Exhibit No. 1

Transmitter Equipment Characteristics

Manufacturer's Model No. :		Tycho Model 400 final Amplifier
Manufacturer's Name:		Tycho Technology, Inc. Transmitter
Type:		Pulse Radar
Tuning Range:		404.37 MHz fixed
Method of Tuning:		Fixed Crystal
Frequency Tolerance:		+/- 5 ppm 0 - 50 Deg. C
Emission Bandwidth:		
	-3 dB	120 KHz (Measured)
	-20 dB	11 MHz (Measured)
	-40 dB	31 MHz (Measured)
	-60 dB	50 MHz (Measured)
	OC-BW	1.96 MHz (Calculated)
Maximum Bit Rate:		600 K bits/sec
Modulation Techniques:		Phase coding of pulse
Pulse Characteristics:		
	Rate	6000 - 10000 pps
	Width	1.67 - 6.67 micro seconds
	Rise Time	0.25 micro seconds
	Fall Time	0.25 micro seconds
Power:		
	Mean:	1 - 2 Kw, 1.5 Kw nom.
	Peak:	20 - 40 Kw, 35 Kw nom.
Output Device:		CPX 5000 A7
Harmonic Level:		
	2nd	-58 dBc
	3rd	-59 dBc
Spurious Level:		-65 dBc (est)

Note: Tycho Technology Inc. is currently licensed to operate the prototype system (See attached).

Exhibit No. 2

Antenna System Specifications:

The antenna consists of two overlaid phased arrays of coaxial colinear antenna elements. The two arrays are perpendicular to each other. Only one array is active at any time.

The antenna can generate 5 discrete pointing angles for the main beam - one at a time. The allowed beam angles are as follows:

Beam 1 - Vertical

Beam 2 - 15 deg off vertical toward +X direction.

Beam 3 - 15 deg off vertical toward -X direction.

Beam 4 - 15 deg off vertical toward +Y direction.

Beam 5 - 15 deg off vertical toward -Y direction.

Each of these beams has the same beamwidth and sidelobe specifications. The beam stays at each position for 1 minute. The beam is blanked during steering.

EXHIBIT No. 3

Wind Profiling Theory of Operation:

The system for which this application applies is an Model 400 - 404.37 MHz Doppler Wind profiler system designed and manufactured by Tycho Technology, Inc. of Boulder, Colorado. The Model 400 consists of an external phased-array antennae, a 35KW pulsed transmitter, a receiver/processing system which produces doppler spectra for each level of the atmosphere sensed and a display/graphics component. This system is designed to remotely sense the horizontal and vertical components of wind in the lower portion of the atmosphere from a surface based platform.

Wind profiling depends upon the scattering of electromagnetic energy by minor irregularities in the index of refraction of the air. The index of refraction is a measure of the speed at which electromagnetic waves propagate through a medium. For wind profiling, this medium is the atmosphere. A spatial variation in this index encountered by a propagating electromagnetic wave (radio wave - 404.37 MHz) causes a minute amount of the energy to be scattered (or dispersed in all directions). Most of the energy incident on the refractive irregularity propagates through it without being scattered. Backscattering (scattering of energy toward its point of origination) occurs preferentially from irregularities of a size about one-half the wavelength of the probing radio wave. Since these irregularities are carried by the wind, they prove to be good "traces" of the mean wind. By measuring the shift in frequency of the radar return signal (the Doppler shift) the radial velocity of the scatterers, and thus the wind, can be calculated.

The calculated radial velocity is determined for discrete increments (gates) of range sufficient to cover the heights of interest, up to 16 km for the Model 400, depending on local meteorological conditions. The data in each range gate for each beam direction is carefully analyzed to provide the desired information. Spectral analysis techniques are applied to obtain a Doppler spectrum from which three moments are calculated: received power, mean radial velocity, and spectral width.

Wind Profiler System Design:

The VHF 404.37 MHz wind profiler consists of four primary subsystems. These are : 404.37 Mhz transmitter/circulator, receiver/modulator, processor/display (which produces the doppler spectra, converts them to meteorological variables and displays them) and phased array antenna. The system is shown schematically in Figure 1.

On command from the Processor Subsystem, the antenna Controller/Monitor Processor (CMP) sets up the proper phasing for the desired antenna beam position. The processor sends a prompt signal (pulse) to the receiver/modulator, which produces a pulsed RF signal. This is then amplified by the transmitter and sent to the antenna subsystem to complete the transmit cycle. The receiver is disconnected from the antenna during the transmit cycle to prevent overloading it.

