

INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications Passenger and Cargo Reservations
Type of Industry Air Line
Name of User Pan American World Airways
New York, N. Y.

Equipment Used IBM 7080 Computer Systems (Three)
IBM 7750 Transmission Control Units (Three)
IBM 1401 Computers (Two)
IBM 1301 Disc Files
Bunker-Ramo Input/Output Units, Models 203, 212
Bunker-Ramo Control Units, Models 222 and 223

Synopsis

Pan American World Airways is presently using a multi-computer system for a variety of applications, which include handling of passenger and cargo reservations, controlling message traffic and the providing of hotel room availability.

The passenger reservations portion of the system answers telegraph messages from other carriers requesting space, requests connecting space on the flights of other airlines and processes information regarding equipment and flight changes received from Pan American operations.

Three mechanical cargo processing systems have been combined with the computer system to speed the flow of freight through Pan American Airways' cargo terminal. Some 26 Bunker-Ramo input/output units are tied into the system providing access to the central processor. As cargo is received at the terminal for import and export, pertinent data is recorded by the Bunker-Ramo units and transmitted over high speed communication lines to the computer.

Pan American World Airways is operating a world-wide communication network which links 114 cities to its data processing center in New York City. At the center of the network is a multi-computer system consisting of three IBM 7080 computers, three IBM 7750 transmission control units, two IBM 1401 computers and IBM 1301 disc files.

The system handles passenger reservations, cargo reservations, message flow and hotel room availability. In addition, it performs other functions such as payroll, general accounting, inventory control, purchasing, statistics and forecasting.

Passenger reservations are recorded in disc files in the data processing center. Information recorded includes the passenger's name, itinerary, phone number and other pertinent data.

Current information which ranges from special passenger diets to arrangements for rental automobiles can also be included.

Some 700 reservations sets, IBM Model 1003/4, connect agents to the data processing center in New York.

In the cargo handling and reservations system, 26 Bunker-Ramo Model 203 and Model 212 input/output units are tied into the central computer system. Three mechanical cargo handling systems are combined with the computer system to speed the flow of freight.

THE SYSTEM

Passenger Reservations

Pan American's passenger reservations system provides the necessary information needed to issue passenger tickets, to answer customer questions and to cancel all or part of the passenger's record on short notice regardless of where the original reservation was made. In effect, it handles



NEW YORK
CONTROL CENTER
IS THE HEART OF
COMPUTER COMPLEX
WHICH PROVIDES
RESERVATIONS
SERVICE.

the functions associated with the sale, confirmation and control of an air travel reservation from the time a customer requests flight information until he arrives at his final destination.

A description of a typical transaction follows:

When a passenger calls Pan American, (say from Paris) to reserve a seat on a flight to New York, the reservation agent selects an "air information card," inserts it into the air information device (IBM 1003), depresses the keys for date and the number of seats desired, and the availability button. This data is then transmitted to the data processing center in New York.

The computers in New York scan the flight records in order to find which flights to New York have space available for the date specified. This availability status is sent to the originating station.

When a passenger accepts a particular flight, the reservation agent then presses a SELL button instructing the computers to record a reservation and to automatically update the inventory.

A record of the sale is printed out automatically at the reservations set. This record contains the flight number, date, action taken (sell), the number of passengers, destination city and departure time. The same data is immediately stored in the passenger record at the data processing center.

The agent then confirms the sale to the customer and writes out the ticket. If the passenger wants return reservations, the reservations agent selects the air information card showing the return flights. The steps described above are then repeated.



PAN AMERICAN TELEPHONE
RESERVATIONS SPECIALIST
ANSWERS PASSENGER'S
REQUEST, AIDED BY AN
ELECTRONIC RESERVATIONS
AND COMMUNICATIONS
SYSTEM.

After the itinerary has been entered, additional information such as the passenger's address and telephone number and any special travel requirements are obtained. This information is then transmitted to the data processing center in New York by typing on the reservations set. The computer acknowledges receipt of each item of information by transmitting a reply to the agent, who then presses the END TRANSACTION button.

All of the items on the transaction are checked by the computer and, if there have been any omissions, the agent is notified by a printed message. If there are none, the message "O. K.," is printed out. All the information is stored in the random access memory files as the "passenger information record," which is then made available to any reservations agent in the system.

The passenger reservations system also performs a number of other functions. It answers telegraph messages from other carriers requesting space, requests connecting space on flights of other airlines and processes information regarding equipment and flight changes received from Pan American operations.

If flight space becomes critical, passenger name records are checked for expired ticket time limits; this information is then referred to a supervisory agent in the proper city.

