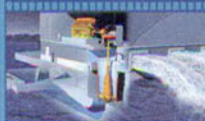


HEADLINES

DISCOVERIES, ADVANCES AND DEBATES IN SCIENCE



28

A new flood-busting plan for New Orleans



32

Harry Kloor makes quarks fun



34

A supercomputer takes on Jeopardy

METEOROLOGY

EYES OF THE STORM

A SMALL TEAM OF SCIENTISTS PROVIDES THE MOST ACCURATE FORECASTS EVER

Last September, five days before Hurricane Ike pulverized the Texas coast, the National Hurricane Center pegged a point near Corpus Christi as the storm's most likely landfall. Residents of the low-lying region around Galveston, some 250 miles north, breathed a sigh of relief.

But then, 20 hours before Ike reached land, it hooked a right turn in the Gulf of Mexico, plowed into Galveston, and buried the city under a deadly storm surge. If only a different prediction had gotten the headlines. The hurricane's eye made landfall less than 10 miles from the location predicted by AirDat, an eight-person team of private-sector forecasters in Raleigh, North Carolina. AirDat has nailed the path of a number of storms and, as the Atlantic hurricane season hits its peak this month, national weather agencies will probably look to the company for help.

For the past 60 years, meteorologists at the National Oceanic and Atmospheric Administration have created forecasts primarily from weather balloons that measure atmospheric pressure, moisture, temperature and wind speed. But the balloons get released only twice a day and from just 70 locations around the country, leaving vast swaths of atmosphere unsampled.



THWARTING DISASTER Galveston residents could have better prepared for Hurricane Ike had they known that they were in its path.



STORM SEEKERS AirDat's Tamdar sensors, currently installed on the nosecones of 160 commercial airplanes, beam real-time atmospheric data to forecasters.

Since 2004, AirDat has honed an entirely different method for gathering more-accurate daily atmospheric data and delivers it to airlines, energy companies with mid-ocean drilling rigs and wind-turbine platforms and, on occasion,

to NOAA. The key to AirDat's success is its wallet-size, airplane-mounted Tropospheric Airborne Meteorological Data Reporting (Tamdar) sensors. The sensors, which test the same variables as weather balloons, provide data from the ground

TICKER >>> **JUNE 1** For the first time, scientists track migrating Antarctic penguins. The trick: spotting penguin-poop-stained ice on satellite imagery. >>>

DISASTER TECH

FOILING THE FLOOD

THE WORLD'S LARGEST PUMP STATION OFFERS HURRICANE RELIEF FOR NEW ORLEANS

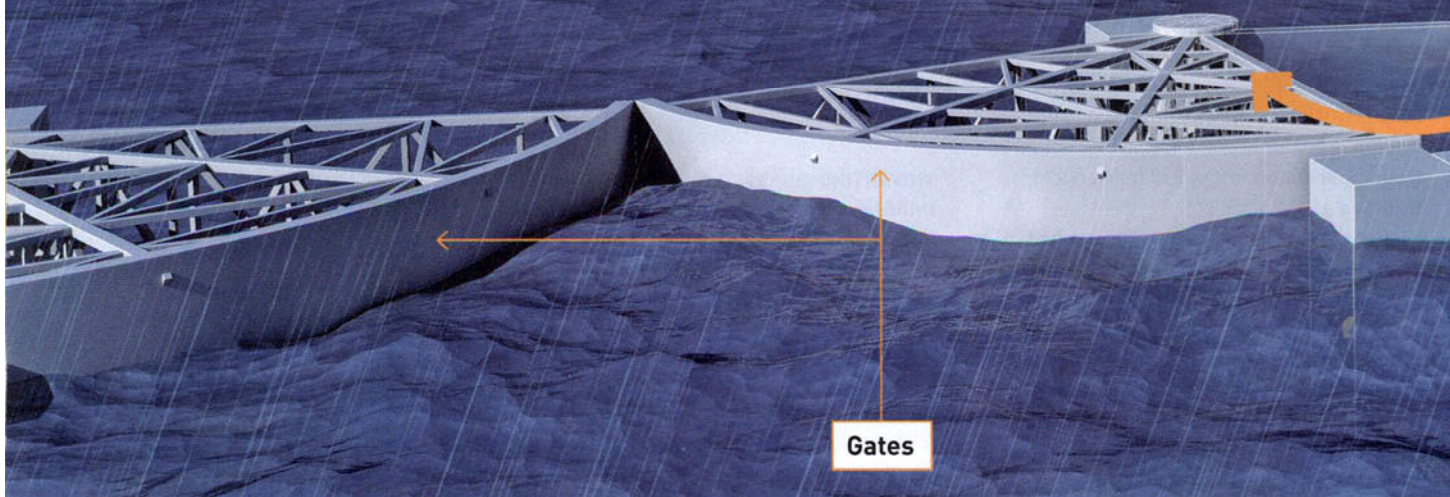
New Orleans sits smack dab between the Gulf of Mexico and Lake Pontchartrain, and when a hurricane comes rolling in, those bodies of water tend to spill into the streets. This summer, the U.S. Army Corps of Engineers started construction on a barrier that can block a 16-foot swell blown in from the Gulf and a massive pumping station that will blast floodwaters back to sea.

