Nota: Este documento contiene imágenes en mal estado.

U.S. Department of Transportation
Federal Aviation Administration

Southern Region

P. O. Box 20638
Atlanta, Georgia 30320

OCT 10 1984

Dr. Cid Guimaraes
MEDICO
Av. Angelica, 954
Sao Paulo, Brazil

Dear Dr. Guimaraes:

I certainly appreciate your assistance and cooperation in our recent airport safety assessments in Brazil. Your contributions were especially helpful due to your knowledge of the local situation. Bob, George, and I sincerely enjoyed meeting and working with you. I was very favorably impressed with Brazil and the people we met.

I look forward to receiving your written comments.

Sincerely,

David E. Clemens, Manager
Safety and Standards Branch
Airports Division

US Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: Review of Airport Disaster Preparedness at Rio, Sao Paulo, Brazilia

Date: November 19, 1984

From: Manager, Safety and Standards Branch, ASO-610
Airports Division

Reply to Attn of:

To: Robert C. Barr (NFPA)
George F. Gallagher (Pan Am)
Dr. Cid Guimaraes (PAHO)
Ollie Davidson (AID/OFDA)
Howard D. Lusk (U.S. Embassy--Brazilia)
Ray Ybarra (FAA--Consulate General--Rio)
Robert Francis (FAA--ASO-4)

The attached advance copy of subject report is self-explanatory. The six copies going to Brazil will be mailed from Atlanta on November 26, 1984.

David E. Clemens

Attachment

US Department
of Transportation
**Federal Aviation
Administration**

Southern Region

P. O Box 20636
Atlanta, Georgia 30320

November 19, 1984

Salvador Storino Neto
Major Aviador
Ministerio da Aeronautica
Anexo - 1.º Andar
Brazilia - DF - CEP 70.045

Dear Major Storino:

Review of Airport Disaster Preparedness
at Rio, Sao Paulo, Brazilia

On behalf of the Federal Aviation Administration (FAA) and the State Department (AID/Office of U.S. Foreign Disaster Assistance), it is my pleasure to transmit the enclosed review team comments. Six copies are provided for appropriate distribution within your organization and the airports we visited.

It was the review team's pleasure to have visited your country and have the opportunity to exchange airport related views and ideas. We all learned much from this visit and look forward to returning your fine hospitality. Please express our sincere appreciation for all the assistance and friendship provided by those with whom we worked, especially Major Filho and Lt. Mendel.

Should you have any questions, please feel free to call me or any of those referenced in our comments.

We will keep you advised in reference to our discussions concerning the review team and representatives from the host countries getting together for an airport disaster type workshop.

Sincerely,

David E. Clemens
Manager, Safety and Standards Branch
Airports Division

Enclosure

cc:
Review Team Members (with encl)
Ollie Davidson (with encl)
Howard D. Lusk (with encl)
Ray Ybarra (with encl)
Robert Francis, II (with encl)

REVIEW OF AIRPORT DISASTER PREPAREDNESS

AT SELECTED BRAZILIAN AIRPORTS

BY

UNITED STATES SPONSORED SAFETY TEAM

AT THE REQUEST OF THE BRAZIL

Ministerio Da Aeronautica

NOVEMBER 1984

REVIEW OF AIRPORT DISASTER PREPAREDNESS

EXECUTIVE SUMMARY: The three airports reviewed are in general conformance with the guidance in ICAO's Airport Service Manual, Part 7, Airport Emergency Planning. Airport management and Ministerio da Aeronautica officials are aware of the importance of disaster preparedness and have conducted various planning, training, and simulation exercises that are comparable with similar activities at major U.S. airports. These efforts should continue, disaster preparedness must be current. Review team comments and recommendations should be carefully evaluated for appropriateness.

BACKGROUND

Participants attending a recent airport certification meeting sponsored by the FAA Southern Region identified the need to review U.S. and International Airport disaster preparedness. Each international airport is required by ICAO to have an airport disaster plan; however, many plans are inadequate or have not been reviewed or tested recently. Since many passengers travel through South American Airports, the Department of State (AID/OFDA) and FAA offered to provide specialists to review airport disaster preparedness with local aviation authorities in South America, Central America, and Caribbean area.

Brazil was one of several countries that accepted this offer of review and invited a team to visit Brazil during the week of September 24-28, 1984.

Major Aviador, Salvador Stovino Neto, Ministerio da Aeronautica, was the team's official point of contact with the government of Brazil. Major Stovino, Major Luciano Aives Filho, and Lt. Rejane e Mendel accompanied the team on all airport inspections and the review of all disaster plans. Names and addresses of individuals associated with these airport reviews are provided in Attachment I.

PURPOSE OF TEAM REVIEW: 1) Provide technical advisory service to the Brazilian government in regard to airport disaster preparedness. 2) Identify any local procedures or practices that might be beneficial to airports in other countries.

