THE
ATMOSPHERIC RESERVOIR
Examining the Atmosphere and Atmospheric Resource Management

""A Jump Through Our Atmosphere"

By Mark D. Schneider

On October 14th, Felix Baumgartner jumped from a balloon-tethered capsule and fell through 24 miles of our earth's atmosphere. This event was both the highest free fall and manned balloon flight ever recorded and Felix was the first person to break the speed of sound outside of a craft or capsule. Coincidentally, 65 years prior (to the day) Chuck Yeager was the first person to break the speed of sound in a rocket-powered airplane. The official name of the mission was "Red Bull Stratos," but it was occasionally referred to as a "space jump." Did this jump actually take place in outer space?

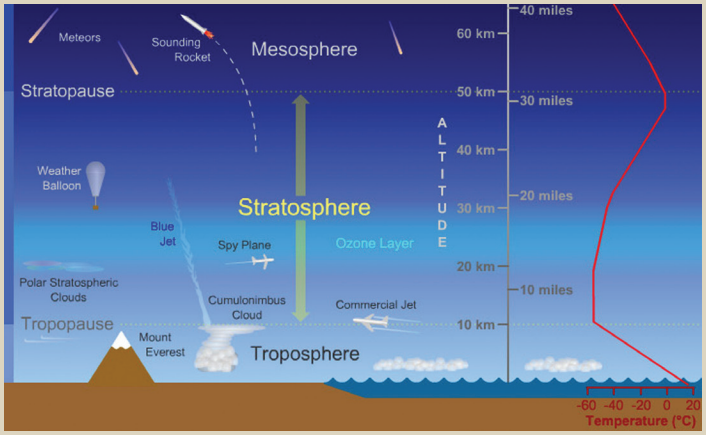

Image courtesy of Windows to the Universe.

There is an international standard called the Kármán line, named for physicist Theodore von Kármán, which defines the boundary between the earth's atmosphere and outer space as 100 kilometers or 62 miles above sea level. Kármán chose 100 kilometers because it's the altitude where earth's atmosphere becomes too thin for aeronautical operations. Also, at this altitude there is a dramatic increase in exposure to solar radiation and corresponding temperature increase.

What we know from observation, though, is that there isn't a definitive "line" where atmosphere ends and space begins. Each layer of our atmosphere is dynamic and has constantly changing temperature and pressure. The only exceptions to this are relatively shallow areas between the layers, where the temperature remains constant within an isothermal zone. The primary layers of our atmosphere in ascending order are the troposphere, stratosphere, mesosphere, and thermosphere. Beyond the thermosphere, atoms and molecules begin to escape the earth's gravitational pull and pass into outer space from what's referred to as the exosphere, or top of our atmosphere.

Starting from the earth's surface and ascending through the troposphere, temperature and pressure typically decrease with height. Once reaching the stratosphere, temperatures actually begin increasing with height because of the concentration of ozone, which absorbs much of the sun's ultraviolet (UV) energy. This means that during the initial start of Felix's descent through the stratosphere, the air actually cooled from approximately -20 to -60 degrees Fahrenheit! Then as he entered the troposphere temperatures began warming again. When Felix opened the door to the capsule and readied for his jump from 128,100 feet above the earth, his specially designed spacesuit shielded him from the cold temperatures and provided life-sustaining pressurization. At this altitude, the atmospheric pressure is virtually zero and only a few seconds of exposure would be fatal to humans. Pressure gradually increased on the way down to earth; until Felix reached an altitude of two to three miles above earth, his suit continued to provide essential pressurization and oxygen to him.

So the "Red Bull Stratos" mission was appropriately named because its origins were in the stratosphere and not in outer space. Whenever humans leave the earth and travel to high altitudes or into space, we're reminded of just how hospitable our planet is and that the immediate atmospheric layer we live in (the troposphere) shields us and provides us with life sustaining conditions.

Atmospheric Resource Board
North Dakota State Water Commission
900 East Boulevard, Bismarck, ND 58505
(701) 328-2788 • http://swc.nd.gov

ND Weather Modification Association
PO Box 2599, Bismarck, ND 58502
(701) 223-4232