

= Hurricane Gonzalo =

Hurricane Gonzalo was a powerful Atlantic tropical cyclone that wrought destruction in the Leeward Islands and Bermuda in October 2014 . At the time , it was the strongest hurricane in the Atlantic since Igor in 2010 , Gonzalo struck Bermuda less than a week after the surprisingly fierce Hurricane Fay ; 2014 was the first season in recorded history to feature two hurricane landfalls on Bermuda . Gonzalo formed from a tropical wave on October 12 , while located east of the Lesser Antilles . It made landfall on Antigua , Saint Martin , and Anguilla as a Category 1 hurricane , causing damage on those and nearby islands . Antigua and Barbuda sustained US \$ 40 million in losses , and boats were abundantly damaged or destroyed throughout the northern Leeward Islands . The storm killed three people on Saint Martin and Saint Barthélemy . Gonzalo tracked northwestward as it intensified into a Category 4 major hurricane , the first in the Atlantic since Ophelia in 2011 . Eyewall replacement cycles led to fluctuations in the hurricane 's structure and intensity , but on October 16 , Gonzalo peaked with maximum sustained winds of 145 mph (230 km / h) .

After Hurricane Fay caused extensive power outages on the island just days before , residents of Bermuda were forced to complete preparations for Gonzalo in haste . Banks , businesses , schools , and government offices closed in advance of the storm , while the Royal Navy ship HMS Argyll left its post in the Caribbean to provide Bermuda with emergency assistance . The cyclone gradually weakened before crossing directly over central Bermuda at Category 2 strength around 00 : 30 UTC on October 18 . Gonzalo battered the island with wind gusts as high as 144 mph (232 km / h) , downing hundreds of trees and creating widespread roof damage . At the height of the storm , about 31 @, @ 000 out of 36 @, @ 000 total electricity customers were without power ; service was not fully restored until early November . Many roads were impassable immediately following the hurricane , and in many cases the damage done by Gonzalo was indistinguishable from that of Fay . Bermuda Regiment soldiers and sailors from the Argyll took part in initial cleanup and repairs on the territory , and preliminary assessments revealed that the storm did not compare to the devastation of Hurricane Fabian in 2003 . Catastrophe modelling firms estimated that Bermuda suffered up to \$ 400 million in losses , and despite the heavy disruptions , no deaths or serious injuries were reported there .

Departing Bermuda , Gonzalo accelerated toward the waters of the North Atlantic , passing close to southeastern Newfoundland before becoming extratropical on October 19 . Gusty winds and bands of heavy rain in the southeastern Avalon Peninsula engendered minor flooding and power outages . A large storm system involving the remnants of Gonzalo battered the British Isles and central Europe on October 21 , killing three people in the United Kingdom and severely hindering transportation . The system later played a role in triggering torrential rains over the Balkans , which resulted in severe flooding in Greece and Bulgaria .

= = Meteorological history = =

Hurricane Gonzalo originated in a tropical wave that emerged from the western coast of Africa on October 4 and trekked across the Atlantic . Despite an attendant expanse of clouds and thunderstorms , hostile winds from an upper @-@ level trough hindered cyclogenesis . On October 10 , after encountering an eastward @-@ propagating Kelvin wave , the system developed more concentrated convection . With conditions increasingly favorable for further development , the disturbance gradually became better organized , forming a small low pressure area by October 11 . In turn , a tropical depression formed at 00 : 00 UTC on October 12 , located approximately 390 mi (630 km) east of the Leeward Islands . Continued maturation amid warm waters and low wind shear yielded Tropical Storm Gonzalo 12 hours later . Operationally , the National Hurricane Center (NHC) did not begin issuing advisories on the cyclone until midday on October 12 , after a Hurricane Hunter flight into the system reported surface winds of 40 mph (65 km / h) .

A powerful ridge over the central Atlantic steered the nascent storm westward toward the Lesser Antilles . Thunderstorm activity was strong near the center , although initially somewhat disorganized and asymmetric . However , a tight inner core soon took shape , and Gonzalo began to

quickly intensify throughout the day on October 12 . Following the appearance of an eye feature early the next day , the storm was upgraded to a Category 1 hurricane while located near Antigua in the eastern Caribbean . Shortly thereafter , the storm passed directly over the island . The hurricane later struck Saint Martin and Anguilla , and skirted just north of the British Virgin Islands while continuing to intensify . By that time , it was headed toward the northwest around the periphery of the aforementioned ridge .