AIRPORTS REVIEWED

1) Rio de Janeiro International Airport (September 24, 1984)
2) Sao Paulo Congohhas Airport (September 25, 1984)
3) Brazilia International Airport (September 27, 1984)

NOTE: The team visited Cumbica Airport (scheduled for opening in January 1985) for general information purposes on September 26, 1984.

GENERAL

All review team comments, observations, opinions, and recommendations are based entirely on the very brief and limited personal inspections and observations made during these review visits. Time did not permit follow-up on numerous points which may have shown that the team comments or concerns are not appropriate or, in fact, are not valid. Therefore, should further investigation show a review team comment or concern invalid, simply remove such item from further consideration. The following example illustrates this type of comment: While observing the simulated aircraft disaster exercise at the Brazilia International Airport from the control tower, it appeared that the mock aircraft accident site was within the runway safety area (the runway remained open during the simulation). This was mentioned to the airport officials and they indicated they were being careful to stage the accident outside the safety area and, while it may appear otherwise, the accident was outside the safety area. This response completely satisfied our comment/concern.

Both positive and negative comments/observations/opinions are included.

Comments that apply to more than one airport are shown in the Rio de Janeiro section and are preceded by an asterisk (*) and apply to the airports indicated in parenthesis ( ).

COMMENTS/OBSERVATIONS/OPINIONS[1]

Rio de Janeiro International Airport

Airport Emergency Plan

- The airport authority showed us their Airport Emergency Plan which, although complete, does not follow the format contained in Part 7 of the ICAO Airport Service Manual. The document contained no publication date nor was there any page to denote revisions.

- It was not clear whether or not "Paper" or "Table-Top" disaster exercises are conducted. If not, we recommend such at least once every 12 months. (The publication "Disaster Exercise", FAA-Rocky Mountain Region, provides guidance on Table-Top exercises and is forwarded under separate cover). It is also recommended that individual sections of the plan be tested from time to time.

*- No provision has been made in the Airport Emergency Plan for a temporary morgue nor for a refrigerated facility capable of handling a major disaster. The Rio Airport does stock 100 body bags. (Rio, Brazilia)

[1] Detailed comments relating to medical support will be provided by Pan American Health organization under separate cover.

- It was readily apparent that all levels of airport management were familiar with the emergency plan. Top management appeared exceptionally well informed as to the plans and details and displayed considerable operational knowledge in demonstrating various aspects of the emergency plan. This type of involvement by top management is outstanding.

*- Planning and training should continue to emphasize "strong command". While strong leadership is needed in responding to an airport disaster, the role of the on scene disaster commander cannot be overrated. The commander will establish the tone of the entire disaster response - choose him carefully and provide him the necessary training and resources to represent you well. (Rio, Sao Paulo, Brazilia).

Community Disaster Plan

- We were advised that such a plan exists. However, we were shown no formal document outlining its provisions.

*- Be sure other governmental organizations have officially approved the plans that will determine how things will be done in their jurisdiction. There can be no question of who has authority for what - key personnel must readily know this and be prepared to act themselves or support others as the plan directs. (Rio, Sao Paulo, Brazilia).

Airport Emergency Plan Test

- We were shown various reports of previous simulated accident conditions which have been held on a regular basis with a preplanned scenario. It appeared that a major accident was simulated every year. This is excellent and will pay many dividends in a real accident. The fact that these major exercises are conducted clearly demonstrates top management's support in the area of disaster preparedness. The partial test, such as that conducted for the review team, is a very effective training tool.

Airport/Community Medical Support

- There is a well organized airport medical department, but it is doubtful that it is sufficient in size to perform triage for a major aircraft disaster.

Water Rescue

The emergency plan included water rescue, and the airport has several high speed rescue boats located in multiple locations adjacent to the airport. The airport should assure that the boats have sufficient flotation devices for a major water accident (300+ people). While we do not have details, we understand that there are specially designed inflatable hoses that can be quickly inflated and deployed for assisting large numbers of water victims. (We will attempt to provide additional information on this at a later date). We also understand an additional boat was on order or was being considered. Agreements with other organizations that could assist in water rescue should be worked out and included in the overall disaster plan. See NFPA 403, Aircraft Rescue and Fies Fighting Services, Chapter 6.

Communications

- What we saw of the communications center was excellent - very modern equipment. Personnel appeared well trained. However, regardless of how well airports have planned, when a major accident has happened, communication in general has been a problem. You should continue your improvement efforts in this area.

*- The disaster alarm system appeared to work quite satisfactorily - especially in alerting the volunteer emergency units. In regard to alerting the CFR station, we suggest that the initial information be broadcast over loud speakers so all CFR personnel will have as much information as possible. We recognize additional information must be transmitted over radios while the CFR trucks are en route. (Rio, Sao Paulo, Brazilia).

