AIRPORT DISASTER PREPAREDNESS IN A COMMUNITY CONTEXT

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Abstract

In our current economic, climatic, and political environment, airports and their surrounding communities are seeking effective ways to address disaster planning with foresight, common sense, and economy. Airports are traditionally reliable, essential assets in nearly every aspect of disaster preparedness, mitigation, response, and recovery, and they currently engage in cooperative planning, training, drilling, and exercising with a wide array of local, state, and federal emergency management agencies (EMAs). Building on these existing cooperative connections, forging new relationships, sharing expertise and resources, and ensuring that these links stay strong over time can efficiently and economically move airport and community preparedness to a measurably higher level.

This study uses survey results from 37 U.S. airports to examine the current state of cooperation among airports and their partners and suggests ways to strengthen and develop existing bonds to ensure community preparedness along with the protection and promotion of both airport operations and business continuity. Cooperation and coordination can be strengthened through building personal relationships, and succession planning can ensure relationship continuity over time. Surge capacity during disaster response can be enhanced through wise mutual aid agreements made effective through intensive joint training, drilling, and exercising. Regional cooperation and coordination among airports and EMAs is a powerful and cost-effective form of mitigation against all types of hazards.

Best management practices, innovative preparedness measures, and gaps in preparedness for non-aviation disasters are explored. Benefits of cooperation between airports and EMAs include efficiency of communications; leveraging personal relationships; mutual trust and mutual respect; rapid response; minimization of red tape; shared experiences building shared expertise; and interoperability and interchangeability of skills and equipment. Areas of concern include lack of “diagonal” awareness, a potential for poor coordination within an airport or an agency, and a potential for mixed signals and crossed communications. Airports and their surrounding communities can effectively enhance preparedness by minimizing or eliminating weaknesses, developing benefits, and building on existing strengths.

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Introduction

Communities rely on their airports as essential assets in nearly every aspect of preparedness, mitigation, response, and recovery for non-aviation disasters and catastrophes. Close, well-established cooperation and coordination with emergency management agencies (EMAs) enhances airports' utility when communities face the unexpected. Sound structural, organizational, policy, operational, and defensive relationships with emergency management agencies can ensure community preparedness and the protection and promotion of both airport operations and business continuity. Effective cooperation between airports and emergency management agencies can create strong, efficient, and economical mitigation against local, regional, and national disasters and catastrophes.

The events of September 11, 2001 changed aviation and airport procedures forever, and airports have spent seven years assimilating those changes. Similarly, airports and their EMA partners have spent three and a half years applying the lessons learned since Hurricane Katrina and its aftermath. Mutual aid pacts are now stronger, more numerous, and are extending into new functional areas. During these years, the all-hazards concept of emergency preparedness has penetrated first the emergency management community, then the airport community. The National Incident Management System (NIMS), incorporating the Incident Command System (ICS), has become the national standard, and training on NIMS and ICS has gradually become mandatory among EMAs. The Index E[1] ARFF (Aircraft Rescue Fire Fighting) Chiefs from 18 of the largest airports have taken an activist role in fostering the installation of strong NIMS/ICS procedures in training and developing stronger relationships with neighboring emergency management agencies. These past seven years have seen increasing professionalism among airport managers and EMA managers, and many airports have created positions for emergency

managers. Now the Federal Aviation Administration (FAA) is moving towards an all-hazards, NIMS/ICS-based approach for airport certification and emergency planning, as evidenced by the draft Advisory Circular 150/5200-31B, Airport Emergency Planning.[2]

These events and trends created the state of affairs at U.S. airports in the fourth quarter of 2008 that this study describes, explains, and analyzes. The dynamic nature of the many variables and factors presented serious challenges in study design, but the goodwill and cooperation of the airports and their emergency management agency partners has helped overcome most of those challenges.

Purpose of this study

This study explores existing patterns of cooperation and coordination between airports and their emergency management agency partners in non-aviation disasters and reveals current trends in airport emergency planning. It explores the extent and effectiveness of relationships between U.S. airports and non-airport EMAs from a multihazards (formerly all-hazards) perspective. Best management practices (BMPs), innovative preparedness measures, and gaps in preparedness for non-aviation disasters are explored. The study also explores the potential for and progress towards mutual aid among regional airports and with EMAs on a scale larger than a city or county and smaller than national cooperative arrangements such as the Emergency Mutual Assistance Compact (EMAC)[3] or large-scale regional organizations such as Southeastern Airports Disaster Operations Group (SEADOG)[4] or Western Disaster Operations Group (WESTDOG).[5] By virtue of its overall scope and design, the study provides a partial snapshot of preparedness in late 2008, and seeks to disseminate this useful information to airport managers, other members of aviation critical infrastructure, and emergency managers. Finally, it suggests areas for further study.

Previous Studies

Extensive literature on airport preparedness exists for aviation-related disasters, that is, incidents that fall under 14 CFR Part 139[6] considerations and requirements. Furthermore, a

growing literature addresses manmade incidents involving airports, that is, incidents that fall under 14 CFR Part 1542[7] considerations; much of that literature is for official use only or classified. Since both aviation-related and terrorist-related incidents lie outside the scope of this study, this paper does not review their literatures.

Studies that bear directly on the non-aviation disaster scope of this study fall into three groups. First is a series of papers in 2007-2009 that address airports, emergency management agencies, continuity of operations, continuity of business, and the application of NIMS at airports.[8,9,10,11,12,13] Second is a series of papers that address the regional coordination of airport passenger operations in limited geographic areas.[14,15] Third is the 2008 Airport Cooperative Research Program (ACRP) report on regional cooperation in the case of a chemical, biological, radiological, nuclear, or explosive (CBRNE) attack on an airport.[16] This study builds on the foundations laid by these three groups of previous studies.

A Note on Point of View

Airports are evaluated and understood from a variety of perspectives. Early in the study, one of the most experienced, most knowledgeable airport managers remarked, “You’re wasting your time—all airports are alike. Parts 139 and 1542 make them like cookie-cutters. Airports are totally interchangeable.” In the same month, an equally experienced manager observed, “Every airport is different. Their place in the community, ownership, geography, operational concepts, physical layout, acreage, legal environment, and history combine to make each one unique.” Both views are true, and the combined truth is nowhere more evident than when airports and EMAs interact.

Hypotheses

The primary focus of this study is on preparedness of airports for non-aviation disasters, primarily natural disasters and pandemics. It looks at the planning, training, drilling, and exercising efforts of the airports and at the relationships in these areas between airports and their

local and state emergency management agency partners. This study considers four research hypotheses:

H_1: Coordination and cooperation between airports and emergency management agencies is a powerful, cost-effective method of enhancing preparedness, mitigation, response, and recovery for multihazard disasters and catastrophes.

H_2: Non-aviation disaster preparedness promotes airport preparedness for aviation-related disasters.

H_3: Protection of airport continuity of operations and continuity of business is essential.

H_4: Airports in the same region can cooperate to adjust for difficulties in the wake of a disaster or catastrophe.

The study comprises two sections: a main study that examines the preparedness activities of the 37 airports and relationships with their emergency management agency partners, and a substudy that is a preliminary investigation of the potential for regional cooperation and coordination among airports and their emergency management agency partners. The focus throughout is on the nexus between preparedness and continuity of both business and operations.

Methods

Data Collection: Based on the results of previous research, questionnaires were developed for airports and their EMA partners that focused specifically on planning and exercising efforts that lie on the interface between airports and their surrounding communities and on the capabilities of airports to interact with those communities. The Transportation Security Agency reviewed the study plan and questionnaires and issued a Findings Letter and Decision Memo, neither of which contained any Security Sensitive Information content. This meant that the study had to confine itself to non-intentional incidents, which was acceptable.