On October 14 , the eye contracted to a diameter of 17 mi (28 km) and improved its satellite presentation . At 18 : 00 UTC , Gonzalo strengthened to a Category 3 major hurricane while located about 170 mi (270 km) north of San Juan , Puerto Rico . Six hours later it became the first Category 4 hurricane in the Atlantic basin since Hurricane Ophelia in 2011 . Subsequently , a concentric eyewall structure indicated an imminent eyewall replacement cycle , with the inner feature " about as small as it can get " according to the NHC . The eyewall replacement cycle briefly disrupted the storm 's core , causing Gonzalo to weaken slightly , but upon completion on the evening of October 15 , the system stabilized and resumed intensification . While moving northward early the next day , Gonzalo reached its peak intensity with winds of 145 mph (230 km / h) and a barometric pressure of 940 mbar (hPa ; 27 @.@ 76 inHg) . By evening it had turned north @-@ northeastward , ahead of an advancing trough over the eastern United States and in the wake of the receding ridge .

From the evening of October 16 through the next morning , the hurricane experienced further internal fluctuations as it approached Bermuda from the south @-@ southwest . Concurrently , the storm began to weaken . In particular , cloud tops around the hurricane warmed , and convection became less uniform , likely attributable to cooler waters and heightened wind shear . The hurricane was downgraded to Category 2 as the northern eyewall crossed Bermuda , and at about 00 : 30 UTC on October 18 , the center of circulation passed directly over the island , signalling an official landfall . Along with Hurricane Fay , which struck Bermuda on October 12 , this represented the first recorded instance of two hurricanes making landfall on the island within the same season . Moving away from Bermuda , the hurricane continued to degrade , but showed signs of increased organization later on October 18 . As Gonzalo accelerated northeastward at over 50 mph (80 km / h) , it passed about 50 miles (80 km) southeast of Newfoundland 's Avalon Peninsula early on October 19 . In spite of sea surface temperatures below 50 ° F (10 ° C) , the storm was able to maintain a central dense overcast and deep warm core . By 18 : 00 UTC , Gonzalo had finally succumbed to the cold environment and intense wind shear , completing its transition into a strong extratropical cyclone about 460 mi (740 km) northeast of Cape Race , Newfoundland . It sped east @-@ northeastward until a frontal boundary absorbed it on October 20 , to the south @-@ southwest of Iceland . The resultant system brought stormy weather to the British Isles and parts of mainland Europe on October 21 , and later contributed to the formation of a large cut @-@ off low .

= = Preparations = =

When Gonzalo first formed , various governments across the eastern Caribbean issued tropical cyclone warnings and watches , extending from Guadeloupe to the coast of Puerto Rico . As the storm was strengthening and moving through the region , a hurricane warning was issued for the British Virgin Islands , Anguilla , and Saint Martin . Several major cruise lines altered their itineraries to avoid the storm .

Late on October 14 , while Gonzalo was still located about 700 mi (1 @, @ 130 km) to the south , the Bermuda Weather Service issued a hurricane watch for the island . The watch was upgraded to a warning the next day . Having been affected by the unexpectedly destructive Hurricane Fay just days earlier , residents quickly began preparing for Gonzalo by obtaining emergency supplies and expediting cleanup efforts from the previous storm . Premier of Bermuda Michael Dunkley advised citizens to complete most preparations by the afternoon of October 16 . Banks and businesses began closing that day , while schools and government offices were closed by October 17 . One school functioned as a storm shelter , and 66 people ultimately sought refuge there . Bus and ferry services were suspended on the evening of October 16 . Bermuda 's only daily newspaper , the

Royal Gazette , did not go to print on October 17 , but distributed the next day 's edition for free . Bermuda Regiment soldiers were stationed at various points to support emergency response crews and ensure the safety of the public .

The Caribbean Electric Utility Services Corporation (CARILEC) sent linemen to assist the Bermuda Electric Light Company (BELCO) crews in the event of power outages from Gonzalo . Still completing restoration work after massive outages from Fay , BELCO stationed vehicles and supplies at strategic points on the island to prepare for the next hurricane . On the morning of October 16 , BELCO switched its focus from Fay to Gonzalo , leaving around 1 @, @ 500 households without power ; the remaining affected customers were asked to refrain from calling to report outages . Ahead of the storm , the Royal Navy frigate HMS Argyll sailed from the Caribbean to provide Bermuda with emergency assistance . Public beaches were closed as hurricane swells began to build , and the decision was made to shut down the Causeway early on October 17 , based on forecasts of long @-@ duration severe winds . Additionally , L.F. Wade International Airport closed prior to the storm 's onslaught , accounting for 62 canceled commercial flights . Three cruise ships were diverted from the island .

