

KEESLER TECHNICAL TRAINING CENTER STUDY

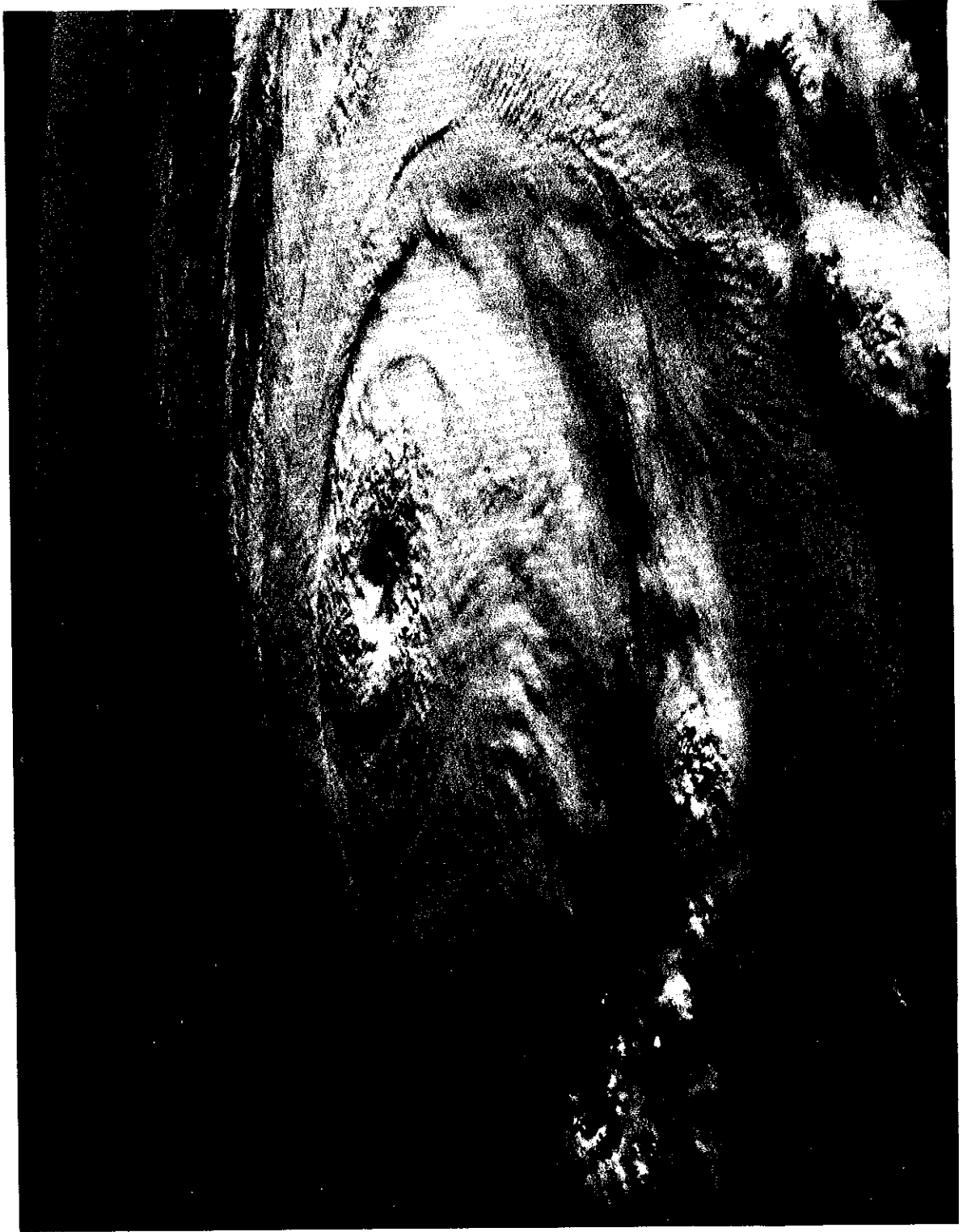
GULF TEMPEST:

MAJOR HURRICANES AND THEIR EFFECTS
ON KEESLER TECHNICAL TRAINING CENTER

DALE M. TITLER

Office of History

Keesler Technical Training Center

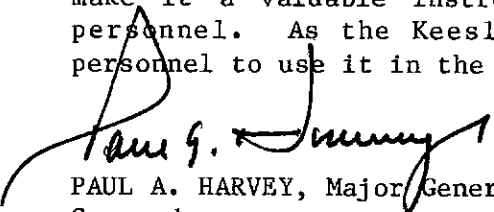


30 August 1985 satellite photograph of Hurricane Elena in the Gulf of Mexico and moving toward the Mississippi coastline.

FOREWORD

Since Keesler's inception in 1941, its geographic location on the Northern rim of the Gulf of Mexico has exposed it to the full fury of destructive tropical storms and hurricanes. On four occasions over the past forty-eight years, when this installation was in the path of the storms, commanders and managers were challenged to cope with massive wind and water forces that were out of control. Each time, the early deployment of resources--airborne warnings, personnel, materiel, and tested operating plans--combined to protect lives and property and to minimize the destructive effects of the storms. Assessments made by disaster control officers after each hurricane provided the most valuable insights on procedures best followed to prepare for, contend with, and recover from the force of the next storm. These cumulative lessons provide the guidance we will apply in future natural disasters of this type. In September 1988, I observed readiness plans swing into action as Hurricane Gilbert threatened to become the fifth storm to strike Keesler. Thankfully, the blow did not strike here, but we were ready and we knew what to do if it had.

With this special study of major gulf hurricanes and their effects on Keesler Technical Training Center, Mr Dale M. Titler, the Center historian, has followed their developments, tracks, and landfalls. He is well qualified to prepare this study for, during three of the hurricanes included here, he personally observed their awesome destructive power, and the base recovery operations that followed. The author has documented this study thoroughly, to make it a valuable instrument for future commanders and disaster control personnel. As the Keesler Commander, I encourage all concerned center personnel to use it in the light of lessons learned from the past.



PAUL A. HARVEY, Major General, USAF
Commander

PREFACE

The Mississippi Gulf Coast has suffered thirty direct strikes and ten near-strikes since August 1717 when Andre Penicaut, a ship's carpenter at Petit Bois Island, recorded the area's first known hurricane. Although the average hurricane strike is one every six or seven years, there have been several strikes in one year, blows in successive seasons, and inactive periods of ten, twenty--or in two instances--more than thirty years.

Although no habitable structure will ever be totally hurricane-proof, the interiors of the solid concrete training facilities of Keesler have proven safe havens against three powerful storms during the past twenty years. But no Keesler building can be tornado-proof, and even weak hurricanes spin off twisters along their paths. Sound structures and the prudent evacuation of the people in the storm's path are the only keys to effective survival.

The Keesler military installation, an integral part of the Gulf Coast community, is located on 1,562 acres within the environs of the City of Biloxi, a municipality that is no stranger to Gulf hurricanes. Hurricane reconnaissance aircraft are based here, where the Center's far-reaching communications network is interconnected with local, state, and national disaster agencies. Within the training installation are protected shelters, stocked with life support materials to outlast the longest confinement in a storm. Here, military and civilian members of Keesler, with their dependents, can safely wait out a storm's passage. Thus, Keesler is not only a haven from nature gone wild, it is a working part of the overall hurricane warning, preparation, and evacuation process that provides a high degree of coordination among federal, state, and local officials, as well as the media.

Hopefully, one of the underlying messages to readers of this study will be: hurricanes are life-threatening and destructive. We are at the mercy of little-understood and unpredictable steering forces, destined to expend their energy at sea or devastate a coastline. Those inhabitants along the rim of the Gulf of Mexico, which includes the entire population of Keesler, face the greatest threat, for once a hurricane has entered the Gulf, it must strike the coast--somewhere. By now, several centuries of experience should have taught coast inhabitants that the only reasonable response to a hurricane is to find safe shelter or get out of its path. Those who refuse to do so lend credence to the pessimistic dictum of Georg W.F. Hegel: We learn from history that we never learn anything from history.



DALE M. TITLER
Chief, Center History Office

CONTENTS

	Page
FOREWORD	v
PREFACE	vi
ILLUSTRATIONS	ix
INTRODUCTION	1
KEESLER AND GULF HURRICANES	1
CAMILLE: KILLER STORM	12
HURRICANE FREDERIC	24
Preparations	25
Riding Out the Storm	26
Base Damage and Recovery	28
Aid to Civilian Communities	30
Affect on Technical Training	31
Recognition for Community Assistance	32
A TRIPLE THREAT - AND HURRICANE ELENA	45
Danny	47
Tracking Elena	47
Riding out the Hurricane	51
Installation Damage and Base Recovery Efforts	63
Operation Helping Hand	67
Recovery of Technical Training Facilities	68
Lessons Learned	69
Recognition	70
Juan	71
Kate	72
SOME CONCLUSIONS	74
NOTES	77
APPENDICES	
I - Saffir-Simpson Scale	87
II - Hurcon Conditions	88
III - Thanks From Grateful Biloxians	89
IV - Alternative Escape/Evacuation Routes	90

ILLUSTRATIONS

Photographs:

Frontispiece: Hurricane Elena iii

1947 Hurricane:

Front entrance of Buena Vista Hotel	6
Parked bus damage on front beach	7
Military Police on patrol duty	8
Pastime Cafe on front beach	9
Devastation at Biloxi Seafood Packing Company	10

Camille:

Rectangle area after storm passage	17
Keesler airmen and volunteer recovery teams in Biloxi	18
Medical patient airlift from Keesler	19
Keesler students and permanent party personnel clear Biloxi	20
Camille burn victim airlifted to the Burn Institute	21
President Richard Nixon and dignitaries pledge hurricane relief	22
Supplies unloaded from Military Airlift Command C-124	23

Frederic:

Commander and Vice Commander monitor storm's progress	33
Shelterees move into protected buildings at HURCON 1	34
Protection of costly electronic equipment	35
Shelterees await passage of the hurricane	36
Amateur radio club operations in a hurricane shelter	37
Wind force destruction of a free-standing wall	38
Pine timber driven through the roof of a housing unit	39
Training Services Division damage	40

Damages to government vehicles	41
Downed powerlines on base	42
School Squadron volunteers for Frederic community clean-up	43
Heavy equipment use in on-base recovery support	44

Elena:

Shelterees pass the time in designated area	52
Tracking the final hours of Hurricane Elena	53
Automobile window damage from flying gravel and debris	54
Bay Ridge Family Housing damages	55
Oak Park Family Housing damages	56
Metal structure damage to roof of Cody Hall	57
Uprooted and fallen trees in the Pine Haven Family Housing area . . .	58
Keesler student pressed into community service after the storm	59
Overturned maintenance shop construction trailer	60
Keesler students load scattered debris	61
Clean-up crews sweep all of the base's open areas	62

Maps:

1947 Hurricane	4
Hurricane Camille	13
Hurricane Camille Approach Track	15
Hurricane Frederic	27
Designated on-base shelters, 1985	46
1985 Gulf Coast Hurricanes	50
Hurricane Elena	73

INTRODUCTION

There was a certain irony in the selection of Biloxi as an Air Corps training installation. Among the desirable features sought by Chanute Field aerial surveyors, Captains Harold L. Kreider and William P. Sloan, was a location far removed from the bitter and blustery cold of the Illinois winters. The Mississippi Gulf Coast offered year round training for pilots and soldier technicians. "I liked the area for training," Captain Sloan recalled in 1981. "I had been director of the Air Mechanic School at Chanute for almost five years. . . and every winter it was fight, fight, fight for the mechanics students to complete their outside work.... They could work in rain, but I never saw them work in sleet and snow.... On my first visit to Biloxi, I mentioned the ideal climate and the recreational facilities along the beach as an ideal place for a training school."¹

But, while it was rare for Biloxi to experience inclement winter weather, there was a different atmospheric factor that could, on occasion, threaten training operations for days and weeks at a time--the Gulf hurricane. But if this contingency was in the minds of the planners, they did not voice it. And so, in 1941, Air Corps Station Number 8 came into being on the northern rim of the Gulf of Mexico.²

During the four years and five months of wartime training, with seven day a week and twenty-four hour³ a day operations, the Keesler Field mission was not affected by Gulf storms.

KEESLER AND THE GULF HURRICANES - 1947 TO CAMILLE

The thirty-one year period that spared the Mississippi, Florida, and Louisiana coastlines since July of 1916 ended on 19 September 1947, when a very large and intense hurricane--the first major storm to strike Keesler Field--came ashore at the middle rim of the Mississippi Gulf Coast. Keesler, in the northeast quadrant of the storm, was in the sector where the characteristic whipping action of the driving wind and rain caused the most damage. Wind speeds at landfall were in the 80 miles per hour range, and maximum gusts were as high as 100 miles per hour. Severe property damage--the result of an unprotected and largely unprepared civilian community--was widespread along the Mississippi Coast. When the storm finally blew itself out over Missouri on 21 September, it⁴ left behind a total of 51 dead and between \$50 and \$500 million in damages.

Although weather reports tracked the growing storm for days before it struck, there was a general complacency among the city's residents, few of whom remembered the last real blow "back in '16." Many considered it unlikely that anything that severe would happen again. Business went on as usual until a few hours before the catastrophe.⁵

On Keesler Field, however, the air was one of concern, and preparations began with traditional military caution. Personnel Services workers and cooks began to prepare for the billeting and feeding of refugees that were certain

to come from the base trailer courts and hutment* housing area. Service Club Number 1 was supplied with emergency equipment, including gasoline lamps.⁶

Early on the morning of 18 September, when the 3704th Army Air Forces Base Unit (AAFBU) commander clearly understood the storm was traveling in the direction of the coast, Brig Gen Edward W. Anderson, the Commanding General, directed the master hurricane evacuation plan placed in operation. Base Personnel took all the necessary steps to assure the safety of personnel and aircraft. Forty-nine aircraft of various types flew to Barksdale Field, Louisiana, and others were tied down or stored in the large hangars the morning before the storm struck. Extensive precautions were taken for personnel safety. Civilians and others housed in hut and trailer facilities were advised to take shelter in Theatre One, the Service Clubs, and the Officers' Club when the base siren warned of approaching severe winds. School was suspended and all permanent party and student personnel were directed to secure the areas outside of buildings. They cleared loose equipment and objects in the training areas that could be hurled about by the wind, and stored much of it indoors.⁷

The sky darkened early on the 18th, and the storm was preceded by rain and a gradual increase in wind force. Along the beach in Biloxi lights continued to burn in night clubs and restaurants as darkness approached. Around 3:00 a.m. on the morning of the 19th, the wind velocity was gusting at 50 miles per hour. By 8:00 a.m., it had increased to 100 miles per hour.⁸

All military personnel were ordered to remain in their buildings. Many citizens of the Gulf Coast who had not experienced a serious storm in their memory, were not as thorough in their preparations. In many cases, had they taken adequate measures, much movable property on the front beach could have been saved. Nevertheless, the greatest damage was inflicted by the high tide and waves. In the storm surge the water rose to thirteen feet above the mean Gulf level, and waves rose several feet higher during the worst of the storm. Frame structures in the path of the tremendous wind and water forces were doomed from the beginning and no amount of pre-storm precautions could have spared them.⁹

With telephone communications seriously limited, and many power lines down, one master sergeant and his assistants set up an amateur radio station in a small room of one hangar. Two radio hams operated the station on electricity supplied by an auxiliary power unit. Although the radio was designed to transmit for only twenty miles under favorable conditions, the operators modified it to reach Jackson, Mississippi, a distance of almost 200 miles. Messages were transmitted to the governor and other officials which enabled Associated Press reporters to file their stories. For several days the ham station was the only contact from the coast to the outside world.¹⁰

As soon as the wind and water subsided to safe levels, Keesler Field, which had prepared for any eventuality, dispatched trucks, buses, jeeps, weapons carriers, staff cars, and ambulances with emergency rations and

*One-story temporary barracks near Gate 2 used during WWII and for a short time afterward.

medical supplies into the stricken area. Some vehicles carried food and bedding, others carried cots and medical supplies. Empty vehicles moved into the most heavily damaged areas and loaded the homeless, driving them to the high school building for food, rest, and medical attention.¹¹

Medical teams were dropped off at each city fire station and several schools. Army buses evacuated people from the hard-hit Point Cadet section. Military and civilian personnel at the Harrison Court housing in the Back Bay area, which was threatened by high water, were also withdrawn. To curb and discourage looting throughout the city, approximately 200 riot troops armed with night sticks--and later with .45 caliber sidearms--maintained patrols and were empowered to apprehend thieves. They were supplemented by 600 enlisted men and 50 officers of the Mississippi National Guard. Army trucks assisted in the distribution of Red Cross food and medical supplies. The Keesler Field commander remained in constant contact with G.B. Cousins, the Mayor of Biloxi,¹² and consulted with him several times during the passage of the storm.

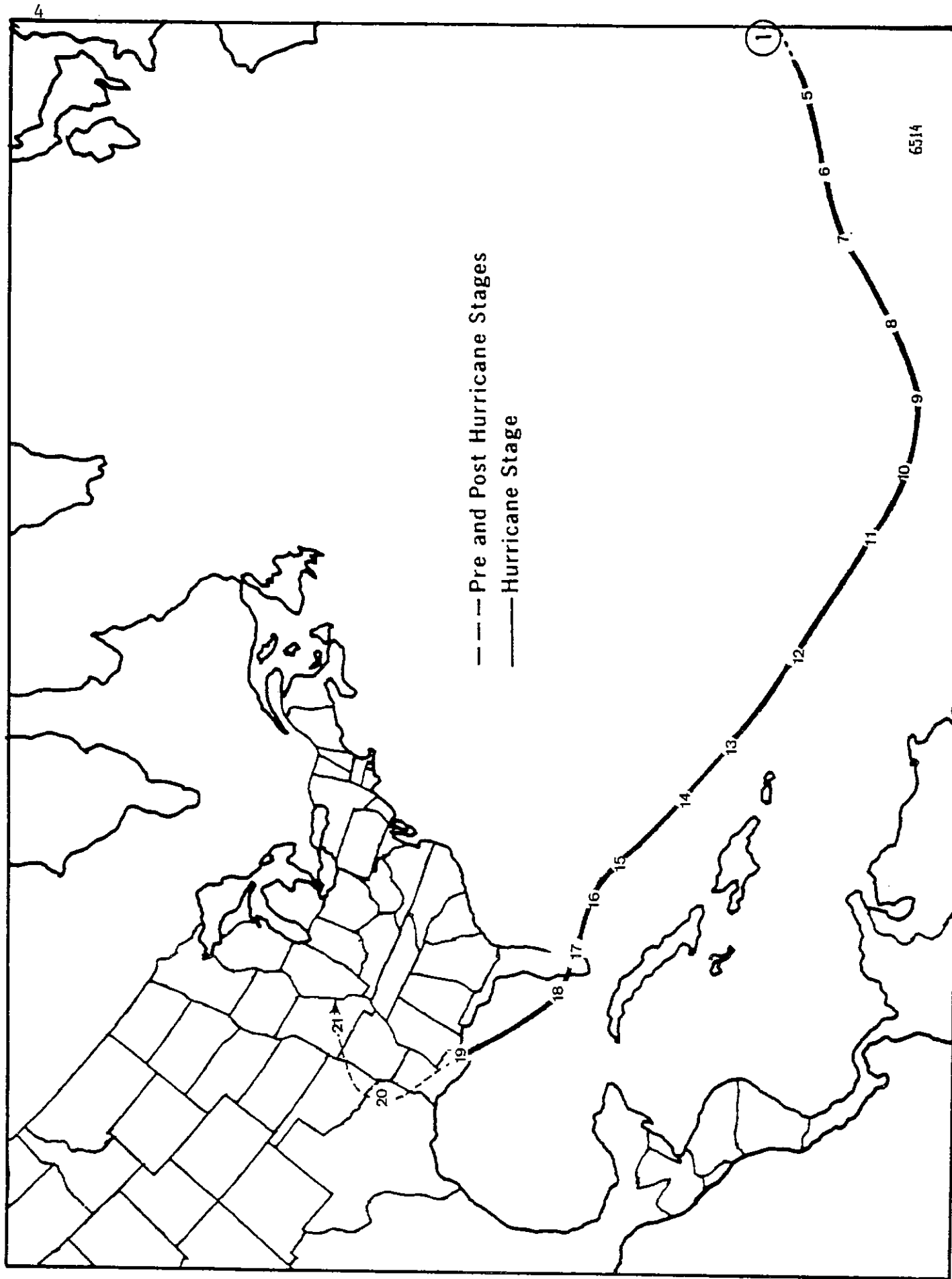
The station hospital, base supply, and motor pool remained on twenty-four hour duty for three¹³ days to provide uninterrupted assistance to the disaster stricken community.

Despite the serious and destructive nature of the storm, the hurricane served one useful purpose for the personnel of Keesler Field. Most of the military population were untried young soldiers with little disaster experience, and the storm gave them an opportunity to perform under actual emergency conditions. Overall, Keesler Field personnel carried out their duties effectively, a fact recognized by Brigadier General Anderson in his praise of their efforts and devotion to duty during the hurricane.¹⁴

After the evacuation of flyable aircraft, two planes on flying status remained on the station--a B-25 and an AT-6. Both were pressed into service on the evening of 19 September and for the next two days carried supplies and conducted search sweeps. The AT-6 flew over Bay St Louis, where the most serious storm damages were inflicted on people and property, and parachuted medical supplies to stricken residents. The B-25 overflew the ground from Biloxi to the low-lying marshlands below New Orleans, and searched for stranded fishermen. When it located them it alerted the Coast Guard, which completed the rescue operations.¹⁵

Training time was not greatly affected by the hurricane. Classes were canceled only on the 19th and, within 48 hours of the storm's passage, all electrical main feeder lines in the area, which included those that serviced Keesler Field, were back in operation. Classes resumed in airplane and engine mechanics and all other technical courses, taught in the training buildings, hangars, and along the flight line.¹⁶

A survey of the storm's affect on Keesler Field revealed only minor damages. A falling pine tree had smashed through the roof and side of one barracks; a few power lines were down and roofing was blown away on several buildings. The damage was estimated at about \$9,000. Although¹⁷ the lower level of the airfield had been flooded, there was no water damage.



The death toll for the Mississippi Coast was twenty persons. Keesler Field had no loss of life and only minor property damage, but the City of Biloxi reported one storm fatality and heavy property damage. Most seriously affected were the city's seafood interests, restaurants, and motel-hotel establishments along the central beach. Damages in the Biloxi coastal area were estimated at several million dollars.¹⁸

The entire beach area of Biloxi south of Highway 90 was a scene of complete devastation. The debris that littered the area was immediately recognized as a dangerous fire hazard, a menace to life and health, and a breeding ground for vermin. To combat the latter threat the rubble was sprayed with insecticide. A lack of equipment and personnel, however, prevented the City of Biloxi from making any appreciable headway in clearing away the wreckage and sand that covered the highway. In a move that was to establish a precedent for future hurricanes, permission was received from higher headquarters by the Commanding General of the base to use the station's personnel and equipment to remove the debris that littered the beach. A troop review and inspection, scheduled for Saturday, 27 September¹⁹, was canceled and a call was made for volunteers to work on the cleanup job.

The volunteers assembled and, accompanied by the Keesler Field band, marched to the beach area. Ten thousand pounds of freight consisting of shovels, axes, picks, and other hand tools were flown in from the Atlanta Army General Depot to equip the men. Operators used prime movers, wreckers, road graders, and other heavy equipment, as well as 86 trucks on two scheduled work shifts, one from 0700 until 1200 and the other from 1300 until darkness. There were 2700 volunteers on the first day. While some of the men cleared the highway of sand and dirt, others loaded trucks with wreckage to be carried to the city dumps. Along the routes to the dumps military personnel were stationed at intersections to prevent accidents and direct the drivers. On 28 September, the second day, volunteers were 2400 strong. Four additional trucks were made available to the workers and the cleanup was completed. The highways and intersections were completely cleared²⁰ of dirt and wreckage, and a normal flow of traffic resumed along the beach.

County and municipal officials, relief agencies, and private citizens were lavish in their praise of Keesler Field personnel for their cooperative efforts to protect life and property during the storm, to help alleviate the suffering that followed, and for the clean-up job that would have taken weeks to accomplish without their assistance.²¹

Nine years passed before the Keesler installation, now Keesler Air Force Base, was threatened by another hurricane. The practice of naming hurricanes began in 1953, and three years later Hurricane Flossy entered the Gulf, crossed the mouth of the Mississippi south of Bay St Louis, and made landfall at Fort Walton Beach, Florida. On the night of 24 September 1956, as Flossy passed offshore to the south of Keesler, 66 miles per hour winds swept the coast, blew over a few roadside signs, and knocked down tree limbs.²²

Another four years passed without a hurricane threat. Then, on 14 September 1960, Hurricane Ethel developed into a full-blown hurricane with 150 miles per hour winds. As the storm moved rapidly due north toward Mississippi, the short warning time moved the machinery of preparation into



On the beachfront, splintered wood and rubble piled up in the front entrance to the Buena Vista Hotel and also deposited a sedan atop the debris.



This bus was parked at the water's edge before the 1947 hurricane struck the coastline. When the winds subsided it had been moved across the road and pushed against a structure. The Buena Vista Hotel is in the background. A Keesler Military Policeman is on patrol duty nearby.



Armed members of Keesler's Military Police unit, as well as members of the Mississippi National Guard, were pressed into patrol duty around the clock after the 1947 hurricane struck the Biloxi beachfront. On 21 September 1947, MSgt Curry was one of the NCOs on duty along the devastated highway beachfront.



Many tourist establishments and local businesses were totally destroyed by the 1947 hurricane. Very little remained of the long-established Pastime Cafe in Biloxi, where it stood a short distance from the beach. High winds and flood waters did the most damage to waterfront structures.