Using 2007 passenger enplanement, freight, and mail data from RITA, the top 20 U.S. passenger airports and top 10 freight airports were identified. The 2007-2008 AAAE membership

directory was used to identify a senior manager in operations, security, or safety, and that manager was asked to identify the best point of contact at that airport for a survey looking at non-aviation disaster preparedness and relationships with neighboring emergency management agencies. Several other airports were invited in order to test the questionnaire's applicability to smaller airports. During the course of the study, other airports participated in order to lay the informational foundation for the substudy in regional cooperation and coordination. Lastly, several airports volunteered in response to publicity from the AAAE and ACI-NA. Altogether, 55 airports were sent the airport questionnaire, and 37 airports completed and returned their questionnaires.

The airport questionnaires asked airport respondents to name two EMA contacts with whom they cooperated closely. The follow-up companion questionnaire was sent to the 54 emergency management agencies identified by the airports, and twelve EMAs returned completed questionnaires. Four additional agencies responded that state law precluded their participation in the study.

On December 15, 2008, eight South Florida airports participated in a workshop in Miami to examine regional cooperation and coordination along with three counties, one state agency, and a number of federal agencies. Participants met in small group meetings prior to the workshop at MCO and TPA, and draft minutes of the workshop were reviewed by all invitees, including those unable to attend. All local EMA agencies and the key federal agencies typically involved in airport disaster operations were invited. The workshop focused on the hypothesis that regional cooperation and coordination among airports and EMAs is a powerful and cost-effective form of mitigation against hazards of all types (multihazards). Discussions generally followed this agenda, which was distributed in advance:

1. Is there a problem or real issue?
2. Status of airport-to-airport agreements in South Florida

3. Status of multi-airport to emergency management agency (EMA) or groups of EMAs, or to multi-agency coordination entities (MACs)
4. Extent of NIMS/ICS application
5. Role of governments
6. Unmet needs
7. Opportunities
8. Possible mechanisms for cooperation and coordination
9. Barriers to implementation

Based on information in questionnaires, site visits and interviews were conducted at BTR, JAN, LAX, MCO, MSY, and TPA.[17] In addition, earlier site visit information for CLT, DFW, MEM, and SFO was updated. Extensive telephone or email follow-up questions were conducted with DEN, DTW, EWY, IAH, MEM, MIA, MSP, ORD, RSW, SBN, SEA, and SLC. General requests for missing data were sent to the 37 airports.

As a final check, the draft final report was submitted to all participating airports and agencies for review, comment, correction, and addition.

Data Analysis

Data from the 35 questionnaires (the general aviation airports VNY and YIP were excluded) were coded and tabulated in an Excel spreadsheet. Summary data were generated, but systematic statistical (quantitative) analysis was severely limited because of the relatively small sample size (n = 35) and the non-continuous type of most of the data. Most data items are either yes/no or categorical, making them unsuitable for principal component analysis (factor analysis). The primary means of data analysis applied to the data matrix were qualitative analysis and graphical analysis, but a combined factor analysis/multiple linear regression analysis was run using SPSS 17.0 on seven key variables for which the data type was suitable.

The results of the South Florida substudy are presented as a narrative based on minutes taken during the workshop.

Validity: Several measures promoted and protected the validity of this study, as validity of a study's methods and results is the main test for its generalizability. The airport questionnaire was put through a series of developmental evolutions, each of which was reviewed by expert airport managers. The EMA questionnaire was similarly reviewed by expert emergency managers.

Content validity also supports the validity of the study. The substantial number of cooperating airports from among the 30 largest U.S. passenger airports (20 of the top 30 participated) and the 30 largest U.S. freight airports (also 20 of the top 30 participated) suggests that the results of the study may be valid for at least the largest airports. This generalizability does not extend to smaller airports, for which the sample size is too small.

Reliability. The paired airport-EMA questionnaires allow a look into the reliability of the airport questionnaires. Twelve EMA questionnaires corresponding to ten airports (AUS, BOS, BTR, CLE, CLT, DEN, HNL, JAC, MSP, RSW, and OAK) gave results that matched very well with the airports' responses on similar items.

Results and Discussion

General Study. Thirty-seven airports responded (Table 1) and named 54 emergency management agency partners. Of those 54 EMA partners, 12 submitted questionnaires (Table 2) and four noted that state law prevented a response.

Airport Characteristics. The 37 airports that responded include 20 of the 30 largest passenger airports and 20 of the 30 largest freight airports based on the 2007 T-100 tables from RITA (See Figures 1 and 2.). The 37 airports accounted for 59% of the total passenger enplanements at U.S. airports, 67% of the total international passenger enplanements, and 61% of the total air freight enplanements in the U.S. in 2007 (Figure 3).

Table 1. Airports Participating in Study

Ted Stevens Anchorage International Airport (ANC)
Hartsfield-Jackson Atlanta International Airport (ATL)
Austin/Bergstrom International Airport (AUS)
Boston Logan International Airport (BOS)
Baton Rouge Metropolitan Airport (BTR)
Cleveland Hopkins International Airport (CLE)
Charlotte Douglas International Airport (CLT)
Port Columbus International Airport (CMH)
Denver International Airport (DEN)
Dallas-Fort Worth International Airport (DFW)
Detroit Metropolitan Wayne County International Airport (DTW)
Fort Lauderdale/Hollywood International Airport (FLL)
Honolulu International Airport (HNL)
George Bush Houston Intercontinental Airport (IAH)
Indianapolis International Airport (IND)
Jackson Hole Airport (JAC)
Jackson-Evers International Airport (JAN)
McCarran International Airport (LAS)
Los Angeles International Airport (LAX)
Orlando International Airport (MCO)
Memphis International Airport (MEM)
Miami International Airport (MIA)
Minneapolis-St. Paul International Airport (MSP)
Louis Armstrong New Orleans International Airport (MSY)
Oakland International Airport (OAK)
Ontario International Airport (ONT)
Chicago O'Hare International Airport (ORD)
Phoenix Sky Harbor Airport (PHX)
Pittsburgh International Airport (PIT)
Southwest Florida International Airport (RSW)
South Bend Regional Airport (SBN)
Seattle-Tacoma International Airport (SEA)
San Francisco International Airport (SFO)
Salt Lake City International Airport (SLC)
Tampa International Airport (TPA)
Van Nuys Airport (VNY)
Willow Run Airport (YIP)

TABLE 2. EMERGENCY MANAGEMENT AGENCY PARTICIPANTS IN STUDY

Charlotte Mecklenburg (NC) Emergency Management Office - CLT
City of Austin (TX) – AUS
City of Boston (MA) Mayor's Office of Emergency Preparedness – BOS
City of Brook Park (OH) Fire Department – CLE
City of Honolulu (HI) Fire Department – HNL
City of Oakland (CA) Fire Department – OAK
City and County of Denver (CO) Office of Emergency Management and Homeland Security – DEN
East Baton Rouge Parish (LA) Mayor's Office of Homeland Security & Emergency Preparedness – BTR
Hennepin County (MN) – MSP
Hickam Air Force Base (HI) ARFF – HNL
Lee County (FL) – RSW
Teton County (WY) – JAC

