into strong helicopter sales, but the potential for growth in Asia and on the Russian mainland still exists. Air medical markets, too, are growing slowly, and seem to show a drift back toward single-engine aircraft as these become more reliable.

Regulation

The collective impacts of stricter European operating regulations (JAR Ops-3), prospective restrictions on noise, and possible user fees, while a potential factor in worldwide growth, were thought to be minimal on the U.S. fleet size. However, it might stimulate earlier replacement of nonconforming helicopters.

Comments on FAA Draft Forecast

The vertical flight panel was unable to directly address FAA forecast worksheet because of a significant disparity between FAA's present estimate of the U.S. civil rotorcraft fleet (about 3,600) and that generally accepted by the industry (in excess of 6,000). The key difference seems to be in the respective estimates of *active* aircraft, and this may be related to the survey procedures used to gather the data. The panel did suggest convening a joint FAA-Industry working group to examine the problem.

The panel felt that a 1996 fleet of 6,000 aircraft would grow by 1.7 percent, 2.3 percent and 1.6 percent in 1997, 1998, and 1999 respectively; and by an average annual rate of 1.5 percent between 1996 and 2002. The implicit annual sales would, of course, translate to much higher growth rates if a fleet size of 3,600 were the used as a basis.

The panel projected an increase in hours flown *per aircraft* of between 1 percent and 2 percent per year from 1997 through 1999, and leveling off thereafter. Again, the resultant change in *fleet* flight hours would be substantially greater using industry's, rather than FAA's, estimates of fleet size.

The panel found no basis for challenging FAA estimates of the piston helicopter fleet size or flight hours.

Suggested Improvements

In view of the disparity between FAA and industry estimates of the present turbine fleet size (3,600 vs. 6,000), the panel suggested that a joint FAA/industry work group be convened to reconcile the data. The key difference appears to be in the respective estimates of active aircraft, and this may be related to the survey procedure used to gather the data.

AIR CARGO

Panel Leader:
Anne Strauss-Wieder
A. Strauss-Wieder, Inc.

Panelists:

Magnus Bjorkman
Innova International

Christopher Brehm
Price Waterhouse LLP

John Cammett
Aeroterm

Brian Clancy
MergeGlobal, Inc.

Charles C. Erhard
Washington Dulles
International Airport

Jim Esswein
Federal Express

Pierre Herron
Pratt & Whitney Canada

Daniel Muscatello
Aviation Development
Services, LLC

Morton Plumb
Anchorage International
Airport

Carl Seiberlach
VZM Transystems
Corporation

George Stamos
Federal Aviation
Administration

Pierre Vilain
Louis Berger &
Associates, Inc.

Introduction

The air cargo panel was a new addition to the workshop, and the group's objectives, therefore, differed from the other workshop panels. Specifically, the discussions held by the panel were geared toward laying a foundation and developing a framework for further discussion of air cargo. The two key questions addressed were:

- What are the key trends and issues in the air cargo industry today?
- Should the FAA resume air cargo forecasting?

This second objective was specifically posed to the panel by FAA to help provide insights into the need for additional or modified data.

The panel included representatives from airport operators and developers, carriers, manufacturers, and consultants to the industry. A wide range of trends and issues were discussed during the panel sessions, and FAA question was fully addressed. However, the panel recognized that these discussions and this summary should be considered only a starting point for more in-depth deliberations.

Overview of the Industry

To understand air cargo, first it is important to understand the overall freight industry. Freight is a *derived demand*. Freight does not move of its own accord. Rather, goods move in response to the demands of industrial and retail users. These users determine when goods need to arrive, either for production processes or to meet customer demands for products.

The summary below provides an overview of industry trends. Mr. Brian Clancy, MergeGlobal, presented a review of the industry during the plenary session and these trends and their implications were discussed during the panel meetings.

Growth in the global arena. Air cargo is a small, but important and growing segment of the goods movement industry. According to MergeGlobal, 22 million metric tons of freight were moved by air in 1996, representing $70 billion in retail revenue. Air cargo is projected to grow rapidly, based on the three forecasts shown below (TABLE 1).

TABLE 1 COMPARATIVE AIR CARGO FORECASTS

Forecast	Time Period	Average Annual Growth
Boeing	1996-2015	6.7 percent
Douglas Aircraft	1995-2015	7.4 percent
MergeGlobal	1995-2000	7.9 percent

Source: AirCommerce, Journal of Commerce, December 30, 1996, p. 37.
Note: The Boeing forecast has been updated to reflect the information provided in the 1996/1997 World Air Cargo Forecast report.

