Lessons from Hurricane Andrew

Supplement to
CSH5 Chapters 57 & 58
BCP & DRP
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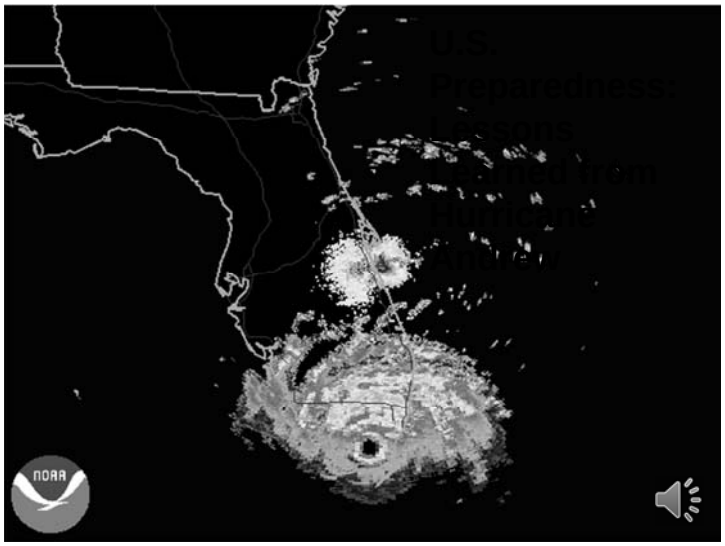


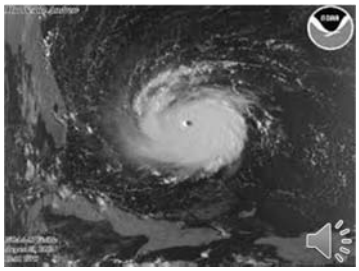
Chronology (1)

- August 1992: low pressure near West Africa
- Aug 16: upgraded to tropical depression
- Aug 17: 1st named storm of season
  - Florida: emergency agencies paid attention
  - General public showed little awareness
  - Last big storm had been Betsy in 1965
- Aug 22: upgraded to hurricane status

Marsden, W. E. (1993). "Andrew and Iniki." *Collier's Year Book 1993*. Accessed using *Microsoft Encarta Premium 2008*.

Chronology (2)

- Aug 23: hit Eleuthra Island in Bahamas
  - Winds of 150 mph
  - Huge tidal surge "wiping out roads, bridges, and resort hotels and uprooting thousands of trees."



Chronology (3)

- Aug 23:
  - 700K residents of S. Florida fled north
  - Highways clogged
  - Hurricane Andrew reaches Class 4 status
    - ✓Windspeed 130-155 mph
- Aug 24:
  - 05:00 eye passes over Homestead, FL
  - Gusts to 164 mph recorded at Natl Hurricane Ctr in Coral Gables (near Miama) before shutdown

Chronology (4)

- Aug 24 05:00-08:00
  - Andrew moves across FL
  - Serious damage in Miami
    - ✓Billboards
    - ✓Light posts
    - ✓Palm trees
  - Devastation in Homestead area
    - ✓22 miles SW of Miami
    - ✓Near Homestead AFB
    - ✓Destroyed most of 27,000 population town

Devastation (1)

Chronology (4)

- Aug 25: moves into Gulf of Mexico
- Massive damage
  - Power outages for 1.5M people
  - 80K dwellings destroyed or badly damaged
  - 250,000 people homeless
  - 1M people without clean drinking water

Chronology (5)

- Aug 26: 140 mph winds reach LA coast
  - Major damage along US 90
  - Destroyed much of sugarcane crop
- Aug 27-28
  - Generated tornados throughout LA, AL, GA, TN
  - LA: 10K dwellings destroyed & 30-50K homeless

Recovery Slow, Disorganized

- Basic services absent
  - "…electricity, telephones, water supply, sewage disposal, banks, gasoline stations, and grocery stores…."
  - Days & weeks of disruption
- Social breakdown
  - Looters
  - National Guard & Army deployed
  - Pres George Bush & Gov Lawton Chiles blamed each other for delays
  - Increasing levels of domestic abuse & family breakdowns

Lessons Learned (1)

- Aug 13, 2004: Hurricane Charley hit FL
  - ❑But FEMA & state, local officials generally praised
- Immediate (day 1) distribution of ice, water, food door to door
- Emergency communications up and running
- Immediate search-and-rescue operations
- 1st 24 hours: emergency toilets, A/C tents, showers, medical emergency rooms in place

AP (2004). "FEMA learned from Hurricane Andrew in 1992." *USTODAY* (2004-08-26). http://tinyurl.com/5db7ef