Figure 1. Airports in Study among Top 30 Passenger Airports

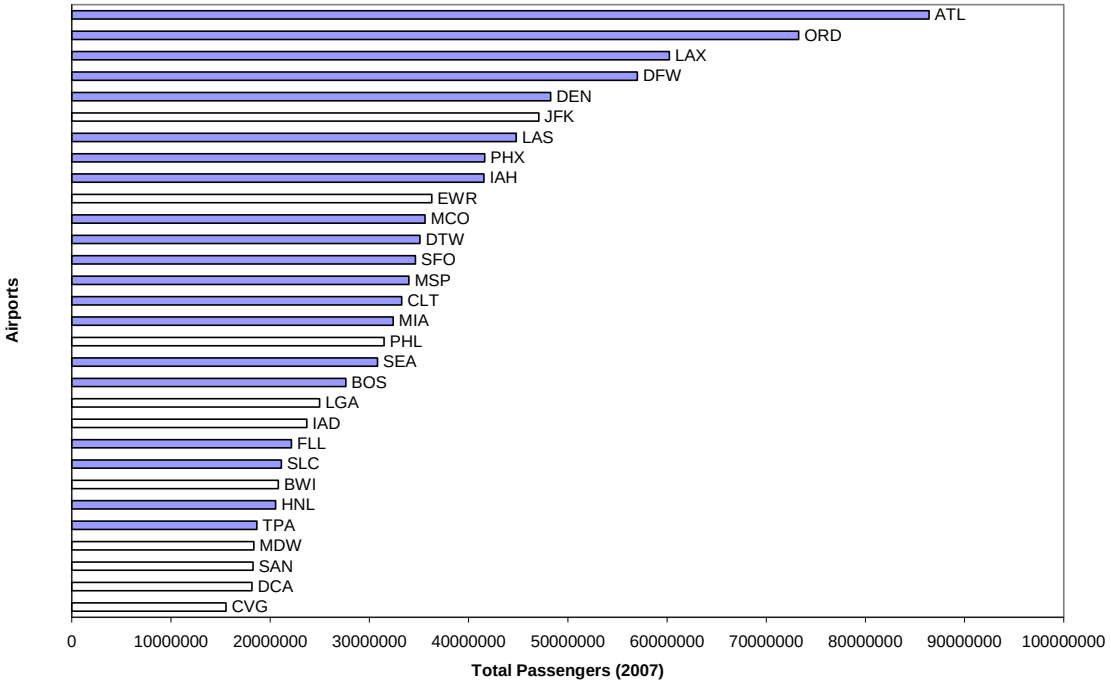


Figure 2. Airports in Study among Top 30 Air Freight Airports

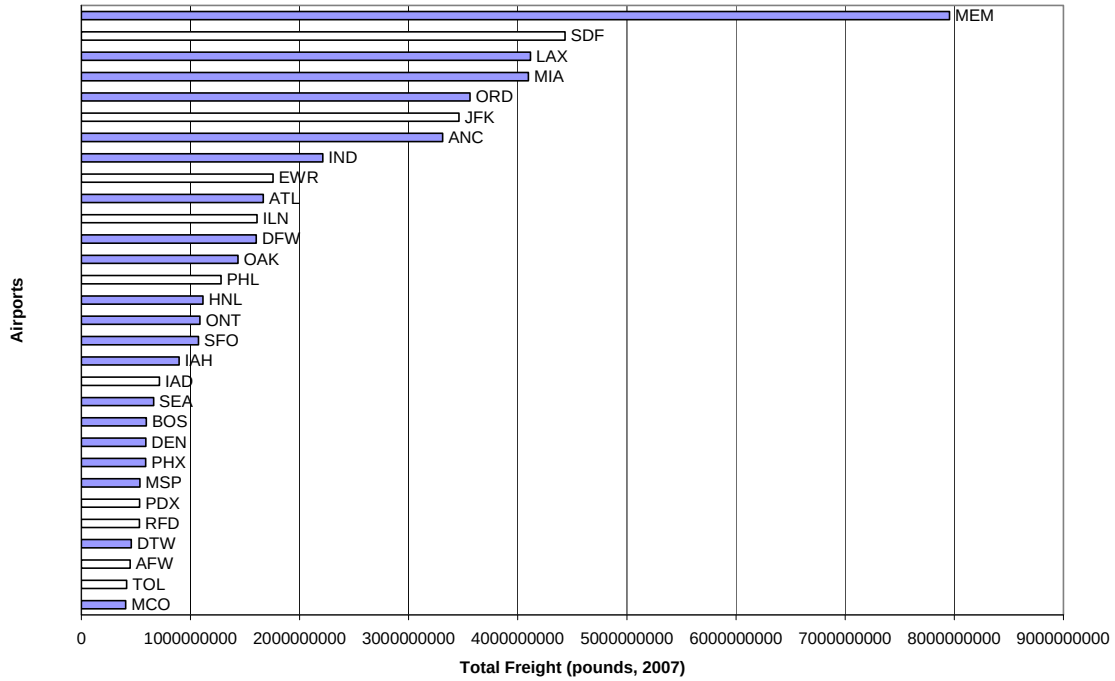
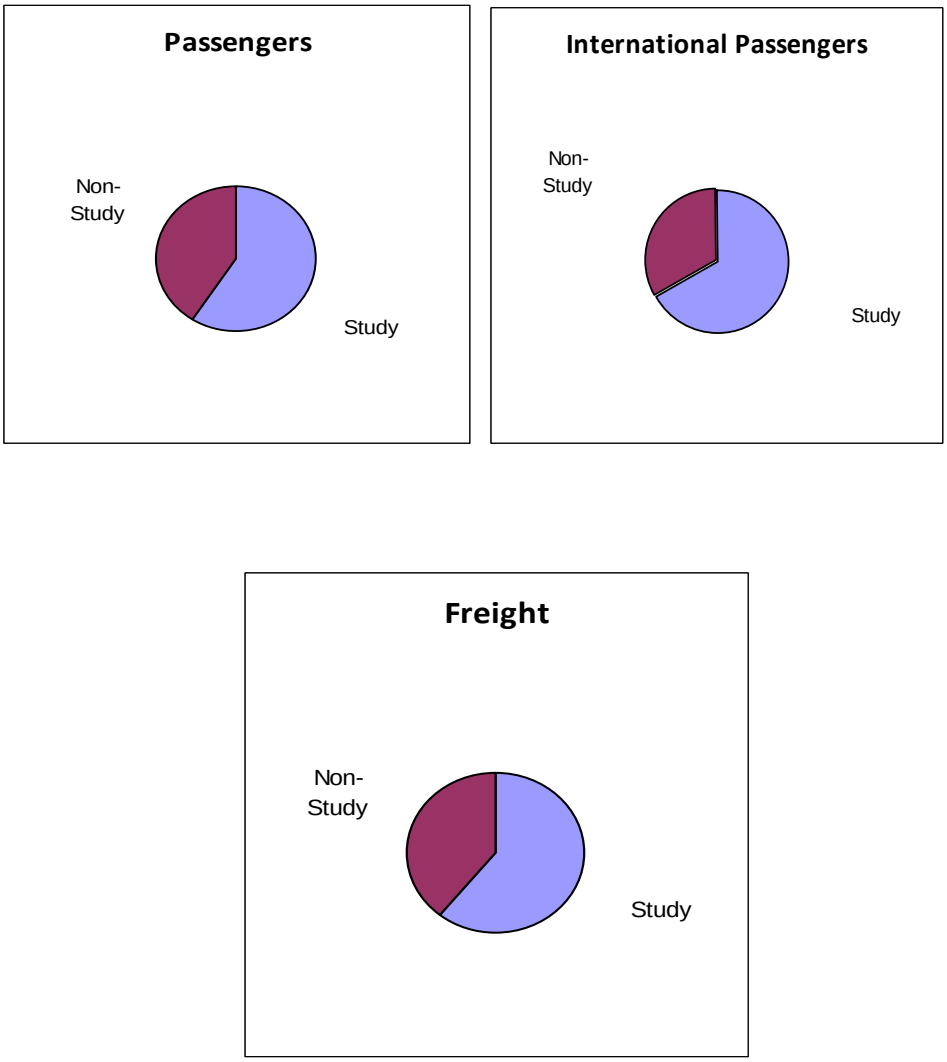