The \$500-million station—the newest installment of a \$14-billion federal project to fortify the Big Easy against the type of fierce storm the city sees once in 100 years—will

protect the 240,000 residents living in New Orleans, a high-risk flood area because of its nearby shipping canals. The Gulf Intracoastal Waterway is one of the city's most trafficked industrial waterways, but it provides a perfect path from the Gulf for a 16-foot storm surge to flood homes and businesses. When a major storm threatens, the waterway's new West Closure Complex will mount a two-point defense. First, operators will shut the 32-foot-tall, 225-foot-wide metal gates to block the surge. Then they'll fire up the world's largest pumping station, which pulls 150,000 gallons of floodwater per second. And unlike the

city's notorious levees, the WCC won't break when residents need it most. "This station is designed to withstand almost everything," including 140mph winds and runaway barges, says Tim Connell, the U.S. Army Corps of Engineers's project manager for the complex.

Army engineers will bring the gates and pumps online as they go, with the goal of wrapping up construction by 2011—provided there are no interruptions, says Dennis Kamber, a senior technical adviser on the project: "We have our fingers crossed that Mother Nature will be kind to us this year."—SUSANNAH F. LOCKE



Gates

up to 25,000 feet, the key atmospheric segment for short-range forecasting because it's where most severe weather forms. AirDat now collects info from 160 sensor-equipped planes making daily flights out of 225 airports from Alaska to Florida, and it is in the process of adding another 320. The fleet produces some 6,000 "soundings"—reports created from millions of Tamdar measurements—per day. AirDat scientists run these high-resolution data packages through computer weather models to

make up-to-the-minute forecasts.

In recent studies, NOAA scientists determined that Tamdar data reduces short-range forecasting errors in temperature, relative humidity and wind speed, the three most critical drivers in creating dangerous weather, by up to 28 percent, 50 percent and 10 percent, respectively. That jump in accuracy is "like someone running a two-minute mile," says Neil Jacobs, an atmospheric scientist with AirDat. When NOAA began incorporating Tamdar data

into its cutting-edge Rapid Update Cycle predictive model last fall, one of the first times the government had used private-sector data in its forecasts, its predictions became up to 30 percent more accurate.

Although AirDat's main goal is to improve the daily weather report, it could also make flying safer by providing pilots with real-time turbulence and icing conditions. When Continental Flight 3407 crashed outside Buffalo and killed 50 people in February, the

GRAHAM MURDOCH

» JUNE 10 New measurements suggest that winds are slowing across the Midwest, possibly because the Great Lakes' wind-driving ice has been forming