Ground Traffic - Off Airport

*- The sheer volume of ground traffic on all roads near the airport appears to present a major problem in transporting goods and people to and from the airport during a major accident. We can offer no solution to this situation, but strongly recommend that appropriate officials consider this problem in more detail. Two-three hundred injured passengers will require major emergency ground transportation. Many lives could be lost if treatment is delayed by transportation problems. First efforts should be toward improving ground transportation to and from adjacent hospitals. (Rio, Sao Paulo)

Security

We saw no major problems in this area. We would assume the military personnel at the on-airport base would be used to supplement airport security personnel if needed. The control of access to the air operations area through the Air Force Base was very good.

On Airport Control of Ground Vehicles

*- While we saw great numbers of ground vehicles on the apron areas, the team was very impressed with orderly movement of these vehicles and their strict compliance with traffic signs and markings. We were told that all drivers receive special training. Each airport has done an outstanding job in this area and should continue their efforts. The handling of large numbers of passengers on the apron area was also very effective. It is quite clear a lot of thought was given to safety in developing the existing procedures for vehicle and passenger control on the apron areas. (Rio, Sao Paulo, Brazilia)

Emergency Volunteers

*- The emergency volunteer program was quite impressive. It appears that the airports have made effective utilization of large numbers of airport employees/tenants. The individuals we observed appeared well-trained and experienced in their assigned duties. Appropriate training is the key to any volunteer program. There are portions of this program that might well be applied in other countries with positive results. It is estimated that several hundred volunteers might well be available at these airports in an emergency. (Rio, Sao Paulo, Brazilia)

Crash/Fire/Rescue (CFR)

*- Most of the vehicles observed at all airports appeared to be in good physical and mechanical condition and adequate in number. However, there is concern that the ability of the present equipment to handle a major wide body aircraft fire. It appears that the turrent discharge rates and turrent stream range are limited and may not be adequate for the fire potential presented by these aircraft.

All airport authorities and air force personnel should examine NFPA 403, Aircraft Rescue and Fire Fighting at Airports, NFPA 402M, Aircraft Rescue and Fire Fighting Operational Procedures and NFPA 414, Aircraft Rescue and Fire Fighting Vehicles. (Rio, Sao Paulo, Brazilia)

*-All airports visited should acquire equipment that can be used to illuminate an accident scene at night. (Rio, Sao Paulo, Brazilia)

*-All crash rescue personnel should be involved in a continuous training program. NFPA 403, Aircraft Rescue and Fire Fighting Services at Airports, Chapter 8 adresses the issue of aircraft rescue and fire fighting personnel and specifies three categories of training. (Rio, Sao Paulo, Brazilia)

Sao Paulo Congohhas Airport

Background

*- The Sao Paulo Congohhas Airport serves a metropolitan area of approximately 14 ~~military~~ people. It is completely surrounded by residential and commercial development. It is also located on top of a hill with rather steep dropoffs at the ends of the runways. All aircraft are boarded from the apron; therefore, there are large numbers of passengers walking or being bussed to and from the terminal or between aircraft. In physical size and the large volume of traffic, the Congohhas Airport could be compared to Washington National Airport in Washington, D.C.. The new Cumbica Airport will greatly improve air service and airport safety. International flights are scheduled to start using Cumbica in January 1985.

Airport Emergency Plan

- We were told that an Emergency Plan exists. However, we were only provided with excerpts. We were not shown the complete document. Based on discussion, we assumed it was in general compliance with ICAO recommendations. Airport management stated they were quite familiar with ICAO standards.

Community Disaster Plan

- SAO has a community disaster plan which incorporates provisions for supporting a major aircraft accident at any of the three city airports. We were provided a copy of this document.

- We understand that the major high-rise fires several years back prompted major community disaster planning.

Airport Emergency Plan Test

- We were advised that regular drills take place, but there was no documentation as to this as in the case of RIO.

- The following comments relate to the tests we observed:

1. Well planned - good response from volunteer group.
2. Good use of wrecked aircraft.
3. If CFR building is to continue to be major medical staging area, we suggest some means of blocking high wind from entering ends of building. This is a real problem in bad weather.
4. We understand a new command vehicle is on order - this vehicle should be marked so everyone could readily recognize it as the command post. It must also have adequate communication. In a major accident, the command post will need more than a single hand held transceiver. As mentioned under the Rio comments, you can always expect major communications problems in a major disaster.

Off Airport Ground Traffic

- As with Rio, transportation to and from the airport during a major disaster would be a major problem due to the large amount of off airport street traffic. There is no early solution, just keep working on it.

CFR Training

CFR personnel appeared well trained; however, there is an urgent need for a better (sound-proof) CFR training classroom. The existing classroom is much too noisy for effective training. It also appeared that additional training aid might add to the training program.