Figure 3. Passengers, International Passengers, and Air Freight at Study Airports



The 37 airports represent 23 states and 34 different owner/operators. The number of states is significant because, while airport operations are governed by federal regulations, emergency management is primarily regulated by state statutes and regulations. At least three states (Florida, Ohio, and Tennessee) represented in the study have statewide mutual aid pacts for emergency response. The 35 commercial airports also represent regions that experience the major types of natural hazards:

1. Floods – of the 35 airports, eight report specific flood plans.
2. Hurricanes – airports from coastal areas of Florida, Louisiana, Mississippi, and Texas; eight report specific hurricane plans.
3. Tornados – airports from the Plains, Midwest, and Southeast; seven report specific tornado plans.
4. Earthquakes – airports from Alaska, California, Washington State, Tennessee, Indiana, and Illinois; eight report specific earthquake plans.
5. Tsunamis – airports from Alaska, California, Hawaii, and Washington; four report specific tsunami plans.
6. Blizzards – airports from Alaska, Colorado, Minnesota, Illinois, Michigan, and Wyoming; four report specific blizzard plans.
7. Ice storms – airports from Alaska, Colorado, Minnesota, Illinois, Indiana, Michigan, Wyoming, Pennsylvania, Massachusetts, Tennessee, and North Carolina; five report specific ice storm plans.
8. Wildfires – airports from the Plains, Rockies, Southwest, and Northwest; six report specific wildfire plans.
9. All-hazards – 13 airports have all-hazards plans for natural disasters with a reasonable probability of occurring in their areas.

In addition, three airports reported volcano plans, and three reported plans for dust storms.

A number of critical variables are suitable for use as independent variables in factor analysis and multiple linear regression analysis: total passenger enplanements,[18] total international passenger enplanements,[19] total airfreight enplanements,[20] total operating budgets, UASI threat risk assessment,[21] the number of AAAE members on staff, and the number of AAE certified managers on staff.[22] The dependent variable of analysis was "current plans," which was constructed as each airport's total number of emergency plans updated within less than 12 months and exercised within less than 24 months. Using plans less than 24 months old and exercised

within 24 months gave weaker correlation coefficients than using the variable chosen for analysis. “Current plans” is taken as an indicator of planning effort and as a proxy for airport preparedness.

Factor analysis, which is also known as principal component analysis, yielded three main components:

- Component 1, which was dominated by total operating budget, percent of international passengers, UASI code, and total passengers, accounted for 39.4% of total variance.
- Component 2, which was dominated by number of AAAE members, number of AAE certified managers, and total passengers, accounted for 25.0% of total variance.
- Component 3, which was dominated by total freight and number of AAE certified managers, accounted for 14.5% of total variance.
- Four other components accounted for the remaining 21.1% of variance.

When a multiple linear regression was run using components 1 through 3 as independent variables and Current Plans as the dependent variable, there was a strong correlation but it fell just short of being significant at the 5% level ($p = 0.068$). Taken together, the factor analysis and regression suggest that total operating budget dominates in effects on planning and preparedness. The other factors in Component 1 are very strongly collinear with total operating budget, so they are not truly independent variables. Component 2, which matches well with a preconception of some sort of measure of professionalism in airport management, is difficult to interpret with the limited data on hand. Component 3, which was overwhelmingly dominated by airfreight, suggests that predominantly airfreight airports (MEM, ONT, IND, and OAK in this study) may plan and prepare differently.

Emergency management budgets were not tested; examination of the questionnaire responses made it clear that the question was poorly worded, making the responses useless. The reported values ranged from the cost of meals for volunteer victims to total costs including a new

ARFF. The data, however, support the conclusion that there is not yet an industry-wide consensus as to a definition of what constitutes an emergency management budget.

A one-way analysis of variance (ANOVA) applied to the presence of an Air National Guard base at an airport found no significant difference ($p = .230$) in the mean number of current plans.

Table 3 summarizes the ownership and governance of the 35 commercial airports. Overlapping categories account for the total number being greater than 35. City and county departments account for over half the airports in the study.

TABLE 3. AIRPORT OWNERSHIP

Ownership/Governance	Airports in study (may total >35)
City department	14
Independent authority	11
Multijurisdictional authority	7
County department (includes SFO and MIA)	5
Port authority	4
State-owned	2
Federal non-military	0
Military	0
Private	0

Table 4 summarizes the independence that the airports have in making budgetary decisions. As this is a complex subject, this simple table only begins to sketch a picture of its intricacies. The most noteworthy item in Table 4 is that none of the 35 airports reported having their unrestricted revenues “taxed” by the jurisdiction that owned them. The most surprising line in Table 4 is how few (9 out of 35) of the airports reported independent bonding authority. Twenty-two airports (Table 3) reported being owned by various types of authorities, and one of the most typical rationales for creating a special use authority is to give it bonding authority separate from the owning jurisdiction. This inconsistency may indicate a problem with either the airports’ responses or the clarity of the question asked.

TABLE 4. INDEPENDENCE OF BUDGETARY DECISIONMAKING

Degree of Independence	Airports in study (may total >35)
Totally independent	12
Subject to general oversight	18
Subject to line-item approval	3
Subject to "taxes" on non-139/1542 revenues	None
Independent bonding authority	9
Final control of concessions revenues	13
Final approval of contracts	12
No response	1

EMA Partnership Characteristics

Most of the airport questionnaire and the entire EMA questionnaire focused on the nature of airport-EMA relationships and their possible effects on disaster planning and preparedness.

Table 5 looks at the possible effects of the presence of a CDC Quarantine Office at the airport on the airport-CDC relationship and on pandemic plans and exercises. Unfortunately, this important relationship between airports and local health departments was overlooked in the construction of the questionnaire and did not come up until the South Florida workshop near the end of the study.

Examination of Table 5 shows that having a quarantine officer on site makes a clear difference in all categories of pandemic planning and exercising. However, it is impossible to tell whether it is the effect of the CDC presence or the importance of international arrivals at those 13 airports that has caused increased awareness and enhanced preparedness. The samples sizes were too small to allow meaningful quantitative analysis of these data.

TABLE 5. EFFECTS OF CDC QUARANTINE OFFICE AT AIRPORT

	Number of Airports in Study	Cooper-ative Planning with CDC	Have Pandemic Plan	Pandemic Plan <12 Months Old	Pandemic Plan Exercised in Past 24 Months	COOP Plan for Pandemic
Quarantine Office at Airport	13	92%	100%	69%	77%	92%
No Quarantine Office at	22	59%	59%	36%	32%	68%

Airport						

Types of mutual aid partners and the intensity of mutual aid agreement making are the focus of Table 6. There are no surprises in this table, with fire, police, emergency medical services, the American Red Cross, and emergency management agencies dominating the list. The number of airports reporting each type of mutual aid partner is the most reliable component of Table 6. Most airports reported the number of mutual aid compacts, but some only indicated the existence of at least one compact in a given category, so the number of agreements reported is quite a bit lower than the actual number, as illustrated by comparing the total number of mutual aid agreements with fire departments for all 35 airports (849) with the total reported by just one airport (550). The picture is further complicated by statewide emergency mutual aid pacts such as exist in Florida, Ohio, and Tennessee.