Air cargo uses. As indicated by Mr. Clancy in his remarks during the opening plenary, users choose to move freight by air for reasons including:

- High value to weight ratio,
- Fragile cargo,
- Perishable cargo (which can be defined as physically perishable such as fresh flowers or economically perishable as in the need to get products on the shelves to meet real-time customer demand),
- Unpredictable demand (both emergency and product life cycle related), and
- Lack of alternative transport mode.

Means for transporting air cargo. Cargo is moved in two ways—in the bellies of passenger aircraft and in dedicated all-cargo aircraft. An estimated 55 percent of the world's air cargo capacity or "lift" is belly cargo.

Domestic air cargo. Air cargo movement in the U.S. is expected to grow by 5.7 percent annually through 2002 according to MergeGlobal. The Boeing forecast anticipates 5.5 percent growth through 2015. It is important to note that a significant portion of the domestic air cargo indicated by waybills or handled on-airport never enters an aircraft; instead this cargo is exclusively handled by truck. MergeGlobal has estimated that "truck-to-truck" movements may represent up to 20 percent of "air cargo" movements. Boeing estimates that "truck-to-truck" movements may be as high as 10 percent.

Industry structure. Three competitive structures currently exist within the world air cargo industry: integrators who provide door-to-door service, multinational freight forwarders who work with airlines to move cargo, and regional or niche forwarders who work with airlines and agents to move cargo. The integrators are increasingly dominating the market. The *1996/1997 World Air Cargo Forecast* estimates that integrators now handle 60 percent of the U.S. domestic air cargo market and may attain a 37 percent share of the world air cargo market by 2015. Examples of integrators include companies such as Federal Express, United Parcel Service, DHL, and Airborne.

In all cases, these companies have extensive and efficient ground systems to expedite the movement of goods door-to-door, as well as electronic tracking systems that allow customers to monitor cargo status. Most experts also agree that the forwarder segments of the market are undergoing a consolidation phase that will eventually lead to fewer—but larger—forwarders who can better compete with the integrators, as well as a group of forwarders who specialize in specific commodities or markets.

The integrator market, itself, is also undergoing

change. This change is driven primarily by a maturation of the just-in-time trends, resulting in a separation of *time definite* and *time critical* cargo. Time definite refers to cargo that must be delivered within a specific time window. However, shippers and suppliers know in advance what this window is and can specify less expensive, slower transport methods. In response to the shift to time definite requirements, integrators now offer second- and third-day delivery services. Time critical cargo is defined as cargo that must be delivered as soon as possible and will remain overnight or same-day service.

The *1996/1997 World Air Cargo Forecast* noted that in 1995, the number of deferred shipments handled by the integrated carriers was roughly equal to the number of overnight shipments. Further, the forecast noted that deferred or time definite shipments have also attracted the attention of the scheduled passenger airlines that can offer this service more easily and competitively than expedited overnight services.

Key Trends and Issues

- *Air cargo is growing rapidly; however, the industry is still in its infancy.* The panel recognized that air cargo plays a crucial and growing role in goods movement. However, in many respects, it is the youngest of the freight modes. For example, in all the other transportation modes—highway, rail, and maritime—the movement of people and goods have separated. Highways are used by cars and buses for the movement of people; trucks carry freight. Separate trains carry people and goods. In the maritime industry, specialized vessels (including large container vessels) transport freight. However, in the aviation industry, 55 percent of the current capacity is in the bellies of passenger aircraft and is secondary in priority to the movement of passengers. Similarly, it was noted that no standard means for moving air cargo exists. Unlike the maritime industry, there are no standard container sizes; instead container sizes are designed to fit existing space on aircraft. The panel members anticipate that the air cargo industry will go through a maturation process similar to the other modes.
- *Air cargo is important.* Many panel members were concerned about the lack of focus on air cargo. As one panel member noted, "Air cargo has always played second fiddle to passengers. If there was ever a time to focus on air cargo, its now with the growth of international trade."
- *Use of all-cargo aircraft or freighters is increasing.* This conclusion was reached based on two trends observed by the panel: (1) a growing portion of the air cargo market is handled by integrators who used dedicated aircraft and, (2) passenger aircraft are increasingly pushed to go further and faster, limiting the amount of cargo they can carry. Further, gate turnaround for passenger aircraft is decreasing, providing less time to handle cargo.
- *Cargo movement is performed by a wide range of aircraft.* Not all cargo movements are done by older 727 aircraft. Instead, cargo is moved by a full range of aircraft including single-engine planes and the Boeing 747 and even larger aircraft. Examples of smaller aircraft used in cargo movement include the Caravan, ATR 42 and 72, PC 12 and Beech 1900C.
- *Air cargo is part of an intermodal system.* Airplanes do not deliver cargo right to the door. Instead, cargo moved by aircraft is part of an intermodal system that generally relies on trucks to bring goods to and from the airport. Accordingly, airports that handle air cargo must ensure efficient truck access and ground handling facilities in order to remain competitive. Similarly, trucks may be used to substitute for aircraft in the movement of air cargo. The choice of modes depends on length of haul, time requirements, and costs.