The system also prepares complete manifests of passenger and cargo reservations; prepares and distributes manifests of passenger and cargo reservations; maintains wait lists in the central file which enable personnel to fill requests in the correct order of priority; handles all schedule changes and expedites the notification of passengers about these changes; checks the accuracy of schedule information entered into the system and advises personnel of any corrections; produces regularly scheduled reports and compiles surveys.

Hotel Reservations

Hotel reservations are handled in a similar manner to that used for passenger reservations. Current availability information on any hotel operated or represented by Intercontinental Hotels Corporation (a subsidiary of Pan American Airways) is maintained in the central files. Hotel reservations may be made independently or at the same time. The system will also handle group bookings. Once a reservation has been made, the system will automatically forward the customer's name and related information to the hotel.

Equipment

At the heart of the system are dual IBM 7080 computers. Each machine can store 240,000 characters of information in internal core memories. The IBM 1301 disc storage units can store approximately 400 million characters of information. Information can be retrieved at the rate of 90,000 characters a second; a record can be located and made available to the computers for transmission in less than a second.

Two IBM 1401 computers supplement the 7080's. These computers edit, sort, print and manipulate tape data and provide statistics and reports on the system.

The processing center also includes three IBM 7750 programed transmission control units. These devices, which function under control of the 7080, link the central computers to the communications network. They accept binary signals simultaneously from a number of incoming lines, convert these signals to messages, code-convert and edit these messages and relay them to the central processor. A similar function is performed on outgoing messages. If either input or output traffic is heavy, the 7750's are programed to store the messages until they can be handled by the central processor or routed to the requesting terminal.

The computing center also contains magnetic tape units, punched card readers and printers.

Cargo Handling Operation

Three mechanical cargo processing systems in conjunction with an electronic computer system form the basis of Pan American World Airways' automated air freight terminal at New York's Kennedy International Airport.



ONE OF BUNKER-RAMO
INPUT/OUTPUT SETS,
IN CARGO TERMINAL
AT KENNEDY INTER-
NATIONAL AIRPORT,
CONNECTED TO
COMPUTER COMPLEX
IN PAN AMERICAN
BUILDING.

The main computers, located in New York City, are linked to electronic equipment in the cargo terminal by high speed communication lines. The primary aim of the computer/handling system network is to speed the flow of freight through the terminal by providing instant readout on freight inventory, handling of reservations and simplifying the dispatch and tracing of cargo movements.

The system uses the IBM 7080 computer and the IBM 7750 transmission control unit. This equipment is connected to two Bunker-Ramo control units at the cargo terminal. The Bunker-Ramo units are, in turn, connected to some 26 input/output sets, also manufactured by Bunker-Ramo.

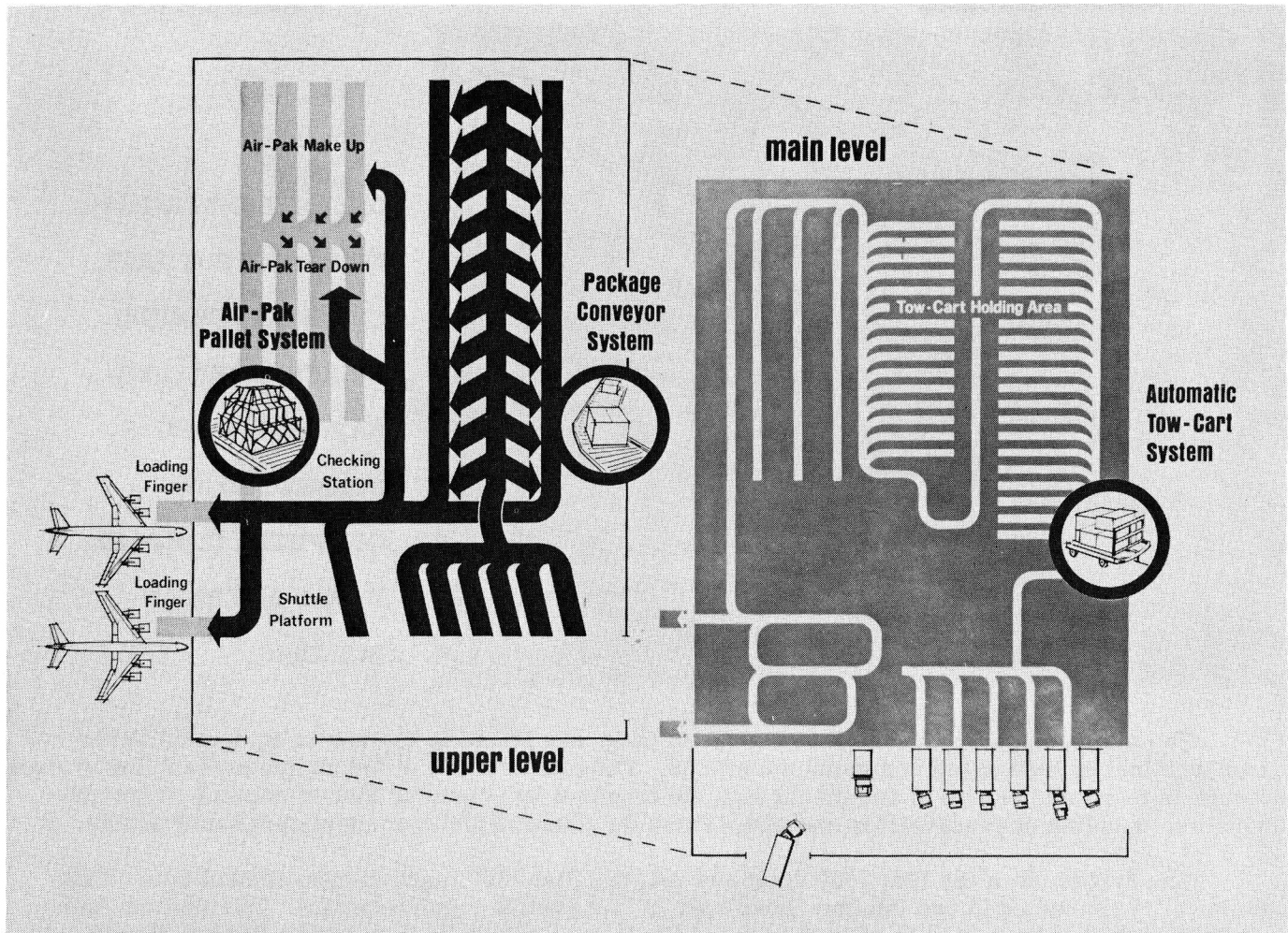
The IBM 7080 has the capability to perform some 300,000 logical decisions a second and has magnetic core storage for 160,000 characters. The IBM 1301 disc file can store an additional 50 million characters of information. The IBM 7750 transmission control unit accepts data simultaneously via the communication lines from the cargo terminal, converts and then relays this information to the 7080 processor. If either input or output traffic is heavy, the 7750 is programmed to store the messages until they can be handled by the central processor.