The most surprising aspect of Table 6 is that only two of the 35 airports reported mutual aid pacts with other airports. As learned in South Florida, this may be because most relationships between airports are informal; even SEADOG is an informal association. However, WESTDOG is a more formally organized group with an official membership list. The last complicating factor is that most airport-airport mutual aid arrangements take the form of diversion or backup airports, as PHX is the backup for widebodies for LAX, and such relationships are controlled by the FAA and the airlines, not the airports.

TABLE 6. MUTUAL AID PARTNERSHIPS

Type Partner	No. Airports	Agreements Reported	Max. at Any Airport
Fire department	32	849	550
Police department	30	297	100
EMS department	27	133	42
American Red Cross	26	29	3
Emergency management agency (EMAs)	24	44	8
Airlines	19	192	60
State agencies	19	29	5
Airport cooperative groups	17	28	12
Search and rescue	15	17	2

Other federal agencies	15	48	12
Tenants	14	222	100
Air National Guard	13	16	3
Other nongovernmental agencies	13	28	5
Multiagency coordination entities (MACs)	11	20	8
Other DOD	9	13	5
Private providers of emergency services	8	21	13
Statewide mutual aid pact	3	3	N/A
Other airports	2	2	1

The data in Table 7, which focus on Military Aid to Civil Authority (MACA), are suspect, as the totals seem low. Some airports may have chosen to skip the three MACA questions even though TSA cleared them as non-SSI. Nevertheless, it is clear from the data that the airports that do have military agreements exercise them regularly and tend to use them. There was no apparent correlation between which airports had Air National Guard facilities and which reported MACA agreements.

TABLE 7. MILITARY AID TO CIVIL AUTHORITY

Characteristic	Number of Airports in Study
Have MACA Agreement	19
Have used MACA Agreement <24 months	17
Have participated in exercise with military	19

Many patterns and combinations of patterns may occur in the relationships between airports and their EMA partners. Table 8 shows the patterns reported by the 35 airports in the study in order of decreasing frequency. ESF stands for Emergency Support Function, which is a key descriptor of any asset's role in a disaster being managed by DHS or, by implication, a state or local emergency management agency. The two options in Table 8 involving ESF differ by the degree of autonomy being exercised by the airport: "Airport acts as ESF in disasters" indicates that the airport is prepared and expects to carry out its transportation role (and possibly other roles) independently. "Fully integrated as ESF(s) in local EOC" indicates that the airport expects

to carry out its duties under the control or partial control of the local, non-airport emergency operations center (EOC). The test of this difference is whether the airport has a desk at the local EOC or is prepared to enter a Unified Command. Since the total responses for these two options exceed 35, some airports are prepared to function in either mode. Examination of the data revealed that most of the fully integrated airports are city or county departments.

The distinction between an airport having its own EOC and being a multiagency coordinating entity (MAC) is likely insignificant in real operational terms. Very large airports, such as most of the 35 in this study, have large airside operations, landside operations, fire, police, EMS, and other departments, and they may view their coordination level as more of a MAC than an EOC. The MAC function may also be triggered when outside agencies come onto the airport under mutual aid pacts. Both EOCs and MACs are based on NIMS and ICS concepts and procedures.

The bottom line in Table 8 is that all airports are engaged with their neighboring or surrounding EMAs and MACs, either as assets (ESFs) or equal partners.

TABLE 8. AIRPORT RELATIONSHIPS TO LOCAL EMA OR MAC

Type of Relationship between Airports and Local EMA or MAC	Airports in Study (May total >35)
Acts as ESF in disasters	25
Is its own MAC	22
Is a city, county, or state department and fully integrated into city, county, or state emergency management system	20
Cooperates informally	18
Has a mutual aid pact	18
Has EOC and acts independently	16
Is fully integrated as ESF(s) in local EOC	14
Employs statewide emergency management system or mutual aid	10
Is its own MAC and acts independently	9
Cooperates with EMAs only for aviation and terrorism and is otherwise isolated from outside EMA/MAC function	2

Airports engage in cooperative disaster planning, training, drilling, and exercising with a wide array of partners. Table 9 summarizes the questionnaire results. The frequency with which partner types appears mirrors Table 8 except that key federal agencies appear in the list.

The number of joint planning efforts involving airports and local health departments was probably low in the fourth quarter of 2008, but it is increasing rapidly. A planning-training-drilling-exercising nexus that involves airports, EMS, local hospitals, local health departments, potentially CDC, and potentially mass transit agencies is emerging with the current strong focus on mass casualty exercises. This emphasis is expected to continue to grow. In interviews, many study airports reported using mass casualty simulations to an increasing extent in Part 139 triennial exercises and in their own training and drilling.

TABLE 9. PLANNING, TRAINING, DRILLING, & EXERCISING PARTNERS

Partner	Airports
Local police	34
Local fire	34
Local EMS	34
TSA	33
FAA	32
Red Cross	29
Local hospitals	28
CDC	26
Local sheriff	26
State emergency management agencies	24
Mass transit agencies	24
Adjacent local governments	23
Other DHS	21
Adjacent EMAs	20
DOD	15
Regional government organizations	15
Other airports	15
FEMA	14
National Guard	14
Adjacent MACs	12
ATF	11
Air National Guard	11
Coast Guard	10
Local military base	10
NORTHCOM	6
National Guard NERF-P	5

Mobile Hospitals/DMATs	2
Local health department	Not queried

Plans and Exercises

The airport questionnaire did not ask about general continuity of operations (COOP) plans; rather, it examined six specific types of airport plans related to continuity of operations during disasters or disaster-support activities: quarantine, damage assessment for the airfield, decontamination, airport repair, use of alternative transport modes, and use of alternative airports in the region. Table 10 presents the results, which indicate that most airports are focused on aviation-related problems and solutions at their own facilities than on alternatives using other transportation modes or other airports. Interestingly, comparison of mutual aid pacts (Table 6) and cooperative planning relationships (Table 9) shows inconsistencies, particularly in the area of efforts involving other airports. While 12 airports reported having plans for using alternate regional airports, two airports reported having mutual aid pacts with other airports, but 15 airports reported other airports as being cooperative planning, training, drilling, and exercising partners. These differences may indicate three different types of interactions.

TABLE 10. CONTINUITY OF OPERATIONS (COOP) PLANS

COOP-Related Plan	Have Plan
Quarantine	27
Damage assessment	25
Decontamination	25
Repair plans	22
Alternate transport modes	14
Alternate use of regional airports	12

The meat of the results from the airports' questionnaires (Table 11) includes information on 27 specific sub-plans that would likely be involved in various disaster situations in which mutual aid is activated in either direction—from outside aiding the airport, or from inside with the

airport serving as an asset to community response. Table 11 presents facility pre-siting philosophy (on the airport or off the airport), the age of the plan, the ratio of plans less than 12 months old to those between 12 and 24 months old, and the number of plans exercised within the last 24 months. The 12-month/24-month ratio indicates a trend, with ratios over 0.50 indicating plans being given more recent attention, through either updates or new creation. Ratios over 0.80 are highlighted in Table 11 to indicate four areas of greatest current interest: employee notification, employee shelter and feeding, pandemic, and communication. Plans over 24 months old do not appear in Table 11.

Most of the 27 sub-plans involve facilities or activities sited within the airport boundaries. The only type of sub-plan with more activity pre-sited outside the airport is for mobile hospitals. This is a surprising outcome considering the wide publicity given to the operational consequences at MSY of mobile hospitals inside the airport after Hurricane Katrina.[23] There also seems to be a trend toward off-airport pre-siting of decontamination facilities.