Lessons Learned (2)

- Recovery affected by insurance policies
  - ❑Institutions & individuals unfamiliar with terms
  - ❑Scope of coverage critical
  - ❑Many exclusions of critical equipment
    - ✓Electrical fixtures
    - ✓Appliances
    - ✓Air conditioning & heating
    - ✓Water heaters
    - ✓Built-in cabinets

Poliakoff, G. A. (2004). "Lessons from Hurricane Andrew." See http://tinyurl.com/6g4qmch

Lessons Learned (3)

- Buildings were poorly built – codes ignored by contractors & FL government officials
- Many insurance companies went bankrupt, leaving policy holders unprotected
- Insurance rates climbed so steeply that thousands of homeowners could not afford insurance
- 1M homes lost all insurance coverage

See US Natl Weather Service (1993). *Hurricane Andrew: South Florida and Louisiana: August 23-26, 1992.* Available as e-book and on paper. http://tinyurl.com/6lg3nmc

Hurricane Preparedness Checklist

- Disaster Plan
- Evacuation Routes
- Emergency Generators & Supplies
- Backup Computer Files
- Secure the Premises
- List of Owners & Employees
- Photograph or Video Premises
- Building and Facilities Plans
- Insurance Policies & Agent Details
- Bank Account Details & Signatories
- Mitigation of Damages
- Debris Removal

Poliakoff, G. A. (2004). "Lessons from Hurricane Andrew." See http://tinyurl.com/6g4qmch

BC511 Continuity of Government Operations

- Organizational analysis
- Risk and threat analysis
- Mitigation and control strategy development
- Implementing organizational structure
  - ❑Sustain program

Organizational Analysis

- Map people to functions
- Discover & establish
  - ❑How people will collaborate
  - ❑On priority issues
  - ❑Regardless of organizational status

Risk & Threat Analysis (1)

- Identify critical infrastructure, equipment and services
  - Agriculture & Food
  - Banking & Finance
  - Chemical Industry
  - Communications
  - Critical Manufacturing
  - Dams
  - Defense Industrial Base
  - Emergency Services
  - Energy
  - Government Facilities
  - Healthcare & Public Health
  - Information Technology
  - National Monuments & Icons
  - Nuclear Reactors, Materials & Waste
  - Postal & Shipping Services
  - Transportation Systems
  - Water

See http://www.dhs.gov/files/programs/gc_1189168948944.shtm

Risk & Threat Analysis (2)

- Compile types of threats to continued functioning
  - E.g., hurricane, tornado, flood, earthquake, insurrection, terrorism
- Identify types of failure
  - E.g., electrical-grid failure, road blockage, rail blockage, communications failures
- Establish approximate probability of specific types of threat
  - Historical records, best-guess estimates

Risk & Threat Analysis (3)

- Compute Annualized Loss Expectancies (ALE)
  - for each component and threat
- ALE(failure) = pc
- ALE(prevention) = (1-p)c'
- where
  - ✓p = probability of failing
  - ✓c = cost of failure
  - ✓(1 – p) = probability of not failing
  - ✓c' = cost of prevention

Mitigation & Control Strategy Development

Use ALEs as heuristic for discussing strategies; e.g., suppose (illustration only)

- Cost of failure of communications infrastructure ~$100M
- Probability(failure)/year = 0.01
- So ALE(failure) = $100M*0.01 = $1M
- But probability of not failing in 1 year = 0.999
- Then what is the breakeven point where we spend enough to balance out possible loss?
- ALE(prevention) = 0.999c' and so for breakeven,
- c‘ = $1M/0.999 = $1.001M
- In other words, spending around $1,001,000 a year gives us a breakeven point IFF the probabilities and costs are correct

Implementing Organizational Structure

- Don’t impose new structures without discussion
- Need to convince colleagues to collaborate
- Create open environment for free contributions of ideas, criticisms, suggestions
- Establish needs, benefits
- Listen carefully to objections and discuss in detail

BC521 Public Sector Incident Management & Emergency Response

- Developing response plan
- Emergency operations centers
- Emergency communications
- Working with first responders
- Best practices for
  - Developing off-site backups
  - Offsite work areas
  - People and equipment for continuing operations

Developing Response Plan

- Critical path analysis
  - What must be done first?
  - Establish priorities for functional recovery
- Continuous Process Improvement
  - Test and refine repeatedly
  - Use video recording throughout exercises
  - Analyze mistakes, reasons for errors, and fixes
  - Adopt non-punitive, collaborative culture