CFR Access to Approach Areas

We did not see any quick access to a crash in the approaches directly from the airport. Consideration should be given to improving CFR access to the runway approach areas.

Safety Areas

The airport clearly has good procedure to keep ground vehicles out of the safety area; however, we did see one small VW car parked in the safety area between the main runway and roadway that runs in front of the CFR building. The car was near the outer edge of the safety area.

Brazilia International Airport

Airport Emergency Plan

-The airport director produced a copy of the Airport Emergency Plan which he advised was under revision, and which would be disseminated to all interested parties, including the airlines, within the very near future.

Airport Emergency Plan Test

-A simulated exercise was carried out for the team which indicated a high state of readiness as well as an impressive display of immediate community support in the form of many city fire and medical detachments which reached the airport within a quarter hour of the emergency alarm. Considering the distances involved in some of the emergency vehicles responding, the response times were exceptionally good. The value of these tests cannot be overstated.

Community Disaster Plan

- As in the case of RIO, we were told that a Community Disaster Plan exists, but we were shown no document. There was no evidence that either the community or the airport were prepared to handle a major aircraft disaster on or within the vicinity of the airport.

ILS Localiser Antenna Support Structure

- We recommend that you investigate replacing the large/massive existing reinforced concrete structure with something less massive and rigid. With the existing grades, an aircraft overrun might be survivable if it were not for this structure. As the Globe accident clearly showed, their structure is a potential problem (we recognize this structure is outside the extended safety area). You may even wish to consider locating the antennas inside the extended safety area (closer to runway elevation) on frangible antenna supports.

Compatible Land Use Zoning

While we did not review or discuss this subject, we noticed a new residential development several miles out under one of the approaches. Considering the excellent opportunity for compatible land use control, we recommend steps be taken to protect existing and future airport development (it is possible this is already being done).

Miscellaneous

- As soon as copies can be made, we will send various disaster/CFR video training tapes to Major Salvador Stovino Neto for appropriate distribution. A list of these tapes is provided in Attachment II. These tapes need not be returned.

- Separate disaster preparedness review teams were sent to Chili, Argentina, Bolivia, the Dominican Republic, and Brazil. We are considering having a workshop for all team members and host countries for the purpose of sharing the information gained during these reviews and further discuss disaster preparedness. Assuming the foreign countries could obtain reasonable transportation through their own carriers to Miami, we wil attempt to hold such workshop there. We will keep Brazil advised of this effort. We will also try to work in some major disaster/CFR demonstrations or special training.

*- All airports (airside and landside) were the cleanest this review team has ever seen. Airport management can be justifiably proud of their efforts in this area. We did not see so much as a chewing gum wrapper on the airside of any airport. The airline ground equipment also looked like it was exceptionally well maintained. (Rio, Sao Paulo, Brazilia).

- Mr. Asdrubal Goncalues Torres Junior requested a comparison between ICAO and FAR-139 CFR requirements. This is provided in Attachment III.

- The team was quite impressed with the construction progress at Cumbica Airport. The quality of runway grooving and making was first class. We understand Cumbica will open to international traffic in January 1985. Since construction will still be in progress, special attention must be given to airport safety during this period.

All CFR vehicles at Cumbica will be new equipment. The new CFR buildings have already been constructed, and have a sound-proof training room. We were assured that equipment would exceed ICAO recommendations.

There were some discussions concerning "Powerback" operations at Cumbica. An article from Airports International on this subject is provided in Attachment IV.

- Many, if not all, of the CFR protective clothing we observed contained asbestos. We no longer recommend CFR clothing that contains asbestos due to its possible relationship with pneumononiosis due to asbestos particles. We recommend that your asbestos CFR clothing be replaced as soon as practical. The FAA is currently developing a specification of CFR protective clothing. See Attachment IV for a list of U.S. manufacturers that procure Fire Fighter Protective Clothing - Aluminized.

In addition, airport fire fighters should also be provided with gloves, boots and self-contained breathing apparatus.

Equipping airport fire fighters with full protective equipment will allow the fire fighters to approach fires and make entry into aircraft for rescue and fire control purposes. In addition, the protective equipment will protect the fire fighters and they will not be susceptible to thermal and respiratory injury.

- As with most airports, the major accidents are going to present the biggest problems. However, when one views the number of large aircraft serving Rio, Sao Paulo and Brazilia, these airports must be prepared for a major accident - involving possibly 20-300 victims. It would appear that these airports have focused the majority of their planning on something less than a major accident. Of course, the efforts to date would certainly contribute to rescue efforts in a major accident. We would simply recommend that these airports place additional emphasis on preparing for a major accident. In addition, top management must be made aware that this additional emphasis requires additional significant resources - responding to a 200 victim accident is certainly going to require much more planning, equipment, and personnel than a 50-60 victim accident.