The Biloxi Seafood Packing Company was among the hardest hit structures on the front beach. It took the full fury of the hurricane winds.

high gear at a frantic pace. Keesler skipped over warning Condition 4--the first stage of its hurricane plan--and went directly into Condition 3 (see Appendix II). This quickly changed to Condition 2--which called for action rather than further warnings--and this soon gave way to Condition 1. Keesler evacuated its aircraft, and shelters in the coastal towns were prepared for the worst of the storm. But while Ethel was still 250 miles offshore, it collided with a cool, dry air mass that forced the warm air mass upward and, instead of a battered coastline, a widespread rain storm resulted.²³

Hurricane Betsy would not be turned away, however. For two weeks before it struck the coast it followed a tortuous path of destruction through the Bahamas, south Florida, and into the Gulf. The coast went into Condition 2 at 11:00 a.m. on September 9, 1965, under the threat of one of the most destructive hurricanes on record. When it struck Grand Isle on the night of 9 September, its winds were reported at 105 miles per hour with gusts to 160 miles per hour. Although hurricane force winds battered Keesler and the Mississippi Gulf Coast for several hours and brought a driving rainfall, no serious injuries or damages were recorded on Keesler. This was credited to extensive preparations and precautions which began when the storm began to move toward the northern coastal rim. Windows and doors were boarded, glass was taped, outside electronic equipment was secured and all was in readiness. When the winds arrived thousands of coast residents, including hundreds of Keesler personnel and their families, fled the low-lying areas and took shelter on base and in local high schools. Coast officials declared it the largest evacuation in the state's history. Academic buildings on base were opened for Keesler families and for on-base airmen who lived in the older, frame barracks. The installation sheltered over 19,000 personnel.²⁴

If lessons are to be wisely learned from experiences, the strikes and near-strikes to Keesler over the twenty-two years since the 1947 hurricane gave Keesler and Harrison County disaster personnel much material from which to draw conclusions about these unusual natural disasters. Harrison County Civil Defense Director Wade Guice was quick to capitalize on lessons taught by the hurricanes. He said after the storm cleanup:

Hurricane Betsy was an excellent training device. She pointed out some deficiencies that we had in particular with an integrated system. And we were able to patch an awful lot of those holes. It pointed out some local government agencies that we had not taken into consideration in our total coordination package. And without those policy makers on the staff in the Emergency Operations Center, we couldn't get policy decisions. We corrected that.²⁵

The lessons from Betsy were beneficial four years later when the Mississippi Coast took a direct hit from a storm whose power was many times greater. It began on 5 August 1969 with a satellite weather photograph that revealed a drifting band of clouds in the Atlantic off the West African Coast. By the 14th, the National Hurricane Center in Coral Gables, Florida, issued its first advisory. The disturbance, which developed rapidly, became known as Camille. The storm conditions favored rapid intensification. The forecast proved to be accurate and Hurricane Camille became the most powerful storm in recorded history.²⁶

CAMILLE: KILLER STORM

On the 15th of August 1969, Hurricane Camille, with 115 miles per hour winds and 10 inches of rainfall, destroyed Cuba's tobacco harvest, heavily damaged the sugar cane crop, and killed three persons. An Air Force hurricane hunter plane from the base at Ramey, Puerto Rico, penetrated the swirling mass. The pilot found the hurricane was "solid," with an eye eight miles in diameter. He recognized it as a "classically formed" hurricane.²⁷

A hurricane watch was posted for the coast area early on the 16th and extended from Biloxi eastward to St Marks, Florida, because weather forecasters expected the eye to turn northerly. The turn never came. By Saturday afternoon, the 16th, Camille locked on a northwesterly course from which it never deviated. The course would pass the center of the eye over Bay St Louis and expose Pass Christian to the northeast quadrant of the storm. Keesler began its countdown on the 16th, as did the Naval Construction Battalion Center at Gulfport. Because of Camille, the Seabees were about to receive war zone training of the first magnitude.²⁸

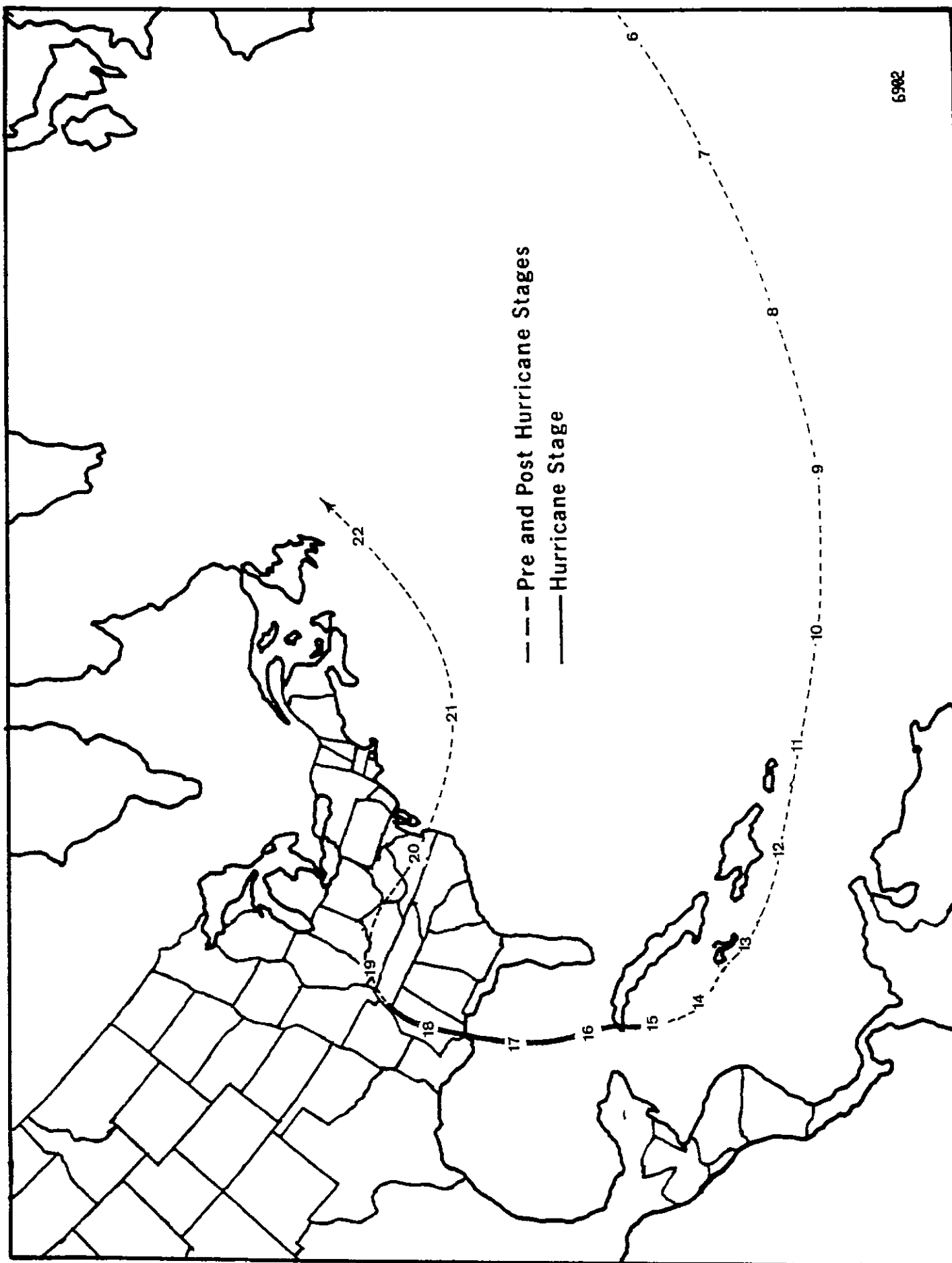
All base organizations hastened to board or tape windows, close and secure fan vents, carry loose objects indoors, and move furniture and appliances to the center areas of buildings. Throughout the night the storm grew steadily in strength. On the morning of Sunday, the 17th, the coast awakened to hear evacuation notices on television and radio stations in the area. Thousands boarded their houses and moved into Civil Defense shelters or drove upstate. Keesler's off-base residents began to move into the base shelters. An Air Force plane penetrated the hurricane early Sunday afternoon and reported a barometric reading of 26.61--reportedly the lowest ever recorded by an aircraft in the western hemisphere. The plane also reported wind speeds near a phenomenal 200 miles per hour. The eye remained small--eight to ten miles in diameter--and the tightly packed storm measured only 80 miles across; half the size of Betsy but far more powerful. When the new information reached Dr Robert H. Simpson at the National Hurricane Center, he wondered whether he was tracking a small hurricane or a large tornado. He warned the populace in its path: "Never before has a populated area been threatened by a storm as extremely dangerous as Camille" (see Appendix I).²⁹

Even Harrison County Civil Defense Director Wade Guice had trouble believing the new data. Later he remarked:

You see, the first information we had on Camille was a 15-foot tide and 150-mph wind, which is comparable to the 1947 storm. Just a little more severe than Betsy. It wasn't until about 3:30 that afternoon that the storm wound up to an excess of 200-mph wind velocity and in excess of a 24-foot tide rise with at least a 10-foot sea on top of that. Anyway you slice it, that's a 35-foot wall of water, unprecedented anywhere in the world....³⁰ There is a tremendous difference there. One hell of a difference.

Maj Gen Thomas E. Moore, Keesler Commander, ordered all aircraft evacuated and at 0845 on the 17th sixteen T-28s and five C-47s were flown to Perrin AFB, Texas. The General directed that all military personnel and their dependents were to enter the base shelters starting at 0900, the 17th. HURCON (hurricane

6902



Hurricane Camille

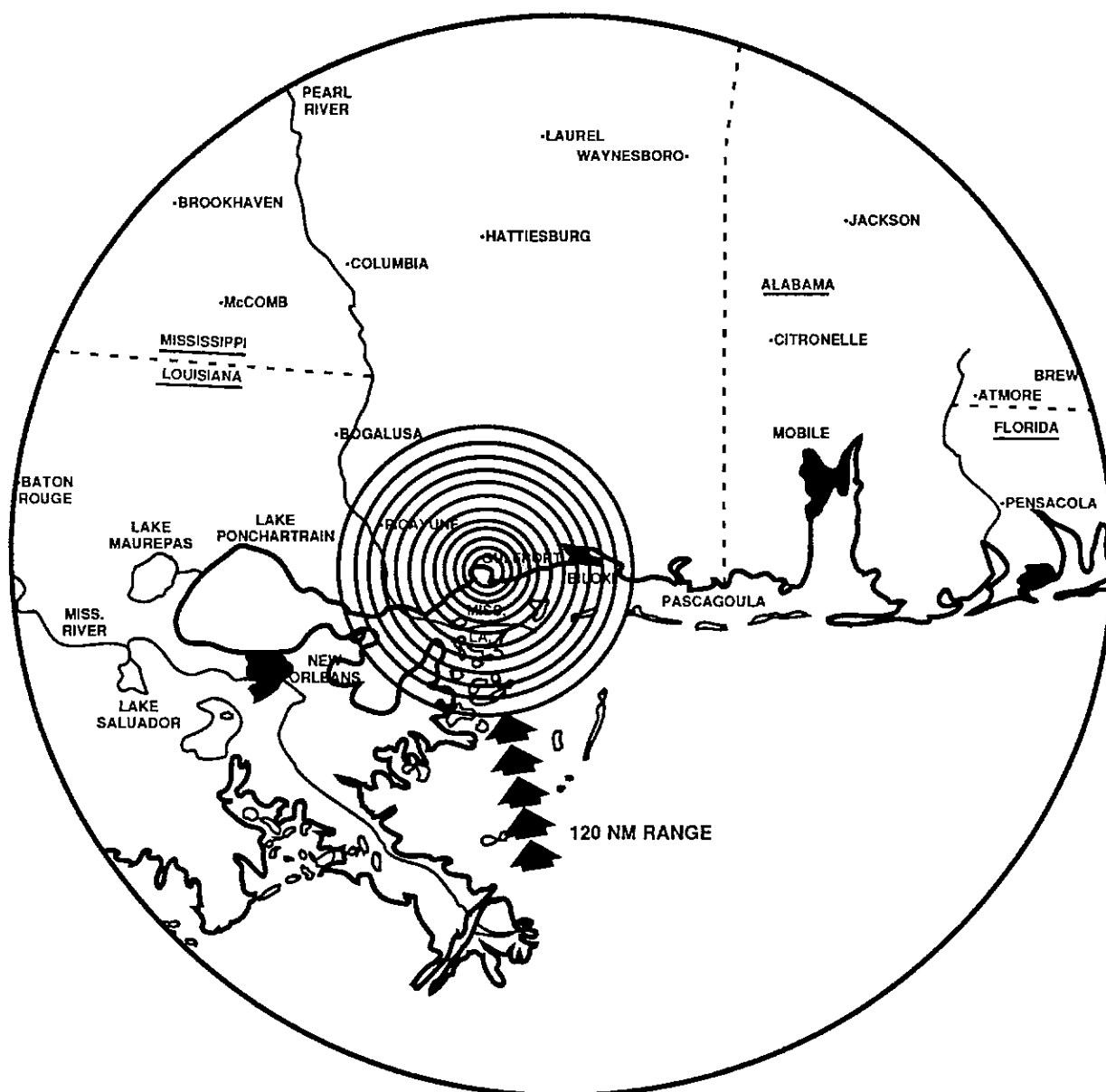
condition) 1 was declared at 0945. Throughout the afternoon and into the night, wind gusts grew stronger as the storm neared landfall at the mouth of the Mississippi River, due south of Pass Christian. The tidal surge rolled through the marshes and overflowed 33 miles of western levees. At Pass Christian a reliable high water mark of 22.6 feet above mean sea level was found. On the beachfront at Biloxi the storm surge mounted the seawall, flooded across U.S. Highway 90, and entered houses. The water level quickly surpassed the 1947 levels. Winds gusted to 135 miles per hour and at landfall between Waveland and Bay St Louis, the wind velocity rose to over 200 miles per hour. Keesler shelterees were unable to observe the turmoil of the windblasts around their buildings. Eventually, toward morning, the gusts subsided and at 0700 on the 18th approximately 25,000 persons were released from the shelters with instructions to use extreme caution, especially in the event they should encounter downed power lines.³¹

There were no on-base injuries, but a survey of the surrounding communities revealed 132 deaths along the coast, 27 persons missing, 8,931 injured, and 5,662 homes destroyed. There were no water, food, power or communications, and no utilities. In contrast with the surrounding communities, Keesler had comparatively light damages overall, although even they were estimated at \$3.5 million.³²

Emergency rescue and assistance for the storm victims became the priority of the local Civil Defense and other disaster relief agencies, as well as Keesler and the Seabee Center. Keesler's Command Post began to coordinate airlift and cleanup activities for the base and the surrounding communities. The USAF Medical Center at Keesler, the second largest Air Force hospital in the continental United States, initially operated under a power handicap but extended full cooperation to civilian health officials and dispatched medical teams to stricken areas along the coast. Air Force aeromedical units assisted the Veterans Administration and local hospitals by airlifting over 600 patients from the two civilian hospitals in Gulfport in fourteen flights. To augment the medical force at Keesler, the Air Force surgeon general assigned 50 medical technicians and 25 Air Force nurses to supplement the staff at the hospital. The action was needed as³³ patients from nearby communities were transferred to the Air Force facility.

Keesler's participation in the recovery operations began with helicopter missions along the Gulf Coast to make an initial damage assessment for key government and military officials. Airlift operations extended well into early September, on a 24-hour basis, as a continuous flow of food, clothing, medical supplies, and other items needed for the relief of hurricane victims and distressed communities arrived from all points in the country. Keesler's Detachment 4* flew more than 100 sorties to provide outlying areas with C-rations and medical supplies. When disaster victims in isolated areas signaled by markers of crosses or circles, the helicopters landed. The

*Assigned to Keesler from Eastern Air Rescue and Recovery Center (EARRC/MAC) as a four-helicopter unit for standby search and rescue operations with the Vietnamese pilot training program.



CAMILLE
TIME: 2340 LOCAL
DATE: 17 AUG 1969

1554

Hurricane Camille Approach Track

combined Civil Engineering teams of the Red Horse** Squadron from Eglin AFB, Florida, and Prime BEEF*** (Base Emergency Engineering Force) converged at Keesler with heavy construction equipment, electric power generators, and a contingent of linemen, carpenters, plumbers, heavy equipment operators, and other Civil Engineering specialists to repair and reconstruct the facilities damaged on base. Assisted by airmen of the 3380th Technical School, they acted quickly to restore base electrical power lines and clear debris. The crews worked in twelve hour shifts, and permanent party personnel manned on-base offices on a 24-hour³⁴ day schedule to help coordinate the relief assistance so urgently needed.

In those first days after the storm, attention to the installation's buildings and grounds was set aside--except for necessary temporary repairs--in favor of the more pressing problems of civilian community members. Keesler's entire military and civilian work force was organized to work hand-in-hand with Civil Defense in recovery and rescue operations that extended from Mobile to Bay St Louis. For days afterward ambulances and medical evacuation helicopters shuttled between the Keesler Medical Center and disaster sites in the outlying communities. The storm had cut critical communication with the outside, and it was Keesler personnel and facilities that kept the nation informed of recovery operations and vital needs until other local information services were restored. The hundreds of volunteer acts by Keesler personnel showed their great desire to assist the storm's victims. Many instructors, with Maintenance and Supply personnel, used private boats to carry food, water, and clothing to those who were marooned along Back Bay and the bayous. A master sergeant in a nearby small town flooded by the hurricane made contact with the Red Cross, Civil Defense and National Guard, to coordinate efforts in providing food and clothing for 1,500 families. He allayed rumors by printing a daily bulletin for these people and organized a distribution center for relief supplies. At one shelter, the wife of an officer student, a registered nurse, volunteered her services to work around the clock. For the first three days, Keesler personnel worked steadily, without relief, distributing food and clothing to coast people who had lost everything and assisting medics caring for the injured. One sergeant said: "We had no time for our own people. If they had fallen from sheer exhaustion, we would have simply laid them aside and had to continue." The unselfish contribution of 17,000 Keesler personnel was recognized in hundreds of letters of wholehearted thanks and appreciation from grateful people, most of whom were the storm's victims. Messages arrived from all levels of the community--from private citizens to the highest officials. They bore scrawled messages of the aged and the seal of the White House (see Appendix III).

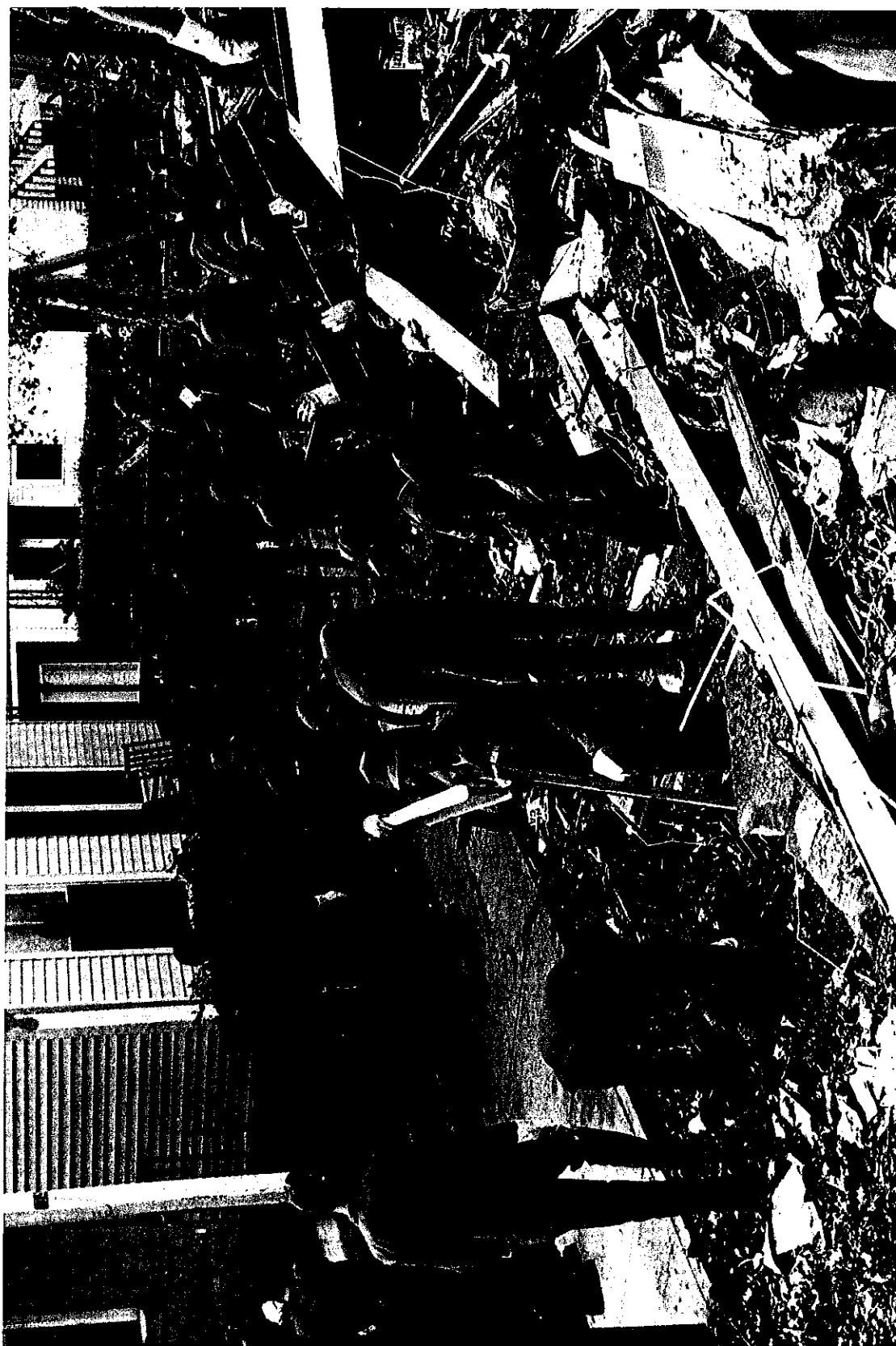
Vice President Spiro Agnew, accompanied by George Romney, Secretary of Housing and Urban Development, inspected the devastation on the coast. They preceded a personal inspection³⁶ tour of President Richard Nixon and Mississippi Congressmen on 8 September.

**Rapid Engineer Deployable Heavy Operational Repair Squadron Engineers.

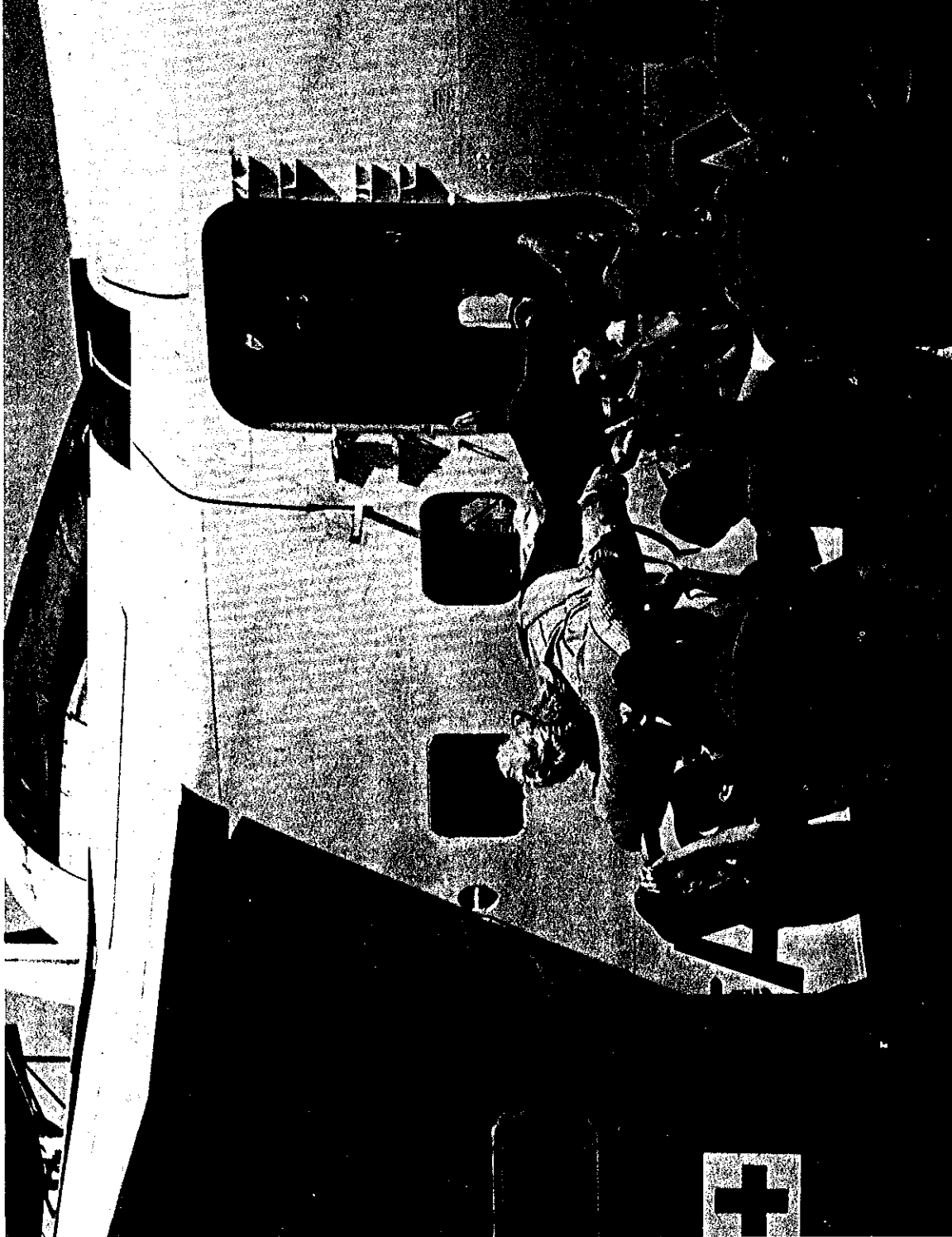
***A program under CE operations to deploy emergency and/or recovery forces where needed.



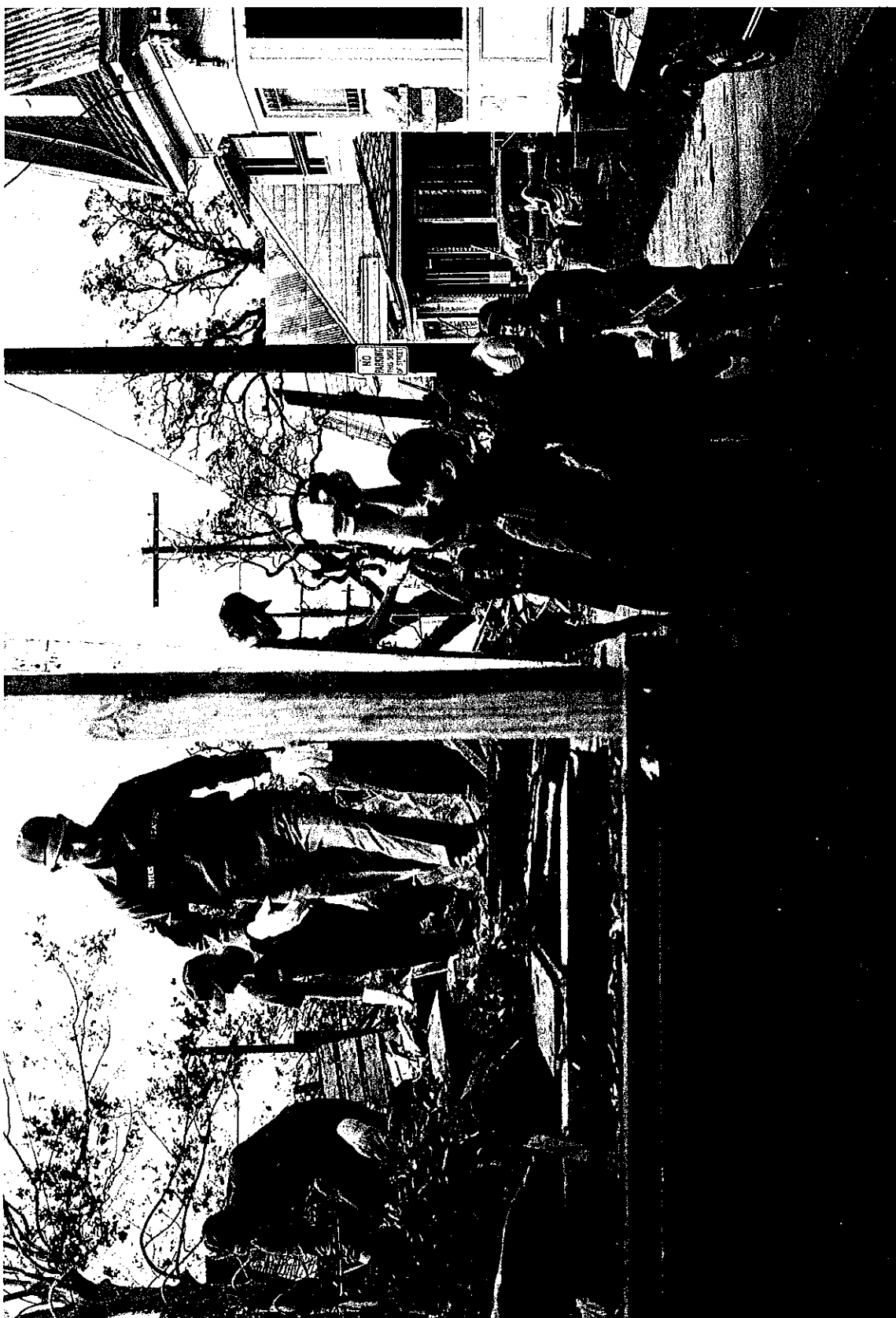
In the Rectangle Area of Keesler, near Gate 3, large trees fell across Larcher Boulevard and blocked traffic until recovery crews could cut paths for emergency traffic. This photograph was made on the morning immediately following Camille's passage.