Emergency Operations Centers

- EOCs critical element of response
  - AKA command centers, situation rooms, war rooms, crisis management centers
  - Coordination of all responses to ensure smooth, effective delivery
- Fixed-position EOCs:
  - Built to withstand appropriate level of stress
  - No good if destroyed during emergency!
  - Can serve multiple uses outside emergency
- Mobile EOCs – local command and control

Emergency Communications

- Incident Command System
  - Software supported by hardware (radio above all; mobile phones & wireless networks if available)
  - Supports management of all operations
  - Coordinate daily operational activities
  - Communications with EOC & personnel on ground
- Event Information Tracking
  - Audit trail of all actions / events
  - Notifications, activations, tasks, resource allocation, performance, status reports

Working with First Responders

- Official responders will be highly trained & equipped with communications tools
  - EMTs, fire-fighters, National Guard, Red Cross, police canine units, doctors, nurses, electrical power workers…
- BUT must plan for volunteers
  - Searchers for survivors
  - Builders, contractors, demolition experts,
  - Truckers bringing supplies
  - May be disorganized, without communications

Developing Off-site Backups

- Data & software must be copied to remote storage
  - Daily, weekly, monthly – depends on needs
  - Adapt schedule to each application & site
- 3 types of operational backup site
  - Cold: all infrastructure but no computers, networks
  - Warm: cold + computers, networks
  - Hot: warm + all software & data
- Hot sites can be used for sharing normal load

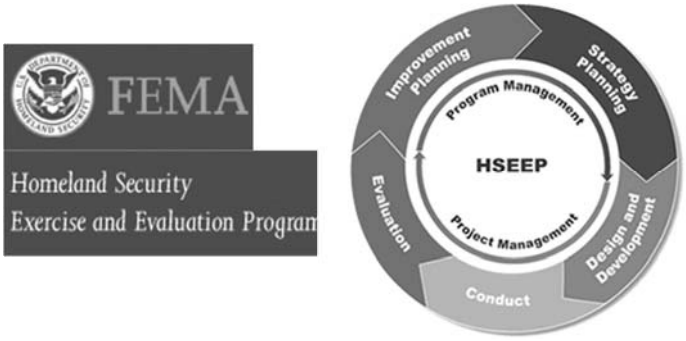
Offsite Work Areas

- Plan for critical operations to be completely ready for immediate occupancy & use
- Some older, little-used or unused sites may serve in emergency
- Immediate need for safety & acceptable working conditions, not luxury
- Some try able to share resources with other agencies
  - But where will THEY get their work done?
  - Generally does not work well

People & Equipment for Continuing Operations

- Budget for contingencies
- Use older but serviceable equipment where possible
- Provide safety for families / loved ones of employees
- Ensure time for communications with families
- Provide emergency sleep accommodations, food, water, washing facilities….

Systems Approach: FEMA



https://hseep.dhs.gov/pages/1001_HSEEP7.aspx

Hurricane Irene: August 2011

- Aug 20: Lesser Antilles – organization of cylconic circulation – Natl Hurricane Center issues advisories
- Aug 21: Virgin Islands
- Aug 22: severe damage in Puerto Rico
- Aug 23-26: severe damage in Bahamas
- Aug 27: veers past FL & hits NC Outer Banks
- Aug 28: 2nd landfall in NJ, moves NE through NY

Irene Hits Vermont

- Aug 28-29: downgraded to tropical storm
- Moves through VT – worst flooding in century – 6 feet in main streets several towns
- Several towns completely isolated when roads washed out (e.g., Killington, Pittsfield)
- Many classic covered bridges washed away
- Damage to crops in low-lying areas

Emergency Response Excellent

- Immediate shelter sites in several areas
- Vermont & Maine National Guard on scene at once
- Politicians, FEMA responded quickly
- Spontaneous coordination through radio, TV, Internet
- Strong community outpouring of financial support and goods (clothing, food)
- Norwich University students pitched in

See http://vem.vermont.gov/

Some Resources for Further Study

- CDC "Emergency Preparedness & Response" http://www.bt.cdc.gov/
- DHS "Critical Infrastructure" http://www.dhs.gov/files/programs/gc_1189168948944.shtm
- FEMA "Are You Ready?" http://www.fema.gov/areyouready/
- FEMA "Emergency Management Guide for Business & Industry http://www.fema.gov/business/guide/index.shtm
- FEMA "National Response Framework Resource Center" http://www.fema.gov/emergency/nrf/
- MIT WORLD "Emergency Response" topics http://mitworld.mit.edu/searches?term=emergency+response
- MIT WORLD "Disaster Recovery" topics http://mitworld.mit.edu/searches?term=disaster+recovery
- Ready.gov http://www.ready.gov/