= = Impact and aftermath = =

= = = Caribbean = = =

While moving through the northeastern Lesser Antilles as a fledgling hurricane , Gonzalo produced sustained winds of 77 mph (124 km / h) on Antigua , with gusts to 90 mph (145 km / h) . Roads were blocked by uprooted trees , while numerous buildings , including several schools , received significant damage . Gonzalo caused an island @-@ wide power outage , and its storm surge damaged boats . Schools and businesses were forced to close , and four emergency shelters opened to storm victims . Debris and flooding forced V. C. Bird International Airport to delay its return to operation after closing as a precaution . Numerous homes sustained damage , largely to their roofs , with the Saint George Parish suffering the greatest losses . Farming communities and a variety of crops were severely impacted , which sparked concerns of imminent produce shortages . Some growers lost their entire banana crops .

Barbuda experienced gusts as high as 70 mph (113 km / h) , as well as radar @-@ estimated rainfall of up to 6 in (150 mm) . Although Barbuda was subject to less widespread devastation than its twin island , there were still snapped tree limbs , reports of flooding , and disruptions to utility services . Damages to residences , government buildings , and agriculture on Antigua contributed to Antigua and Barbuda 's national storm cost of around US \$ 40 million , which also includes compensation to American Airlines for not meeting departing passenger quotas during the hurricane . Numerous individuals were treated for minor storm @-@ related injuries , none of them life @-@ threatening . Further west , Gonzalo caused minor power outages on Saint Kitts and Nevis , while a general 1 ? 2 in (25 ? 50 mm) of rain accompanied wind gusts to 58 mph (93 km / h) on Guadeloupe .

The storm wrecked dozens of boats around Saint Martin , including 22 in Simpson Bay Lagoon , and an elderly man aboard one of the stricken vessels was killed . Two people on Saint Martin and Saint Barthélemy went missing in the storm , and were presumed dead after remaining unaccounted for several months later . Fourteen other missing individuals were returned alive . Winds on Saint Barthélemy blew 86 mph (138 km / h) sustained , with gusts to 126 mph (203 km / h) . Fallen trees obstructed streets , and an aircraft flipped over on a runway at Gustaf III Airport . As many as 40 boats were reportedly beached on Saint Barthélemy .

On Saint Martin , sustained winds exceeded 60 mph (100 km / h) , and L 'Espérance Airport recorded gusts to 93 mph (150 km / h) before the observing equipment failed . As much as 5 @. @ 70 in (145 mm) of rain fell over the island . Reports of urban flooding and entrance of water into homes were common . Gonzalo impaired water and electricity services throughout Dutch Sint Marteen and inflicted significant damage to homes . The St. Maarten Zoo sustained heavy structural

damage , though all resident animals survived unharmed . The French side of the island incurred relatively little destruction , with scattered roof and window damage , though Orient Beach " was a scene of complete devastation " ; several businesses there suffered extensively . Emergency responders and military aircraft from Martinique were dispatched to aid in post @-@ storm recovery on Saint Barthélemy and Saint Martin .

Heavy rain on Anguilla flooded the Clayton J. Lloyd International Airport and portions of several districts , qualifying the government for a US \$ 500 @, @ 000 " excess rainfall " insurance payout . The eastern and western ends of the island bore the brunt of the storm , facing damage to utility poles , vegetation , and roofs , and public schools did not reopen until October 20 or later . The sole hospital experienced minor flood damage .

Gonzalo produced squally weather in parts of Puerto Rico and the Virgin Islands , causing power outages and prompting 20 people to stay in an emergency shelter . Cyril E. King Airport on Saint Thomas was temporarily closed due to the storm ; the airport endured blustery conditions , with gusts reaching 35 mph (56 km / h) . Elsewhere , rough seas affected parts of the Greater Antilles and the Bahamas .