TABLE 11. SPECIFIC SUB-PLANS

Plan	Pre-sited Facility (On airport of off airport)	Plan Age <12 Mo	Plan Age 12-24 Mo	Ratio of 12 Mo Plans to 24 Mo Plans	Exercised in Past 24 Mo
Personnel Access for Emergencies	On 14 Off 4 Both 0	15	5	0.75	15
Emergency Vehicle Access to Airport	On 22 Off 1 Both 3	19	9	0.68	14
Employee Notification	On 20 Off 1 Both 2	21	3	0.88	20
Replacement Employees	On 8 Off 4 Both 0	9	3	0.75	7
Employee Shelter and Feeding	On 19 Off 0	16	3	0.84	9

	Both 2				
Mobile Hospital Pre-Siting and Operations	On 4 Off 8 Both 0	6	2	0.75	6
Triage	On 20 Off 1 Both 2	19	9	0.68	17
Medical Evacuation	On 16 Off 4 Both 0	17	10	0.63	14
Morgue (including Ice Supply)	On 11 Off 7 Both 2	10	10	0.50	7
Damage Assessment	On 21 Off 1 Both 1	15	7	0.68	6
Engineering Assessment	On 16 Off 4 Both 2	14	7	0.67	9
Emergency Repair	On 17 Off 2 Both 3	12	5	0.71	7
Incoming Logistical Aid	On 15 Off 5 Both 2	16	6	0.73	10
Aid Provision Logistical Hub (Redistribution of Aid)	On 11 Off 7 Both 0	6	5	0.55	4
Emergency Intermodal Capabilities	On 10 Off 2 Both 2	7	3	0.70	7
Pandemic	On 15 Off 4 Both 3	17	3	0.85	13
Chemical Decontamination	On 9 Off 8 Both 3	12	10	0.55	10
Biological Decontamination	On 7 Off 9 Both 2	12	10	0.55	7
Radiological Decontamination	On 8 Off 9 Both 2	13	8	0.62	8
Regional Airport Coordination	On 10 Off 3 Both 2	11	3	0.79	8

Airport Emergency Operations Center (EOC)	On 21 Off 1 Both 5	21	7	0.75	15
Airport Backup Emergency Operations Center (BEOC)	On 10 Off 4 Both 2	8	7	0.53	7
Communications	On 20 Off 1 Both 5	24	4	0.86	17
Reception Center	On 15 Off 2 Both 1	14	4	0.78	10
Airport Evacuation	On 19 Off 1 Both 1	16	5	0.76	8
Repatriation Center	On 7 Off 4 Both 1	4	2	0.67	2
Reunification Center	On 8 Off 5 Both 3	9	3	0.75	5

Comparison of sub-plans updated within the past 12 months with plans exercised within the past 24 months led to the inventory in Table 12 of plans that were recently exercised. These data are related to the “current plans” dependent variable used earlier in this report: “current plans” refers to the count of recent plans, recently updated for each airport. It is exactly the same as counting the number of times an individual airport appears in Table 12. This inventory shows which airports may be able to provide specific model sub-plans to other airports.

TABLE 12. REFERENCE LIST TO AIRPORTS
WITH RECENT PLANS, RECENTLY EXERCISED

Plan	Plan Less than 12 Months Old, Exercised within Past 24 Months
Personnel Access for Emergencies	AUS, BOS, CLE, DTW, FLL, IAH, IND, JAC, LAS, MCO, MIA, ORD, SEA, SFO, SLC
Emergency Vehicle Access to	BTR, CLE, DFW, HNL, IAH, IND, JAC, LAS, MCO,

Airport	MIA, ORD, RSW,SEA, SFO, SLC	
Employee Notification	AUS, BOS, BTR, CLE, CMH, DEN, DFW, DTW, HNL, IAH, IND, JAC, MCO, MIA, MSP, OAK, ORD, PIT, RSW, SFO, SLC	
Replacement Employees	AUS, BTR, CLE, IAH, JAC, MCO, MIA, SFO	
Employee Shelter and Feeding	BOS, BTR, CLT, DTW, IAH, MCO, MIA, RSW, SEA	
Mobile Hospital Pre-Siting and Operations	Off-airport	CLT, JAC, MCO
	On-airport	DTW, IAH, MEM, SEA, ORD
Triage	CLE, CLT, CMH, DFW, DTW, HNL, IAH, IND, JAC, LAS, MCO, MEM, MIA, ORD, PIT, SEA, SFO, SLC	
Medical Evacuation	CLE, CLT, DFW, DTW, IAH, IND, JAC, LAS, MCO, MEM, MIA, ORD, SEA, SFO, SLC	
Morgue (including Ice Supply)	CLE, DTW, LAS, MCO, MCO, MIA, ORD, SEA	
Damage Assessment	CLT, DTW, IAH, LAS, MCO, MIA, SEA	
Engineering Assessment	CLT, DTW, IAH, LAS, LAX, MCO, MIA, ONT, SEA, SFO	
Emergency Repair	DTW, IAH, JAC, LAS, MCO, MIA, SEA, SFO	
Incoming Logistical Aid	CLE, CLT, DEN, DFW, IAH, IND, JAC, MCO, MIA, ORD, SEA	
Aid Provision Logistical Hub (Redistribution of Aid)	CLT, DTW, IAH, MCO, MIA	
Emergency Intermodal Capabilities	CLE, CLT, DTW, IAH, MCO, MIA, SEA, SFO	
Pandemic	BOS, CLT, DEN, DTW, HNL, IAH, IND, JAC, LAX, MCO, MIA, ONT, PHX, SEA, SLC	
Chemical Decontamination	CLE, DFW, DTW, IND, LAS, MCO, MIA, SEA, SFO, SLC	
Biological Decontamination	DTW, IND, LAS, MCO, MIA, SEA, SFO	
Radiological Decontamination	DTW, IND, LAS, MCO, MIA, SEA, SFO, SLC	
Regional Airport Coordination	DTW, IAH, IND, LAX, MCO, MIA, ONT, SEA, SFO	
Airport Emergency Operations Center (EOC)	CLE, CMH, DFW, DTW, IAH, IND, JAC, LAS, LAX, MCO, MIA, ONT, RSW, SEA, SFO, SLC	
Airport Backup Emergency Operations Center (BEOC)	DTW, IAH, IND, JAC, MIA, MCO, SEA, SLC (Note special case of MSY doing remote backup EOC from DFW.)	
Communications	BTR, CLE, CMH, DFW, DTW, IAH, IND, JAC, LAS,	

	LAX, MCO, MIA, ONT, ORD, RSW, SBN, SEA, SLC
Reception Center	DFW, DTW, IAH, IND, LAS, MCO, MIA, MSP, SBN, SEA, SLC
Airport Evacuation	DEN, DFW, DTW, IAH, IND, JAC, MCO, MIA, SEA
Repatriation Center	DTW, IAH, MCO, SEA
Reunification Center	IAH, MCO, MIA, SEA, SFO, SLC

Sub-study – Results from the South Florida Workshop and Preliminary Meetings in Orlando and Tampa

Healthy, well-maintained relationships are critical to airport-airport, airport-emergency management agency (EMA), and airports-EMAs cooperation. Peer-to-peer, airport-to-airport, and agency-to-agency relationships are currently strong, but need to be further fostered to ensure preparedness. Succession planning is critical to ensure that connections outlast personal relationships. Sound succession planning practices include managers demonstrating open-mindedness, understanding that they will have successors, practicing mentorship, identifying key talent early, and "wickering in" senior managers (i.e. placing managers in the role of observers) so that watch standers and middle managers have to take initiative in real incidents, drills, and exercises.