HOW TO KEEP NEW ORLEANS DRY

CLOSE THE GATES

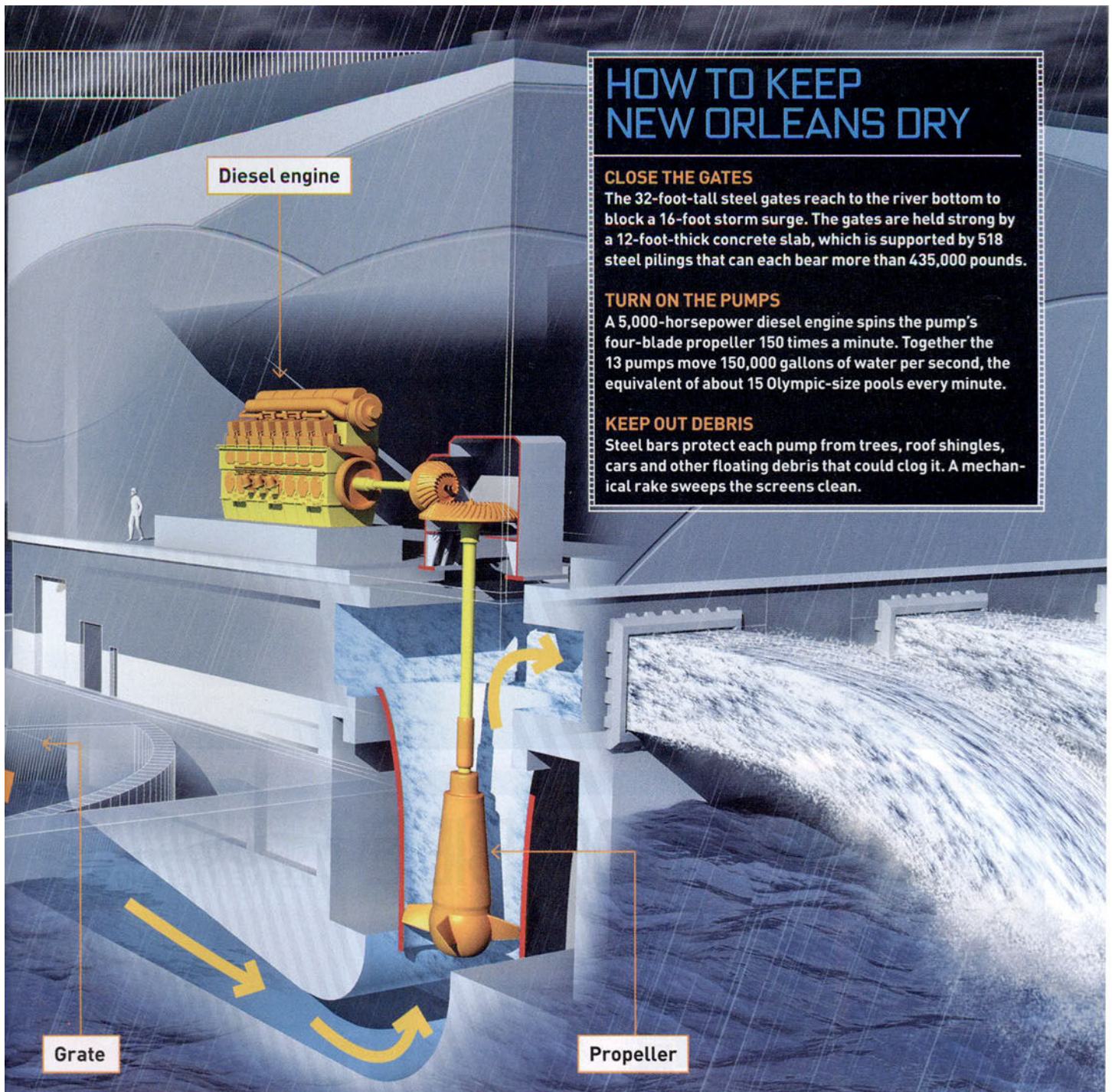
The 32-foot-tall steel gates reach to the river bottom to block a 16-foot storm surge. The gates are held strong by a 12-foot-thick concrete slab, which is supported by 518 steel pilings that can each bear more than 435,000 pounds.

TURN ON THE PUMPS

A 5,000-horsepower diesel engine spins the pump's four-blade propeller 150 times a minute. Together the 13 pumps move 150,000 gallons of water per second, the equivalent of about 15 Olympic-size pools every minute.

KEEP OUT DEBRIS

Steel bars protect each pump from trees, roof shingles, cars and other floating debris that could clog it. A mechanical rake sweeps the screens clean.



TAMDAR COULD HAVE WARNED OF THE ICING THAT DOWNED FLIGHT 3407.

National Transportation Safety Board used GPS-stamped data from Tamdar-equipped planes to confirm that there was icing in the area. "Without Tamdar, we never would have been able to verify the icing," says Donald Eick, a senior meteorologist with the NTSB. Had Flight 3407 been equipped with Tamdar, he suspects, the pilots might have avoided the foul weather altogether.

Currently NOAA has room in its budget to purchase just some of AirDat's data,

and only on a month-to-month basis. Many meteorologists would like to see NOAA get the federal funding to make AirDat the national standard but, says National Weather Service forecaster David Helms, "it's NOAA and the FAA's case to make." Ike's destruction serves as a good argument for ordering the full slate of data: When AirDat looked back to learn why its forecast was so accurate, the key piece of data was a single low-pressure trough it recorded in Alaska.—DEVON O'NEIL

later and melting earlier as a result of climate change. **JUNE 10** Chemists welcome ununbium (Uub), the 112th element, to the periodic table. >>>