- We ask that you review airport emergency plans to assure appropriate attention has been given to keeping the airport open during a disaster. Be sure the authority for closing the airport is clearly defined (this decision must be made rather quickly at times).

- All airport emergency plans should include provisions for dealing with the news media - who will be the airport spokesman, where will the media personnel be housed, when will the media be allowed at the crash site, etc. These plans should be coordinated with major media organizations. (What impact will news releases have on rescue operations?)

- Suggest that major participants in airport disaster activities become more familiar with ICAO Airport Service Manual, Parts 1 and 7. Frequent review of these manuals will certainly keep everyone headed in the right direction.

ATTACHMENT I

Related Names, Addresses, and Phone Numbers

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ATTACHMENT II
List of Films - Video Tapes

Video Tapes

"Operation Air Safe '84" - coverage of disaster exercise at Columbia Metropolitan Airport, Columbia, South Carolina. Contains narrative introduction and critique. Produced by Columbia Metro.

No title as yet - disaster exercise at Allen C. Thompson Field, Jackson, Mississippi. This tape is being produced by Southern Region as training material for use by FAA, Airports, and mutual-aid organizations.

Air Canada Fire - News service coverage of Air Canada on-board fire at Greater Cincinnati International Airport (video only, no narrative).

Air Wisconsin Metroliner

PSA-182 Mid-Air Collision at San Diego - News service coverage.

Aircraft Accident and Hijacking at Peachtree-DeKalb Airport - News service coverage by three local stations and ABC News.

Evacuation of Eastern 727 at Miami International - News service coverage of passenger evacuation after gear up (nose wheel) landing.

Piedmont and Sunbird - Local news service coverage of two arrivals involving landing gear problems.

Films Converted to Video Tapes

"Red Alert" - FAA production concerning on-airport emergencies.

"Everglades and After" - Rescue operations and casualty management after crash of Eastern L1011 in Everglades.

ICAO vs. U. S. CFR Standards

The following tables are a comparison of U. S. minimum crash/fire/rescue requirements for certificated airports and ICAO minimum standards for air carrier airports. These comparisons are based on Federal Aviation Regulation, Part 139 (U. S.) and ICAO "Airport Services Manual, Part 1, Rescue and Fire Fighting" dated 1977.

(U.S.)

TABLE 2-1

(ICAO)

INDEX	Airport Category	Aeroplane Overall Length				Maximum Fuselage Width
A	1	0	up to but not including	9 m	(29.53 ft)	2 m (6.56 ft)
	2	9 m (29.53 ft)	up to but not including	12 m	(39.37 ft)	2 m (6.56 ft)
	3	12 m (39.37 ft)	up to but not including	18 m	(59.06 ft)	3 m (9.84 ft)
	4	18 m (59.06 ft)	up to but not including	24 m	(78.74 ft)	4 m (13.12 ft
	5	24 m (78.74 ft)	up to but not including	28 m	(91.86 ft)	4 m (13.12 ft
B	6	28 m (91.86 ft)	up to but not including	39 m	(127.95 ft)	5 m (16.40 ft
C	7	39 m (127.95 ft)	up to but not including	49 m	(160.76 ft)	5 m (16.40 ft
D	8	49 m (160.76 ft)	up to but not including	61 m	(200.13 ft)	7 m (22.97 ft
E	9	61 m (200.13 ft)	up to but not including	76 m	(249.34 ft)	7 m (22.97 ft

(U.S.)

INDEX	AIRCRAFT LENGTH (FT)
A	Not more than 90'
B	More than 90' and not more than 126'.
C	More than 126' and not more than 160'.
D	More than 160' and not more than 200'.
E	More than 200'.

Table 2-2. - Minimum Usable Amounts of Extinguishing Agents For Aqueous Film Forming of Fluoroportein Foam (see 2.3.4B)

Airport Category	AQUEOUS FILM FORMING OR FLUOROPROTEIN FOAM						COMPLEMENTARY AGENTS					
	Water			Discharge Rate water/compound/minute			Dry Chemical Powders		or Halocarbons		or CO_2	
	l	gal (Imp)	gal (US)	l	gal (Imp)	gal (US)	kg	lb	kg	lb	kg	lb
1	230	50	60	230	50	60	45	100	45	100	90	200
2	670	150	180	550	120	150	90	200	90	200	180	400
3	1 200	270	320	900	200	240	135	300	135	300	270	600
4	2 400	550	660	1 800	400	480	135	300	135	300	270	600
5	5 400	1 200	1 440	3 000	650	800	180	400	180	400	360	800
6	7 900	1 750	2 100	4 000	880	1 060	225	500	225	500	450	1 000
7	12 100	2 700	3 200	5 300	1 200	1 400	225	500	225	500	450	1 000
8	18 200	4 000	4 800	7 200	1 600	1 900	450	1 000	450	1 000	900	2 000
9	24 300	5 300	6 400	9 000	2 000	2 400	450	1 000	450	1 000	900	2 000