= = = Bermuda = = =

Gonzalo generated hurricane @-@ force winds across Bermuda over a period of about six hours , at their strongest from the northwest on the backside of the storm . Tropical storm conditions persisted for up to 24 hours . Elevated weather stations observed the highest winds ; Commissioner 's Point recorded 10 @-@ minute sustained winds of 109 mph (175 km / h) , and St. David 's measured gusts as high as 144 mph (232 km / h) . Gusts reached 113 mph (182 km / h) at the Causeway , closer to sea level . The airport recorded 2 @. @ 85 in (72 mm) of rain , but due to the strong winds , this was most likely an underestimation of what actually fell . The passage of the hurricane 's eye was marked by diminished winds and a lack of rain , but a drizzle of ocean mist reportedly fell over the island . As Gonzalo struck at low tide , the effects of storm surge were minimal . At Esso Pier on the north side of the island , storm tides peaked at 3 @. @ 25 ft (0 @. @ 99 m) above normal .

The intense winds brought down utility poles and hundreds of trees (likely exacerbated by saturated ground from record rainfall in the months prior) , leaving " barely a road " passable . The storm razed several invasive species , with endemic trees proving more resilient . A composting facility received 1 @, @ 200 truckloads of plant debris per day after Fay and Gonzalo , up from an average of 100 . Damage from the storms totaled around US \$ 260 @, @ 000 on Bermuda National Trust properties , which include nature preserves and cemeteries . Similarly , the Bermuda Botanical Gardens and Arboretum were closed due to safety hazards resulting from extensive vegetation damage .

The first storm @-@ related power outages took place in the early afternoon on October 17 as weather conditions worsened . At the height of the storm , about 31 @, @ 000 out of 36 @, @ 000 electricity customers were without power , including the 1 @, @ 500 outages left unresolved after Fay . Backup CARILEC crews helped with specialty assignments , such as commercial outages and homes without power since before Gonzalo 's onslaught . Service was not fully restored until November 3 , and BELCO ultimately spent US \$ 2 @. @ 9 million on system repairs after hurricanes Fay and Gonzalo . The company replaced 228 utility poles , 80 transformers , and over 4 mi (6 @. @ 5 km) of wire . Other utilities , such as television and Internet services , also suffered , and technicians handled individual outages deep into the month of November . About 600 streetlights on main roads and several hundred more on side @-@ streets were inoperative following the hurricane ; some remained unmended through January 2015 .

Structural damage ranged from the superficial to complete wall or roof failure , the latter being relatively uncommon . A multitude of buildings , including churches , a visitor 's center , the House of Assembly building in Hamilton , and the Bermuda Police Service headquarters at Prospect Camp , suffered some degree of roof damage . Older structures were particularly prone to substantial damage , as were commercial storage buildings subject to less strict building codes . In December ,

five new slate quarries were approved to accommodate the demand for roofing materials . Both the new and old portions of the King Edward VII Memorial Hospital received significant damage that exposed the facilities to the elements . An exhibit at the Bermuda Aquarium , Museum and Zoo was unroofed , and coastal erosion threatened to encroach on the site , though no animals were harmed . Part of the structure 's roof was blown a quarter mile (400 m) .

L.F. Wade International Airport sustained some roof and runway lighting damage , and the Bermuda Weather Service building lost a storm shutter and saw water forced inside a communications room . A restaurant at the site of the Gibbs Hill Lighthouse was severely damaged , requiring a complete roof replacement . The Causeway was largely spared , with some damage to the safety walls alongside the road , and it was partially reopened on October 18 after initial repairs . However , one of two lanes remained shut down for several days . Many boats were washed ashore and damaged or wrecked by the storm , and other vessels tipped over in boatyards . According to preliminary estimates , properties in the Dockyard alone incurred US \$ 1 million (2014 BMD) in damage .

The strongest hurricane to directly affect Bermuda since 2003 's Hurricane Fabian , Gonzalo was generally less destructive . Damage modelling firms estimated insured losses from the hurricane to settle between US \$ 200 and US \$ 400 million , not including damage to watercraft , though the CEO of the largest property insurer on Bermuda believed losses to be much lower . It was estimated that a Fabian equivalence in 2014 would cause about US \$ 650 million in damage . Some insurance companies decided to treat Fay and Gonzalo as a single event , allowing one deductible to count toward claims from both storms . After initial assessments , Premier Dunkley reported that the territory fared " much better than we expected " , and the storm was not blamed for any deaths or major injuries on Bermuda .