Integrated carriers have led the way in intermodal systems by improving the efficiency and connectivity of the ground portions of the move and by offering advanced information systems to customers. These efficiencies, along with a focus on the total trip, have enabled the integrated carriers to increase their market share. Forwarders will need similar improvements to their ground operations and information systems if they are to successfully compete for air cargo in the future.

- *Air cargo doesn't have to flow through the airport nearest its origin or destination.* While proximity to the site of production or market can be a factor in airport selection, it is the *overall cost and time* involved in the transport of a shipment from origin to destination across all modes that are the deciding factors. In some cases, integrators have invested in their own infrastructure assets. For example, Federal Express established its major hub in Memphis, Tennessee. In such cases, carriers may seek to maximize the use of their own assets. In addition, an airport more distant to the origin or destination may offer a wider selection of carriers and routes, providing more options for the forwarders making the airport decision. Finally, certain factors such as landing fees or congestion may encourage carriers to seek and use alternative airports in a particular region.
- *Full service airports are still examining where air cargo fits on-airport.* Many full service airports are reaching capacity decision points; that is, assessing means to handle anticipated increases in passenger movements or accommodating projected growth within land constraints. Accordingly, many airports are analyzing or questioning where air cargo fits in.

This issue is particularly important when it is recognized that a significant amount of air cargo conducted on-airport may be truck movements. Some airports have called for a closer relationship between on-

and off-airport activities and investments so as to maximize efficiencies. Integrated carriers are already doing this through the use of on- and off-airport facilities. In some land constrained locations, a powerful financial incentive exists for them to do this—the lease rate differential between on- and off-airport space can be as high as ten dollars per square foot.

- *Use of all-cargo airports is expected to increase.* As full service airports strive to meet passenger growth projections and the use of freighters increases, the use of dedicated all-cargo airports will increase. This is consistent with the belief that passenger and freight movements may separate in the future, similar to the other transportation modes.

Existing and planned all-cargo airports reflect the same near-symbiotic relationship of on- and off-airport uses as that sought by full-service airports. Specifically, all-cargo airports are usually elements in real estate developments that may also include industrial, commercial, retail, or distribution uses on adjacent properties. Examples include Alliance Airport in Texas and Brownfield Airport in California.

Assessment of Current Data and Forecasting Situation

In reviewing industry trends and attempting to answer the question posed by FAA, the panel considered the current situation regarding air cargo data and forecasting. These discussions focused on three topics:

- The uses for air cargo data and forecasts,
- The availability of air cargo data, and
- The status of air cargo forecasts.

The Uses for Air Cargo Data and Forecasts

The panel recognized that air cargo data and forecasts are used for different purposes by the various organizations involved in air cargo and the aviation industry. At the federal level, it was noted that data and forecasts were previously obtained and used as part of the regulatory and certification processes. However, in today's deregulated environment, air cargo data and forecasts would be used primarily for capital investment and policy decision-making. At the airport and regional level, data and forecasts, according to panel members, are used for marketing and operational purposes in addition to capital investment and policy decision-making. As one airport manager noted, "I need to know how many cargo planes are coming; when they are coming; what are they going to do once they get here; and what will FAA give me for handling these aircraft." Airport operators and developers also need air cargo data to assess markets to target, including identifying cargo originating in their region but using an airport in another area, commodities, and new origin/destination partners.

Carriers similarly need air cargo data and forecasts for marketing. However, they also need this information to match capacity requirements to demand, both networkwide and region-specific. This includes assessments of the type of aircraft used in certain lanes and ground facility requirements.

The panel also noted that air cargo data bases must include information on how the mode relates to other elements of the distribution system; that is, information on all the modes (truck, air cargo, etc.) involved in the total trip movement from origin to destination.