Many parallel information and assistance request links operate during normal operations, during unusual aviation operations (e.g., diversions or special security situations), and during all phases of disaster and catastrophe preparedness, response, and recovery. These links typically connect horizontally, i.e. peer-to-peer or vertically within agencies. For example, airport operations chiefs or operational watch standers routinely communicate with each other, as do fire chiefs, police chiefs, security coordinators, TSA officers, CDC officers, and Customs and Border Patrol officers. These parallel links have

many benefits and drawbacks that need to be reconciled to enhance efficacy of operations. Benefits include efficiency of communications; leveraging personal relationships; mutual trust and mutual respect; rapid response; minimization of red tape; shared experiences building shared expertise; and interoperability and interchangeability of skills and equipment. The drawbacks include lack of "diagonal" awareness, a potential for poor coordination within an airport or an agency, and a potential for mixed signals and crossed communications. Airports and communities can enhance preparedness by developing these benefits, building on existing strengths, and minimizing or eliminating these drawbacks.

Reducing red tape may lead to fiscal issues, but this is normally avoided by the "good neighbor" approach to mutual assistance, which is the prevalent approach among all players in South Florida. Linking parallel information flows during disasters is a crucial element, as was seen during Orlando's assistance through SEADOG (Southeast Airports Disaster Operations Group) aid to Louis Armstrong New Orleans International Airport after Hurricane Katrina. SEADOG's conference calls were being used without coordination in DHS's and TSA's briefings to national leadership, which led to misunderstandings regarding the situation and aid requirements; this situation was resolved during 2008 hurricane season.[24] In Florida, however, Florida Department of Emergency Management, operating through county emergency operations centers (EOCs), provides exactly this sort of parallel coordination and link. The primary difficulty in reconciling these information flows may be because SEADOG and the airports use bottom-up communications practices while TSA and most federal agencies use top-down links. This situation could be ameliorated by creating a standing link

among airports in regions that would facilitate simultaneous horizontal and vertical aid requests and situational awareness. Regional WebEOC that will shortly roll out in Palm Beach, Broward, Miami-Dade, and Monroe counties will offer exactly this capability as the airports and EMAs will all have their EOCs as nodes in the system. FL-Regions 5 and 6 already have E-Team Incident Management software in place, and it is available to the airports within the region should they want to use it. Indeed, some airports such as Orlando already have seats on both city and county E-Team systems. This would be a fruitful area for further discussion among the regional players and for other regions.

SEADOG's critical partnerships among airports in the southeast U.S. and the nation are growing and maturing, and could conceivably operate internationally. Based on pro bono mutual aid, each member airport supplies personnel or equipment as requested by a member airport. SEADOG itself does not have dedicated SEADOG personnel or equipment, except for a mobile command center. Expanding these resources and/or conducting a feasibility study could be constructive.

WESTDOG is modeled on SEADOG for the region from Denver to the West Coast, and a similar system is being established in New England. The success of SEADOG could serve as a model for the rest of the country, particularly the mid-Atlantic and Midwestern regions. Joint U.S.-Canada, U.S.-Mexico, and U.S.-Caribbean groups might also be beneficial.

Another asset in building synergy among airports is the Index E ARFF (Air Rescue Fire Fighter) Fire Chief Association, a leader in airport-to-airport communication and cooperation. Of the 29 Index E airports, 18 chiefs participate actively in this association, which could serve as a model for other peer-to-peer relationships. The fire

chiefs' relationships cut across fire, EMS, emergency management, special situations, and operations, demonstrating very strong relationships within their airports. One current initiative of the Index E chiefs is building stronger relationships with the CDC over EMS roles in pandemic incidents.

Florida airports typically have equipment and qualified personnel in excess of the FAA Part 139 minimum operating requirements so that they can effectively accomplish their ever-changing missions. This also means that they can often give as well as receive aid from their EMA partners.

Florida's statewide emergency management mutual aid agreement (based on FC Statute 252) has great power and flexibility to respond in general, to coordinate state and local actions, to use and protect airport assets wisely, and to coordinate communications. Combined with enlightened statutes and funding, it has created an effective preparedness posture, and this posture clearly includes the airports and their emergency management partners.

In Florida during a disaster or catastrophe, county EOCs (emergency operations centers) are the key link between airports and their EM partners. Airport, agency, and city EOCs link directly to the county EOC and, through the county EOC, to the state EOC. As noted above, forthcoming technological innovations such as WebEOC and E-Team will facilitate the execution of these roles. However, the use of different multi-EOC connection software may create compatibility issues when adjacent regions are involved in the same incident, and these issues must be addressed. Clearly, this scope of this issue extends beyond the physical environment of airports.

NIMS and ICS are the operational standard at all Florida airports and EMAs, which facilitates cooperation, coordination, and communication.

Aviation cooperation is outstanding among airports, and this level of cooperation clearly transfers to disaster situations. Managers at all eight airports emphasized this point and gave concrete examples.

The Federal Aviation Administration (FAA) plays an essential role in any situation involving operations at two or more airports through airport closures or flight diversions. The FAA must be a key member in any regional emergency management planning for airports and their EMA partners.

Airlines are key players in that they decide when and where to fly within the limits set by the FAA. Like the FAA, airlines need to be involved in regional contingency planning.

In Florida, federal agencies have been active partners with the airports in preparedness activities. The Transportation Security Administration (TSA) has been highly cooperative when non-routine operations have been required, as is evidenced by the success of short-notice screening responses in conjunction with airports during flight diversions due to weather and by hurricane preparations involving cruise ships and airlines. TSA actively participates with airports in planning and exercising. In Florida, USDOT, DHS including TSA, and HHS including CDC have just developed a Risk-Based Border Strategy that was exercised for the first time in fall 2008, and the exercise was in South Florida. Like TSA and FAA, CDC works cooperatively with the airports in the region.

The Florida Department of Health is working with CDC and the airports to expand the pool of fully qualified health personnel to deal with pandemic incidents. Also in conjunction with CDC, Florida is in the lead in domestic reporting of communicable diseases. These two initiatives combine to optimize the thoroughness and timeliness of response to health issues initially reported by airlines, airports, or federal agency personnel.

The four largest airports (FLL, MCO, MIA, and TPA) all report training, drilling, and exercising at levels above the basic requirements. (The four smaller airports were not questioned on this point.) Their drills and exercises improve readiness by focusing on realism, succession training, EOC operations, involvement of EMA partners, and strong after action reviews and procedural changes. MCO noted that when an issue surfaces in after action reviews, it is built into the scenario for the next tabletop exercise (TTX).

Some issues of credentialing EMA personnel for airport access during disasters remain unresolved. In some cases, EMA personnel must be escorted within airports. This undoubtedly varies from airport to airport and probably depends on the ownership of the airport and the terms of mutual aid agreements with EMAs. Airports sometimes have to deal with self-appointed volunteers who arrive to help with disaster response or recovery. Airports and EMAs, like everyone else, would benefit from credentialing, control methods, and staging procedures to handle such volunteers.

In summary, the South Florida workshop found a pattern of strong cooperation among airports and between airports and other agencies that contributes to regional preparedness and resilience in the face of hurricanes, pandemics, or other disasters. The

workshop also highlighted a number of areas that can be improved, including fiscal concerns, policies, and procedures.