Table 2-3. - Minimum Usable Amounts of Extinguishing Agents For Protein Foam (see 2.3.4B)

U.S. INDEX	Water (gal)	DRY CHEM /AFFF	Airport Category	PROTEIN FOAM ICAO						COMPLEMENTARY AGENTS					
				Water			Discharge Rate water/compound/minute			Dry Chemical Powders		or Halocarbons		or CO_2	
				l	gal (Imp)	gal (US)	l	gal (Imp)	gal (US)	kg	lb	kg	lb	kg	lb
A	0	450/50	1 2 3 4				See Table								
B	1500	450/50	5	3 600	800	960	2 600	600	700	135	300	135	300	270	600
C	3000	450/50	6	8 100	1 800	2 160	4 500	1 000	1 200	180	400	180	400	360	800
D	4000	450/50	7	11 800	2 600	3 200	6 000	1 300	1 600	225	500	225	500	450	1 000
E	6000	450/50	8	18 200	4 000	4 800	7 900	1 800	2 100	225	500	225	500	450	1 000
			9	27 300	6 000	7 200	10 800	2 400	2 900	450	1 000	450	1 000	900	2 000
				36 400	8 000	9 600	13 500	3 000	3 600	450	1 000	450	1 000	900	2 000

Table 2-4. - Minimum Number of Vehicles

US INDEX	ICAO Airport Category	Rapid Intervention Vehicle		Major Vehicle	
		ICAO	U.S.	ICAO	U.S.
A	1	1	1	0	0
	2	1		0	
	3	1		0	
	4	1		~~1~~	
	5	1		1	
B	6	1	1	2	1
C	7	1	1	2	2
D	8	1	1	2 or 3	2
E	9	1	1	3	2

ATTACHMENT IV

Fire Fighter Protective Clothing - Aluminized

Cairns and Brothers Inc./Midwest Safety Manufacturing
60 Webro Road
Clifton, NJ 07012
Phone: (201) 473-5867

*Fyrepel Products, Inc.
Post Office Box 518
Newark, OH 43055
Phone: (614) 344-0391

General Scientific Equipment Company
Limchiln Pike and Williams Avenue
Philadelphia, PA 19150
Phone: (215) 424-1550

*Globe Firefighter Suits
London Road
Pittsfield, NH 03263
Phone: (603) 435-8324

Holcomb Safety Garment Company
328 S. Jefferson Street
Chicago, IL 60606
Phone: (312) 648-1778

*Janesville Apparel /Division Lion Uniform, Inc.
2735 Kearns Avenue
Dayton, OH 45414
Phone: (513) 278-6531

MFA International, Inc.
Seven Broadway
Taunton, MA 02780
Phone: (617) 823-1111

Mine Safety Appliance Company
600 Penn Center Boulevard
Pittsburgh, PA 15235
Phone: (412) 273-5175

Newtex Industries, Inc.
Railroad Avenue
Post Office Box 25
Victor, NY 14564
Phone: (716) 924-9135

Protector Safety, Inc.
2613 Lucena Street
Charlotte, NC 28225
Phone: (704) 483-5396

Protexall Company, Inc.
Post Office Box 307
Green Lake, WI 54941
Phone: (414) 294-6511

Pulmosan Safety Equipment Corporation
30-48 Linden Place
Flushing, NY 11354
Phone: (212) 939-3200

The Sager Glove Corporation
4030 N. Nashville Avenue
Chicago, IL 60634
Phone: (312) 286-6600

Powerback or push back?

THE SIGHT of airliners moving backwards has become so normal at airport terminals since nose-in gates were introduced, that passengers and airport personnel do not notice the powerful little tugs usually used to tow the planes out. As a result, nobody seems to have noticed that the little tugs are disappearing in many cases and the aircraft are taxiing backwards by themselves.

Since mid-1981, more and more airlines have abandoned the use of tugs for narrowbodied aircraft at many locations and have adopted what the Federal Aviation Administration calls "the use of reverse thrust for rearward taxiing." The airlines prefer to call it "powering back". This should be distinguished from "powering out," which is what the aircraft do when there is no loading bridge, or when the bridge can be moved aside so the aircraft can taxi forward and turn to make its departure.

Eastern Air Lines was the first airline to power back, using the procedure at first only with Boeing 727s and only at Atlanta (*Airports International*, October 1981, page 15). It said at that time that it was considering using the procedure at other airports "but only with 727s at present." It is now powering back regularly at about 35 airports with 727s, DC-9s and, at some locations, with 757s.