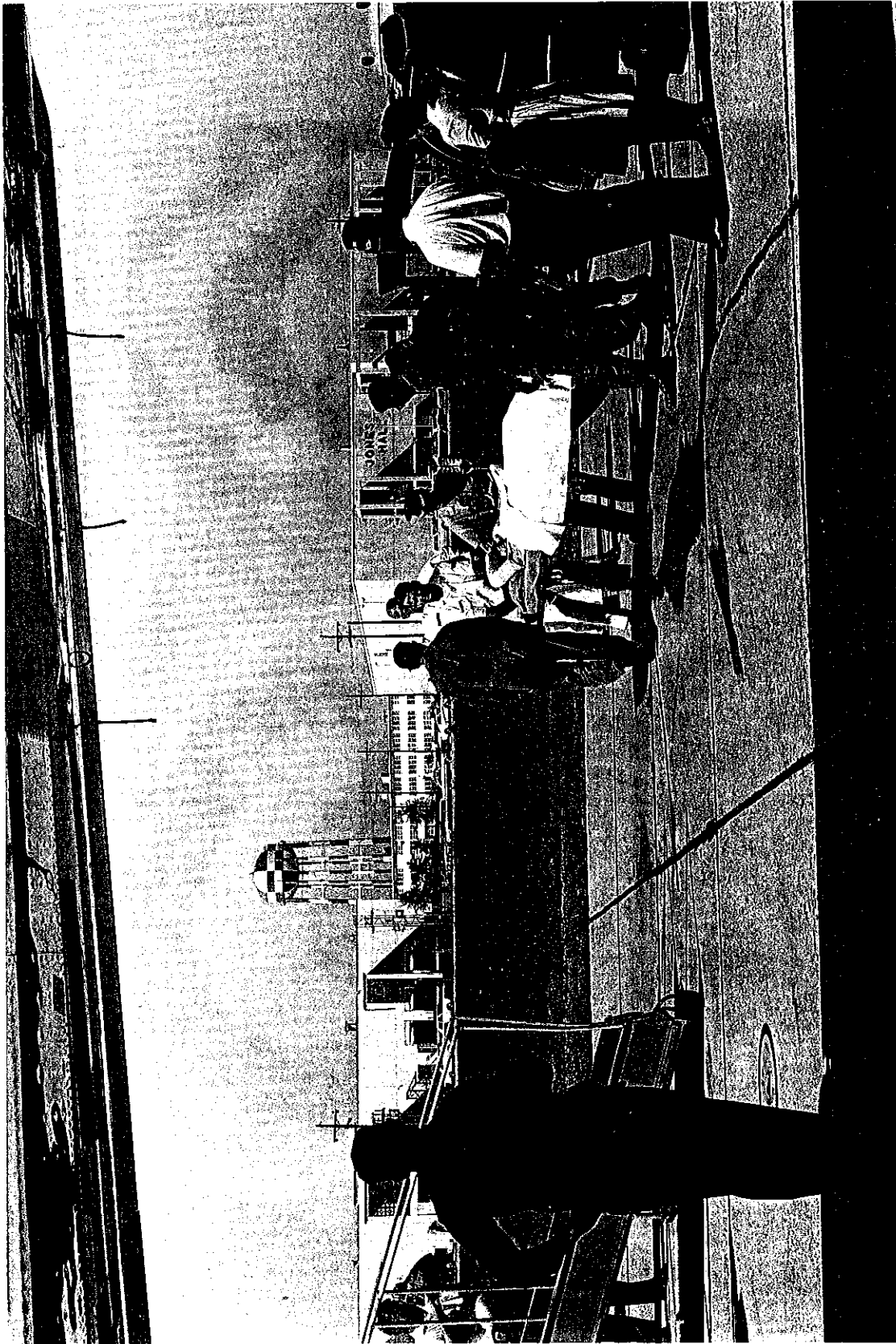
The helping hands of Keesler's airmen cleared the streets of Biloxi and loaded hundreds of tons of Hurricane Camille rubble and debris for transport to dump areas. The recovery teams assisted in all aspects of the recovery efforts in the hard-hit coastal communities.



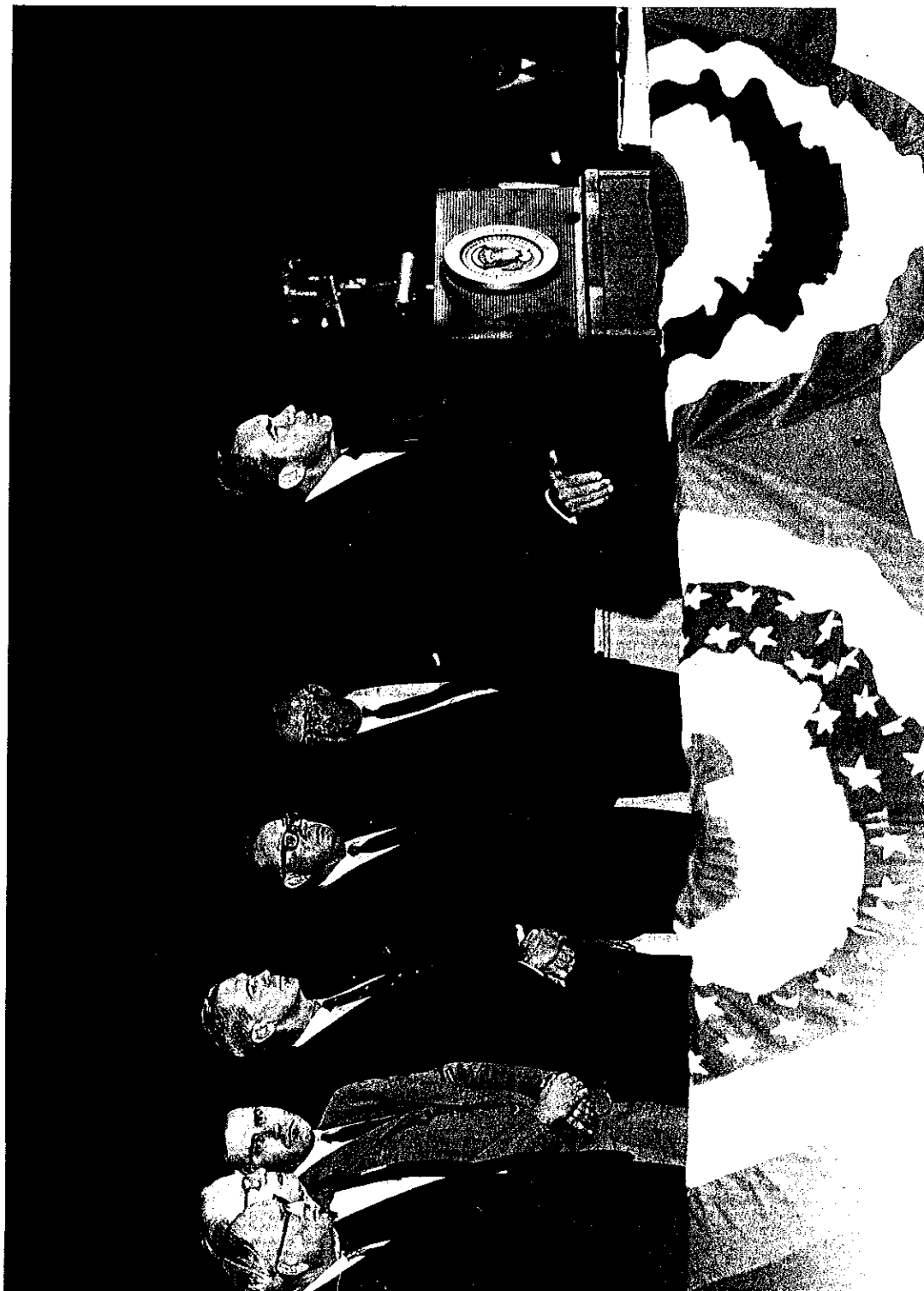
After coastal medical facilities were put out of operation by Hurricane Camille, Keesler personnel assisted in the airlift of many patients to hospitals where adequate power, space, and specialized care were available.



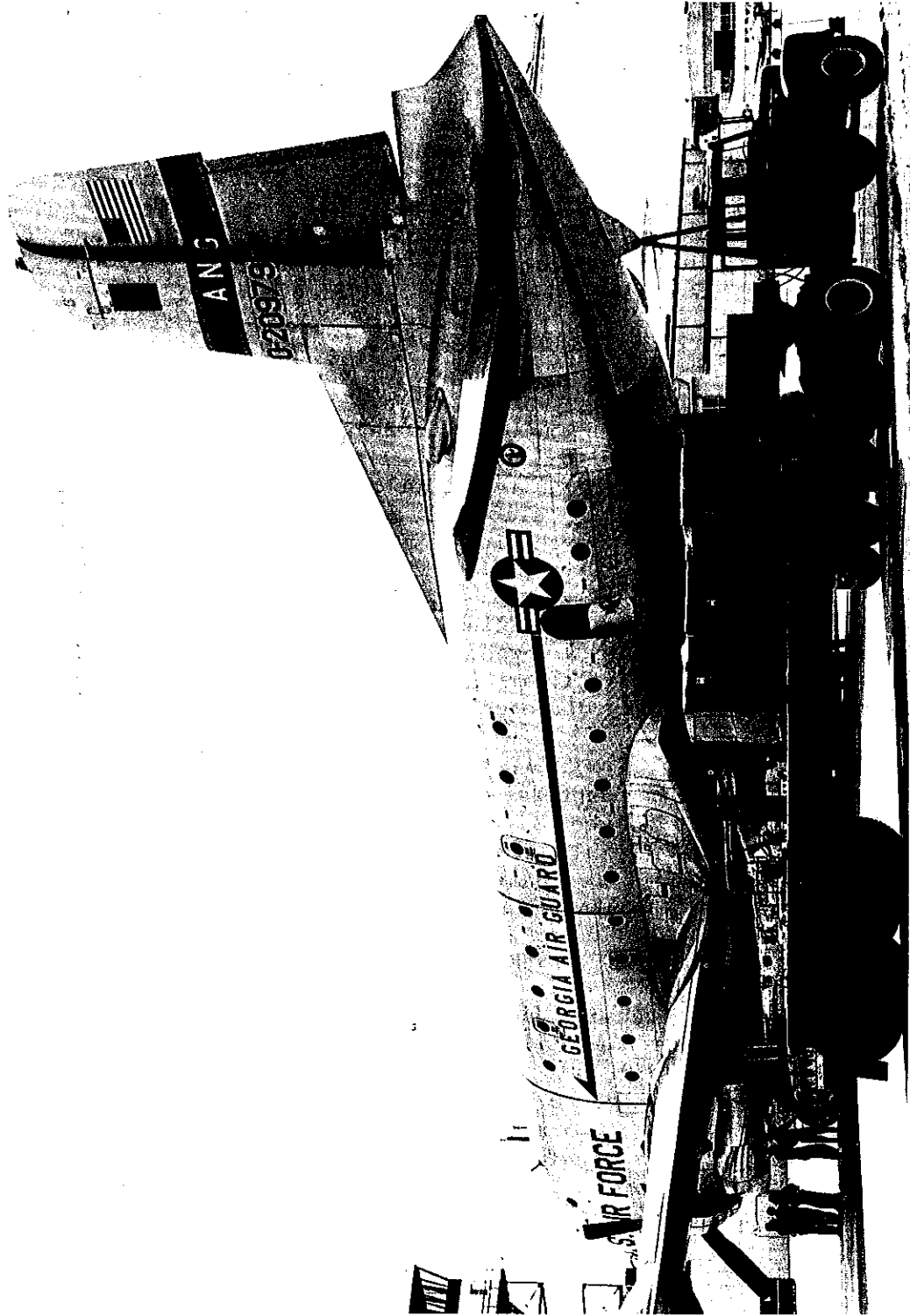
Kesler volunteers, students, and permanent party personnel worked long hours in Biloxi residential districts to clear the streets of debris and rubble scattered by Hurricane Camille.



Despite the heavy demands to airlift supplies and materials into the stricken Biloxi area, Keesler's USAF Medical Center and Base Operations coordinated efforts to airlift a Biloxi child to the Shriner's Burn Institute in Galveston. The young boy had been critically burned as a result of Hurricane Camille.



As the widespread recovery effort began, President Richard Nixon addressed the Camille-ravaged coast at the Biloxi-Gulfport Regional Airport. From the left: U.S. Senator James O. Eastland, U.S. Representative William Colmer, Charles Griffin, U.S. Representative G.V. Sonny Montgomery, Governor John Bell Williams, U.S. Attorney General John P. Mitchell.



Supplies are unloaded from a Military Airlift Command C-124. Students from Keesler's 3380 Technical School helped unload many cargo aircraft which landed at the base loaded with relief materials for the victims of Hurricane Camille.

Camille affected training on Keesler more than any previous hurricane. Technical Training ceased from 0600 on 18 August to 0600 on 2 September because of the hurricane damage to facilities. However, eight courses, most of which supported Southeast Asia operations and which contained only 68 students, were continued during the period. Twenty-one training facilities were without the electrical power needed for training equipment to operate. Five structures had roof damages. Within three days of the storm's passage, power and partial air conditioning were restored to Wolfe Hall, a training building, as well as to the Television Studio. All students--approximately 600--who were scheduled to graduate during the week of 18-22 August were allowed to graduate at that time. House lighting power was steadily restored to other training buildings, but full power needed for air conditioning and training equipment came slowly. It was evident that until all power could be restored to its full capacity, the heavy electronic training gear could not be used in classroom or laboratory situations. The Medical Center and other facilities that were critical to victims' survival had priority.³⁷

On the 26th and 27th, Civil Engineers (CE) announced that sufficient power had been restored to operate the base air conditioning systems. A priority listing of training buildings was given to CE for restoring full power and air conditioning to all training buildings. Between 28 August and 1 September, it restored these services--with three minor exceptions--to all training buildings. On 2 September, after an assessment of the restoration of electrical power to almost all base activities, training equipment was energized and, with minor exceptions, found to be operational. All courses resumed on their original schedules. Training supervisors were notified that two weeks of nonacademic time would be programmed into each training class of each course with students in training on 13 August, and prior, who had not yet graduated. Exceptions were allowed by the school commander if they were based on individual hardships, if there was an insignificant loss of subject matter coverage, and if they were directed by ATC Headquarters.³⁸

A few years after Camille, the coast received its own early warning system. The Hurricane Hunters, the 53rd Weather Reconnaissance Squadron, moved to Keesler in 1973 when its base at Ramey, Puerto Rico, was closed. In the same year, the 815th Tactical Airlift Squadron moved to Keesler and converted to weather reconnaissance missions as the³⁹ 920th Weather Reconnaissance Group, popularly known as the Storm Trackers.

HURRICANE FREDERIC

Twice within the decade, hurricanes struck severe blows to Keesler Air Force Base. Following Hurricane Camille, Hurricane Bob went ashore near New Orleans on 11 July 1979 bringing 50 mph winds with near-flooding of base housing on Keesler. Damage to hangars, power lines, and equipment amounted to approximately \$230,000. Two months later, on the night of September 12-13, Hurricane Frederic made landfall to the east at Mobile Bay and temporarily suspended Keesler operations. Wind and rain caused extensive damage to the installation facilities, but no deaths or injuries occurred.⁴⁰

Preparations

A close surveillance of tropical storm patterns in the Gulf of Mexico by the two Keesler base weather units, the 920th Weather Reconnaissance Group "Storm Trackers" and the 53rd Weather Reconnaissance Group "Hurricane Hunters," supported by satellite scans reviewed by the National Hurricane Center (NHC) in Miami, revealed that Hurricane Frederic was a growing threat to the northern coastal areas. By the afternoon of 11 September, combined weather estimates indicated that Hurricane Frederic was likely to pass close to Keesler. Maj Gen Don H. Payne, Keesler's commander, ordered a staff recall to assess the storm threat and review hurricane preparations contained in Base Operations Plan 355-1. At 1450 hours, local time, HURCON 4 was declared (see Appendix II). Throughout the afternoon the growing intensity and track of the Gulf storm was continuously monitored. At 1700, HURCON 3 went into effect. Personnel were released from duty with instructions to secure their homes during the evening hours. They were next alerted to prepare to secure the base the next day. The Contingency Support Staff met at 2330 to assess the storm threat again. It declared HURCON 2 at 0001 local time on 12 September, and all on duty personnel began to secure their areas. The staff did not recall off duty personnel at that time because it seemed more reasonable to accomplish the precautions during the daylight hours before the 50 knot winds reached the vicinity. The staff also⁴¹ believed the workers would be most work-effective after a full night of rest.

At daybreak, full storm preparations began. HURCON 1 began at 0900; personnel were released from normal duty, and students were released from classes to assist with hurricane preparations and report to their assigned shelters. As required by the Operations Plan, the Center's Disaster Preparedness and Safety Offices' personnel monitored the base-wide preparations. Earlier practice exercises in hurricane preparedness proved their value as Keesler personnel were soon found to be knowledgeable in emergency duties and areas of responsibility. Sufficient supplies were available to secure the vital facilities. The Base Commissary and Exchange opened an hour early to allow base people to stock up on emergency supplies. Low-lying areas were sandbagged to protect exposed buildings from ground water and all windows were taped or boarded. Except for one AFRES C-130 and the Keesler Aero Club aircraft, all base airplanes were evacuated to locations out of the storm's reach at Little Rock AFB, Arkansas; Dyess AFB, Texas; and Pope AFB, North Carolina. The dining halls prepared a special meal for shelterees on base, and shortly after 1200 local time the 12 base shelters began to fill in an orderly manner. Invalids and women in their eighth month of pregnancy were sheltered in the Keesler Medical Center where immediate care, if needed, was available. Some Keesler employees traveled from Pascagoula, Gulfport and Bay St Louis to spend the night within the safety of the base shelters. When the preparations were completed by 1800 hours more than 15,000 military personnel, students and their dependents, were in protected areas. At that time the Center Commander ordered all nonessential personnel into the shelters. At approximately 2100 hours, when the wind velocity exceeded⁵⁰ knots, the Security Police forces were ordered into their assigned shelters.⁴²

Riding Out the Storm

At approximately 2100, commercial power to the base was intentionally turned off to reduce possible electrical system damage. Essential base facilities were converted to emergency power without difficulty and all standby generators operated until commercial power went back on. This began about 40 hours after commercial cutoff and was essentially complete by 16 September. As the emergency power system was turned on, Hurricane Frederic moved northward toward the coast at 15 mph. The storm's eye was 50 miles wide and it appeared certain that it would make landfall somewhere on the coast between Gulfport and Pensacola. At that time, its position was 25 miles south of Alabama. Frederic, on a 1 to 5 scale denoting storm force, was rated at Category 3. As the storm intensity increased, damages from wind driven rain and flying debris were reported to the Command Post in Wolfe Hall. Dolan Hall reported leaks in rooms, the Hospital reported leaks at the doors, and Maltby Hall reported several doors torn from their hinges. At Locker House, a 1,000-occupant dormitory, windows were blown out in at least 4 rooms by 2230 hours. In other shelters, rooms were shut down because of water leakage and tiles that fell from the ceilings. In Building 4904 between 30 and 40 shelterees requested evacuation when several windows popped out, but they simply moved into the center hallway of the building.⁴³

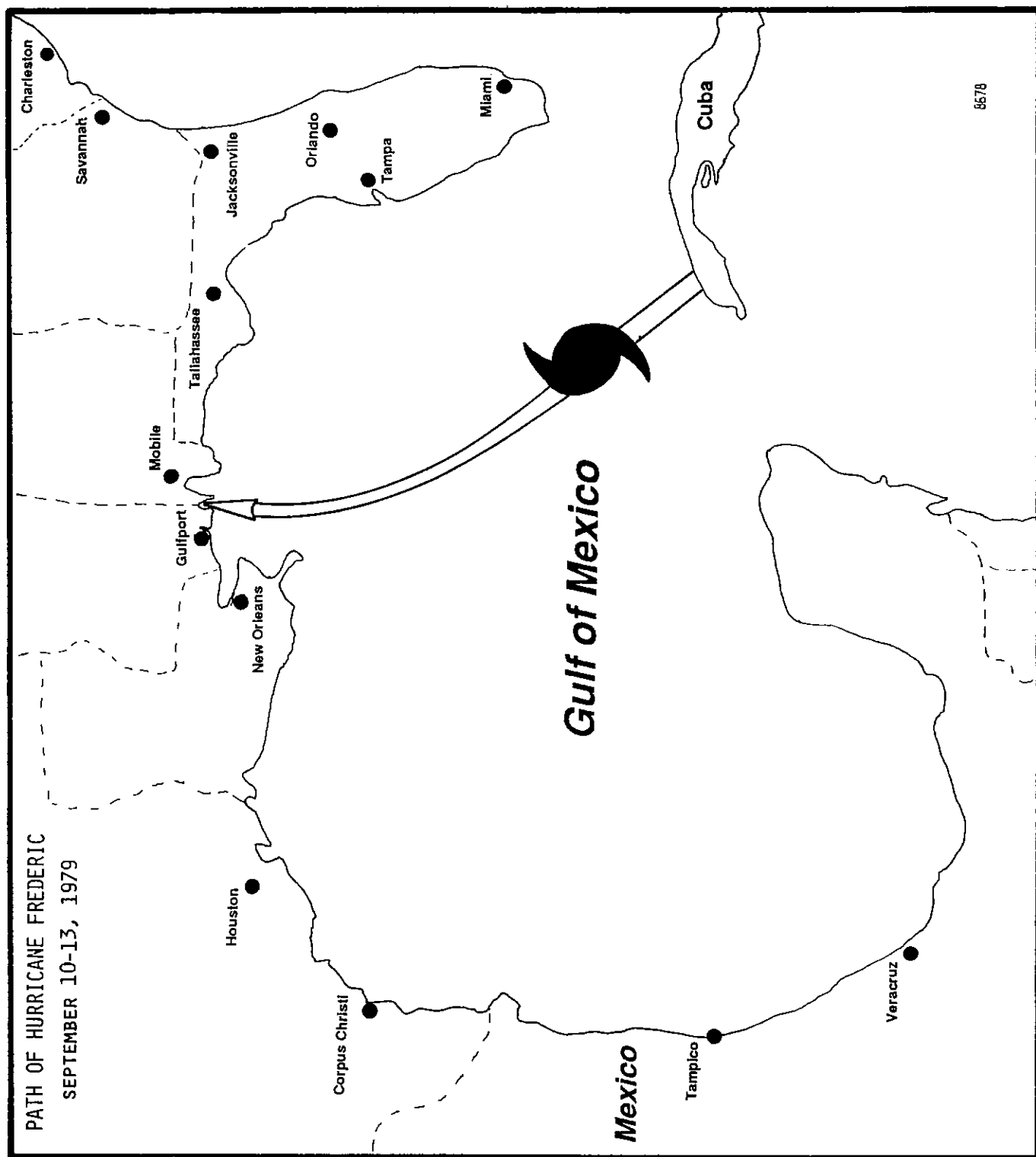
One shelteree, Mrs Donna R. Iseminger, who was there with her daughter, remembered the sounds of the hurricane at its peak:

We were on the second floor of a two story concrete building with no windows. As I lay on my sleeping bag, listening to the wind, it occurred to me that it sounded like thousands of bowling balls rolling across the roof. It was indescribable and a noise I hope I never hear again.⁴⁴

Ambulances were summoned twice to take persons in need of emergency medical treatment to the Hospital. A woman was transported from Jones Hall at 2210 and a sixteen year old girl was taken from Bryan Hall at 0440 on the 13th. Neither incident was injury-related.⁴⁵

Shortly after midnight several school squadrons reported heavy water damage and window breakage. The base wind-measuring instruments failed when the storm velocity reached 72 knots. At that time the glass in the control tower broke and instrument circuits into the weather station became inoperative. Throughout the storm, however, essential emergency communications remained operational. The base Military Affiliated Radio System (MARS) and the ham radio club which established operations adjacent to the Command Post (see below), provided augmentation. All line communications on the state Civil Defense network remained in operation and were the source of subsequent velocity reports. The highest wind velocity recorded in the Keesler area was 85 knots.⁴⁶

Having chaplain and medical personnel in the shelters proved beneficial. When HURCON I went into effect the chaplains moved directly to their assigned shelter areas and ministered to the needs of the shelterees. This was an excellent morale booster for those who were frightened and ill at ease because



of the storm. Where nurses were also available in the shelters, they produced a further calming effect, particularly upon the dependents.⁴⁷

The Keesler Amateur Radio Club was one of the few links off base during the storm. It operated for three days without interruption on a 2-meter* network using emergency equipment installed in Allee Hall. It provided communication for the shelters, barracks, and Civil Defense units in Gulfport, Biloxi, and Ocean Springs. The all-volunteer group relayed vital emergency information that normally would not have been received, including messages from parents all over the United States to their sons and daughters stationed at Keesler. The main antenna of the amateur radio station blew down during the storm, but under the direction of TSgt Gary Coon, the Air National Guard installed a makeshift antenna.⁴⁸

To serve as liaison between the civilian community and his office on Keesler, SSgt Robert J. Kosiba of the Disaster Preparedness Office deployed to the Emergency Operation Center (EOC) at Gulfport when HURCON 1 was declared. He used the radio and telephone net between Keesler and Biloxi Civil Defense to relay⁴⁹ updates from the Weather Service to the Keesler Disaster Preparedness Center.

Shelter operations worked well where preplanning occurred. There were isolated cases of some shelterees showing disrespect and unwillingness to cooperate with shelter monitors and authorities. The success of the shelters varied by degrees; however, the strength of leadership by the shelter commander (the senior ranking officer in the shelter) was decisive in resolving behavior problems. When shelterees brought in alcohol, there were discipline problems. But shelter monitors learned that information passed to the shelters on the storm situation aided in keeping the shelterees calm.⁵⁰

At 0450 on the 13th, the Disaster Preparedness Control Center notified all shelters to begin a clean-up of their immediate areas. By 0700 all shelterees were informed that they would be allowed to leave and return to their homes, but they were encouraged to remain in their shelters because of debris and blocked roads. Military personnel were instructed to return to their duty sections within a reasonable time. It was announced that Friday, 14 September, would⁵¹ be a normal duty day despite the absence of commercial electrical power.

Base Damage and Recovery

By daybreak the wind had diminished and the rainfall ended. Security Police patrols and Civil Engineering Personnel surveyed⁵² the base and reported that most of the base roads were usable, with caution.

Civil Engineers found most of the damage was caused by the wind, compounded by heavy rain. The winds, predominately from the west and north, prevented a local storm surge (high tide). County Civil Defense, in fact, reported storm tides of three to five feet below normal. Rainfall and water

*Radio frequency band of 144 to 146 megacycles.

drainage had flooded local rivers, but there was no flooding on the base. The general damage pattern indicated that wind pressures uprooted small trees and broke off limbs of larger trees that were scattered throughout the base. The roofs and windows of many buildings had failed. Debris carried by the high winds caused other structural damage and the rain that entered added to the interior damage. Total Air Force damage estimates, as of the end of the calendar year, were \$11,355,307. This was divided as follows:

Base structures and facilities: \$11,000,000

Government vehicles (GMV): \$32,470

Claims for on-base private property damage: \$289,837

Non-appropriated fund (NAF) property damage: \$15,000⁵³

There was no evidence of damage because of items left unsecured before the storm arrived. The high-value and essential facilities received only minimal damage, which indicated that preparations for the storm had been adequate.⁵⁴

Immediately after the storm, Civil Engineers' (CE) recovery and restoration activities began. On the 13th, HQ ATC issued instructions for them to proceed with contract roof repairs on approximately 17 major buildings, for a sum not to exceed four million dollars, with contracts to be obtained on a unit price basis. Heavy equipment was needed for hurricane recovery support and HQ Air Force Engineering and Services Center (AFESC) at Tyndall AFB, Florida, requested Andrews AFB, Maryland, to provide a high-reach bucket truck and exterior three-person line crews to assist Keesler's storm recovery operations. Requests for personnel specialized in Civil Engineering fields quickly resulted in temporary manpower support from Langley AFB (6), Lowery AFB (7), Chanute AFB (4), Sheppard AFB (7), Reese AFB (5), and Eglin AFB (6). Other installations and activities that provided assistance were Columbus AFB MS, Maxwell AFB AL, and the San Antonio Consolidated Civil Engineering Team. The Personnel Control Center (PCC) was involved in TDY strength accounting and support for 65 visiting recovery Prime BEEF team members (Civil Engineers) deployed to Keesler who worked in relays on the recovery efforts.

