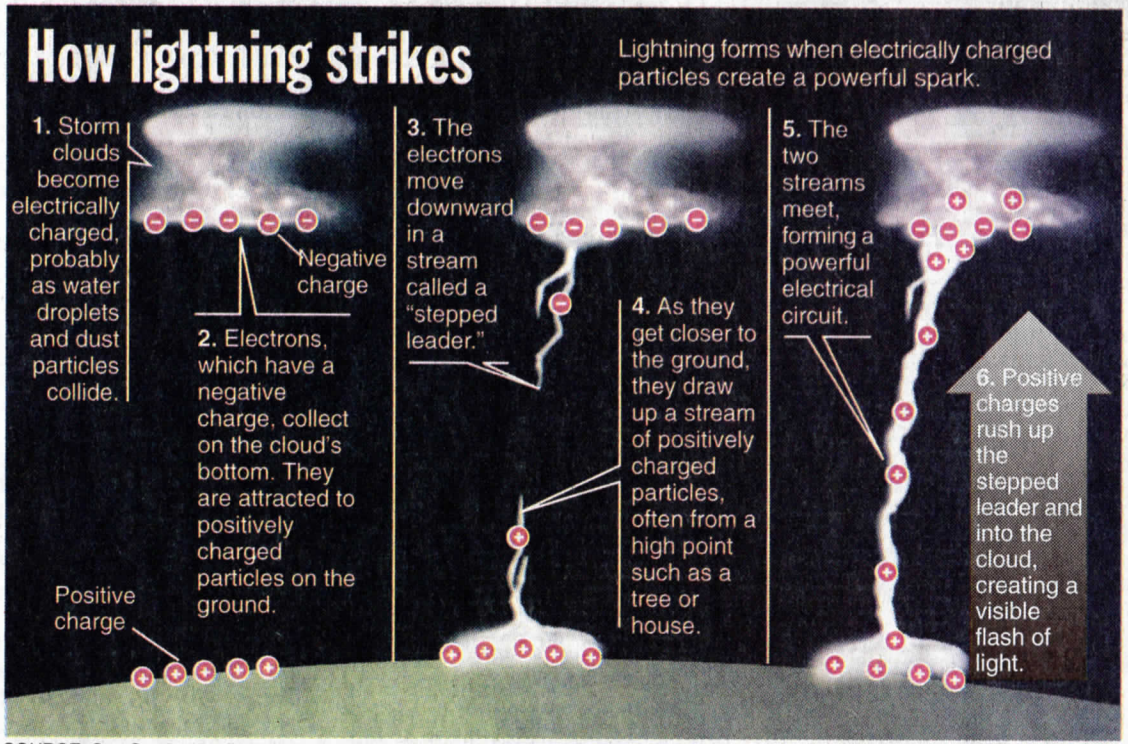
LOOK OUT FOR LIGHTNING

CAMERON GILLIE/special to the News

A thunderstorm rolls across eastern Collier County, near Naples, and lightning flashes across the evening sky. During the past 40 years, lightning strikes have killed an average of 73 people across the country annually — more than the annual number of deaths from tornadoes or hurricanes.

Scientists explore ways to predict deadly bolts



SOURCE: Sun-Sentinel staff research

Staff graphic/Daniel Niblock

By Dan McCue
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STUART

Summertime: A season of sultry temperatures and sudden changes in the temperament of the sky. In a flash, the blue canopy populated by billowing white clouds turns menacing, dangerous and sometimes deadly.

Just this past week, seven people, ranging in ages from 2 to 80, were injured by lightning on a tiny island near Apollo Beach, 13 miles south of Tampa.

On the other side of the state, four people were struck by lightning in Jacksonville, including two who were in houses at the time.

Meanwhile, a fiberglass company in Jacksonville was destroyed after lightning sparked a blaze in the building, said Lt. Billy Clements, of the Jacksonville Fire Department.

No one was seriously injured in those strikes, officials said.

Not as fortunate was Gregory Marich, a 50-year-old construction foreman who was clearing his crew off a Savannah, Ga., work site last week, just ahead of a fast-moving thunderstorm.

The construction men were lucky Marich was paying attention to the weather; the foreman, how-

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ever, was not. He was taking one final look at the construction site when a bolt struck him square in the chest, killing him instantly.

A similar tragedy occurred in early May in Fort Lauderdale. In that case, a Colorado tourist was killed and his girlfriend injured when they were struck by lightning while on the beach.

The couple had just begun their vacation when the tragedy occurred. There were some clouds and a little rolling thunder, but the sun was still out, remembered Lynne Allen, 30, of Denver.

"I had no idea there was lightning close by," Allen said. "Out of nowhere, it just struck."

During the past 40 years, lightning strikes have killed an average of 73 people across the country each year — more than the annual number of deaths from tornadoes or hurricanes.

Florida leads the nation in lightning-related deaths.