Republic Airlines is now performing about 200 powerback departures a day with 727s and DC-9s (series 10, 30, 50 and 80) at the 35 airports on its system where it cannot power out. American Airlines is using powerback departures with 727s and DC-9 80s at most airports it serves. Pan American is using the procedure wherever it operates 727s and does not have its own tugs. Continental and Frontier are also reportedly powering back, and the latter seems to be the only carrier doing it with 737s.

There are three main reasons for powering back, according to Richard Raymond, Airport Planning Engineer for Eastern. It saves time, it saves money and it is the only feasible way to handle the large number of departures within a few minutes of each other required by hub-and-spoke operations.

Richard Raymond said that the time saving "averages one minute per departure —and with 1 500 departures a day that is significant." On the importance of powerback departures to hub operations, he cited Kansas City, where Eastern sometimes has seven departures in five minutes. "Unless we had a whole lot of tugs and a whole lot of people," he said, "that would be quite hard to do. With powerbacks, when they are buttoned up, they are gone."

Richard Raymond preferred not to discuss the cost savings, but Charles E. Hanebuth, Director of Flight Standards and Training for Republic Airlines, said that the main saving resulted from the elimination of the need for a tug and from the fact that the tug driver, who is usually an aircraft mechanic "is freed to do the things he is trained to do."

Warren Goodman examines the arguments for and against doing without a tug

Powering back cannot be done at some gates.

The powerback procedure still requires two ground crew members (a wing walker and a "powerback coordinator," who signals the pilot) in lieu of the tug and driver, it requires an expenditure of "about $15 worth of fuel."

Although turboprop aircraft such as the Lockheed Hercules and the Convair 580 had been moving backwards under their own power for years, there was some question in 1981 as to whether powering back was advisable, practicable, safe and permissible for turbojets. Some aircraft flight manuals prohibited it, but there was no prohibition against it in FAA regulations. When Eastern first proposed to power back at Atlanta, FAA's regional office asked Washington for guidance.

Rick Cremer, Manager of the Air Carrier Branch of FAA's Office of Flight Operations, told us what happened. "We decided," he said, "that if this were to become common practice, we had better control it to see that whatever was to be done would be done safely." In September 1981, the FAA promulgated a new standard prohibiting the use of reverse thrust for taxiing except at specific locations with specified types of aircraft, subject to the approval of the FAA in each case.

The FAA's requirements for approval have been amended twice since then and are now embodied in operations specifications promulgated November 18, 1982. This requires that:

- the carrier's operating manual must contain detailed procedures for the operation;
- the carrier must specify the personnel to be used and the restrictions which will apply at each location to ensure safety;
- the carrier must have a training programme for personnel involved;
- the airport authority must be advised; and
- the carrier must conduct a demonstration of the safety of the operation with each type of aircraft.

At first, the idea of powerback departures for turbojet aircraft was opposed by many airline and airport people. They predicted that:

- the procedure would place a strain on the engines and cause maintenance problems;
- the jet blast would damage other aircraft, ramp vehicles and terminal buildings;
- the engines would ingest loose objects on the ramp;
- there would be a danger of collision with ramp vehicles or other aircraft because the pilot taxiing backwards would have no rearward vision; and
- an aircraft taxiing backwards might tip back on its tail if stopped suddenly.

All of these fears have either been proved groundless or have been obviated by the procedures adopted. To avoid undue strain ▶

on the engines, engine thrust during powerback is limited to 75 per cent N_2 RPM (N_1 RPM is the speed of the low pressure compressor, N_2 RPM is the speed of the intermediate compressor; N_3 RPM is the speed of the high pressure compressor).

With this restriction, powerbacks are performed only where the ramp surface is level or slopes down away from the terminal building. With 757s, Eastern powers back only where the ramp has a downward slope of at least 0.8 ft per 100 ft.

As a further engine protection measure, the powerback procedures usually require the aircraft to move forward 12 to 18 m before putting the engines into reverse thrust. "This is done," Charles Hanebuth explained, "to overcome tyre 'flat spotting.'"

The fear of jet blast damage has been allayed by tests performed by Eastern and Republic and by demonstrations at various airports which the carriers have conducted to satisfy FAA and the airport authorities. The DC-9 tests, according to Hanebuth, showed wind velocities from zero to 14 knots at the wing tip and from 7 to 23 knots at the nose of the aircraft.

"The jet blast from a powerback departure," Richard Raymond says, "is much less of a factor in relation to the terminal building than the 'normal' power out."

"No one has ever broken a terminal building window on powerback," Charles Hanebuth points out, "but windows are broken every now and then with power out departures."