Of immediate concern to the Civil Engineers were damaged and downed power lines and inoperative electrical equipment which needed to be restored as quickly as possible. Mr Jack Miller, Acting Electrical Superintendent, said the engineers' primary emphasis was to restore power to the most vital base functions. He added, however, that this could not be done until all of the lines and equipment on a particular circuit were safe to use and all safety hazards such as hot lines were removed. The most vital areas included the Medical Center and the Cold Storage Facility at the Base Commissary. After they got electrical power, it was restored to those areas that suffered the least damage. "We tried to get power to the largest amount of people in the quickest...time," Miller said. "Then we could put our full time and efforts in getting the more badly damaged areas...back on line."⁵⁵

Capt James M. Blackstock of the Civil Engineering Squadron, who was one of the first to survey the extent of the damage, said: "It looked as if the base had been devastated.... Every major power line was down.... Every square foot of the runway and ramp area was covered with debris. About 70 percent of the facilities on base had glass breakage." Pavement and Ground workers, as well as the electrical workers, remained on extended hours voluntarily and worked well into the evening of the first day after the storm. They removed broken tree limbs and downed trees that blocked roads and threatened homes and base facilities.⁵⁶

One of the technical school support facilities, the Training Services Division Photographic Laboratory and Graphics Division in Building 0231, suffered heavy damage from Hurricane Frederic. Most of the roofing and several ventilators had blown away. There was heavy water damage to the interior of the building; ceiling tile, insulation and electrical fixtures had to be replaced. Over 80 percent of the photographic equipment and materials on hand were destroyed. The Base Photo Laboratory was temporarily relocated in Wall Studio's audiovisual operation, and the Base Hobby Shop. Two of the Art (Graphic Services) units, as well as the Visual Services Branch Office, were moved into Allee Hall. Many services were curtailed for the duration of CY79 and were expected to be limited until the restoration of Building 0231, projected for completion in June 1980.⁵⁷

Because of the widespread damage, Civil Engineering was forced to cancel all work orders and work requests for which materials were not already ordered and which were not mission-essential or related to safety. Full workforce energy was concentrated on the complete recovery from hurricane damages.⁵⁸

From 14 to 17 September a special Keesler Bulletin, the "Freddie Flyer" was published and distributed on base. It informed all Keesler personnel of recovery progress and included messages from the Commander, schedules for dining and technical school classes, curfew information and updates on facility operations. Announcements of concern to the dependents of military personnel were also included.⁵⁹

Aid to Civilian Communities

Among the 128,000 persons who received care in 212 American Red Cross shelters during and after the storm in Florida, Alabama, and Mississippi, hundreds were victims in the civilian communities adjacent to Keesler. These were people in Harrison, Jackson, and George Counties in Mississippi. With most electrical power out of service and water, ice, and food in short supply, Red Cross mobile canteens circulated throughout the stricken areas to provide food and assistance where possible. It was evident from a survey of the widespread devastation that considerable manpower was needed for recovery operations.⁶⁰

By the 14th, Keesler was answering calls from communities for manpower to help in cleanup operations. This involved many permanent party personnel and all student squadrons. Troops were assigned through a manpower pool established by the Director of Personnel with the cooperation of the recreation and services activity at the Spirit of Keesler Center. Working through this center, the 11 school squadrons supplied over 1,500 students

during the first days of the cleanup effort. The requesting agencies determined the types and numbers of troops needed, most of whom were assigned to work at public schools and in Civil Defense operations. Others were detailed to the Public Works Office in Gulfport. Hundreds assisted in Ocean Springs and Jackson County, which was hardest hit in the local area. No request went unfilled.⁶¹

The Haven Children's Home in Gautier (Jackson County), was severely damaged. Fifteen of the Home's children and three adult supervisors were housed for approximately two weeks in quarters of the 3383 School Squadron under the 3380 TCHTG. According to 2Lt Probyn Thompson, the squadron commander at that time, a large tree fell on the Home during the storm and both of the staff's mobile homes were destroyed.⁶²

From 14-18 September, Keesler personnel cleared eleven Biloxi and three Jackson County school areas and assisted the Jackson County Civil Defense Director in cleanup operations. They assisted 300 elderly persons in Harrison, Hancock and Jackson Counties. Keesler personnel directed traffic on the 15th for the City of Biloxi and on the 16th for the City of Gulfport. They removed debris from the grounds of Beauvoir, the Jefferson Davis Shrine, and assisted in the clearing of the base and all base housing areas. In all, 1,724 troops were dispatched to surrounding communities for a total of 13,792 manhours and 1,724 mandays.⁶³ In a letter to all technical training students, General Payne praised their endurance of hardships throughout the difficult time. He said:

Your tolerance of a difficult situation and willingness to work hard were highly commendable and reassuring. You are the future Air Force and you have already displayed what it takes to get the tough jobs done.⁶⁴

You should all be proud of your efforts, as I am proud to have served with you during the restoration of Keesler after Hurricane Frederic.

Affect on Technical Training

When HURCON I went into effect on 12 September, technical training ceased. All students proceeded to their assigned shelters where they remained until the all clear on the 13th. The students were excused from classes until Monday, 17 September, when "S" shift and "A" shift were scheduled to operate from 7:30 a.m. to 1:00 p.m., and "T" shift and "B" shifts were slated to go back on schedule from 1:30 p.m. to 7:30 p.m. The regular shift was 8:00 a.m. to 5:00 p.m. (for interpretation of schedules, see 1978 Keesler History, Vol I, the Eight-Hour Training Day).⁶⁵

Technical training students lost approximately two and one-half days of training time. Mr Fred Eddins, Training Advisor for the School, said:

By Monday, all the electricity was back in service for the training areas, and instructors and training staffs were able to make-do [sic] with what we had. The classes were made up. Lost time was recovered. . . so that practically all the students graduated within a week of the date on which they would have normally graduated. There was no excessive loss of training time. We merely accelerated our training; everyone pitched in and worked harder.⁶⁶

There was water damage in several training areas. Some training equipment was out of service until the units could be dried and cleaned or, in some cases, repaired. A review of the training areas revealed that several structures sustained considerable damage. According to Maj William D. Cobb, Chief of the Radar Systems Branch, the equipment and classrooms in the rear half of Cody Hall were temporarily out of service. This area housed Autotrack, ground-controlled approach radars, and an indicator, transponder, and ASR/FPM 47 Radar Laboratory. From two to three inches of water collected in the hallways because of roof damage. According to Maj Cobb:

There was no significant or long lasting damage that cost us in training. We were slow to recover because we had to allow time for the equipment to dry before we could power it. The three to four days of actual scheduled training time involved were made up through adjustments in our courses. There was a slight degradation in training, but no training loss. This was because some of the students didn't have an opportunity for hands-on instruction in the final stages of the block when equipment use was called for. None of the outside [training] equipment was damaged.⁶⁷

The Visual Flight Rules Simulator in Hangar 1, among the most expensive items of training equipment on Keesler, was the cause of much concern as Hurricane Frederic approached. "When the storm hit, we were sweating bullets as to the outcome," said Lt Col Marvin L. Smith, Chief of the ATC Operations Branch, "but, we got very little water from the roof damage. In effect, we have a building within a building. There was only slight moisture in the building, and no training time was lost. As soon as we got students back, we were in the training mode."⁶⁸

The roof of Hangar 3 was severely damaged, and the heavy ground radar equipment, located directly under the roof, was exposed to the rain. Training personnel attempted to protect the equipment from further exposure by covering the radars with plastic, but water on the floor created a safety hazard. Wet and falling ceiling tiles made the classrooms unusable. Classes were moved to the training annex for about five training days where duplicate or similar equipment was available for the students. SMSgt Phillip B. Richardson, Chief of the AC&W Systems Branch, said that while there was a deviation in the training plans, there was no loss in actual training.⁶⁹

Many training facilities had no damage to laboratory equipment. Typical among these was Building 2804, a WWII one-level wood training structure, and McClellan Hall. In surveying the effects of the storm on the CE Officer Branch training, Lt Col Randall F. Scott, Chief, noted that training time lost in the shelters and the delays caused by power outages were quickly made up by acceleration and adjustments in the training schedule in the days that followed.⁷⁰

Recognition for Community Assistance

The Biloxi Chamber of Commerce recognized Keesler's contributions to the restoration of community services and facilities in Biloxi and Jackson County on 28 October. The organization presented Keesler Air Force Base with an engraved plaque in honor of the installation's generous aid. Gen Payne



Early practice exercises for hurricane conditions at Keesler proved their value in 1979 with Hurricane Frederic. Maj Gen Don H. Payne, Keesler Commander, and Vice Commander Col Donald F. Wenzel monitored storm developments during simulated and actual conditions.



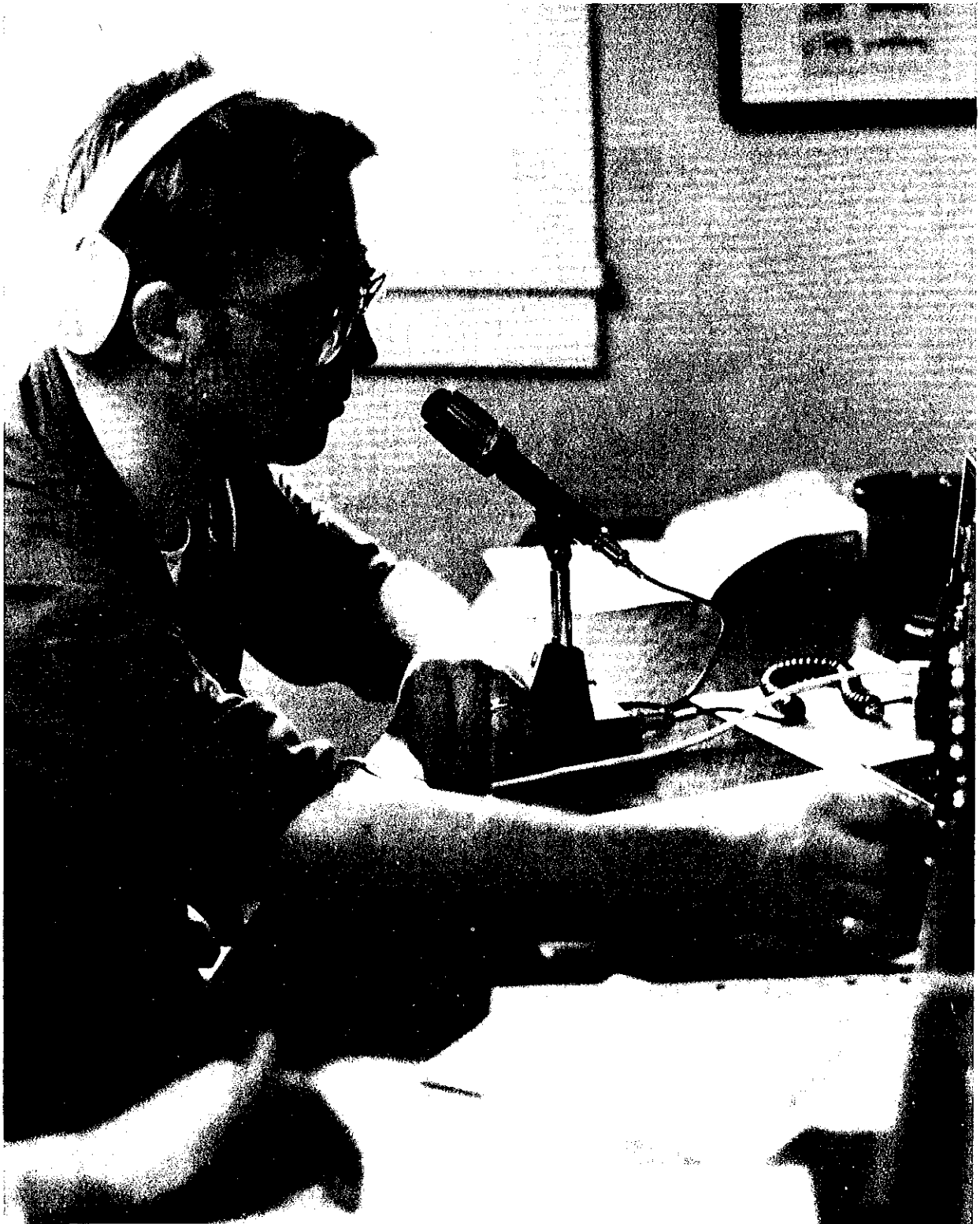
As Hurricane Frederic approached Keesler under blustery grey skies and intermittent rainfall, base members and dependents moved into shelters soon after HURCON 1 was declared.



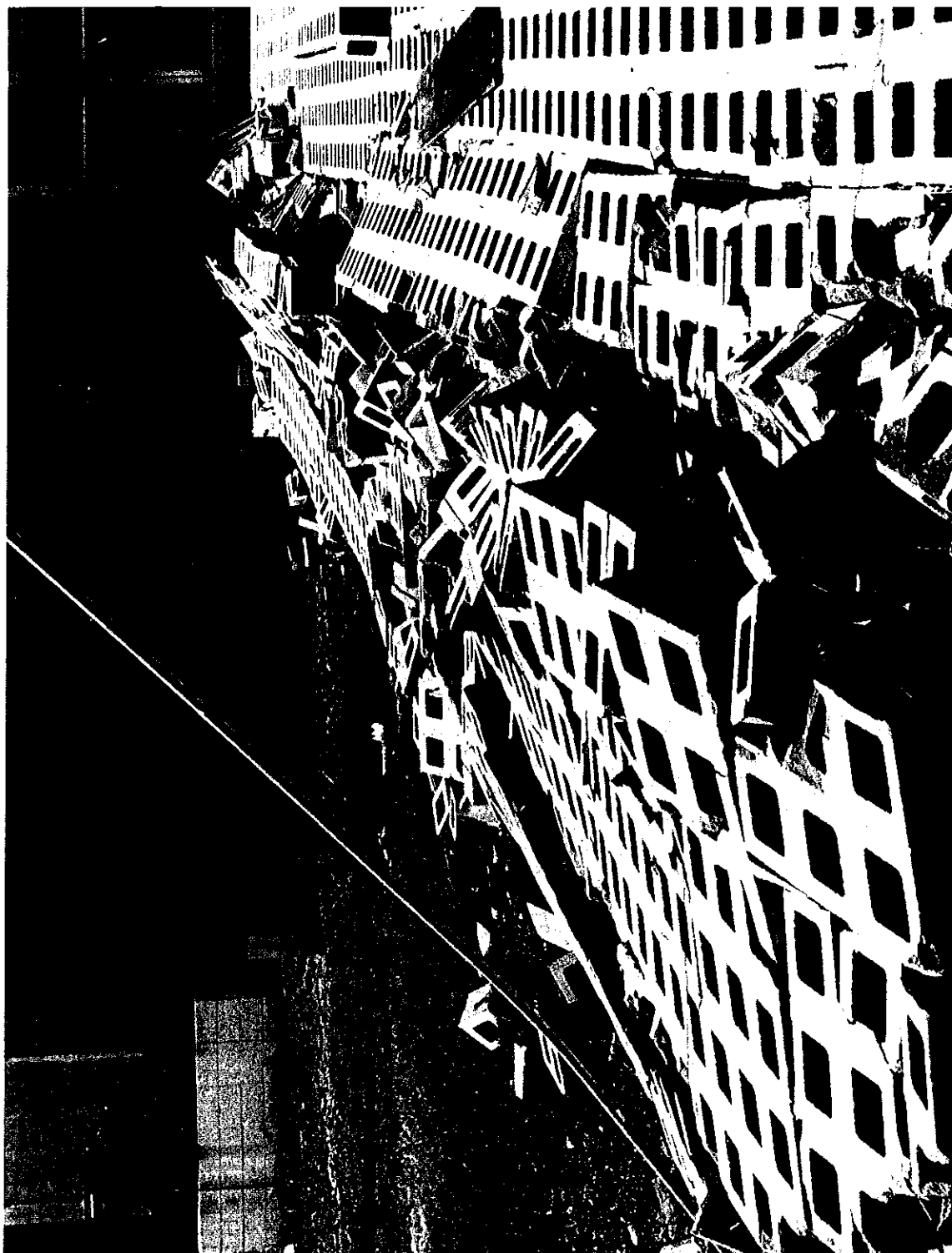
Costly electronic equipment in many training areas was protected with plastic covers to prevent water damage from leaking roofs.



Fifteen hundred Keesler personnel--dependents and students--settled into the twelve protected shelters when HURCON 1 was declared and waited out Hurricane Frederic during the night of 12-13 September 1979.



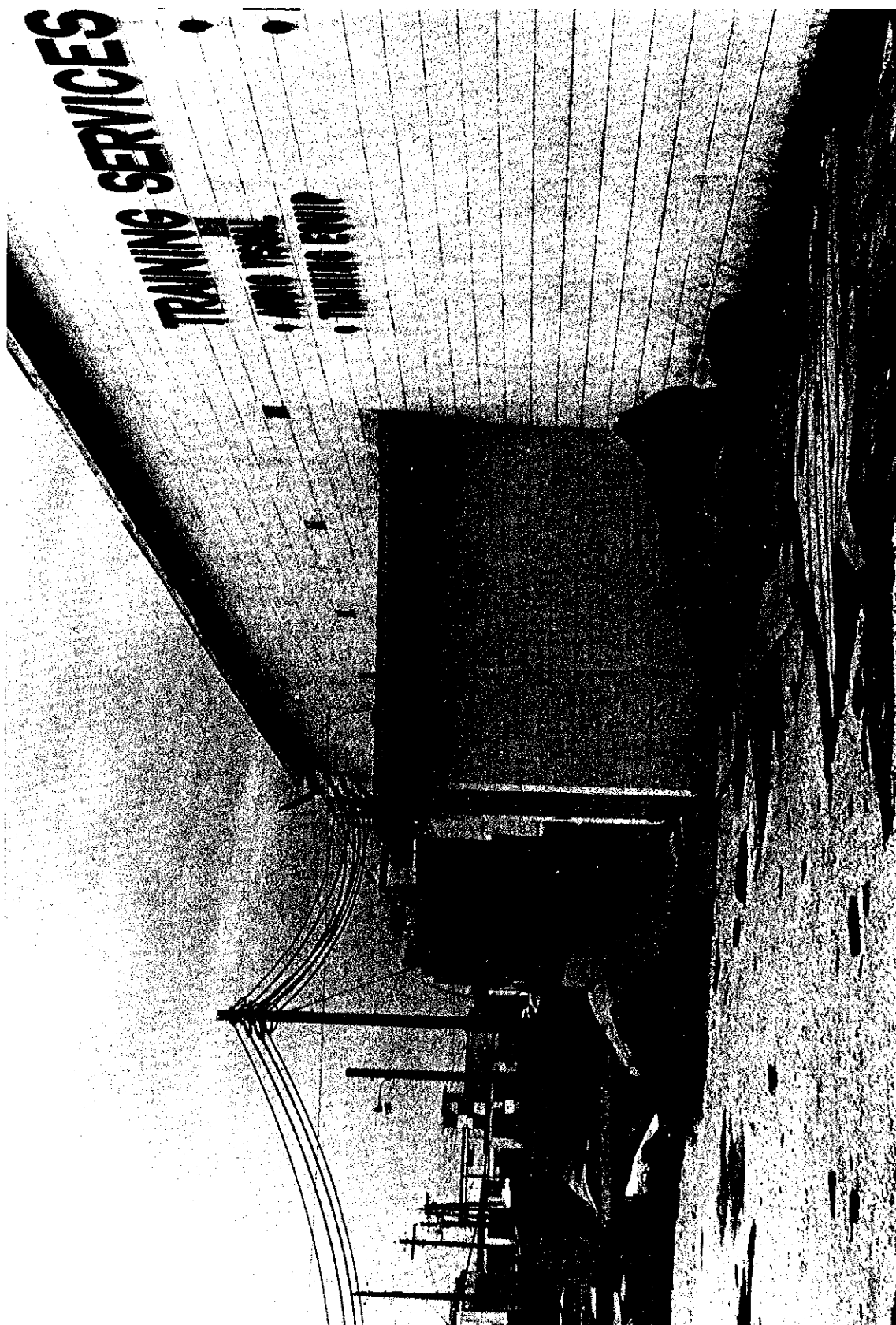
Members of the Keesler Amateur Radio Club spent many hours during the night of the storm relaying emergency radio traffic and vital information over their high frequency and very high frequency communications radio nets.



Free-standing walls that were exposed to the force of the 85-knot hurricane winds were blown to the ground when the storm made landfall near Mobile, Alabama.



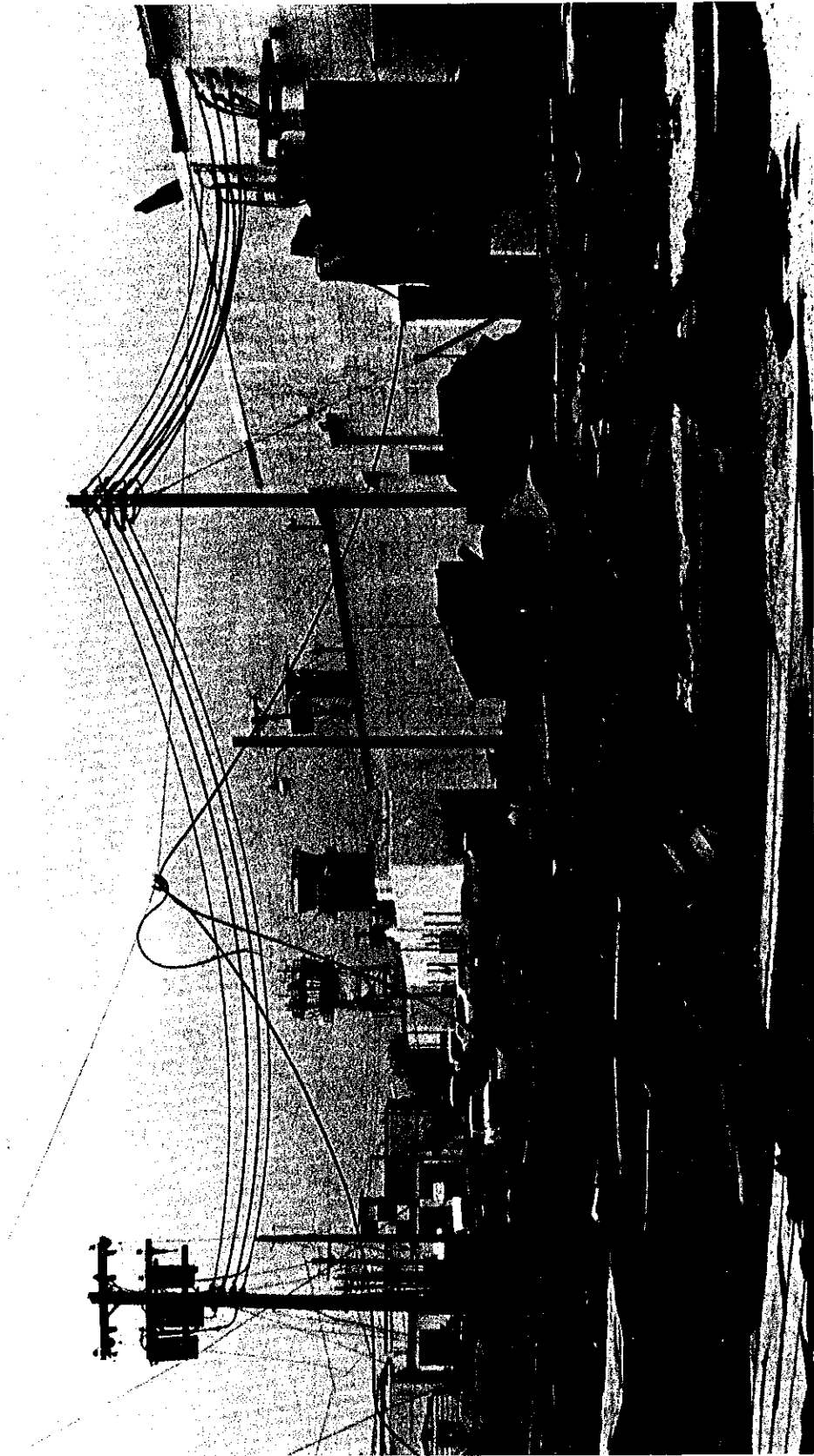
The force of Frederic's 85-knot winds created unusual damages to several of the on-base structures. Among them was this pine timber that was driven through the roof of a base housing unit and into the living quarters.



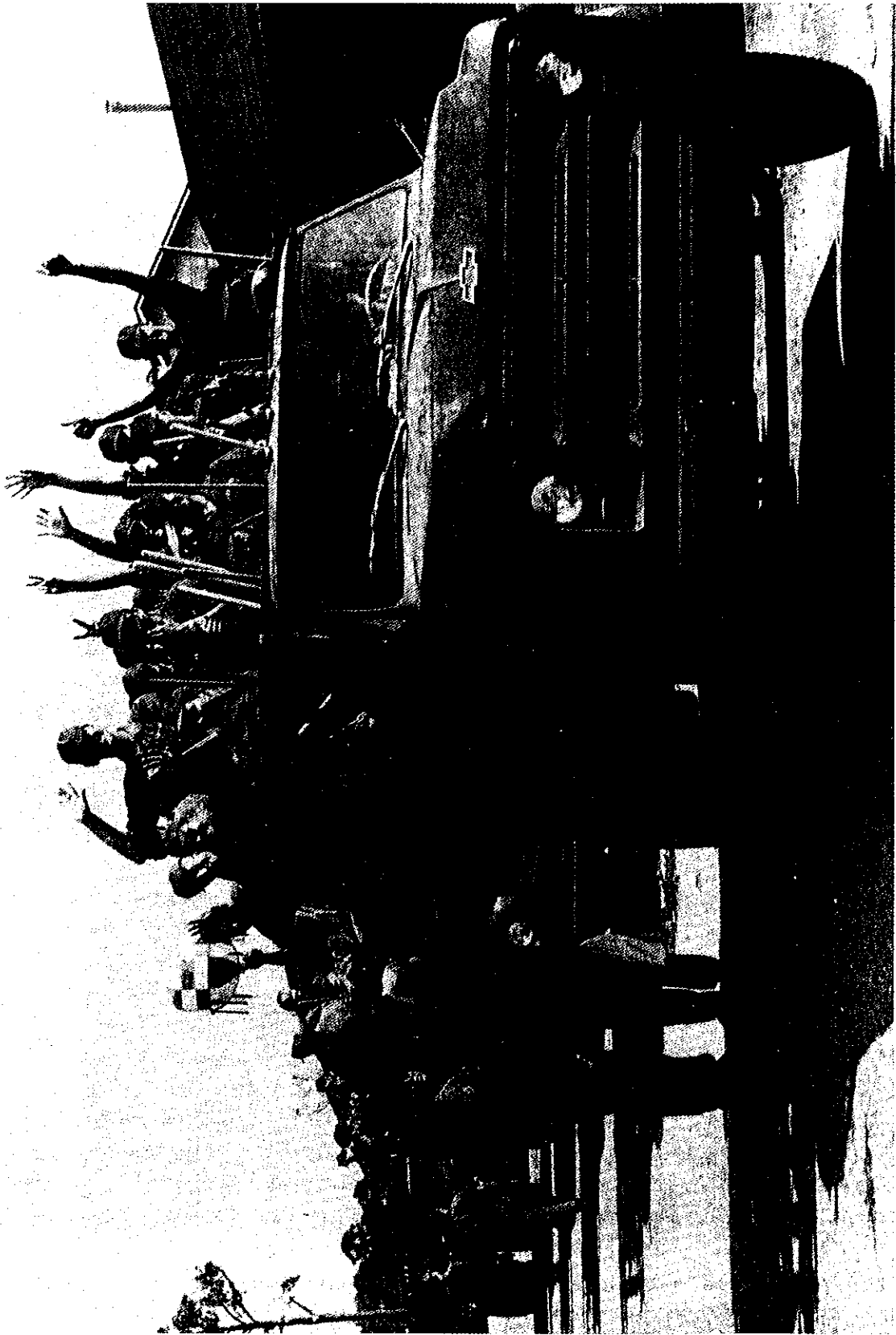
Among the most heavily damaged of the base facilities was the Training Services Division. Operators moved to Wall Studio, Allee Hall, and the Base Hobby Shop until the building could be restored and its equipment replaced.