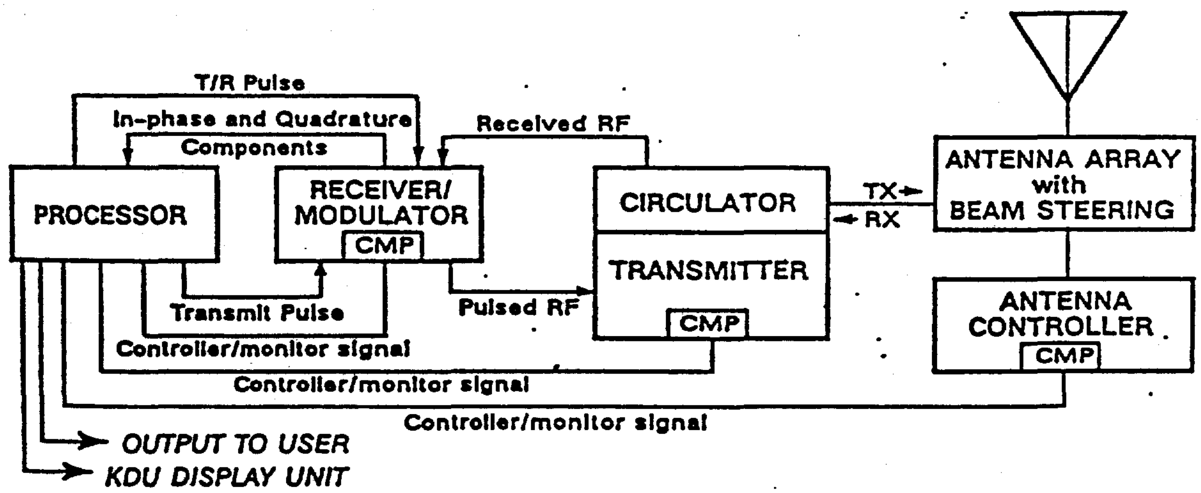

Figure 1 : Block diagram of a 400 MHz wind profiler system.

The system is then set to the receive configuration. The receiver is reconnected and the circulator directs the weak return signal from the antenna to the receiver subsystem. The receiver amplifies the signal and extracts the in-phase and quadrature (or sine and cosine) phase components from which the radial wind velocity is derived. Filtered outputs from the receiver are sent to the processor subsystem, which performs the various processing steps necessary to produce the radial wind component and other important parameters relative to the return signals from that beam.

The processor controls the cycles through this sequence for each of the 5 discrete pointing angles (see exhibit No. 2). Each of the 5 beams has the same beamwidth and sidelobe specifications. The beam stays at each position for 1 minute. The beam is blanked during steering.

Supported Research:

The Doppler Wind profiler system will directly support both current and future studies of the physical processes in the atmospheric boundary layer. In order to understand the evolution of the boundary layer and its's attendant properties, such as visibility, clouds, density, wind and moisture structures, we must be able to monitor the motions of the layer and it's exchanges of mass and energy with the free atmosphere as well as with the surface. The documentation and understanding of these complex dynamic interactions will improve our ability to verify simulations of boundary layer evolution and to ultimately verify predictions of the properties of the boundary layer.

In addition to the on-going research projects that the wind profiler will complement, three areas of new research have been identified. These include the interpretation and optimization of wind profiler data to deduce the dynamic structure of the atmosphere. Another area of new research will be the study of two weather features associated with the lee position relative to a mountain barrier. These two phenomenon include severe down-slope windstorms and up-slope precipitation events.

Government Contract Agencies:

Department of Defense
Office of Naval Research
Marine Meteorology Program
800 North Quincy Street
Arlington, VA 22217-5000

Contact : Dr. Robert Abbey (202)-696-6598

NASA/Langley Research Center
Mail Stop 483
Hampton, VA. 23665-5225

Contact : Mr. David McDougal (804)-864-5832

Exhibit No. 4

The Department of Atmospheric Sciences at Colorado State University utilizes a 404.37 MHz wind profiler system as an integral part of its instructional and research programs. Currently it is located on university property at the foothills campus as specified on its operational license for station KC2XAF file number 1154-EX-R-92. In order to provide the greatest return in terms of research information, the faculty at the department has decided to collocate the instrument with an existing research radar funded by the National Science Foundation and operated by Colorado State University. The National Science Foundation (CHILL) radar is located on property owned by Colorado State University north of the town of Greeley, in Weld county in the state of Colorado at 30750 County Rd. 45 at geographical coordinates: 40° 27' 18" N latitude and 104° 37' 54" W longitude. This move is scheduled to commence in the middle of March 1995 and it is anticipated that the profiler will remain at this location for a period of not less than one year. There are no significant environmental impacts that would result if this relocation is approved.