In the aftermath of the hurricane , a Royal Navy helicopter aboard the Argyll flew out ahead of the ship to start aerial damage assessments . Members of the Bermuda Regiment immediately began cleanup and recovery efforts , while the government provided tarps to affected homeowners . Sailors from the Argyll teamed up with Regiment soldiers upon the ship 's arrival to continue relief work . Some 35 of the vessel 's crew members worked to clear debris from the runway at the airport , which reopened on October 19 after thorough evaluations . Including damage from Fay , about \$ 2 million was spent on airport repairs , and the storms were later cited as evidence of the need for a newer terminal in a more protected location . All schools on the territory resumed classes by October 21 .

= = = Atlantic Canada = = =

On October 17 , the Canadian Hurricane Centre issued a tropical storm watch for the Avalon Peninsula of Newfoundland , between Arnold 's Cove and Chapel 's Cove . Some communities , including St. John 's , worked to clear debris from culverts and storm drains to minimize the effects of flooding . Outer rainbands produced up to 2 @. @ 7 in (69 mm) of rain in just a few hours , which produced localized urban flooding in St. John 's . Winds gusted to 66 mph (106 km / h) at Cape Pine and 55 mph (89 km / h) at Cape Race . At St. John 's International Airport , sustained winds of 34 mph (54 km / h) were punctuated by gusts to 46 mph (74 km / h) . The winds briefly cut power to about 100 households in a St. John 's neighborhood . Offshore , a buoy over the Laurentian fan recorded peak wave heights to 68 ft (21 m) , and an oil rig southeast of the storm 's center experienced sustained winds of 98 mph (158 km / h) . Low astronomical tides prevented significant coastal flooding , but a 2 @. @ 6 ft (0 @. @ 8 m) surge was recorded at both St. John 's and Argentia . Farther west , the hurricane generated rough seas and rip currents along the Atlantic coast of Nova Scotia .

= = = Europe = = =

The extratropical storm complex incorporating the remnants of Gonzalo generated strong winds across the British Isles , especially over Ireland and the northern United Kingdom . Winds gusted to

88 mph (142 km / h) at Oban in western Scotland , while gusts exceeding 60 mph (100 km / h) were common elsewhere . The system halted transportation throughout the region , forcing the cancellation of more than 100 flights at London Heathrow Airport , grounding ferries , and blocking roads and railways with debris . Falling trees killed one woman near Hyde Park , London , and injured several others . In Essex , the winds collapsed a car jack supporting a van , fatally crushing a man working underneath , while poor weather conditions were blamed on a traffic accident in Liverpool that killed a male motorist . The storm triggered minor power outages in Scotland and Wales , with more extensive outages in northwestern Ireland after gusts as high as 70 mph (115 km / h) .

Western and central Europe were also impacted by damaging winds and downpours . The coast of the Netherlands endured high seas and gusts to 67 mph (108 km / h) , uprooting trees and flooding the coastline . Rail services and flight operations were disrupted throughout the region . In Germany , gusts over 90 mph (145 km / h) were recorded at high elevations . In Stuttgart alone , 50 vehicles were damaged by falling debris ; downed trees , torn roofs , and power outages were common throughout the nation . In the capital of Munich , the storm destroyed a large tin roof measuring over 850 sq ft (80 sq m) , parts of which impacted cars and fences on the ground . Damage from the incident was estimated at ? 500 @ , @ 000 . Throughout Germany , the storm wrought ? 60 ? 100 million in insured losses . A woman died in a traffic accident , attributed to wet road conditions , along the Bundesstraße 303 in the Bayreuth district . Northwestern gales yielded a storm surge along the country 's North Sea coastline , with tides running over 7 ft (2 m) above normal along the Elbe River at Hamburg . Neighboring Austria and Switzerland also experienced gales and power outages . A tornado touched down near Neukirchen an der Enknach in Austria , damaging homes and farms . Gusts in southern Switzerland reached 115 mph (185 km / h) , leading to road and rail closures . In southern France , the system initiated a mistral wind event .

The upper @-@ level low associated with the hurricane 's remnants blanketed parts of the Alps with heavy snowfall , accumulating to several feet , and subsequently fueled torrential rains in the Balkans on October 24 and 25 . Floodwaters caused by estimated rainfall totals nearing 6 in (150 mm) inundated entire villages in southeastern Bulgaria , forcing hundreds to evacuate , and there were widespread disruptions of power and water services . A woman in Burgas died from drowning . In the Greek capital city of Athens , the deluge filled streets with rushing water that swept away hundreds of vehicles . More than 300 buildings were inundated in the Attica area .