Of the 2,920 reported lightning deaths during the past 40 years, 394 — 13.5 percent — occurred in the Sunshine State.

Between 1959 and 2000, one person was killed by lightning in Martin County, while seven were killed in St. Lucie County, 10 in Indian River County and 24 in Palm Beach County.

The Sunshine State also leads the nation in lightning activity.

Of the estimated 20 million bolts of lightning that strike the ground in the United States each year, more than 2 million occur in Florida, making for a daily average of more than 3,500.

Since the onset of the state's six-month rainy season seven weeks ago, lightning has killed one person, injured at least four and is thought to be the cause of scores of wildfires, including two in Jonathan Dickinson State Park in mid-June.

Although lightning strikes can generate impressive stories, there's a lot about lightning that even those in the weather business don't know.

But that could be about to change. This summer and next, teams of scientists representing different organizations and with different objectives in mind will scan the sky each time there's so much as a rumble in the distance.

The common thread linking the various research projects is their aim: helping people and organizations prepare for and manage the threat of destructive lightning.

"Lightning — and by that I really mean the whole area of atmospheric electricity — is a subject about which there are still a lot of things to learn," said Richard Blakeslee, a lightning researcher at the Marshall Space Flight Center in Huntsville, Ala.

the strike shook the launch team. Uman and a host of other researchers found a calling.

Research team special

What sets the University of Florida team apart from other lightning researchers is its work with "triggered lightning" — lightning they coax from passing thunderstorms using small rockets trailing a thin metal wire.

This summer, they're working on two projects. One examines the environment within the electromagnetic field of lightning to determine how it interacts with materials used to build aircraft.

"The research is being done for the Federal Aviation Administration, which will present the information to aircraft manufacturers and will lead, hopefully, to the construction of better aircraft," Uman said.

The other project Uman is involved with is the third year of a study for Florida Power and Light Co. to improve systems intended to protect the utility's power lines.

Flights to gather data

In another of the experiments getting under way this summer, NASA researchers led by Richard Blakeslee will use an unmanned aerial vehicle, or "UAV," to try to get a better handle on how lightning forms and dissipates during thunderstorms.

"It's a very strange looking vehicle," Blakeslee said of the slow-flying aircraft, which can soar at altitudes of 80,000 to 100,000 feet for as long as eight hours at a time. "It's kind of like a rocket, with a three-finned tail and two wings."

Because of its experimental nature, the craft, built by General Atomics of San Diego, will initially fly only over restricted air space, meaning it will take off from Patrick Air Force Base and fly over Cape Canaveral.

If initial flights scheduled for the summers of 2002 and 2003 go well, and the FAA gives NASA the go-ahead, the program might be expanded to include flights into storms in other parts of the state, including Martin and St. Lucie counties, said David E. Steitz, a spokesman with NASA headquarters in Washington, D.C.

But for the time being, as he lays the groundwork for the $4 million project, Blakeslee is just as happy to focus his attention on the Space Coast, where there's been at least one thunderstorm almost daily for the past month.

Blakeslee's researchers include professors and graduate students from the University of Alabama at Huntsville, as well as scientists from NASA's Goddard Space Flight Center, in Greenbelt, Md.

"What we're looking for, of course, are days when thunderstorms are expected to develop directly over the Kennedy Space Center," Blakeslee said. "When they do, we'll start to fly around them, and if they're small enough, we might even fly over them, collecting data."

As it cuts across the sky, delicate instruments on board the plane will take measurements of the electrical current flowing from and surrounding the storm, something scientists call a storm's "electrical budget."

"As surprising as it might sound, no one's ever really examined this before," Blakeslee said. "What we're going to be looking at is the electrical budget over the life cycle of a storm."

Scientists view thunderstorms as huge electrical generators, what Blakeslee described as a "single component of the global electric circuit."

"What a thunderstorm is, if you think about it, is a huge airborne battery," Blakeslee said. "From one pole, the top of the storm, electricity flows out into the ionosphere. From the other, the bottom, it trickles out to the ground."

But there's more to Blakeslee's research than the purely electrical. Among the questions he and his team want to answer is how the prevalence of lightning can be used as an emergency preparedness tool.

"If we can learn more about

Flight Center in Huntsville, Ala.

Blakeslee heads a team that's spent the past several weeks preparing to fly an unmanned aircraft near the most charged and dangerous parts of lightning storms.

"Although we all have had some experience with lightning, it's still a very mysterious thing," Blakeslee said. "We understand how lightning forms, but among the things we don't know is why certain storms are more electrically active than others, and how lightning is related to other aspects of the storms in which it occurs."

What makes lightning extremely dangerous is not just its high voltage, but the fact that it often catches people by surprise.

Although most lightning strikes occur close to the rain area of a storm, it can also strike many miles away.

David Sharp, science officer for the Melbourne office of the National Weather Service — which provides forecasts to Martin and St. Lucie counties — said his agency has verified instances in which lightning from an identified storm has struck people as far as 50 miles away.