The fear of foreign object damage (FOD) has also proved groundless. Republic observed the effect of the blast on ramp objects by seeding the ground with Styrofoam pellets. When a DC-9 moved over them in reverse thrust, Hanebuth says, "they swirled up to about 30 inches above the ground, then drifted out towards the end of the wing." He says that the chance of FOD is much greater after a landing when the aircraft has slowed down to 60 to 70 knots and points out that no aircraft powering back has ever sustained any FOD.

Rick Cremer of the FAA said that since powerbacks started three years ago there had been only two minor collisions—one with a blast fence and one with the horizontal stabiliser of another aircraft. He said that both had involved the same carrier, which he did not name, "and we stopped the whole programme until they retrained the wing walkers."

Charles Hanebuth readily admitted that Republic had been the carrier involved. He said that the way to minimise the possibility of such incidents in the future, in addition to better training of wing walkers, was not to use the procedure on heavily congested ramps or on ramps where there was insufficient clearance (as in Las Vegas where the blast fence collision occurred). "You have to remember," he added, "that we have had ground handling accidents for years with aircraft taxiing forward—and tugs have also pushed aircraft into other objects."

To avoid the possibility of the aircraft tipping on its tail, powerback procedures call for stopping the aircraft only by putting the engines into forward thrust with throttles at idle speed. Republic's procedures, for example, specifically prohibit any use of brakes while moving rearward and require the pilots to place their feet flat on the floor. Any steering adjustments required must be done with nosewheel steering.

At the FAA's request, tests were conducted with aircraft loaded to maximum permissible rearward centre of gravity, using light and moderate braking action while moving rearward at normal powerback speeds. "As expected," Charles Hanebuth says, "the aircraft would pitch slightly aft, but at no time during the tests was nosewheel steering capability lost, nor did the nose strut reach full extension. We didn't even come close to tipping the aircraft on its tail."

What do you think?

Does anybody powerback at your airport? Has your airline any experience of the technique? Or did you reject the idea? The Editor will print your views in a future issue. Address on page 3.

Each airport and each gate position must be carefully evaluated as to ramp slope; congestion; proximity to taxiways and blast fences; obstructions such as bumps or drains; and other relevant factors before powerback procedures are instituted. In addition, powering back should not be done when a ramp is contaminated with snow or ice.

With those caveats, the airlines using the procedure are enthusiastic about its value and most pilots on those airlines share that enthusiasm. The Air Line Pilots' Association, however, says that it is witholding its judgement on powerback operations pending "completion of current evaluations." The International Federation of Air Line Pilots' Associations, without waiting for ALPA's decision, is already on record as opposing powerback departures.

In Boston, Massport is concerned about the noise of powerbacks because there are some residential areas unusually close to the airport terminal area. It has permitted American to perform powerback departures at some gates where the terminal building acts as a noise shield between the aircraft and the communities. But Massport is now retaining a consultant to formulate an overall policy.

Despite the enthusiasm of some carriers for powerback departures, no carriers outside of the US seem to have adopted the procedure as yet.

Air Canada studied powering back about a year ago, at the request of Transport Canada, which wanted guidance on a number of requests from US airlines for permission to power back at Canadian airports. Charles Simpson, vice president flight operations, told us that Air Canada had concluded that "there is nothing wrong with powerbacks under all the right circumstances."

But Air Canada does not use the procedure. At the smaller airports it uses, there are usually no loading bridges and the aircraft power out. At larger airports it operates six types of aircraft and would have to have tugs and crews available to tow the widebodies. "Those crews would just sit and watch the powerback departures," Mr Simpson said, "so we have yet to identify any savings".

Air Canada is also concerned with the potential engine damage, "especially when there is a lot of snow and sand around", a condition it faces about six months a year. "But we are studying it again," Mr Simpson said.

At least one or two airlines in the US do not believe in it. Melvin E. Volz, vice president flight operations of United, said, "It's costly, it is noisy and there are some safety considerations we don't feel comfortable with. We use it only as a last resort, only with 727s and only at six airports out of the 135 we serve."

Mr Volz said he disagreed with the figures on fuel costs which Republic had cited and pointed out that powering back required running the engines two or three minutes more on each departure than a tow-back. He also said that United powered back only where it was necessary to avoid the addition of manpower and equipment to airports with only a few departures a day.

At present, none of the carriers using powerback procedures for narrow-bodied aircraft seem to have any thought of trying the same thing with widebodies. The carriers say that such aircraft are too heavy to move with reverse thrust. McDonnell Douglas says it "does not recommend powering back for the DC-10 because the construction of the high-bypass engines increases the possibility of foreign object damage and there is greater possibility of compressor stall."

Lockheed says no studies of the feasibility of the procedure for the L-1011 have been done "because there is a restriction on using reverse thrust below 70 knots."

The almost unanimous feeling on powerbacks for wide-bodies, therefore, is that it can't be done. But that's what everyone thought about powerbacks for all turbo-jets just four years ago. ■