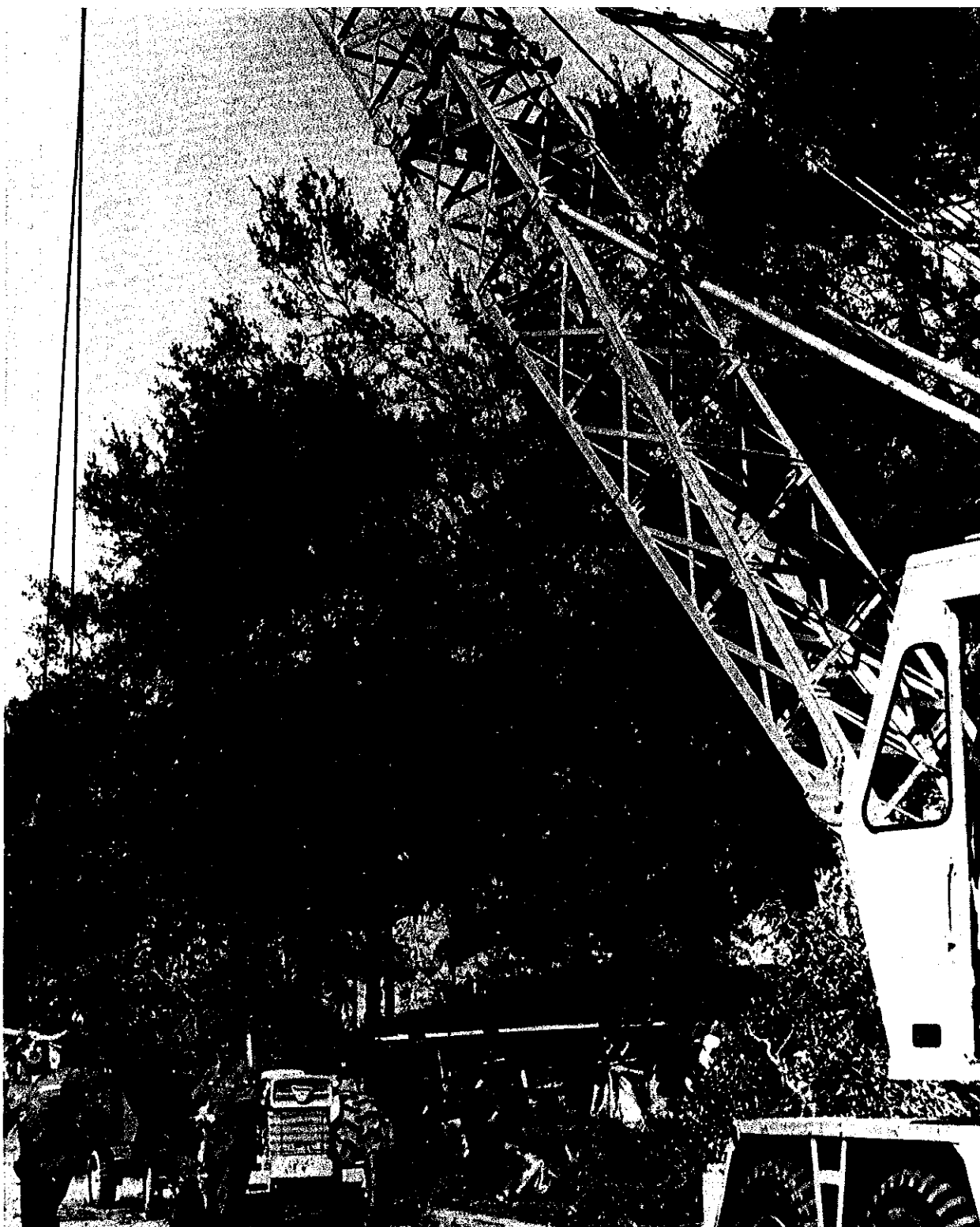
Fallen trees on Keesler caused damage to structures and vehicles throughout the base. Government vehicle damage amounted to \$32,470; damage to base structures and facilities, \$11,000,000.



Of immediate concern to base civil engineers were the downed power lines throughout the base. First priority in the recovery effort was to restore inoperative electrical equipment as quickly as possible.



Keesler's eleven school squadrons supplied over 1500 students for community clean up teams during the first days that followed the storm. They worked 13,792 manhours in Biloxi, Gulfport, Ocean Springs, and throughout Jackson County.



Heavy equipment was needed for the on-base hurricane recovery support. Requests to Air Force Bases throughout the U.S. brought machinery and specialized personnel to Keesler to expedite the recovery effort.

accepted the plaque from Mr Bill Pittman, the retiring Chamber president, on the grounds of Biloxi's historic Tullis Manor. In the presentation, Pittman told the assembly: "Keesler provided 1,724 military personnel who gave 13,800 manhours and cleaned up 11 Biloxi schools, as well as schools in Jackson County." A resolution of the Chamber's Board of Directors in public praise of Keesler accompanied the plaque.

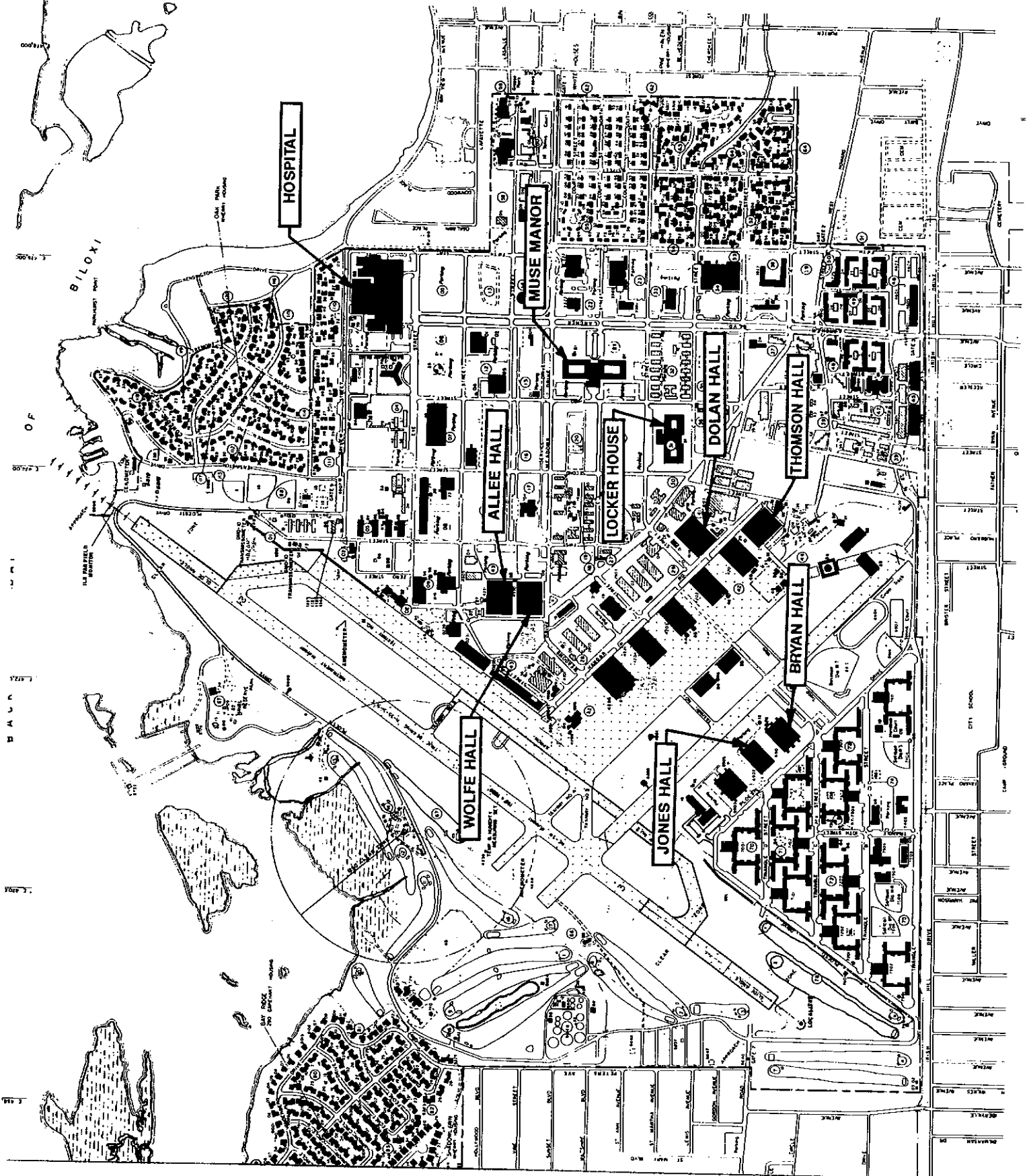
A TRIPLE THREAT--AND HURRICANE ELENA

The strength and patience of disaster preparedness officers was sorely tried during the summer and fall of 1985, when three hurricanes threatened Keesler and a fourth one passed directly over the base.

Keesler and Mississippi coastal residents were forced into hurricane preparations six times during 1985, in a hurricane season considered one of the most active on record. Although the average number of named storms and hurricanes had amounted to ten per season over the preceding forty years, the 1985 season had eleven named storms and seven hurricanes. Four of the hurricanes affected the Mississippi Coast--Danny, Elena, Juan, and Kate--and all occurred during the second half of the season, which began in August. Hurricane Danny was considered a nuisance storm by hurricane specialists. It eventually made landfall in South Louisiana on 17 August. Elena caused two major evacuations and gathered strength off the West Florida Coast before it made landfall on the Mississippi Coast on Labor Day, 2 September. It was reported as the most expensive hurricane ever to strike Mississippi. Hurricane Juan made two loops before it finally lost strength when it made landfall in Louisiana on 29 October. Hurricane Kate was an extremely late storm for the northern Gulf Coast. It headed directly for the Mississippi Coast but veered northeast and made landfall in Northwest Florida on 21 November.

On 31 May, one day before the official opening of this particularly horrendous hurricane season, the Keesler Disaster Preparedness Office included detailed plans and procedures in the Keesler News for base residents in the event hurricane conditions threatened Keesler. Hurricane Watch notices were to be issued when the hurricane moved toward the mainland; Hurricane Warning notices were to be released when forecasters determined that a particular section of the coast would be affected by the force of the storm. The Disaster Preparedness Office defined the hurricane conditions (HURCON) that would be declared as the storm moved closer (see Appendix II).

Instructions were included as to procedures Keesler residents would follow under each HURCON condition, such as window taping, the internal arrangement of furniture, and tie-down or storage of outside equipment. A list of stock items such as food, portable radios, flashlights, and medications was also included. The hurricane shelters and units assigned to them were listed by name. The ten designated shelters were: Muse Manor, Locker House, Dolan Hall, Thomson Hall, Wolfe Hall, Allee Hall, Bryan Hall, Jones Hall, Maltby Hall (at Annex 1, off base), and the Medical Center. Lt Col Dennis Wood, Commander of the 53rd Weather Reconnaissance Squadron, advised Keesler residents to take some time to form a plan of action for themselves and their families, to be prepared and know what to do. "In the Hurricane Hunter squadron," he said, "in conjunction with the National Hurricane Center, we can



Designated on-base shelters, 1985

gather information, track the progress, and forecast the movement of the storm, but we cannot alter its course."⁷⁴

Danny

The first warning of the storm that became Hurricane Danny arrived as Tropical Depression Number 4, Warning Number 1, at base operations on 12 August at 1352 hours Zulu*, or 0752 hours, Central Daylight Time (CDT). Its position was 19.0 N latitude and 82.5 W longitude or 90 miles west-southwest of Grand Cayman Island, with sustained winds of 25 knots. Its movement was west-northwest at 10 knots. The tropical depression gained strength steadily and moved generally northwestward through the Straits of Yucatan and into the Gulf of Mexico. At 1600 hours, with Warning Number 11, the storm became a hurricane, designated as Danny. As the hurricane continued to move toward landfall somewhere on the Texas, Louisiana, Mississippi, Florida Coasts, HURCON 4 was declared for Keesler at 1210 on 13 August. This was upgraded to HURCON 3 at 1710 on 13 August. By early morning, HURCON 2 was declared and base officials expected Danny to make landfall about 0900 on the 15th. A list of precautionary measures was made available to all base personnel. The base began to contemplate evacuation of C-130 aircraft at 1730 on the 13th, pending a review of further reports. The decision to evacuate aircraft to Dyess AFB, Texas, and Little Rock AFB, Arkansas, occurred early in the morning of the 14th. The main concern of base Disaster Preparedness and Harrison County Civil Defense officials was that Danny, in following a path similar to that of Hurricane Camille in 1969, would also develop into a killer storm. This did not happen and the Mississippi Coast was released from the hurricane watch by the National Weather Service. As Danny continued north and west, it made landfall on the southwest Louisiana coast about 1000 on the 15th. Maximum winds were 75 knots, with gusts to 90 knots, and it was classified as a Category 1 storm*. No shelters on Keesler or in Harrison County were activated, and although the Louisiana Coast suffered from wind damage and flooding, there was no damage to Keesler. Orders were issued from Keesler to redeploy all C-130 aircraft to the home station. On the evening of the 16th, Danny was downgraded to a tropical storm, then to a tropical depression.⁷⁵

Tracking Elena

Shortly after daybreak on Labor Day, September 2, 1985--after it had followed a tenuous and unpredictable course through the Gulf of Mexico for five days--Hurricane Elena came ashore in a diagonal landfall east of Biloxi.

The fifth tropical disturbance of the 1985 hurricane season had been a well-developed depression when it began to move through the Florida Straits on Tuesday, the 27th of August. The following day at 1300 hours, with the release of the first weather advisory, it became as tropical storm Elena. The

*Greenwich Mean Time.

**The weakest of the five categories. Hurricane Camille was classified as a Category 5 storm.

storm moved steadily on a northwesterly course at an average speed of 20 knots. Its internal strength increased steadily. At 1100 hours on the 29th, it was 375 miles southeast of New Orleans with sustained winds at 75 miles per hour. The storm's course at that time was on a line directly toward the Mississippi-Louisiana coast. At 0900 on the 29th, Elena was declared a hurricane. Civil Defense directors in Harrison and Jackson Counties notified their populations of available shelters by newspaper, radio, and television announcements. Keesler entered HURCON 2 condition as of 1211 hours and base officials followed all required checklists in anticipation of the hurricane's landfall on the Mississippi Coast on Friday morning, the 30th. Public Affairs (PA) personnel at the PA Control Center and Command Post maintained events logs. As the hurricane continued to move northwest, its strength increased. HURCON 1 was declared at 1700 hours on the 29th and all Keesler residents in base housing were instructed to secure their quarters and either evacuate the Gulf Coast area or enter base shelters. The decision to again evacuate C-130 aircraft to safe areas occurred at 1100 hours on the 29th, and the last aircraft departed Keesler at 1500 hours. Col Jerry E. Singleton, 3380 ABG Commander, requested HQ ATC Director of Personnel to discontinue troop movements into and out of Keesler until further notice.⁷⁶

On 30 August, the National Weather Service reported that Elena moved only 49 miles between 1100 and 1700 hours, which provided time for it to intensify. At 0100, the storm began a slow turn to the north. By 1800 hours, it was on a new, well-defined track to the east-northeast and moved directly toward Cedar Key on the west coast of Florida. Until a definite, sustained track away from the Mississippi Coast could be confirmed, the Keesler area remained under the hurricane warning. The base continued to operate under emergency conditions as selected personnel manned only essential positions. Base officials announced that military members, civilian employees, and their dependents would remain sheltered on base until the coast was no longer threatened by the hurricane. Although Keesler personnel began to enter the on-base shelters late Thursday afternoon, the 29th, they were allowed to leave the shelters for a short time the following morning when the storm slowed and stalled in the Gulf of Mexico which delayed the projected time of landfall. Because of the storm's unpredictability, and the uncertainty of the location and time of its eventual landfall, all Keesler personnel who had reported to the shelters on Thursday were directed to return to them by 1200 hours and remain there until further notice. Keesler sheltered 13,041 military and civilian employees and family members overnight.⁷⁷

Throughout the day, as the hurricane continued its westward path, the possibility grew that the Keesler area would be spared the force of the storm. Nevertheless, procedures for base recovery operations were issued in the Keesler Update, a daily newsletter about the hurricane, published by the Public Affairs Office.⁷⁸

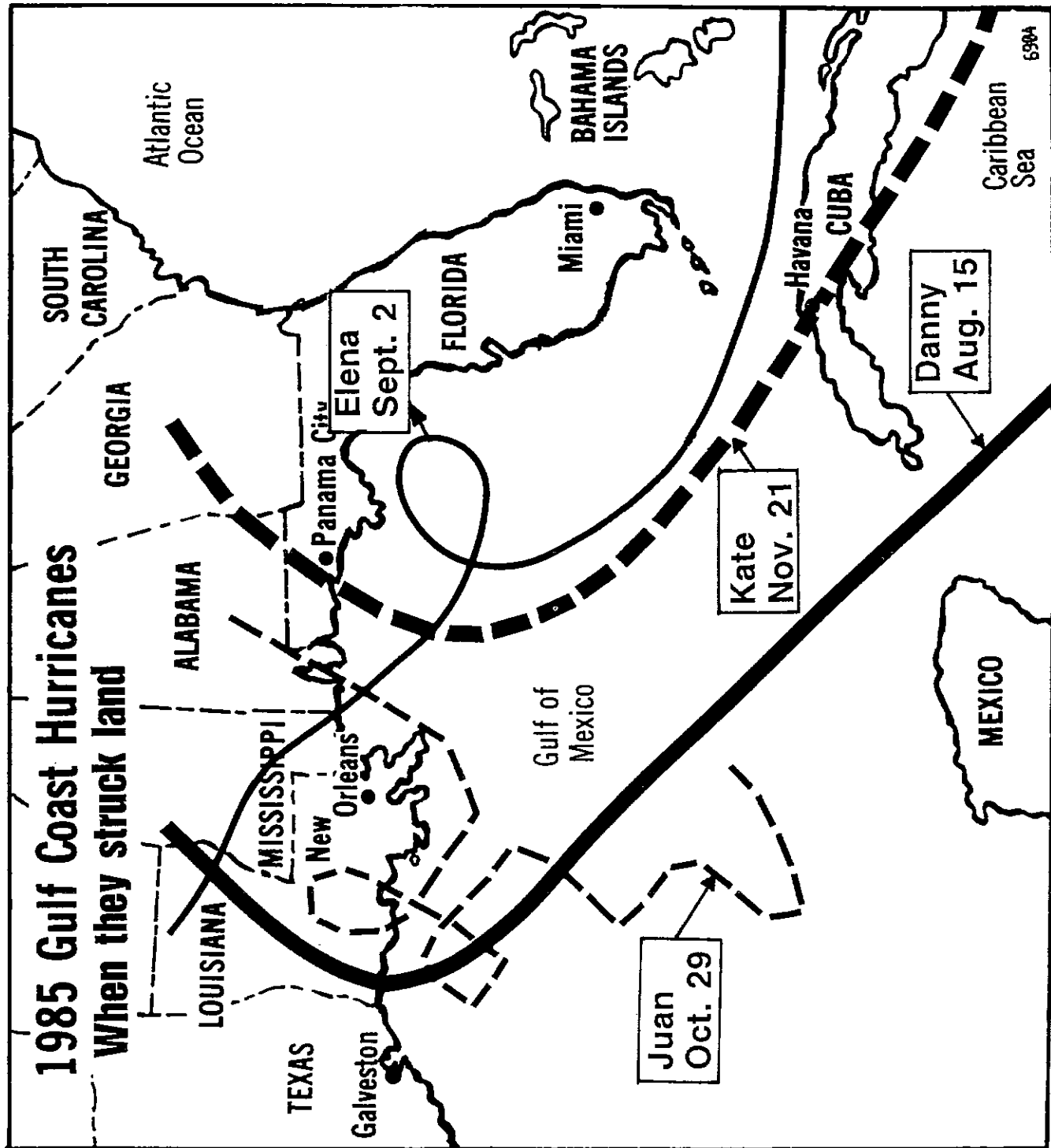
After almost two days of speculation and uncertainty as to where Hurricane Elena would strike, Mississippi Gulf Coast residents believed their area would be spared. At 1700 hours Saturday, the 31st, the National Hurricane Center lifted the hurricane warning west of Pensacola, Florida, which included the Mississippi Coast. The entire Coast remained under a hurricane watch, however, Mr Wade Guice, Harrison County Civil Defense Director, said: "It was a real threat. But now that threat is over, we're looking forward to a real

nice Labor Day weekend. Obviously, we're delighted." A skeleton crew remained on duty at the Civil Defense Emergency Operations Center to monitor the storm's meandering progress until it made landfall, which was expected to occur somewhere in the eastern Florida panhandle. Most Harrison County shelters began to close about 1630 hours on the 31st, after the warning was lifted. Guice said he did not think the people would regard Hurricane Elena as a false alarm and that Coast residents would be just as alert to evacuate quickly if another storm threatened the area. Emergency workers were scheduled for a meeting the following week to critique how well the threat of Elena was handled by Civil Defense. At 2000 hours, the National Hurricane Center reported the storm's center was at latitude 28.6 north and 86.0 west, or about 100 miles southwest of the town of Apalachicola, Florida, which experienced heavy rainfall. Highest winds were recorded at 100 mph. At that time, the storm's diameter was estimated at 350 miles, and its outer cloud levels reached from Mexico's Yucatan Peninsula and southern Cuba to Virginia. It was designated as a Category 2 hurricane.⁷⁹

Throughout the evening of the 31st and the morning of 1 September, Elena's forward speed diminished to a near-stall. The 2300 hours National Weather Service Advisory for 31 August said that "Future motion is quite uncertain but one of several possibilities is that the center will remain nearly stationary off the coast for the next 12 to 24 hours and then start a drift toward the west or southwest." An editorial in The Daily Herald of 1 September declared Elena a near-miss for the Biloxi-Gulfport area and elaborated on lessons learned from it. The predicted movement of Elena became a reality and by 1500 hours on 1 September the hurricane had backtracked and now moved toward the Pensacola-Mobile area. The PA Control Center on Keesler noted that all base personnel were directed to report to their shelters beginning at 1900 hours. At 2104 hours, the base was declared to be under the HURCON 1 condition and those Keesler personnel who planned to evacuate rather than remain in base shelters were directed by Maj Gen Thomas J. Hickey, the Center Commander, to use extreme caution.⁸⁰ "If you are planning to evacuate the storm area," General Hickey said, "you should plan to travel northwest to best escape the effects of Hurricane Elena. Do not go east toward Mobile. This is a very dangerous hurricane. I ask your prompt and orderly movement to assure the safety of all of you."⁸¹

The hurricane continued a west-northwest movement throughout the evening of 2 September and at 2100 hours veered slightly more westward. At 2230, the storm's forward speed had increased to ten knots. Keesler residents were warned that 110 knot winds were expected by morning and that Elena was projected to strike land at 1300 hours on Monday, 2 September, between Pascagoula and Mobile. This projection was updated at 2340 hours and the time of landfall moved forward to 0600 hours on 2 September. The projected storm path was also adjusted; it was expected to pass the Biloxi/Keesler area enroute to New Orleans.⁸²

The decision to again evacuate the C-130s at Keesler was made at 1530 hours on 1 September. Four EC-130s of the 7th Airborne Command and Control Squadron evacuated to Dyess AFB, Texas; four WC-130s assigned to the 53 Weather Reconnaissance Squadron evacuated to Little Rock AFB, Arkansas; and four WC-130s assigned to the 403 Rescue and Weather Reconnaissance Wing evacuated to Homestead AFB, Florida. The first aircraft departed Keesler at

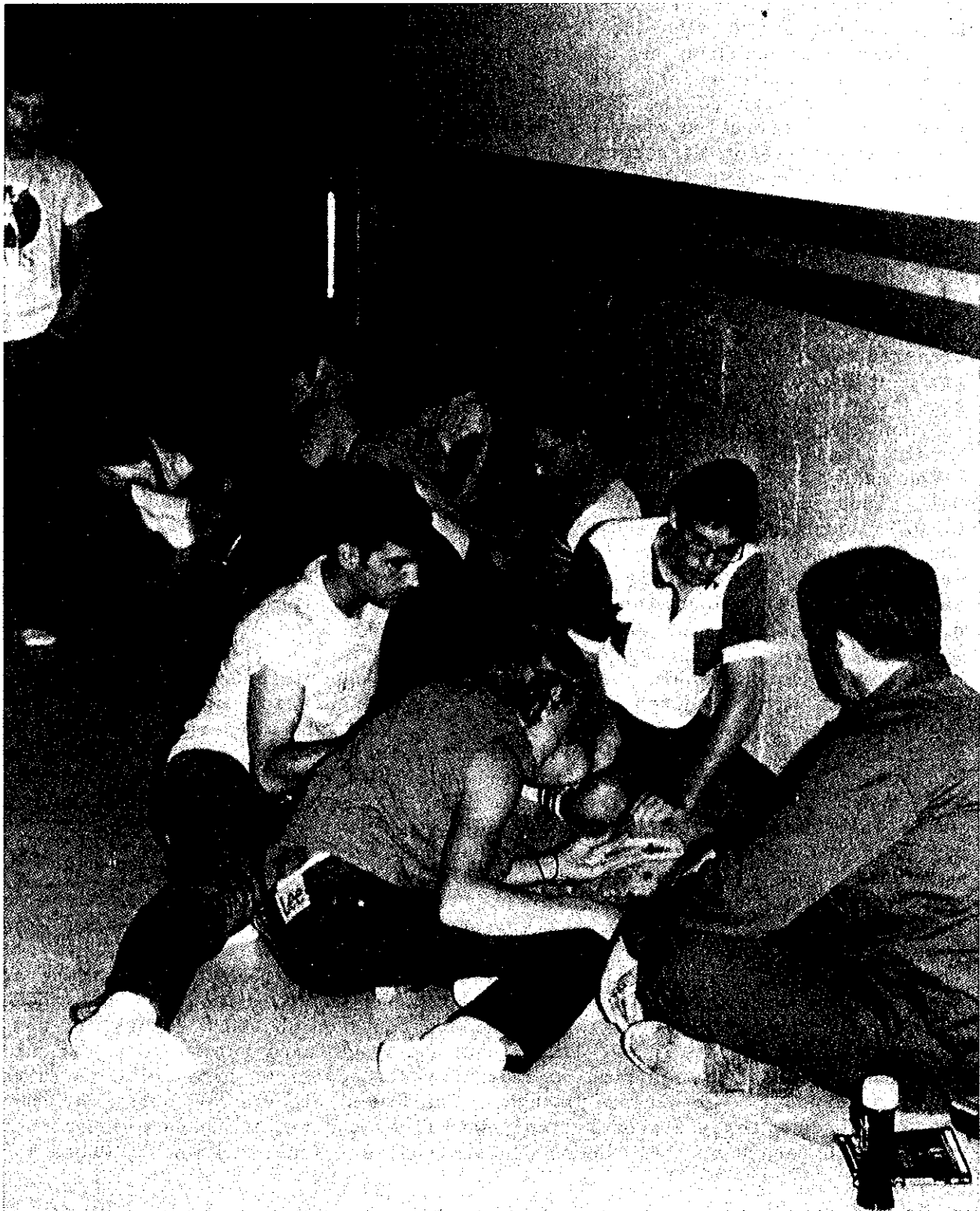


1545 hours and the last C-130 departed at 1907 hours. Long before Elena became a threat to Keesler, however, Air Reservists with the 815th Weather Reconnaissance Squadron and their seven WC-130H aircraft were tasked with nine penetration missions into the eye of the storm to report its development, movement, and size to the National Hurricane Center in Miami. They actually flew eleven penetration missions, however. Between 26 August and 2 September, the squadron's storm trackers flew from Keesler and Homestead AFBs and from Antigua in the West Indies. They spent as much as twelve hours on each mission and encountered winds around the eye of the storm that peaked at 135 mph.⁸³

Riding Out the Hurricane

A request to discontinue troop movements into and out of Keesler was transmitted to HQ ATC Director of Personnel for the second time, due to the imminent approach of Hurricane Elena. At 0530 hours on Monday, Labor Day, the storm was centered offshore from Pascagoula, and moved steadily onshore with 125 mph winds. Coastal residents in shelters from Mobile to Bay St Louis, and Keesler families and dependents in the on-base shelters, had little rest as Elena made landfall in the predawn hours. The northern edge of the eye, with wall cloud winds* and tornadic rains, swept into Pascagoula and Moss Point. By 0700 hours, official landfall was recorded in Ocean Springs and the eye of the storm next passed over Biloxi and Keesler. The ferocity of the high winds was lessened only slightly by the fact that the storm made a near-parallel landfall with the coastline, rather than perpendicular to it. Although this drained off part of the storm's total force, winds of 125 mph with gusts to 140 mph, raked through the coastal communities. On Keesler, ten shelters housed over 13,000 people. MSgt Michael Carr, superintendent of the Disaster Preparedness Office, noted that people came together in times of crisis. He credited the shelter supervisors for the support and cooperation within the shelters. MSgt Robert Mecchi, one of three shelter supervisors at Jones Hall, credited disaster preparedness training as the major factor that assured their readiness. "From assigning people to rooms to providing water, everything in Jones Hall ran smoothly," he said. "The biggest help came from the numerous students who volunteered their services during the storm. They helped with security, [acted] as guides, and kept the facilities clean." Two specialized teams provided support to disaster preparedness. A three-man team served as communicators for the Disaster Preparedness Control Center and a twelve-man group provided runners and backup staff for shelter teams in need of them. In Wolfe Hall, some members admitted to discomfort but regarded the temporary situation as worth the inconvenience in exchange for the security. One mother said that except for being a little uncomfortable on the hard floors, it was a small price to pay for their lives. As the wind force subsided, the Keesler shelters remained in operation as emergency cleanup crews began to work in the early afternoon. The winds from the storm calmed about 1700 hours. By then, on-base roads were safe from fallen power lines and trees, and shelterees were released to return to their homes or dormitories. Keesler members, whose

*Strong surface winds under the wall of clouds that encircles the eye of the hurricane.