Conclusions

Two very strong conclusions emerge from this study. First, U.S. airports have generally been aggressively planning for disasters beyond the traditional boundaries of Part 139, either in advance of Advisory Circular 150/5200-31B or in anticipation of it. Second, based primarily on in-person conversations with airport managers and the South Florida workshop, airport managers have a deep understanding and appreciation that good working relationships with surrounding emergency management agencies are essential to airport preparedness. Airports' needs for surge capacity during disaster response can be met through wise mutual aid agreements made effective through joint training, drilling, and exercising.

In the special case of South Florida, a number of very strong conclusions arose from the workshop and the pre- and post-interviews. South Florida's airports and EMAs have a tradition of working well together born out of experience with past disasters, good statutes and local ordinances, and a spirit of operational cooperation and good-neighborliness. There are multiple strong, quick communications networks among airports and EMAs, as well as within federal agencies. These communications networks have grown out of routine operations such as weather diversions, and have proved to work in more extreme scenarios. They could profitably be rationalized.

SEADOG is viewed as a powerful alliance that the Florida airports can count on if they are struck by disaster, just as Louisiana and Texas airports counted on their assistance through SEADOG in 2005-2008. The key federal agencies involved in aviation

in South Florida—FAA, TSA, CDC, and CBP—show responsiveness and flexibility in working with airports in unusual operational situations. Access control to airports to facilitate EMA participation in incidents may merit examination, at least at some airports. Intensive joint training, drilling, and exercising enhance local and regional partnership and preparedness. Personal relationships are essential in cooperation and coordination, and relationship continuity should be the goal of succession planning.

Although this study intentionally did not address manmade disasters such as terrorism, the preparedness measures included in it will serve the airports and their surrounding communities, as most or all of the specific plans would apply to any large-scale intentional disaster affecting the airport or its wider community.

Best Management Practices (BMPs) for Airport Preparedness in a Community Context

a. Cooperative planning with EMA and other mutual aid partners
b. Joint training with mutual aid partners and other EMAs
c. Frequent drills
d. Realistic drills
e. Using real incidents for training and drills
f. Airport involvement as asset in non-aviation community drills
g. Aggressive after-action reviews (AARs) for real incidents, drills, and exercises
h. Formal NIMS and ICS training at all levels within the organization, including refresher training
i. Succession planning
j. Drills and exercise that test succession by removing key employees

k. "Wickering in" senior management during training, drills, and exercises

l. Pre-siting as many disaster response facilities outside the airport as possible

Innovative preparedness measures

a. **Establish remote EOC during disaster evacuation.** In 2008, MSY's senior management relocated to DFW and successfully tested handling a simulated disaster response using DFW's EOC connected to MSY's. Similar applications could use local government EOCs or mobile command centers.

b. **Utilize training CDs compiled from surveillance tapes during real incidents.** JAN makes CDs from CCTV surveillance tapes to show actions and consequences during real incidents, and uses the CDs in AARs and training. This may be the ultimate extension of the BMP of using real incidents for training.

c. **Establish frequent, regular meetings of operations and emergency managers**. At MEM, key airport, tenant, airline, local government, and state EMA leaders meet every two to four weeks to focus on two agendas: (1) planning, training, drilling, and exercising, and (2) maintaining the person-to-person relationships that undergird trust.

d. **Integrate GIS into EM and EM communications**. (This strategy may have already crossed over into BMP status.) Of the 35 airports, eight have GIS systems integrated into their emergency management communications systems that include EMA partners and 13 airports with such applications under development. Airports have recently put great emphasis on GIS for controlling aircraft and vehicles on the airfield as a management tool and a

method for reducing collisions and intrusions. Communications improvements allow sharing of GIS information with EMA responders. Table 13 summarizes the status of airport GIS systems connected to EMA systems.

TABLE 13. GIS APPLIED TO EMERGENCY MANAGEMENT

	Yes	Under Development	No	No Response
GIS used for EM	8	13	13	3

e. **Institute cooperative pandemic planning with CDC, state health department, local health department, and airport.** This is already happening at many airports, but the South Florida airports are well advanced in this effort.

Characteristics of Successful Airports in Terms of Emergency Preparedness & COOP

First, it must be noted that U.S. airports have all been phenomenally successful at dealing with disasters and at serving as community assets during catastrophic events. On those terms, all U.S. airports, including those in this study, are successful. Based on all information gathered in this study and the 2007 studies, airports that are notably successful at emergency preparedness in a community context develop and cultivate the following practices:

a. Sense of community
b. Stability of staff
c. Top-down support and leadership
d. Ongoing cooperation with surrounding EMAs
e. Frequent realistic drills and exercises
f. Use of real events as training and drilling opportunities

g. Aggressive use of AARs and innovative use of documentation of incidents

h. Presence of EM position (not tested in this study)

i. Active in Index E Chiefs association (where applicable)

j. Active in SEADOG or WESTDOG

k. Presence of CDC and interactive planning with health agencies

l. Cooperative relationship with TSA (not tested in this study)

m. Greater proportion of international passengers

n. Large operating budget.

Suggestions for further study

Regional cooperation and coordination among airports, both in general and specifically in emergency preparedness, are promising research areas strongly suggested both by the questionnaire data and at the South Florida workshop. Participants also suggest fruitful areas of investigation into relationships between regional groups of airports and groups of regional or state emergency management agencies. Research is currently planned in these two areas during 2009 in New England and the State of Minnesota. ACRP has also made cooperation and communication among airports a research topic for 2009.

Sharing current plans between airports, as listed in Table 12, is worth investigating further, and ways to facilitate sharing of specialized plans should be explored. This need for dissemination of information may suggest a new role for groups like SEADOG and WESTDOG or an expanded role for AAAE and ACI-NA. For now, Table 12 indicates which airports reported specialized plans that are current.

Airports where emergency preparedness has been dominated by managers with a fire background have more aggressively adopted NIMS and have instituted a wider variety of non-aviation emergency planning than airports dominated by managers with a law enforcement perspective, according to questionnaire results and interviews. Since this correlation cannot be definitively demonstrated by the data thus far, further studies regarding effective management and leadership styles would be worthwhile.

SEADOG and WESTDOG have made magnificent contributions in the form of airport-to-airport voluntary aid. Future research could document and analyze this aid in the past and investigate enhancements such as credentialing of specialized airport employees, establishing equipment pools, and utilizing publicity methods to make airports aware of the groups' capabilities. An informative comparison could be made between the relatively free-form SEADOG and the more structured WESTDOG. Areas of the country not involved in SEADOG or WESTDOG—the Midwest, Middle Atlantic, and New England—could be investigated for the feasibility of developing similar groups. The 2009 New England and Minnesota coordination and cooperation studies already planned may bear on this.

Coordination of communications among different networks (DHS and SEADOG, for example) is worth pursuing as a way to improve situational awareness, enhance management tools, and reduce confusion.

Application of geographic information systems (GIS) to airport operations and to coordination with mutual aid agencies is another fruitful area for future research. This area is rapidly evolving, as is shown by the 13 out of 35 airports having GIS-EM communications systems under development in the fourth quarter of 2008.

The advantages of off-airport pre-siting of disaster activities such as mobile hospitals for airport COOP and COB during disaster-related operations would be productive areas for further study. Table 11 indicates that most airports still pre-site disaster-related activities at the airport.

Safety Management Systems (SMS) are a burgeoning technology with excellent potential for improving preparedness and enhancing relationships between airports and EMAs. Further study of SMS could yield promising results for enhancing airport and community preparedness.

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[1] Index E refers to a commercial airport used each day by five or more passenger aircraft greater than 200 feet in length.
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[17] Throughout this report, the three-letter airport codes will be used to identify airports. Table 1 shows the full name corresponding to each code.
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[24] Tom Draper, email, February 17, 2009.