adjustment of the residual gas in the aneroid.

2. Altimeter. Altimeter is an instrument that determines the altitude of an object with respect to a fixed level. There are several types of altimeters are commonly used. They are the pressure altimeter, the radar altimeter, and the Global Positioning System (GPS).

3. Altimeter Setting. Altimeter setting is the value of the atmospheric pressure used to adjust the subscale of a pressure altimeter so that it indicates the height of an aircraft above a known reference point. Pressure Altitude (PA) increases at 10 feet per tenth of an inch of Mercury. So if you are at 29.92 the standard atmospheric pressure, your at 0 feet for PA when you take off all of a sudden your at 29.80 a sudden increase in altitude of 120 feet which is you new PA.

4. Pressure Altitude. Pressure altitude is the altitude that corresponds to a given value of atmospheric pressure according to the ICAO standard atmosphere.

5. Station Pressure. The atmospheric pressure measured at a station. A "station" can be any location. It might be your house, the top of a mountain, or on the shore. Station pressure is usually the base value from which sea-level pressure and altimeter setting are determined.

6. Barometric Pressure. Barometric pressure is the same as atmospheric pressure. The station pressure adjusted in proportion to the altitude of the station. For the special case of the station at sea level, station pressure and barometric pressure are the same.

BODY:

1. Weather Reports. When weather forecasters and observers report pressure, they always report barometric pressure. If you happen to live at high altitude, the reported pressure will be much higher than the station pressure. Most commonly the pressure used is in inches of mercury. When an air traffic controller gives an airborne pilot an "altimeter setting" it is the barometric pressure for that flight level.

2. Barometry. Barometry is the study of the measurement of atmospheric pressure. The main focus is on the difference in readings from individual barometers. Air pressure is also called barometric pressure because instruments called barometers are used to measure it. Instruments used to measure atmospheric pressure include the aneroid barometer, mercurial barometer, microbarograph, digital barometer and pocket barometer. You can do some basic weather forecasting by using the wind and barometric pressure. Barometric pressure is reported in hectopascals (hPa) or inches of mercury (Hg).

3. Altimetry. Altimetry is the measurement of altitude or height. “Q” codes are a system in place used by aircraft, it is a letter code used in requests for information, it is also used in the supply of information to the aircraft. There are several Q codes that are used in reporting altimeter setting; they are as follows:

a. QNE. The standard altimeter setting of 29.92 inches of mercury the contraction is Hg.), or 1013.25 hectopascal (hPa for short), or 1013.25 millibars (use mb).

b. QNH. Is the height above sea level when corrections are applied for local atmospheric pressure that is above or below the standard altimeter setting of 29.92 Hg. QNH is the altimeter setting provided in the ATIS information and by ATC.

c. QFE. An altimeter setting that is corrected for actual height above sea level and local pressure variations.

SUMMARY: There is a compelling reason to report all atmospheric pressure measurements as barometric, rather than station values: The isobars on weather charts would be meaningless except over the sea, and over those land areas happening to be at sea level. Any hill or mountain would produce a local lowering of pressure (station pressure) and the isobars would shift with the terrain. Since a change in altitude of only a few hundred feet corresponds to a large change in station pressure, weather analysis would be greatly complicated. It is crucial that pressure be reported accurately to aircraft. With out an accurately reported altimeter setting, aircraft may believe their altitude to be several hundred feet different than what it really is, creating a huge danger to aircrews and ground crews alike.

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