Into the eye of a storm —by Christopher Lee

The 2007 hurricane season was relatively quiet, but whenever the next big cyclone spirals into life in the open ocean and takes aim at the U.S. coast, Joseph Cione will be ready to plunge into it. Not literally, of course. Cione, a hurricane researcher with the National Oceanic and Atmospheric Administration, is the lead scientist on a government project that aims to send an unmanned aerial drone with advanced weather-watching equipment deep into a hurricane for the first time, and at the earliest opportunity.

The goal is to fly the 28-pound craft as low as 500 feet, gathering detailed observations of the high-wind, low-altitude eye-wall regions that are too dangerous for manned hurricane hunter airplanes to probe. By learning more about the lowest layers of the storm, scientists hope to better understand the energy transfer from the ocean to the atmosphere that fuels hurricanes and causes them to intensify and grow more deadly.

The drone, known as an Aerosonde after the Australian company that designed it, is one of several emerging technologies being used to help unlock the secrets of hurricanes and, scientists hope, give rise to more accurate computer models. Better and earlier forecasts, particularly of a storm's intensity, can help drive decisions to evacuate regions and save lives.

Another novel tool is the North American Lightning Detection Network, a growing network of more than 180 highly sensitive land-based remote sensors that can study storms from hundreds or even thousands of miles away. Scientists report that by using the sensors to examine the frequency of lightning strikes within the eye wall, they will be able to gauge when and whether a hurricane will intensify.

Earlier in 2007, NOAA significantly upgraded its weather and climate supercomputers, and, with them, meteorologists are able to generate more advanced models of storm behavior which they hope will make predicting hurricane intensity easier.

The most exciting of the new technologies may be the drone. With a wingspan of nearly 10 feet, the propeller-driven orange and white aircraft can be launched from the roof of a sport-utility vehicle and can fly 1,200 to 1,300 miles round-trip. Scientists initially steer it by radio control using a joystick, then, at greater distances, via satellite.

Its instruments record moisture, temperature and pressure, as well as ocean surface temperatures and, of course, wind speeds. The data is sent to scientists at the National Hurricane Center in Miami via satellite and made available to forecasters immediately.

Traditionally, hurricane hunter aircraft have dropped bundles of instruments through storms, which provide only a momentary look at a limited section of the storm. The Aerosonde collects data continuously, yielding a fuller picture of where and how powerful the strongest winds are, and helping to predict what the storm surge will be.

Researchers sent a drone on a 10-hour mission into Tropical Storm Ophelia, but they are eager to probe a hurricane, the most powerful of which have sustained winds of more than 155 mph. There were "rapid response" teams stationed at a NASA facility in Wallops Island, Va., and at Key West Naval Air Station in Florida until Oct. 31 last year, waiting to catch a hurricane within range.

The drone, while small, is pretty sturdy, and its size also makes it quite economical on fuel. Cione compared the 24-cc. fuel-injected engine to that of "a fancy lawnmower" and noted that in the 10-hour Ophelia flight the craft burned less than two gallons of gasoline.

Other forecasters are working to learn more about hurricanes combining data from the remote sensor network with readings from NOAA's hurricane hunter aircraft and a NASA weather satellite. The ground-based sensors, about the height of a person and topped by a white bulb, can detect electromagnetic signals produced by cloud-to-ground lightning strikes from thousands of miles away. [Based on an article published in *The Washington Post,* Oct. 8, 2007.]

Groundhog Day

With so much depending on weather, it would seem remiss of me not to comment on Groundhog Day. For those not familiar with the event, Groundhog Day, which takes place on February 2 every year, is the modern American version of an age-old tradition originating in Europe centuries ago. The modern Groundhog Day is celebrated in the United States in Punksutawney Pennsylvania (about 100 miles west of Penn State University). According to legend, if the groundhog–who is named Punxsutawney Phil–sees his shadow, there will be six more weeks of winter weather. If he does not see his shadow, there will be an early spring. After Phil emerges from his burrow on February 2, he speaks to an event official in "Groundhogese," and his prediction is then translated for the awaiting public. The event was popularized in the 1993 movie of the same name, starring Bill Murray.

Sadly, it appears that global warming may soon add Phil to the ranks of the unemployed. With the warming of 4-8ºC (7-14ºF) predicted over North America by the end of this century if we continue to increase greenhouse gas concentrations at current rates, the answer will become simple. Spring will come early every year. While this may seem like a pleasant outcome of climate change, it could in fact lead to serious problems for plants, animals, and entire ecosystems. Living things have adapted to the timing of the seasons over many thousands of years. Here, we are changing the timing of the seasons on time scales of decades. Plants and animals just don't adapt well to changes on such short time scales. [By a professor at Penn State]