As in the case of the Denver couple, most people struck by lightning are hit before the rain arrives at their location or after the rain has ended.

Locating lightning

Lightning discharges can occur from cloud-to-cloud, cloud-to-air, and cloud-to-ground.

Because cloud-to-ground lightning has the greatest impact on people, it's the form most researchers study.

University of Florida professor Martin A. Uman is chairman of the International Center for Lightning Research and Testing at Camp Blanding, a Florida National Guard base near Gainesville.

Together with another University of Arizona researcher, Phillip Kreider, Uman developed the first lighting location system.

"Since then the basic technology has been sold and re-sold and become a major part of forecasting and subsequent lightning research," Uman said.

Two events, one tragic and one nerve-wracking, helped spur funding for early lightning research.

On Aug. 12, 1963, lightning caused the fuel tank of a Boeing 707 to explode over Elkton, Md., killing all 81 people aboard. It remains the country's single worst lightning-caused aviation disaster.

Six years later, on Nov. 14, 1969, Apollo 12 was struck by lightning seconds after it lifted off launch pad 39A at Kennedy Space Center.

Although Apollo 12's mission was completed without trouble,

the atmosphere in and immediately around these storms, and what kinds of things are going on there, we think lightning could prove to be a very good sensing tool," Blakeslee said.

"If you have a lot of lightning, you'll likely have more rainfall; so the more we understand what's going on inside a storm, the better we'll be able to predict where major flooding might occur, and we might even begin making strides toward predicting and preventing wildfires."

Lightning might also be able to predict formation of tornadoes, he said.

NASA doing own studies

The Alabama-based scientist isn't the only researcher looking into the properties and potentials of lightning. He's not even the only NASA researcher doing so.

Since early 2000, Frank Merceret, chief of applied meteorology at Kennedy Space Center, has been trying to divine whether launch rules are too stringent.

He's working with a team of 60 and a special plane from the University of North Dakota.

"Because we really don't know a lot about how electricity behaves in clouds, we have to have very broad safety margins when it comes to launch," Merceret said. "However, there are times, because the margins are so broad, that you sit on the ground when you can actually fly."

One study the team is undertaking will focus on the anvil clouds at the top of severe thunderstorms.

"Electrified anvils can be very dangerous to fly through. In fact, you can't safely fly through or within 10 miles of one," Merceret said. "And when one is in our launch path, we say you can't fly for at least three hours. We know three hours is safe. But is an hour just as safe? Maybe."

During the study, which has an annual budget of $1.3 million and employs balloons, radar and a specially equipped plane, NASA's team will measure the size and shape of water droplets and ice crystals, and the distribution of the material compared to the electric fields in clouds.

"We want to use this science to make the rule simpler, but also safer, so that we can fly more often," Merceret said. "Our goal is to replace launch 'exceptions' with knowledge."

There's a financial impetus behind the research. Though $1.3 million might seem like a lot to spend to send people flying around a thunderstorm, NASA need only avoid two scrubbed missions a year to make up the expense.

Forecasters in on act

But NASA researchers aren't the only ones who'll be looking to the lightning-lit skies this summer.

David Sharp said the Melbourne office of the National Weather Service will also be actively researching lightning this summer.

"What we're doing — and what we've actually done the past several years, whenever the weather proves cooperative — is documenting flash density: how often lightning manifests itself in a given area or within a given storm, and what factors influence it," Sharp

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said.

"June, July, August . . . that's prime time for lightning, and it's also the time most people are outside. So it's something we really need to have a handle on."

Between issuing their daily forecasts and updates, the office's 16 meteorologists have been poring over 10 years worth of climatological information, trying to identify patterns that can reliably be applied to future forecasts.

"Think about it this way: You're planning to go to the beach and there is a chance of thunderstorms in the forecast," Sharp said. "Wouldn't you like to know whether the scattered storms forecast might actually be in your area? Or whether you'll be safer in the morning or the afternoon?"

In recent years, the Melbourne office has begun including more lightning information in its hazardous weather outlooks, but now meteorologists are looking to make their forecasts more up-to-the-minute.

The primary research tool for forecasters in Melbourne is the National Weather Service's lightning database, a detailed accounting of cloud-to-ground lightning.

In the past 2½ years, the forecasters, like Blakeslee, have also been trying to find a way to use lightning as a warning that a tornado might be in the offing.

"That's a direct result of the February 1998 tornado outbreak in Central Florida," Sharp said. "Our hope is that severe lightning will tip us off to severe storms, then help us determine whether they could possibly be tornadic.

"However, as good a tool as lightning might become, you're always going to have those tragic cases where people are killed or property is destroyed by it," he said.

To others, the main problem with lightning is human nature.

"Oh yeah," Uman said. "Golfers never leave the golf course. Sailboats are never brought into port. That's why 10 to 20 people are killed every year in Florida by lightning."

The Associated Press contributed to this report.