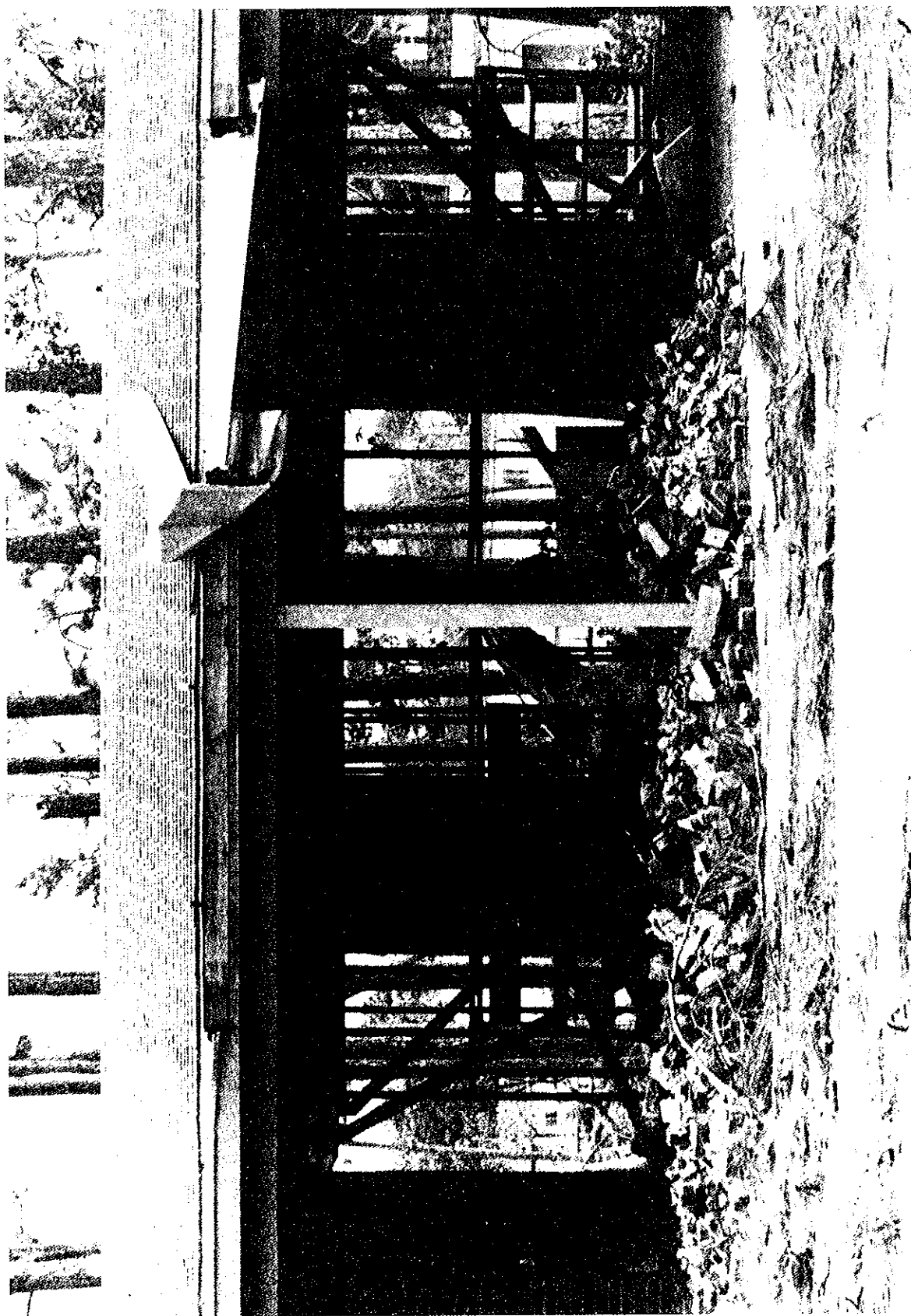
Shelterees passed the time at one of Keesler's designated shelter areas as Hurricane Elena moved back toward the Mississippi coast and a Biloxi-Keesler landfall.



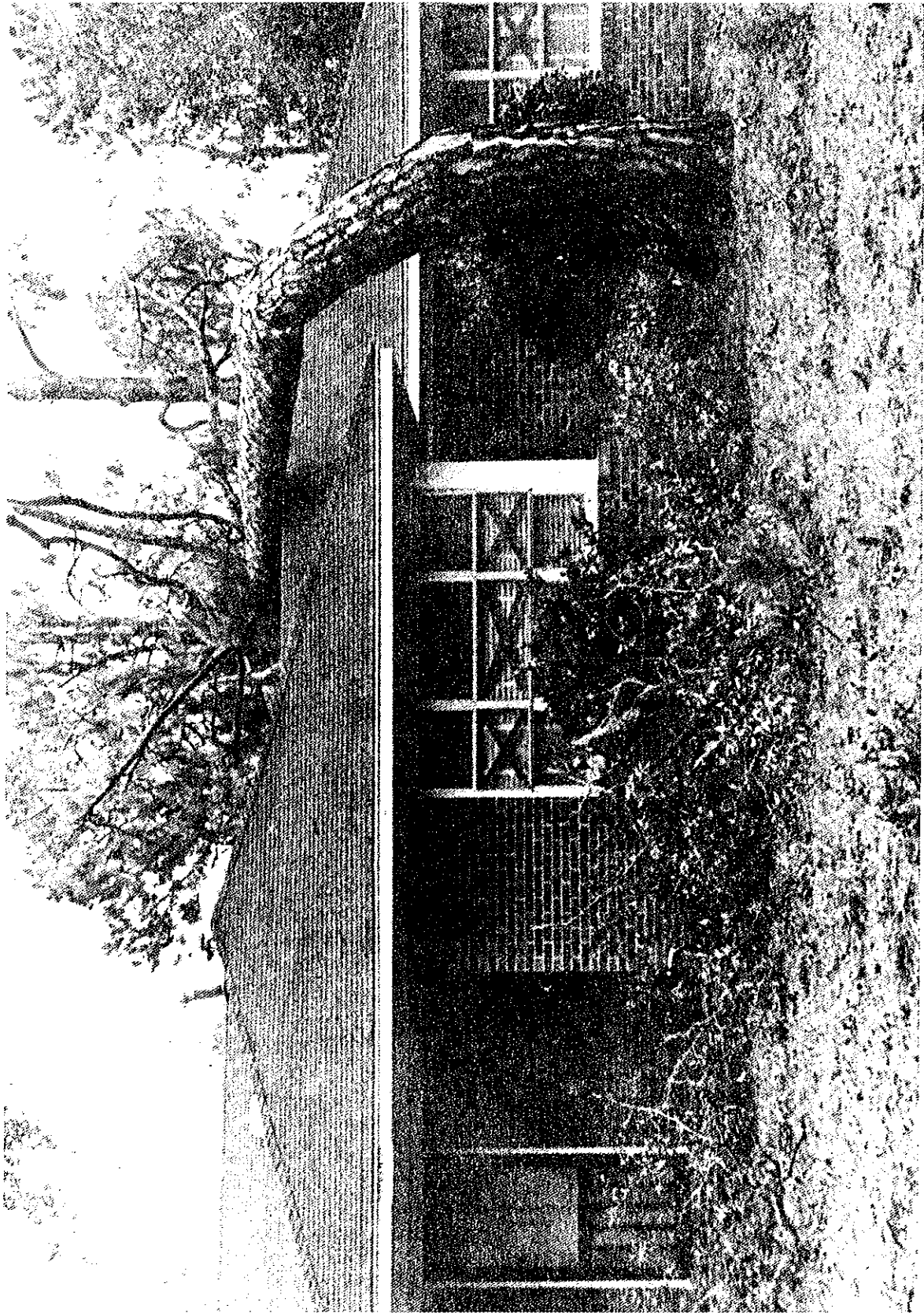
In the Disaster Preparedness Control Center, Sgt Liddy Pasquini tracked the final hours of Hurricane Elena as it headed for landfall along the Mississippi Gulf Coast.



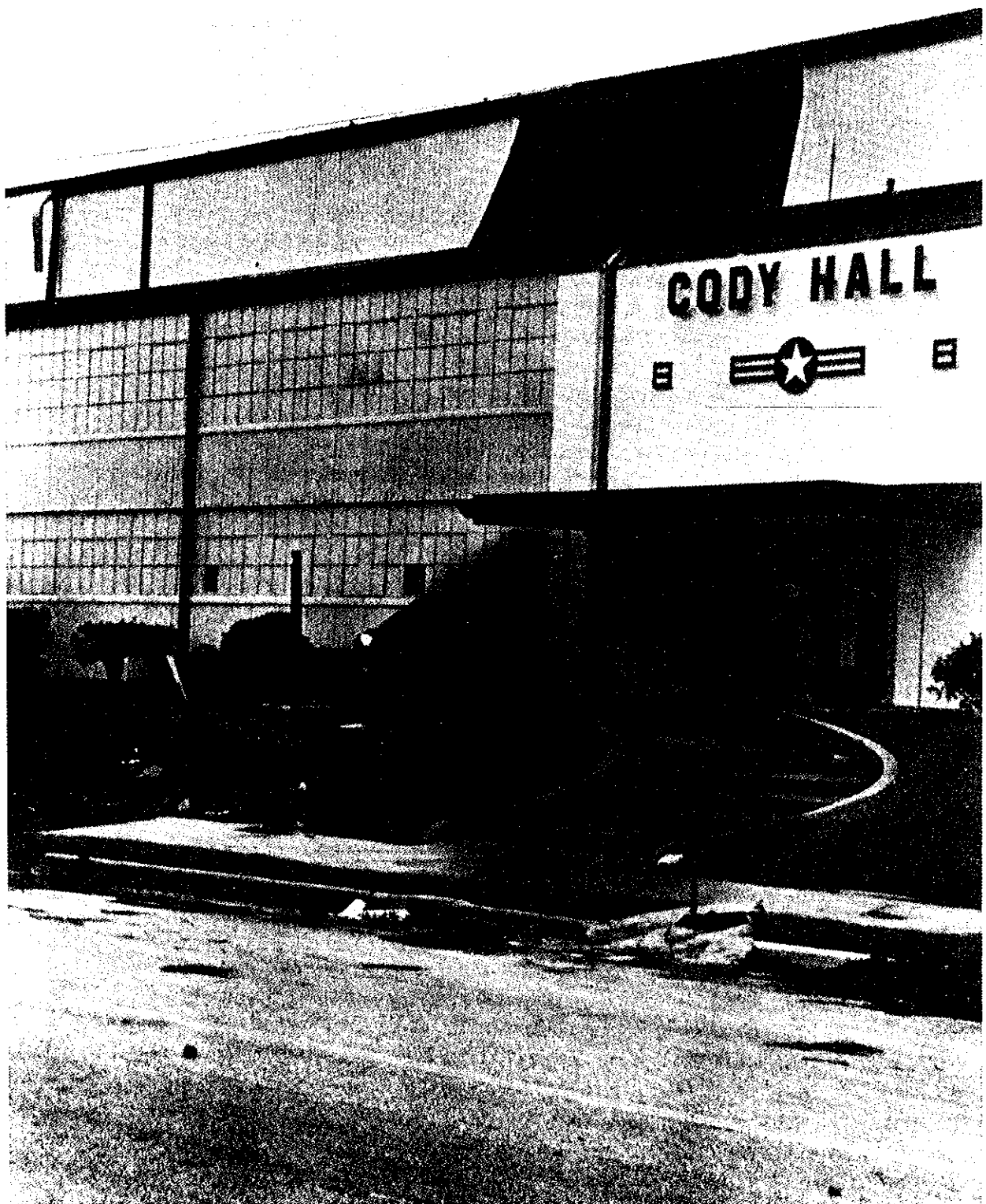
Car windows shattered by flying debris and roofing gravel during the height of the storm constituted the major damage to vehicles in the base parking lot.



The Bay Ridge family housing area on Keesler suffered some of the most extensive damage when the maximum winds of Hurricane Elena swept directly across the training center.



The force of Elena curved this large pine tree around the roof of a house in the Oak Park family housing area on Keesler.



Cody Hall lost part of the sheet metal structure in the upper part of the building as well as its large identification sign at the main entrance.



This area of Pine Haven Family Housing suffered extensive damage from fallen and uprooted pine trees.



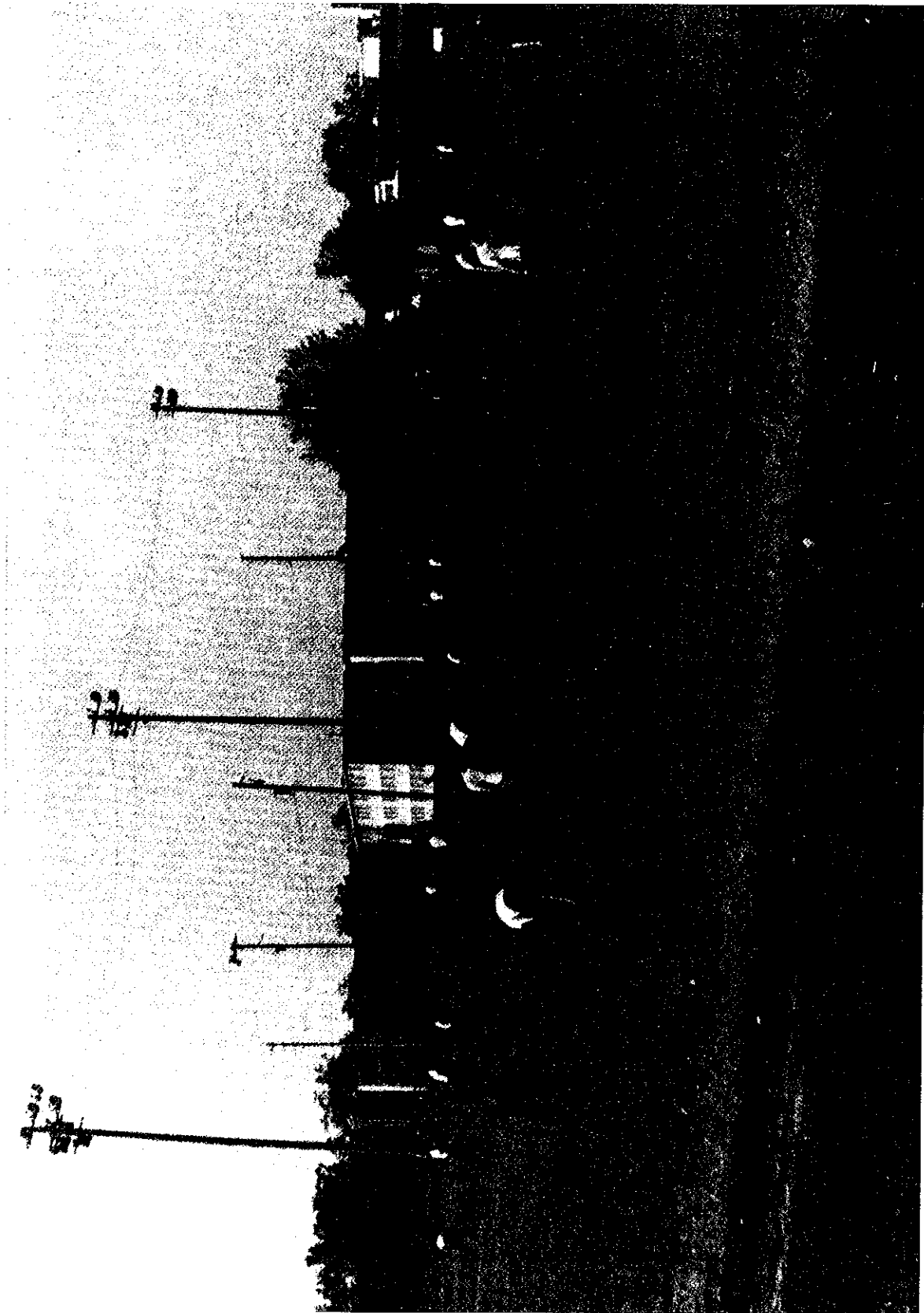
Keesler students pressed into community service immediately after the storm, directed traffic on Highway 90 along the coast and were especially valuable at the intersections adjacent to the base where power failures made traffic lights inoperative.



This trailer, at the new multipurpose aircraft maintenance shop construction project near the flight line, was overturned by the force of Hurricane Elena's 130 miles-per-hour winds.



For several days following Elena, Keesler students worked on and off base in hundreds of work details to collect and load the storm's scattered debris.



Cleanup crews comprised of Keesler students and permanent party personnel made sweeps of all base open areas to gather and remove the debris scattered by the storm.

on-base homes were found to be uninhabitable, were directed to report to Muse Manor for temporary emergency quarters. For those families whose vehicles were damaged by flying debris during the storm, bus transportation was provided to each housing area. The base also provided transportation for Keesler members and their families who were stranded due to damaged vehicles.⁸⁴

Throughout the storm, the Military Affiliate Radio System (MARS)* network on Keesler was activated to keep in touch with off-base agencies and higher commands in the event telephone communication was lost. One of the three persons who manned the alternate communications system was SSgt David Cozad of the 3400 TCHTG. "Basically," SSgt Cozad said, "our only job was to act as an ATC contingency net. If the base would have lost power, we could have maintained communications with Headquarters ATC. But since we didn't lose anything, we were activated but didn't perform any traffic."⁸⁵

Installation Damage and Base Recovery Efforts

As soon as the major roadways were cleared, the base made a preliminary assessment of storm damage and a message apprised the Air Force Chief of Staff. There were no casualties on Keesler because of the storm and, in fact, no storm-related fatalities were reported anywhere along the coast where Hurricane Elena made landfall. Injuries were minor and the Keesler Medical Center remained operational with only minor wind damage and leaks. The immediate major problem that faced Keesler managers was the total loss of electrical power from its supplier, Mississippi Power Company. The base electrical distribution system also suffered major damage. In the aircraft maintenance complex, all hangar roofing was blown away, which resulted in extensive water damage to the interior. In the 3300 TCHTW, there were minor damages to the academic buildings and dormitories. Civil engineers and training managers judged an early resumption of training would occur soon after power was restored. Major damage was sustained by the radar antennas used to train aircraft control and warning students. The 7 ACCS and 53 WRS building received major structural damage. The preliminary assessment of the base housing units revealed that approximately fifty units were uninhabitable and about five percent of the trees on base had been blown down, many of which fell on buildings and blocked roadways. As to airfield operations, an assessment revealed that limited visual flight rule (VFR) operation could be restored by 1700 hours if the winds continued to decrease and a crew could repair roof leaks. In the control tower the backup radios were inoperable, however. Although the Gulfport-Biloxi Regional Airport was operational, its runway lights could not be used until power was restored. One damaged area that received early attention was the primary fire notification net. The cable was cut by the storm, but an alternate means of fire notification was developed. Most of the three-county coastal area was without electrical power. Mississippi Power Company spokesman John Hutchinson announced on 3 September that it would be a week to ten days before electric service was fully restored.⁸⁶ Fortunately, the water supply in most areas of the coast was not contaminated.

*A two-way radio communications system on which only one person could talk at a time, but all others on the frequency could listen.

Although Keesler sustained heavy wind damage, there were no injuries or loss of life to personnel. This was credited to extensive disaster preparedness, and to a program that provided safe on-base sheltering of military personnel and their dependents, as well as area military retirees and their families.

When personnel sheltered on Keesler were permitted to return to their homes and dormitories late on the afternoon of 2 September, base officials contemplated placing an announcement in the Keesler Update that military members would remain on a two-hour standby status. This was generated by the possibility of severe weather conditions that might result from the aftermath of Hurricane Elena. As the weather conditions continued to improve in the wake of the storm, however, the proposed warning did not appear. ⁸⁷

General Hickey praised the dedication and commitment of Keesler personnel for their actions during the preparation and passage of the storm. He identified the primary problem in the storm's aftermath as the lack of electrical power. The secondary problem was a low water supply on base, which caused concern for the Civil Engineers because of the possibility of fires on base. The base commissary opened at 1230 hours on 3 September, but due to the absence of electrical power to operate cash registers, only checks were accepted as payment for items. Duty hours for military personnel were 0730 to 1700 hours, and 0730 to 1630 for civilian employees. A 2030 hours curfew was ordered in force. Dining facilities in Muse Manor and Locker House were open for meals, as was the NCO Club. ⁸⁸

At 1230 hours on 3 September, Mayor Gerald Blessey of the City of Biloxi requested assistance from Keesler to help clear the roads and access streets in Biloxi and on Highway 90 intersections along the beach. Keesler responded immediately and committed its resources to labor details, transportation assistance, debris cleanup for emergency access, and traffic control. By 1730 hours the same day, 208 persons were employed in assisting the city and an increased number was expected in response to anticipated further requests from other civil authorities. Because of the base power outage, the Director of Personnel for the 3380 ABG requested, in an interim status report, that HQ ATC delay the shipments of non-prior service students from Lackland AFB to Keesler until all base debris had been cleared and damages repaired. ⁸⁹

By 4 September, only two days after the hurricane struck the base, recovery efforts were in full swing. Electrical energy from the Mississippi Power Company was restored and the base electrical distribution was partially activated. The airfield was partially operational; however, fuel supplies were limited. Commercial power was completely restored to the Keesler Medical Center, but a serious lack of water pressure continued to be a problem. Hangar roofs were under repair in order of primary importance, and Prime BEEF teams from Eglin, Sheppard, and Columbus AFBs arrived to assist basewide recovery efforts. Equipment arrived on scene from the Gulfport Seabee Base, together with elements of a construction battalion. Equipment also came from the Gulfport ANG base and Camp Shelby, Mississippi. An initial assessment of the aircraft control and warning antennas and the building that housed their technical training courses showed that they had sustained extensive storm damage. The impact on technical training was undetermined until managers could ascertain when power would be restored to the interior equipment. Of

concern to Civil Engineering was the use of small alternating current generators connected to the electrical panels in the dwellings of the housing units. They posed a definite safety hazard because the current they generated could feed back into the base's main distribution system and electrocute a worker repairing a power line. Anyone who had made a connection of that type was directed to inform Civil Engineering. No electrical hazards were reported, however; nor were any dangerous connections noted.⁹⁰

Full water pumping capacity was restored by 5 September, the Medical Center was fully returned to normal operations, and the airfield was operational. Temporary repair was completed on the roof of Hangar No. 1 and work began on Hangar No. 3. Aircraft maintenance remained degraded because of lack of power and work continued to restore the power distribution system. By 1545 hours, power was restored to forty percent of the main base and a limited area of base housing. Limited student training resumed and was projected by training managers to reach near-complete operation by 10 September. In anticipation of the resumption of training, the Director of Personnel requested the Command and Control Division of ATC to proceed with troop movements to Keesler effective 6 September.⁹¹

As base recovery efforts continued at a pressing pace, results became evident throughout the center. Saturday and Sunday, the 7th and 8th of September, were declared work days for Keesler military personnel. People were supposed to perform mission-essential duties to assist in the cleanup and movement of debris from the base housing areas. Personnel who resided off base were excused to clean up their local damaged areas. The base civil engineers and Keesler students were made available to assist on-base housing residents. By 6 September, the base curfew was lifted and many of the base facilities were open. The Keesler Update notified personnel of those facilities returned to operation. There were still problems with lack of power, however, and many base residents remained without electricity despite long hours of work to restore the circuits. Residents of Oak Park and Harrison Court learned they would be the last housing areas to have power because of the excessive damages to power lines there. Base telephone system problems continued. Off-base dialing and access to AUTOVON lines remained degraded due to storm damages. Officials of the 2052nd Communications Squadron identified the source of much of the problem as a damaged underground cable that traversed Larcher Avenue near the Officers' Club. Until the damage could be repaired, access to AUTOVON and off-base numbers was provided by use of the Hammer Ace communications system,⁹² brought to Keesler to help the base meet its immediate communications needs. According to Major John Schroff, who was 2052nd Communications Squadron Deputy Commander at the time of Hurricane Elena:

Hammer Ace is a special communications package that is managed, and located, out of Headquarters AFCC at Scott AFB. Following the hurricane, we made coordination through the office at Scott AFB to have the package deployed here to Keesler. It is designed to provide off-base, long-haul communications. We used the system to set up a satellite link and an AUTOVON link. That's what it was designed to do; it doesn't give us local telephone service. It also provided us with a land mobile radio capability to augment our systems [and] a secure voice channel for security⁹³ use. After base phone service was restored, the system was returned.

