LibHuAirProp Functions

Thermodynamic Properties	
$c = \mathrm{f}(p,t,W)$	Speed of sound
$c_p = \mathrm{f}(p,t,W)$	Specific isobaric heat capacity
$c_v = \mathrm{f}(p,t,W)$	Specific isochoric heat capacity
$h = \mathrm{f}(p,t,W)$	Air-specific enthalpy
$\kappa = \mathrm{f}(p,t,W)$	Isentropic exponent
$p = \mathrm{f}(z_{\mathrm{ele}})$	Pressure of humid air from elevation
$\rho = \mathrm{f}(p,t,W)$	Density
$s = \mathrm{f}(p,t,W)$	Air-specific entropy
$u = \mathrm{f}(p,t,W)$	Air-specific internal energy
$v = \mathrm{f}(p,t,W)$	Air-specific volume
$Z = \mathrm{f}(p,t,W)$	Compressibility factor

Transport Properties	
$a = \mathrm{f}(p,t,W)$	Thermal diffusivity
$\eta = \mathrm{f}(p,t,W)$	Dynamic viscosity
$\lambda = \mathrm{f}(p,t,W)$	Thermal conductivity
$\nu = \mathrm{f}(p,t,W)$	Kinematic viscosity
$Pr = \mathrm{f}(p,t,W)$	*Prandtl* number

Water Content Functions	
$\varphi = \mathrm{f}(p,t,W)$	Relative humidity (decimal ratio)
$W = \mathrm{f}(p,t,\varphi)$	Humidity ratio from total pressure, temperature, and relative humidity
$W = \mathrm{f}(p,t,p_{\mathrm{H2O}})$	Humidity ratio from total pressure, temperature, and partial pressure of water vapor
$p_{\mathrm{H2O}} = \mathrm{f}(p,t,W)$	Partial pressure of water vapor in moist air

Saturation Properties	
$f = \mathrm{f}(p,t)$	Saturation pressure enhancement factor of water (decimal ratio)
$p_{\mathrm{H2Os}} = \mathrm{f}(p,t)$	Partial saturation pressure of water vapor
$t_{\mathrm{d}} = \mathrm{f}(p,W)$	Dew-point temperature
$t_{\mathrm{wb}} = \mathrm{f}(p,t,W)$	Wet-bulb temperature
$W = \mathrm{f}(p,t_{\mathrm{d}})$	Humidity ratio from total pressure and dew-point temperature
$W = \mathrm{f}(p,t,t_{\mathrm{wb}})$	Humidity ratio from total pressure, (dry bulb) temperature and wet-bulb temperature
$W_{\mathrm{s}} = \mathrm{f}(p,t)$	Saturation humidity ratio
$t = \mathrm{f}(p,t_{\mathrm{wb}},W)$	Temperature from total pressure, wet-bulb temperature and humidity ratio
$t_{\mathrm{s}} = \mathrm{f}(p,p_{\mathrm{H2O}})$	Saturation temperature of water vapor from total pressure and partial pressure of water vapor

Backward Functions	
$t = \mathrm{f}(p,h,\varphi)$	Backward function: temperature from total pressure, air-specific enthalpy and relative humidity
$t = \mathrm{f}(p,h,W)$	Backward function: temperature from total pressure, air-specific enthalpy and humidity ratio
$t = \mathrm{f}(p,s,W)$	Backward function: temperature from total pressure, air-specific entropy and humidity ratio

Range of Validity of LibHuAirProp

I-P Units

Pressure:	0.00145	$\leq$	p	$\leq$ 1,450.4	psi
Temperature:	–225.67	$\leq$	t	$\leq$ 662	°F
Humidity ratio:	0	$\leq$	W	$\leq$ 10	$\mathrm{lb_w/lb_a}$

SI Units

Pressure:	0.01	$\leq$	p	$\leq$ 10,000	kPa
Temperature:	–143.15	$\leq$	t	$\leq$ 350	°C
Humidity ratio:	0	$\leq$	W	$\leq$ 10	$\mathrm{kg_w/kg_a}$