The Availability of Air Cargo Data

The panel acknowledged that there are many sources for air cargo data. Publicly available sources include the T100, international trade data, the Commodity Flows Survey, Airport Activity Statistics, Traffic by Aircraft Type and Class of Service, and Statement of Operations. However, each source supplies only a small segment of the information needed. Accordingly, various data sources must be matched together. The lack of comprehensive or centralized air cargo data bases, according to the panel, is a problem in the industry.

The Status of Air Cargo Forecasts

Air cargo forecasts are currently being done by several organizations, including Boeing and MergeGlobal that publish their findings. These publications are considered valuable resources for the entire industry. Many airport authorities, carriers, and consultants forecast air cargo for private or internal use. These forecasts may be developed for specific uses; for example, an airport may forecast air cargo for its own region.

Suggested FAA Role

With this understanding of key industry trends and issues, as well as the current status of air cargo data bases and forecasts, the panel developed the following suggestions regarding FAA's role in these areas:

- *Identify the key questions that need to be answered at the federal and regional/airport level.* Identifying the questions will identify the critical pieces of information needed to answer them. This process provides a starting point for developing the key data sets and their parameters—level of detail, time frame for collection (monthly, yearly or semiannually).
- *Spearhead an effort to develop comprehensive air*

cargo data bases, primarily through leveraging existing sources. The panel members felt that FAA was the logical modal agency within the federal government to champion the need for comprehensive data bases and to oversee their formulation. In this regard, the panel acknowledged the range of information already amassed by federal agencies. The panel also recognized that new mandated data collection initiatives would not be popular with either the industry or federal budget organizations. Accordingly, the panel strongly suggested that efforts focus on optimizing the use of existing data bases and collection channels.

- *Convene a forecasting forum to develop a consensus view and report*. The panel suggested that FAA follow an established practice in the economics field. Specifically, it was suggested that FAA regularly invite leading air cargo forecasters to a forum to discuss their findings, assumptions, and methods. The objective of this forum would be to develop a consensus view and forecast, which FAA could publish for industry use. It was hoped by the panel that this format would encourage the participation of a broad range of industry and airport forecasters, including organizations that do not routinely publish their forecasts.
- *Consider undertaking air cargo forecasting at the macro level*. Similar to airport and private industry forecasts, the panel recognized that certain needs and uses for macro-level forecasts exist at the federal level which may not be fully addressed by current air cargo forecasts. The panel, therefore, suggested that FAA consider undertaking its own air cargo forecasting to meet these needs.

Summary

The air cargo panel at the 1997 workshop faced a unique mission to establish a framework for future discussions and to address a very specific question raised by FAA. The panel concluded that air cargo is an important part of the domestic and global distribution systems, with the use of air cargo growing annually.

The panel also recognized that the industry is still in its infancy, with many changes and challenges facing it as it undergoes the maturation process. These challenges include evolutions in the way goods move (e.g., belly cargo or in all-cargo aircraft); who moves the goods (e.g., integrators or forwarders); where the aircraft will go (e.g., full service airports or all-cargo airports); how the aircraft portion of the move is integrated with ground operations (e.g., intermodal systems); and how cargo is tracked and information is supplied to customers (e.g., electronic data interchange, tagging, and advanced information systems). The outcome of these trends will affect investment, policy, and operational decisions for both the public and private sectors.

Accordingly, good information and forecasts are important, and it appeared to the panel that FAA is the logical federal agency to spearhead efforts in this area. Equally important, since the industry is still evolving, is the need to continue discussions of air cargo on an on-going basis as a means for identifying emerging trends and issues and assessing their implications.

AIRPORTS AND INFRASTRUCTURE

Panel Leaders:

George W. Blomme
Airport Planning & Technology Systems

Gene S. Mercer
Industry Economist

Leonard Ginn
Airports Council International—NA

Panelists:

Ted I. Alman
North Carolina Dept. of Transportation

Lloyd McCoomb
Greater Toronto Airports Authority

Paul C. Burnette, Jr.
Virginia Department of Transportation

Paul J. McGraw
Air Transport Association of America

Edward J. Doyle
Innova International Corp.

John J. McIntyre
Executive Jet Aviation

Kenneth I. Flick
Metro. Washington Council of Governments

William C. Spaeth
Metro. Washington Airports Authority

Elmer H. "Moe" Haupt
National Business Aviation Association

Daniel E. Taylor
Federal Aviation Administration

Laurence Kiernan
Federal Aviation Administration

Participating:

Linda H. Boner
Glassman-Oliver Econ. Cons., Inc.

Mark C. Pfeifer
GRA

Ken Bunauskas
MergeGlobal

Carl Seiberlich
VZM TransSystems Corporation