In a continuing program, base environmental engineering officials regularly sampled the base water distribution system to determine possible contamination levels. The test results revealed that water from the base system was pure and posed no threat to users. Water conservation measures were lifted due to the return of full water pressure. The curfew hours on the main base were lifted on 6 September; however, curfew hours in the Harrison Court, Oak Park, East and West Falcon, and Thrower Park housing areas remained in effect from midnight to dawn.⁹⁴

With President Reagan's declaration of Jackson, Harrison, and Hancock Counties as disaster areas, the Federal Emergency Management Agency (FEMA) opened Disaster Application Centers on 9 September. Keesler personnel, primarily off-base residents, were eligible to apply for disaster assistance. Through several federal disaster assistance programs, the centers were intended to help coastal residents with such needs as those for temporary housing, individual and family grants, legal counseling, emergency assistance, and veterans benefits. Programs were also available to help residents pay for hurricane damages that were not covered by private insurance.⁹⁵

In a situation report to the Air Force Chief of Staff and fourteen concerned installations, Keesler Command and Control reported, at 1345 hours on 6 September, that all technical training would resume on Monday, the 9th. Power was restored to all main base circuits and was available to half of the housing units. All 53 Weather Reconnaissance Squadron and 7th Airborne Command and Control Squadron aircraft that evacuated Keesler had returned or were on mission tasking, and the airfield was fully operational, with the instrument landing system (ILS) and tactical air navigation (TACAN) systems fully checked.⁹⁶

In a message to Keesler personnel, Gen Hickey expressed his congratulations. "I am proud of all of you and the professional manner in which you have jumped in and taken on any and all projects to get Keesler AFB back on its feet following Hurricane Elena." The Commander took special note of the concerted base-wide effort to recover quickly. "Everywhere I've visited throughout the base," he said, "I've seen men and women with rakes, brooms, and saws, working from dawn to dusk, fixing up and cleaning up after the storm. I want to thank each of you for your concern and support." The general added that while preliminary estimates indicated Keesler suffered over \$25 million in damages from the hurricane, the figure could go higher in the days ahead.⁹⁷

Keesler Command and Control's final situation report to the Chief of Staff on 9 September declared that hurricane recovery operations were generally completed. All technical training had resumed, and a schedule to recover the training time lost was under development on a course-by-course basis. Power restoration to base housing was 90 percent complete. Aircraft maintenance was fully operational and could support the normal flying schedule. Contract specifications for permanent roof repairs were complete and funding documentation was under preparation. Preliminary damage estimates had been completed, but detailed assessments to support contracting and in-house programming continued. An estimate put the time required for full restoration at twelve months. Debris collection was 80 percent complete on the main line and 90 percent complete in the housing areas. The communications capability

was at 100 percent of normal and Hammer Ace operations had halted. TSgt Robert Bashaw, Readiness NCOIC for Keesler's Prime BEEF operations, identified the off-base military support agencies that aided Keesler after Hurricane Elena. They were: Sheppard, Eglin, and Columbus AFBs, the Red Horse Detachment at Hurlburt Field, vehicle support drivers from Camp Shelby, and the Seabee Detachment from Gulfport.⁹⁸

Once again, as in earlier disasters caused by Hurricanes Camille and Frederic, and as already noted in this study under Keesler and Gulf Hurricanes, the Keesler community came to the aid of local townspeople. In the aftermath of Hurricane Elena, Keesler responded to the requests of civilian officials in surrounding towns to provide the assistance that helped restore order. More than 300 students went into civilian communities daily. The service began the day after the storm and continued through the end of the week. Approximately 200 students were assigned to Biloxi each day to help clear debris. Other students were posted at street intersections to help direct traffic due to power outages. The remaining students were assigned to cleanup details in Ocean Springs and D'Iberville. "The community really appreciated our involvement and concern for them, and vice versa," said SSgt Wilborn Andrews, the student detail monitor. "This was indicated by the favorable attitude and abundance of water, ice, food, and praise our students received from the people."⁹⁹

Eight days after the storm struck, base officials agreed that Keesler's recovery from Hurricane Elena had been swift and well coordinated, largely because of the response of all the base agencies and Keesler recovery personnel. "The Base Safety Office reported only two major injuries. At a gathering of over 300 military and civilian members of Keesler on the afternoon of Sunday, 8 September, the Center Commander, military chaplains, and other speakers gave thanks that their lives were spared. In appreciation of the base personnel's efforts, General Hickey directed that all nonessential Keesler members cease work at noon on Friday, 13 September, to participate with their families in unit picnics on the base. The Commander said "... take a break from the rigors of the base restoration and enjoy the comradeship of your co-workers, family, and friends. Take some time to smell the roses."¹⁰⁰

A detailed and updated list of damages, with Hurricane Elena recovery costs, was forwarded to ATC on 9 September. The cost estimates, as of 26 September, totaled \$32.7M, including the direct costs for recovery, replacement, and repair for damages to all Air Force organizations on Keesler AFB.¹⁰¹

Operation Helping Hand

A program precipitated by Hurricane Elena, "Operation Helping Hand," reached out to active duty Air Force members and their spouses in need of emergency financial assistance. The program on Keesler began as the result of the Center Chaplain's observations in Military Airlift Command. Col James W. Millsaps, the Center Chaplain, came to Keesler from MAC, which had about seven bases with a similar program authorized by the base commander to facilitate emergency relief in the event of a crisis situation in a person's life. The chaplains were coordinators for the commander, but not the decision-making authorities in the process. The Command Chaplain's office contacted the Chief

of Chaplains' office and authorized a \$5,000 grant to start the fund from the Chief of Chaplain's nonappropriated funds. Offerings were received, and the Chief of Chaplains, apprised of the damage estimates and the needs of Keesler's personnel, authorized all chapel congregations in the Air Force to take a second designated offering for the month of October. The response was a generous outpouring of contributions worldwide. Chaplain Millsaps received about \$45,000 from chapel congregations and added it to the \$5,000 from the Chief of Chaplains. The highest contribution, \$3,500, came from the Air Force Academy. Notable among contributors was Hickam AFB, which contributed \$2,600 from the Protestant and Catholic congregations. Chaplain Millsaps, who related how a young airman and his wife, in anticipation of the hurricane, depleted their budget for emergency food and supplies. Their rent came due, but they were unable to pay the \$150 needed. The fund filled the gap in their budget and paid the rent. In another case, an Air Force wife, whose husband was on active duty in Korea, had a monetary crisis as the result of the hurricane. Operation Helping Hand validated her need and provided funds to offset the emergency conditions. The program, which continued after the trauma of Hurricane Elena, provided the basis for future contingencies where emergency financial help would be needed.

102

Recovery of Technical Training Facilities

Of major concern to Keesler managers was the earliest possible resumption of the primary mission, technical training. Even as damage assessments were made, Civil Engineering crews began to restore the damage to the training environment. By 4 September the 3300 TCHTW Commander, Col Harry M. Edwards, was able to report to Headquarters ATC that four of Keesler's five training groups had returned to training status and were making up the lost time. In the 3395 TCHTG, however, there were significant problems with performance training. Because of severe roof damage to Cody Hall and Hangar 3, water leakage during rainstorms caused the training group to shut down training equipment housed there to prevent further damage and unsafe working conditions. Performance training was suspended and several actions were taken to minimize 3395th TCHTG course deficiencies. Arrangements to repair the building roofs by contract were expedited. By 11 September, there had been significant progress toward the restoration of all training in the Group. Base Civil Engineers completed temporary roof repairs on Cody Hall and Hangar 3. The air conditioner in Cody Hall was back in service and all major training equipment there was technically operational. In Hangar 3, all training equipment was operational except for the FPS-206 Antenna. On 18 September, Col David W. Saunders, Chief, Operations Division, reported to Headquarters ATC that all conditions that caused training interruptions to the 3395th TCHTG were under control. All training in the Group was in progress. A contractor was bonded to accomplish roof repair on Cody Hall, with an estimated starting date of 23 October 1985.

103

Mr Fred Eddins, Training Advisor for the 3300 TCHTW, observed that the pace with which permanent repairs were made to training buildings after Hurricane Elena was slower than the two previous major storms. Mr Eddins noted that at year's end there remained significant unrepaired damages that continued to affect training during heavy rains. The major areas were Hangar 1, the Wing Headquarters building, and other locations in scattered pockets, repairs of which had not been completed because of contract delays. Mr Eddins observed that:

Five months after that storm we still have some roofs that have not been back on buildings. Based on the recovery from past storm damages, this is the worst recovery we've ever had.... The situation was different in this hurricane as compared with the previous storms and bad weather incidents. As far as the activities of the training managers following the storms [were concerned], we did the usual things. We got the people back in and we did all the temporary repairs we could do in-house. I don't think that aspect operated any differently than before. But I think the permanent fix has been slower, in my memory, than it was in the past. ¹⁰⁴

Lessons Learned

As the base recovery progressed, and within hours after Hurricane Elena's passage, Gen Hickey tasked KTTC's Programs Division to prepare a detailed after-action report. In directing the report, the Commander said: "We have just gone through a hurricane and consequently have learned a lot of valuable lessons. Therefore, let's document our 'lessons learned,' update our contingency plans/checklist, and provide valuable information to those who will follow us." ¹⁰⁵ The twenty-five page document contained extracted inputs from thirteen KTTC organizations. Each organization identified lessons learned, the office of primary responsibility, and a proposed recommendation. In all, there were 112 different lessons learned, with 127 attendant recommendations. Gen Hickey directed the report be placed in a permanent file and reviewed by all Commanders and Keesler Agencies during HURCON 4 conditions for all future storms. ¹⁰⁶

Keesler Disaster Preparedness managers had correctly anticipated their strongest challenges would be in the areas of sheltering and feeding the people, emergency power, care for the ill, communications, rationing of ice, water, fuel, vehicles, and other assets, and the safe evacuation of aircraft. In the sheltering aspect, the report recommended that, to limit traffic, only essential people should be released from the shelter at the "all-clear" notice. They would include civil engineer personnel with heavy equipment and debris-clearing tools to remove downed trees from the key egress routes to base housing and debris from storm drains to prevent flooding. Communications in each shelter were found lacking, and the recommendation was made to install a public address system in each shelter so information could be passed to all personnel simultaneously. An observation was made that the five aircraft hangars on base had routinely lost their roofing plys during hurricanes, which meant equipment stored in the hangars was especially vulnerable to water damage. The attendant recommendation was made to discount the time and cost of temporary repair by placing rolled roofing over all damaged hangar roofs as early as possible. Plastic sheets were recommended to cover equipment such as typewriters, computers, and electronic equipment in those areas where roof damage was likely to occur. Civil Engineering also observed that during the past 30 years all of the hangars and a number of other buildings had their roofs blown off or severely damaged. The roofs were replaced or repaired with no change to the design of five of them and, as a consequence, during each hurricane the roof structures and the building contents sustained hundreds of thousands of dollars in damages. The Civil Engineers recommended a new roof design for those structures that were damaged, and an improved roof design for new buildings, to withstand hurricane force winds. They pointed out that the

roof of the Old Biloxi Hangar, Building 0228, received very little damage during past hurricanes and perhaps its design could serve as a model.¹⁰⁷

In a notable experience, the Center Commander said:

What lessons did we learn from a session of that type? We learned a lot. A typical example was when I walked out of the shelter and. . . surrounded with all the debris and damage, there was a crusty old master sergeant who said, "Boy, look at all the windows broken out of the cars; the same damn thing happened in Frederic." That was the first time I knew that all these roofs shed those rocks that broke out all car windows. It had never been mentioned [before]. I don't know what I would have done about it had I known, but I'd have thought twice about letting them fill the parking lot. I may have had them go over and park in some other place to get away from those buildings. But I never heard that comment before: "Oh, that's just the same way it was in Frederic." So what we did, starting right then, was documenting. As a result, we've built a fairly extensive document from everybody's lessons learned, of things that we did this time that we ought not to do next time.¹⁰⁸

Other notable recommendations included the need for radio communications between shelters, the use of school buses to transport cleanup personnel to and from local community recovery projects, and the need for Morale, Welfare and Recreation (MWR) Division to purchase generators for the Child Care Center and the NCO and Airmen's Open Messes, which would put the facilities back into operation quickly. The International Training Office submitted a recommendation to accommodate international students by establishing separate shelters. This was because of the religions of those students from Middle East Countries which required men and women to be apart in times of danger; it was recommended that the women and children would be grouped in one or more rooms, and the men assembled in another location.¹⁰⁹

Overall, General Hickey said he thought Keesler did very well; the base was really well organized, well managed, and the people reacted very well. He pointed out that certain things could be done on Keesler to hurricane-proof it. He said an underground electrical distribution system would make a lot of sense here. If it could be done on a year-to-year basis, it would improve our recovery capability tremendously, he said. "...the important thing is [that] we documented our experiences," he reflected, "and the lessons are going to be left there for people to see it the next time."¹¹⁰

Recognition

In the aftermath of Hurricanes Camille and Frederic, air base personnel extended their resources to the local communities and, when Elena disrupted essential city services in Biloxi, Gulfport, and Ocean Springs, once again Keesler's people responded. Their labor was not unnoticed by townspeople, local government, and Congressional parties. In letters to the editors of local newspapers, readers who saw the benefits of Keesler's participation pointed out that without Keesler's assistance traffic would not have been directed, properties not protected, nor debris cleared from the homes of those who could not work. Resolution 444-85, approved and adopted unanimously by

the members of the Biloxi City Council, publicly recognized and commended the outstanding service and selfless effort of Air Force personnel. A letter from Congressman Trent Lott, 5th District of Mississippi, to General Hickey, recognized the assistance of Keesler personnel in aiding local townspeople, especially those who volunteered unselfishly to help the elderly and handicapped. In his assessment of community relations and the aftermath of Elena, General Hickey acknowledged the ability of Keesler to help the local areas.

"We were fortunate to have some labor force that one could put out there in a hurry and help them. We were well organized--which sometimes they have difficulty getting in civilian agencies--so we could react in a hurry. We'll continue to do that when we have to. I think it is purely a frame of mind and attitude between the community and Keesler."

Juan

Nearly two months after the Mississippi Coast survived Hurricane Elena, the third Gulf Coast storm of the season, Hurricane Juan, caused severe flooding in the low-lying coastal and river areas of Harrison and Hancock counties. The storm formed as a tropical disturbance in the western Gulf of Mexico on 26 October and, from 250 miles in the Gulf, took a northeasterly heading toward Gulfport. By 1400 hours on the 27th, the rapidly developing weather system's sustained winds reached 75 miles per hour and it was officially declared a hurricane by the National Weather Service. At 1730 hours, the Center Commander activated the Center's Contingency Support Staff (CSS) to discuss preparations on Keesler with the possibility that Hurricane Juan would make landfall in the area. All essential personnel were placed on standby. By the 28th, following indications that the Mississippi Gulf Coast might be the landfall target for the hurricane, the 3380 CES and Base Disaster Preparedness Team (DPT) were placed on alert. On the 28th and 29th, WC-130s of the 53 WRS flew into the storm, tracked its movement to the northeast and reported their findings to Keesler weather officials. The storm was nicknamed "Juan deloop deloop" by weather forecasters and civil defense officials because it looped twice during its travel. It proved as unpredictable in its path as it was in its late formation, although it was quick to reach hurricane strength. Eventually, the storm's winds reached 85 miles per hour as it wandered, stalled, shifted, and turned, and at various times threatened Gulf Coast communities from Port Arthur, Texas, to Mobile, Alabama. Hurricane Juan made two landfalls, the first in South Louisiana on 29 Oct, and the second one in the East Alabama-Northwest Florida area. The hurricane warning for the Coast was lifted at 1000 hours on the 29th as the hurricane, now with an ill-defined center, moved inland through Louisiana, and slowly weakened. Wade Guice, the Harrison County Civil Defense Director, said that as a result of Juan's passage, Harrison County received 6.7 inches of rain between 27 and 30 October. The rain caused river and tidal flooding and the high Gulf tides, recorded at 6.36 feet above normal in Bay St Louis, caused extensive beach erosion in Harrison County and were more damaging than the force from Hurricane Elena. The defense director called Juan "one of the most unpredictable, outlandish, frustrating storm systems" he had experienced in his twenty-five years as Civil Defense Director.

On 29 October, when base weather officials declared Juan an imminent threat to Keesler, the DPT prepared the ten shelters for occupancy. One shelter, Muse Manor, was opened late that day for people who resided in low-lying housing areas, mobile homes, and any other locations where they felt threatened by the approaching hurricane. Two additional shelters were placed on standby to handle any overflow from Muse Manor. When nonessential personnel were released from duty, the shelter management team began to receive shelterees, and fifty persons were logged into the shelter by 1800 hours. No other shelterees arrived, and all persons were released the following morning.¹¹³

With the worst of the storm's wind force diminished on Wednesday, the 30th, the base damage assessment revealed that Keesler had sustained only minor damage. The roof of the kindergarten was damaged and rain seeped into the interior. The temporary roofing on some of the hangars was blown away. One power line pole was broken and several others had to be strengthened. Some temporary power loss occurred in a few base areas.¹¹⁴

Kate

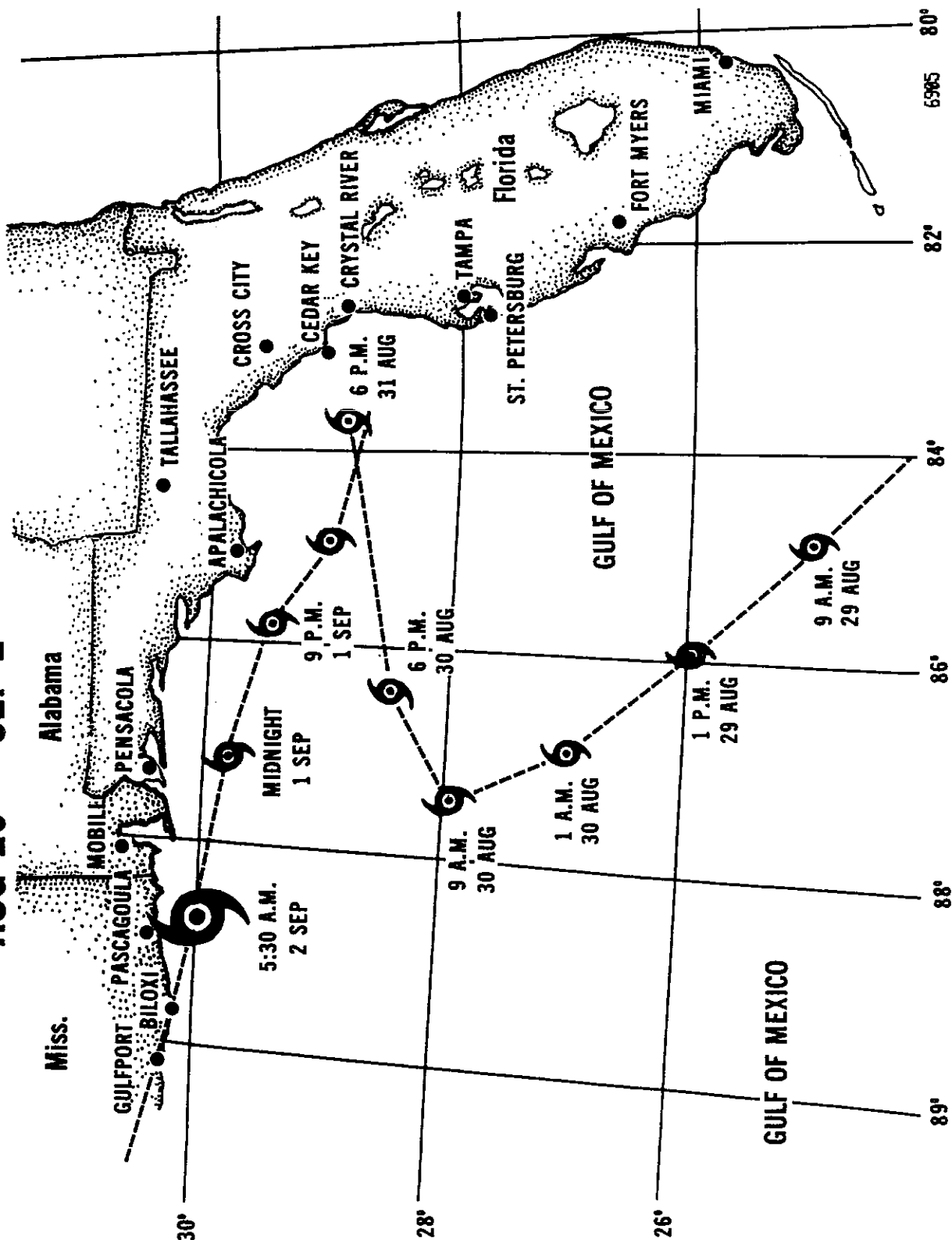
The fourth--and final--storm of the 1985 hurricane season to threaten Keesler was Hurricane Kate. It moved toward the northern Gulf region for several days as it continued on a somewhat-wandering, somewhat-steady line for the Mississippi Coast. The tropical storm, which began on 15 November, developed southeast of the Bahamas and reached hurricane force by 18 November, gathered strength, and moved through the Florida Straits and into the Gulf of Mexico. By 1000 hours on 20 November, when the Mississippi Gulf Coast was placed on hurricane watch, Hurricane Kate was 275 miles south of Apalachicola, Florida, with sustained winds reported at 115 miles per hour and strengthening. At that time, a slow, northerly-turning trend was detected with landfall predicted for the Panama City area. The forecast proved accurate when¹¹⁵ the hurricane went ashore in the Florida Panhandle on 21 November.

As had occurred with the earlier approaching storms, Keesler personnel sandbagged low-lying areas, boarded windows, and secured loose items on the base. On 15 November, the 53rd and 815th Weather Reconnaissance Squadrons made the first of a series of WC-130 flights into the storm to track its movement and learn its strength, making several penetrations at altitudes of 5,000 or 10,000 feet into the eye of the hurricane. Fourteen aircraft from Keesler evacuated to Dyess AFB, Texas, where aircraft crews of the 53rd and 815th Weather Reconnaissance Squadrons continued to fly weather reconnaissance missions throughout the week. Although the storm weakened considerably after it made its Florida landfall, it passed through the southeast corner of the U.S. and re-entered the Atlantic Ocean east of Charleston, South Carolina, on 22 November. The Keesler-based WC-130 units continued to track the storm until it no longer threatened land.¹¹⁶

Although Hurricane Kate was an extremely late storm for the northern Gulf Coast, it was not the latest on record.* There were no damages on Keesler as

*On 25 November 1921 and 30 November 1925, hurricanes struck land on the northern Gulf Coast.

HURRICANE ELENAAUG 29 - SEP 2



the result of Hurricane Kate, and the only major effect on Mississippi was in economic losses due to the temporary shutdown of the marine and shipping industries, as well as other commercial interruptions.¹¹⁷

Keesler's disaster preparedness was put to the test in 1985, and it's ability to cope, in rapid-fire order, with four powerful hurricanes within twelve weeks testified to the Center's readiness for future hurricanes and natural disasters. In his overview of the base response to Elena, Captain Gary Pace, Base Disaster Preparedness Officer, attributed the successful performance to two factors: "...well-trained and efficient disaster preparedness personnel and shelter management teams, and a responsive and cooperative general public."¹¹⁸ After Hurricane Juan, Colonel Jerry E. Singleton, 3380 ABG Commander, remarked: "It seems that hurricanes are becoming almost 'business as usual'--an attitude that could lead to apathy. Fortunately, that is definitely not the situation at Keesler. The response to Juan, like Danny and Elena I and II, reflected a professional sense of urgency tempered with good judgment. I think we were well prepared, and I'm thankful we didn't have to prove ourselves."¹¹⁹ In a summary of hurricane preparedness operations during the usually busy season, General Hickey said:

We were a little rusty (on) the first couple of warnings. . . and we were rusty the first time we sheltered for Elena. But when it turned out (that) sheltering wasn't necessary, we got back out of the shelters. When we went back in, it really counted, and when we came out of that one after the hurricane, the base was really well-organized, well-managed, and the people reacted very well. Then, when Juan came by, and Kate, I thought everything went like clockwork. You could go over there and sit in the Contingency Support Staff; everybody knew what to do, knew what they were doing, knew what the problems were going to be, and what reactions to have. It was kind of a relatively routine operation. Nobody feels routine in the pit of their stomach, but it was a professional environment and the people knew what to do--and were doing it.¹²⁰

SOME CONCLUSIONS

To residents of the Gulf Coast, the lessons of hurricane history have been plain. In nearly three centuries of battling them, coastians have learned they can neither be predicted nor prevented; neither controlled nor lessened in their fury. Defenses have been seawalls, better building codes, and evacuation. Of these, only the last guarantees personal safety, for massive evacuation from early warning will save the most lives, especially in a Camille-like storm. The worst hurricane experienced by the peninsular towns of the Mississippi Gulf Coast was Camille. Biloxi is a peninsular town and Keesler Air Force Base is located within its environs. In 1969, early warning and evacuation probably spared 10,000 lives, but twenty years afterward, with subsequent population growth, some new thinking is in order about evacuation routes. We have no way of knowing whether, at some time in the future, another storm of Camille's power--or greater--may strike again. Nor can we predict whether a greatly expanded Keesler population may necessitate an expanded role in evacuation--as well as sheltering. Should this contingency arise, it will be necessary to reduce the heavy traffic on Interstate 10 and US Highway 49.

In his work: Hurricanes of the Mississippi Gulf Coast--1717 to Present, Dr Charles L. Sullivan suggests two previously overlooked evacuation routes that could serve the most heavily populated part of Harrison County. Highway 15, he points out, could, with the paving of a few short stretches, be a direct route all the way to the Tennessee border. Another alternative, Dr Sullivan suggests, is Highway 67 to Ellisville, northeast of Hattiesburg. Because this route also follows Old Wire Road, City Bridge Road, and Oil Well Road to Highway 29, it would require evacuation markers along its length as guideposts to the evacuees. Either of these routes would eliminate the bumper-to-bumper traffic on both I-10 and US 49. But both routes need adequate right-of-way tree clearance to prevent them from blocking the roads if a hurricane-force wind blows them down (see Appendix IV).

But whatever happens in the future--if the past is any guide--the humanitarian response of Keesler's people will come to the forefront again. And again it will prove equal to the challenge. And again the individual and combined acts of military and civilian personnel will earn the everlasting gratitude of their community neighbors. After Camille especially, every facet of the community was touched and aided by Keesler recovery operations. They were effective, they were massive--and they were appreciated. The local citizens in surrounding communities realized, many for the first time, that Keesler Air Force Base was more than a national defense operation--it was an agent of mercy and strength throughout the ordeal of a national disaster.

All of the changes wrought by the fury of Camille were not destructive; one change was for the better. And it endures today. It was the change in thinking of a great many coast residents toward the human compassion demonstrated by a military installation in times of great personal hardship. It was the strengthening of the human bond between Keesler and its surrounding neighbors for, enshrined in that terrible moment of Gulf Coast history, is the reflection of man's humanity to man.

NOTES

1. Monograph, Dale M. Titler and SSgt Gary M. Murphy, Inception to Pearl Harbor, Apr 81, p 6.
2. Ibid, p 23.
3. Monograph, SSgt Gail R. Russell, The War Years, Oct 86, p 95.
4. Charles L. Sullivan, Hurricanes of the Mississippi Gulf Coast, (Dolphin Press, Biloxi, 1986); History of Hurricane Occurrences Along Coastal Louisiana, US Army Engineers, 1972; "21 Dead, Damage in Millions," "One Life Lost, Heavy Damage Done at Biloxi," "Gulfport Men Describe Fight to Save Lives," Keesler Field News, 20 Sep 47; "Keesler Planes Fly Mercy Missions After Hurricane Hits Gulf States," "'All Hands on Deck!' Keesler Rides it Out," "Gulf Coast Battered by High Winds and Waters," Keesler Field News, 26 Sep 47; Biloxi-Gulfport Daily Herald: "Coast Area Prepares for Worst," "Highway Patrol Warns Residents Near Pensacola," 18 Sep 47; "Death Toll Stands at 20 Persons," "Resort City of Biloxi Totals up its Damage," "Beachfront is Devastated by Furious Winds," "Keesler Began Storm Service Early Thursday," "13 Foot Tide is Recorded at Biloxi," "Coast Leaders Make Plans to Clean up Beach," "Large Force Restoring Power Lines," 22 Sep 47; "Death Toll Still at 20; Coast on Way to Normalcy," "Rehabilitation Along Beach Front at Biloxi Gets Into High Gear; Streets Cleared," 23 Sep 47; "Salvage Goods on Beachfront; US 49 Now Free," "Once Busy Biloxi Beach Deep in Sand," "Hurricane-Battered Biloxi is Getting Back on Feet; Normal Save for Some Areas," 24 Sep 47; "Biloxi Seafood Industry Loss set at \$604,000," "Guard Units Returning to Homes," 25 Sep 47.
5. "Coast Area Prepares for Worst," Herald, 18 Sep 47; "'All Hands on Deck!' Keesler Rides it Out," 26 Sep 47.
6. See note 5 above.
7. Hist, 3704 AAF Base Unit, 1 Jul - 30 Sep 47, pp 124-130.
8. See note 5 above.
9. See note 7 above.
10. "'All Hands on Deck!' Keesler Rides it Out," Keesler Field News, 26 Sep 47; "'Hams' Keep Coast in Touch With Outside," Herald, 23 Sep 47.
11. "'All Hands on Deck!' Keesler Ride it Out." Keesler Field News, 26 Sep 47; "Rehabilitation Along Beach Front at Biloxi Gets Into High Gear; Streets Cleared," Herald, 23 Sep 47; "Salvage Goods on Beachfront; US 49 Now Free," Herald, 24 Sep 47.
12. Hist, 3704 AAF BU, 1 Jul - 30 Sep 47, pp 124-130; "Gulf Coast Battered by High Winds and Waters," Keesler Field News, 26 Sep 47.

13. "Gulf Coast Battered by High Winds and Waters," Keesler Field News, 26 Sep 47.
14. See note 7 above.
15. Sullivan, Hurricanes, 1986; "Keesler Planes Fly Mercy Missions," Keesler Field News, 26 Sep 47.
16. "Large Force Restoring Power Lines," Herald, 22 Sep 47.
17. See note 13 above.
18. See note 7 above.
19. Ibid.
20. Ibid.
21. Ibid.
22. Sullivan, Hurricanes, 1986; Hist, Hurricane Occurrences, US Army Engineers, 1972.
23. See note 22 above.
24. "Storm Spares Center," Keesler News, 10 Sep 65; Also see note 22 above.
25. Sullivan, Hurricanes, 1986.
26. Ibid.
27. See note 22 above.
28. See note 22 above.
29. Hurricane Camille, KTTC Final Report 69-8-17, Vol V, 17 Aug 69; Sullivan, Hurricanes, 1986.
30. See note 25 above.
31. KTTC Final Report, Vol V, 17 Aug 69; Hist (U), KTTC 1 Jul 69 - 30 Jun 70, Vol I; Hist, Hurricane Occurrences, US Army Engineers, 1972; "Keesler Recovers From Hurricane Camille," Keesler News, 29 Aug 69.
32. "Keesler Hurricane Damage Estimated at \$3.5 Million," Keesler News, 5 Sep 69; Sullivan, Hurricanes, 1986.
33. "Rescue Center in Key Role Following Hurricane," Keesler News, 29 Aug 69; Maj Gen Thomas E. Moore, KTTC, Commander, "Keesler Responds to Disaster." Keesler News, 29 Aug 69.
34. See note 33 above.

35. Dale Titler, KTTC Historian, "Reflection: Gulf Coast Residents Look Back at Camille," Keesler News, 17 Aug 79.
36. Sullivan, Hurricanes, 1986.
37. "Students Return to Class," Keesler News, 5 Sep 69; KTTC Final Report [Hurricane Camille], Vol V, 17 Aug 69.
38. See note 37 above.
39. See note 36 above; Hist (U), KTTC, 1 Jul 73 - 30 Jun 74, Vol I.
40. Intvw, Mr Titler with MSgt Tommie McRae, Station Chief, Det 22, 24 Weather Squadron (as based on Station records), 16 Jun 80; Alan Rodd, "Bob Hands Base \$123,000 [sic] Damage Bill," Keesler News, 20 Jul 79.
41. Log, Emergency - Disaster Preparedness Log of Hurricane Frederic, 11-14 Sep 79. "Born-Again Frederic may Venture Into Gulf," Daily Herald, 10 Sep 79; "Feisty Frederic Drifts Into Gulf," Daily Herald, 11 Sep 79.
42. See note above; 2Lt Chuck Roque, "15,000 Seek Keesler Shelters," Keesler News, 14 Sep 79; Rpt, Keesler Form 320, Keesler Alert Net Notifications, 13 Sep 79 (Doc 320); Rpt, Ground Mishap, Col Donald P. Wenzel, 11 Jan 80; Ltr, General Payne to Brig Gen Albert J. Kaehn, Jr., subj: Support of Det 22, 24 Weather Squadron, 19 Sep 79; "Hurricane Frederic Heads for Coast; Residents Flee in Path of 130 mph Storm," Daily Herald, 12 Sep 79.
43. Rpt, Ground Mishap, 11 Jan 80; Log, Hurricane Frederic.
44. Donna R. Iseminger, "Dependent Details Day of Freddie," Keesler News, 21 Sep 79.
45. Log, Hurricane Frederic.
46. Rpt, Ground Mishap, 11 Jan 80.
47. Rpt, Lessons Learned--Hurricane Frederic, 3380 ABG/DW, Capt Robert P. Bortner, Base Disaster Preparedness Officer, 12 Oct 79.
48. SSgt Don Mucha, "Amateur Radio Provides Hot Link," Keesler News, 21 Sep 79.
49. Rpt, Hurricane Frederic, SSgt R. J. Kosiba, undtd (Disaster Preparedness Office file, Hurricane Frederic [sic] 12-13 Sep 79).
50. Rpt, Lessons Learned; Rpt, Shelter Operation--Hurricane Frederic, Col Burer to 3380 ABG/DW, 16 Oct 79 (Disaster Preparedness Office file); Rpt, Shelter Occupancy of Locker House, Bldg 3101, 12/13 Sep 79 (Hurricane Frederic) [sic], TSgt O'Brian to 3380 ABG/CCAA/DW, undtd (Disaster Preparedness Office file); Log, Hurricane Frederic.

51. Ibid; "115 mph Winds Leave Pascagoula in Shambles," Daily Herald, 13 Sep 79; "Tornadoes, Winds Damage Harrison County," Daily Herald, 13 Sep 79.
52. Rpt Ground Mishap.
53. Ibid.
54. Rpt, Lessons Learned. Msgs, (U) HQ ATC/DE to HQ USAF/LEE/ACB, subj: Storm Damage, Keesler AFB, Preliminary Report, 131700Z Sep 79, HQ AFESC/DEOP to HQ AFSC/DEM/DPX/ACB, subj: Prime Beef Development 79-47 Hurricane Frederic Recovery Support, 141810Z Sep 79, 3415 CES/DE to HQ ATC/DE, subj: Prime Beef Development 79-1 Hurricane Frederic, 141430Z Sep 79, HQ AFESC/DEOP to HQ TAC/DEPX, subj: Hurricane Frederic Recovery Augmentation, 171432Z Sep 79, HQ ATC to 3345th ABG/CC/DP/DE, subj: Prime Beef Deployment 79-1, Hurricane Frederic, 171730Z Sep 79, HQ ATC/DED to 3750th ABG/CC/DP/DE, subj: Engineering Staff Support, Hurricane Frederic Recovery, 191600Z Sep 79; Ron Mucha, "CE Responds to Old Frederic," Keesler News, 21 Sep 79; Hist (U), Military Personnel Division, 1 Jul - 31 Dec 79.
55. 2Lt Chuck Roque, "Keesler Gets Power Back," Keesler News, 21 Sep 79.
56. 2Lt Chuck Roque, "Civil Engineers Tackle Fred's Mess," Keesler News, 21 Sep 79.
57. Hist, Training Services Division TTV, 1 Jan - 31 Dec 79; "Hurricane Frederic Causes Severe Damage to Photo Lab," Keesler News, 28 Sep 79.
58. Ltr, Col D. N. Burgess to 3380 CES/DE, subj: Cancellation of Work Requests, 1 Oct 79.
59. Bulletins, Freddie Flyer, 14 through 17 Sep 79.
60. Rpt, Disaster Relief Operations, American National Red Cross, John B. Roberts, Field Director, Keesler AFB, 17 Sep 79.
61. Ann Mike Robinson, "Helping Hand," Keesler News, 21 Sep 79; "1700 Keesler Staffers Help in Recovery From Hurricane," Daily Herald, 30 Sep 79. Ann Mike Robinson, (Students Supply Large Work Force," Keesler News, 21 Sep 79.
62. Intvw, Titler with 2Lt Probyn Thompson, Commander, 3386 School Squadron, 19 June 1980; Hurricane Frederic Victims Stay in Keesler Quarters," Keesler News, 28 Sep 79.
63. Rpt, Keesler Assistance to Community w/Atch Troop Breakdown and Work Distribution Log, Col Edd Barnes, DP, 18 Sep 79.
64. Ltr, General Payne to KTTC/TT (All Students), subj: Student Assistance During Hurricane Recovery, 18 Sep 79.
65. Bulletin, Freddie Flyer, 17 Sep 79.

66. Intvw, Titler with Mr Eddins, 20 Jun 80.
67. Intvw, Titler with Maj William D. Cobb, Chief, Radar Systems Branch, 20 Jun 80.
68. Intvw, Titler with Lt Col Marvin L. Smith, Chief, ATC Operations Branch, 20 Jun 80.
69. Intvw, Titler with SMSgt Phillip B. Richardson, Chief, AC&W Systems Branch, 20 Jun 80.
70. Intvw, Titler with Lt Col Randall F. Scott, Chief, CE Officer Branch, 20 Jun 80.
71. Marie Langlois, "Keesler Honored for Storm Assistance," Daily Herald, 29 Oct 79; Resolution, Biloxi Chamber of Commerce, Keesler News, 2 Nov 79.
72. George Lammons, "Nerve-Wracking Season Over," The Sun Herald, 1 Dec 85; George Lammons, "Storm After Storm Aimed at Coast," The Sun Herald, 1 Jan 86.
73. See note 1.
74. Keesler Disaster Preparedness Office, "Be Prepared as Hurricane Season Blows in Saturday," Keesler News, 31 May 85; Lt Col Dennis Wood, Commander, 53rd Weather Reconnaissance Squadron, "Be Prepared for Hurricane Season," Keesler News, 31 May 85.
75. List, Teletype storm warning reports, 12-15 Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Hurricane Declaration, 132115Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Hurricane Declaration, 132345Z Aug 85; Keesler Update, KAFB Public Affairs Office, subj: Base Officials Caution Residents of HURCON 2 Conditions, 14 Aug 85; Msg, 7 ACCS, Keesler AFB to HQ 23 AF, Scott AFB IL, et al, subj: Contemplation to Evacuate, 140150Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, et al, subj: Contemplation to Evacuate (53 WRS), 140315Z Aug 85; Msg, 7 ACCS, Keesler AFB to HQ 23 AF, Scott AFB IL, et al, subj: Decision to Evacuate (7 ACCS), 10000Z 14 Aug 85 (file copy); Msg (U), Command and Control, KTTC, to Aerospace Rescue and Recovery Service, et al, subj: Decision to Evacuate (7 ACCS), 141200Z Aug 85; Msg, 7 ACCS, Keesler to HQ 23 AF, Scott AFB IL, et al, subj: Start of Evacuation, 1300Z 14 Aug 85 (File copy); Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Decision to Evacuate (53 WRS), 141315Z Aug 85; Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Start of Evacuation (7 ACCS), 141325Z Aug 85; Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Start of Evacuation (53 WRS), 141615Z Aug 85; Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Completion of Evacuation (7 ACCS), 142005Z Aug 85; Msg, Command

and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Completion of Evacuation (53 WRS), 151230Z Aug 85; "Mississippi, Alabama Hurricane Watch Lifted," The Daily Herald, 14 Aug 85; Keesler Disaster Preparedness Office, "Keesler Hurricane Readiness Update," Keesler News, 15 Aug 85; Ray Formanek, Jr., AP, "Danny Pounds Louisiana Coastline," The Daily Herald, 15 Aug 85; George Lammons, "Coast Braces for Flooding, High Tides," The Daily Herald, 15 Aug 85; Preparedness Procedures, "Hurricane Evacuation Routes Set," Keesler News, 15 Aug 85; Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Redeployment to Home Station, 161230Z Aug 85; Msg, Command and Control, Keesler, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Return to Home Station, 161830Z Aug 85; George Lammons, "Rivers at Flood Stage After Danny," The Daily Herald, 16 Aug 85; Guy Coates, AP, "Danny Darkens Much of Louisiana," The Daily Herald, 16 Aug 85; "We Were Ready," Keesler News, 23 Aug 85.

76. List, Teletype Storm Warning Reports, 28-30 Aug 85; "Hurricane Continues Trek Toward Coast," The Daily Herald, 29 Aug 84; Keesler Update, KAFB Public Affairs Office, subj: Base Officials Caution Residents of HURCON 2 Conditions, 29 Aug 85; Events Logs, Public Affairs Control Center and Command Post, 29 Aug 85; News Release, USAF, "Keesler Prepares for Hurricane," Keesler Office of Public Affairs, Release 85-5-39, 29 Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Contemplation to Evacuate (7 ACCS), 291240Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Contemplation to Evacuate (53 WRS), 291255Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Contemplation to Evacuate (815 WRS), 291345Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Decision to Evacuate, 291700Z Aug; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Hurricane Condition II Declared for Keesler AFB MS, at 291636Z, 291715Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Start of Evacuation, 291822Z Aug 85; Msg, Command and Control, KTTC, to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Completion of Evacuation, 292103Z Aug 85; Msg, Commander, 3380 ABG, Keesler AFB, to HQ ATC, Randolph AFB TX, Director of Personnel, et al, subj: Discontinue Troop Movement, 291710Z Aug 85.
77. "Coast Braces for Elena," The Daily Herald, 30 Aug 85; Editorial: "Our Storm Luck May be Dwindling," The Daily Herald, 30 Aug 85; Commander's Comments, Keesler News, 30 Aug 85; "Keesler AFB Prepares for Hurricane Elena," Keesler News, 30 Aug 85; Keesler Update, KAFB Public Affairs Office, subj: Sheltering Requirements Continue at Keesler, 30 Aug 85; News Release, USAF, "Keesler Remains in Emergency Conditions," Release 85-5-40, 30 Aug 85; Events Log, Public Affairs Control Center and Command Post, 30 Aug 85.

78. Keesler Update, KAFB Public Affairs Office, subj: Be Prepared for Base Recovery, 30 Aug 85; "Hurricane Preparedness Procedures for Keesler Members," Keesler Disaster Preparedness Office, Keesler News, 30 Aug 85.
79. Terry R. Cassreino, "Hurricane Warning is Replaced With a Watch, The Daily Herald, 31 Aug 85; "Elena Churns Toward Florida," The Daily Herald, 31 Aug 85.
80. "The Lessons Elena's Near Miss Teaches," The Daily Herald, 1 Sep 85; Ron Word, "Stalled Elena Lashes Florida," The Daily Herald, 1 Sep 85; Events Log, Public Affairs Control Center, 1 Sep 85; Msg, Keesler Command and Control to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: HURCON Condition I Declared for Keesler AFB at 020304Z Sep 85, 020315Z Sep 85.
81. Keesler Update, Keesler AFB Office of Public Affairs, subj: Hurricane Elena Sheltering, 1 Sep 85.
82. Keesler Update, Keesler AFB Office of Public Affairs, subj: Hurricane Elena Status, 1 Sep 85.
83. Msg, Keesler Command and Control to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: HURCON Condition 2 Declared for Keesler AFB MS, 012259Z Sep 85, Msg; Keesler Command and Control to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Decision to Evacuate/Start of Evacuation, 012215Z Sep 85; Msg; Keesler Command and Control to Aerospace Rescue and Recovery Service, Scott AFB IL, et al, subj: Completion of Evacuation, 020108Z Sep 85; Msg, HQ Service Information and News Center, Kelly AFB TX, to USAF Public Affairs Agencies, et al, subj: Hurricane Elena Batters Gulf Bases, 092200Z Sep 85.
84. Msg, HQ Services Information and News Center, Kelly AFB TX, to USAF Public Affairs Agencies, et al, subj: Hurricane Elena Batters Gulf Bases, 092200Z Sep 85; Ed Birk, "Storm's Tornadoes Leave Major Damage in Central Florida," The Daily Herald, 2 Sep 85; "Elena Takes Second try at Coast," The Daily Herald, 2 Sep 85; Msg, 3380 ABG, Keesler AFB MS, to HQ ATC Director of Personnel, subj: Discontinue Troop Movement, 020040Z Sep 85; Don Broadus, "Storm Turns Fury on County," Mississippi Press, 11 Sep 84; Judy Johnson, "Elena Throws Wild Tropical Temper Tantrum," Mississippi Press, 11 Sep 84; Chart, Path of Elena, National Hurricane Center, 29 Aug - 2 Sep 85; SrA Gary Leitz, "Keesler Shelters Provide Safe Haven," Keesler News, 6 Sep 85; Keesler Update, Keesler AFB Office Public Affairs, subj: Shelter Release and Transportation, 2 Sep 85; George Lammons, "A Wacky Turn And Coast is Victim," The Daily Herald, 8 Sep 85.
85. Intvw, Titler with SSgt David Cozad, 3400 TCHTG, 7 Nov 85; "Do you Copy?--Over," Keesler News, 6 Sep 85.
86. Keesler Update, Keesler AFB Office Public Affairs, subj: Be Prepared for Base Recovery, undtd [ca 3 Sep 85]; Msg (U), Command and Control, KAFB, to Chief of Staff, USAF Washington, subj: Preliminary Damage Assessment Report, 022045Z Sep 85; Terry R. Cassreino, "Elena Returns to Coast for Landfall," The Daily Herald, 3 Sep 85.

87. Proposed Item for Keesler Update, undtd [ca 2 Sep 85].
88. Keesler Update, Keesler AFB Public Affairs, subj: Base Recovers from Elena, 3 Sep 85.
89. Msg, KTTC/CC to 14 AF, Dobbins AFB GA, subj: Tempest Rapid I Report, 031730Z Sep 85; Msg, 3380 ABG Director of Personnel to HQ ATC, Randolph AFB TX, Command and Control Division, subj: Troop Movement--Interim Status, 032200Z Sep 85.
90. Msg, Keesler Command and Control to Chief of Staff, USAF, et al, subj: Hurricane Elena Damage Assessment Update, 042115Z Sep 85; Msg, Commander, KTTC, to 14 AF Dobbins AFB GA, subj: Tempest Rapid I Report, 042235Z Sep 85; Keesler Update, Keesler AFB Public Affairs, subj: Some Base Facilities Open, 4 Sep 85; George Lammons, "Storm's Impact on Coast Residents Just Beginning," The Daily Herald, 4 Sep 85; Staff Report, "Utility Services Remain Rare Commodities on Coast," The Daily Herald, 4 Sep 85.
91. Msg, Keesler Command and Control, Keesler AFB to Chief of Staff, USAF, et al, subj: Hurricane Elena Recovery Update, 052145Z Sep 85; Msg, Director of Personnel, Keesler AFB MS, to Command and Control, HQ ATC, Randolph AFB TX, subj: Troop Movement, 051110Z Sep 85; "Base Housing Damage," Keesler News, 6 Sep 85; "Keesler Damage," Keesler News, 6 Sep 85; ALC Terry Peterson, "Keesler Cleans up After Elena," Keesler News, 6 Sep 85; "Hurricane Damage? See Claims Office," Keesler News, 6 Sep 85; George Lammons, "Power to the Coast; Most get Electricity," The Daily Herald, 6 Sep 85; Ruth Ingram, "Biloxians Push Aside Debris, Begin Piecing Their Lives Back Together," The Daily Herald, 5 Sep 85; Coast Overview, "Keesler Work Centers Have Electricity," The Daily Herald, 5 Sep 85; Ruth Ingram, "Volunteers Helping out With Biloxi's Cleanup," The Daily Herald, 6 Sep 85; "Members of 3392 Student Squadron, etc.," The Daily Herald, 7 Sep 85; "Keesler Students Pick up Debris, etc.," Keesler News, 13 Sep 85; ALC Terry Peterson, "Keesler Helps Community Clean up," Keesler News, 13 Sep 85.
92. Keesler Update, Keesler AFB Office of Public Affairs, subj: Weekend Cleanup, undtd [ca 6 Sep 85].
93. Intvw, Titler with Maj John Schroff, Information Systems Group Chief of Operations, 2052nd Communications Squadron, 21 Feb 86.
94. See note 21.
95. Msg, Commander, KTTC, to 14 AF, Dobbins GA, subj: Tempest Rapid I Report, 062215Z Sep 85; Keesler Update, Keesler AFB Office of Public Affairs, subj: Application Centers Open to Help State, Local Disaster Relief, 6 Sep 85; "Base Claims Office Operations Continue," Keesler News, 13 Sep 85; ALC Doug Hays, "CFC Agencies aid Hurricane Victims," Keesler News, 13 Sep 85.
96. Msg, Keesler Command and Control to Chief of Staff, USAF, et al, subj: Hurricane Elena Recovery Update, 062045Z Sep 85.

97. Commander's Comments, Keesler News, 6 Sep 85; Editorial: "Elena: Best of Times; Worst of Times," The Daily Herald, 8 Sep 85.
98. Msg, Keesler Command and Control to Chief of Staff, USAF, et al, subj: Hurricane Elena Recovery Update, 092045Z Sep 85; Intvw, Titler with TSgt Robert Bashaw, NCOIC, Keesler Prime BEEF, 19 Sep 85; SrA Gary Leitz, "Outside Help aids in Base Recovery," Keesler News, 13 Sep 85.
99. Keesler Update, Keesler AFB Office of Public Affairs, subj: "Keesler Continues Hurricane Recovery at Fast Pace, 10 Sep 85; "After Elena," The Daily Herald, 6 Sep 85; "Keesler Gives Thanks," The Daily Herald, 9 Sep 85.
100. Commander's Comments, Keesler News, 13 Sep 85.
101. Memo, Lt Col David M. Cannon, Commander, 3380 Civil Engineering Squadron to KTTC/HO, subj: Hurricane Elena Damage Estimates, undtd [ca 26 Sep 85] with atch Msg 091700Z Sep 85, subj: Hurricane Elena Recovery Costs; Staff Summary Sheet, subj: FY86 Hurricane Elena Funding Status, w/Atch (undtd) [ca 26 Sep 85]; "Housing Repair Program," Keesler News, 13 Sep 85; ALC Richard Monahan, "Base Housing gets Battered by Elena," Keesler News, 13 Sep 85, SrA Gary Leitz, "Hurricane Elena Rips Base; Officials Expect Cost to Rise," Keesler News, 13 Sep 85; "Most Base Facilities, Services Operational," Keesler News, 20 Sep 85; "Base Civil Engineer Discusses 'Elena' Cleanup, Recovery," Keesler News, 20 Sep 85.
102. Ltr, 3380 ABG Center Chaplain to All Commanders, KTTC, subj: "Operation Helping Hand," 9 Oct 85; Intvw, Titler with Col James W. Millsaps, Center Chaplain, 6 Nov 85.
103. Msg, Col Edwards, 3300 TCHTW, to HQ ATC Technical Training, subj: Continuing Training Interruptions Resulting from Hurricane Damage, 041900Z Oct 85; Msg, Col Saunders, Operations Division, 3300 TCHTW, to HQ ATC Technical Training, subj: Continuing Training Interruptions Resulting from Hurricane Damage, 111905Z Oct 85; ALC Terry Peterson, "Technical Training Back in Business," Keesler News, 13 Sep 85; Msg, Col Saunders, Operations Division, 3300 TCHTW, to HQ ATC Technical Training, subj: Continuing Training Interruptions Resulting From Hurricane Damage, 181900Z Oct 85.
104. Intvw, Titler with Mr Fred B. Eddins, Training Advisor, 3300 TCHTW, 19 Feb 86.
105. KTTC Hurricane Elena After Action Report, KTTC/Programs Divisions. 15 Nov 85.
106. Ibid.
107. Ibid.
108. Intvw, Titler with Hickey, 4 Feb 86.

109. KTTC Hurricane Elena After Action Report, KTTC/Programs Division, 15 Nov 85.
110. Ibid.
111. "Keesler Troops due Elena Credit," Nancy C. Steele, The Sun Herald, 17 Oct 85; Resolution 444-85, City of Biloxi, 21 Oct 85; Ltr, Honorable Trent Lott to Maj Gen Thomas J. Hickey, subj: Recognition of Cleanup Efforts, 2 Oct 85, Intvw, Titler with Hickey, 4 Feb 86.
112. George Lammons, "Nerve-Wracking Season Over," The Sun Herald, 1 Dec 85; George Lammons, "Storm After Storm Aimed at Coast," The Sun Herald, 1 Jan 86; Perry Jenifer, "Base Hurricane Seasoning Pays Off," Keesler News, 1 Nov 85; "Juan Brings Rain, High Winds," The Daily Herald, 29 Oct 85; Gaynell Terrell, "Coastians Breathe Easier as Storm Takes Turn to West," The Daily Herald, 29 Oct 85; "Swollen Rivers Should Crest Early Today," The Daily Herald, 29 Oct 85; "Juan: Coast Prepares Again," The Daily Herald, 29 Oct 85; Guy Coates, "Juan Wreaks Havoc in Gulf," The Daily Herald, 29 Oct 85; "Hurricane Juan Teases Coast," The Daily Herald, 30 Oct 85; George Lammons, "Juan a Late bloomer, but Others Were Later," The Daily Herald, 30 Oct 85; Guy Coates, "Billion-Dollar Storm Juan Stalls; Louisians Deluged," The Daily Herald, 31 Oct 85.
113. Perry Jenifer, "Base Hurricane Seasoning pays off," Keesler News, 1 Nov 85.
114. Ibid.
115. George Lammons, "Nerve-Wracking Season Over," The Sun Herald, 1 Dec 85; George Lammons, "Storm After Storm Aimed at Coast," The Sun Herald, 1 Jan 86; Hurricane Kate Moves Toward South Florida," The Sun Herald, 20 Nov 85; "Coast Keeps Watchful Eye on Hurricane," The Sun Herald, 20 Nov 85; Greg Myre, "Late Hurricane Catches Forecasters by Surprise," The Sun Herald, 20 Nov 85; "Keesler gets Ready of Hurricane Kate," Keesler News, 21 Nov 85; "Kate Veers Away From Coast," The Sun Herald, 21 Nov 85.
116. ALC Terry Peterson, "Hurricane Kate Threatens Keesler," Keesler News, 27 Nov 85.
117. Ibid. George Lammons, "Nerve-Wracking Season Over," The Sun Herald, 1 Dec 85; George Lammons, "Storm After Storm Aimed at Coast," The Sun Herald, 1 Jan 86.
118. Capt Gary Pace, "Keesler's Disaster Preparedness put to the Test," Keesler News, 13 Sep 85.
119. Perry Jenifer, "Base Hurricane Seasoning Pays off," Keesler News, 1 Nov 85.
120. Intvw, Titler with Hickey, 4 Feb 86.

APPENDIX I
SAFFIR-SIMPSON SCALE

Scale Number (Category)	Winds (MPH)	Surge (Feet)	Damage
1	74-95	4-5	Minimal
2	96-110	6-8	Moderate
3	111-130	9-12	Extensive
4	131-155	13-18	Extreme
5	155+	18+	Catastrophic

The Saffir-Simpson Scale, developed by consulting engineer Herbert Saffir and former National Hurricane Center Director Robert H. Simpson, enables hurricane forecasters to combine storm surge, wind velocity and other factors, to communicate the disaster potential of the storm to emergency sources.

APPENDIX II

HURCON CONDITIONS

- HURCON 4: 72 Hours prior to the forecast arrival
of 50 knot (58 mph) winds or higher.
- HURCON 3: 48 Hours prior to the forecast arrival
of 50 knot winds or higher.
- HURCON 2: 24 Hours prior to the forecast arrival
of 50 knot winds or higher.
- HURCON 1: 12 Hours prior to the forecast arrival
of 50 knot winds or higher.



Thanks

3380th TECHNICAL SCHOOL

From Grateful Biloxians

In our tragic hour of need your generous help and kind sympathies welded an eternal bond of comradeship; and buoyed our citizens through the sea of heartbreak and chaos created by Camille, August 17, 1969.

Thanks to your unselfish and devoted assistance our City and its beleaguered peoples were able to lift their heads in hope and begin the arduous task of rebuilding with a rekindled burst of faith in the boundless future.

Your strong hand of aid was a stalwart staff in combating the destruction and heartache left by Camille and has lifted us high on a crest of new hopes and dreams.

For all time to come, Biloxians, and those who come after them, will respect and love those who stood so firmly by their sides in this their greatest hour of need.

Daniel D. Guice, Mayor

Errol Bradley, President

Dominic A. Fallo, Commissioner

Walter F. Fountain, Gen. Mgr.

Peter Parker, Commissioner

Biloxi Chamber of Commerce

City of Biloxi

ALTERNATE ESCAPE/EVACUATION ROUTES