Included in the cargo handling system is a package conveyor arrangement, an automatic tow cart network and an AirPak pallet system. AirPak is Pan American Airways' name for its jet freighter pallet loading system.

The terminal itself is geared for both import and export freight and is capable of moving cargo directly from truckside on pallets or containers into jet freighters capable of carrying 90,000 pounds.

The system can load and unload two jet freighters simultaneously. Both aircraft can be unloaded in 20 minutes.

The terminal includes special facilities for animals and refrigerated rooms for perishables and pharmaceuticals. The deep freeze cold storage space has the capacity to handle 10,000 pounds of perishables and can accept the carts on which these perishables are loaded from aircraft or trucks permitting automated movement of the material both into and out of the storage area.



CARGO HANDLING SYSTEMS IN TERMINAL INCLUDE TOW CART NETWORK, PACKAGE CONVEYOR ARRANGEMENT, AND AIRPAK PALLET SYSTEM, ALL LINKED TO COMPUTER NETWORK.

When a package is delivered to the cargo terminal for export, it is necessary to obtain pertinent data on the shipment, not already contained on the waybill. This information includes the height of the package, the width, length, actual volume, cubed volume and weight in kilograms or pounds.

Two electronic measuring systems are used to obtain this data. Each unit performs essentially the same function, but in a different way. In both cases, the package is placed on a conveyor belt which passes it through a weighing and measuring device. The Caprocon system, manufactured by Fairbanks Morse Inc., utilizes a photo-electronic unit to determine much of the readout information. The Data-Cube system, manufactured by Detecto Scales, Inc. obtains the same readout information through a sonic beam unit manufactured by Digitrol Systems, Inc.

The maximum piece of freight that can be measured by either of the two units is 36 inches wide by 36 inches high by 60 inches long. This particular size of freight accounts for 95 percent of the cargo handled by Pan American Airways.

Each unit can send this information directly to the cargo inventory computer system. Depending upon the size and weight, individual packages arriving at the terminal for export are placed in one of the three automated handling systems.

As freight is unloaded from the truck and placed on one of the three mechanical handling systems, information regarding the shipment is typed into a Bunker-Ramo input/output unit. The operator can view the data he is typing on a cathode-ray tube display device.

Included in the basic information record are the date and time of cargo receipt, airwaybill number, destination, number of pieces in the shipment, weight of the total shipment, cube of the total shipment in cubic feet, a description of the contents and where the cargo will be stored in the terminal. In addition, other data such as special handling instructions for animals and perishables may be recorded. If the freight is placed in a tow cart, the number of the tow cart is recorded, as is the number of a pallet if the shipment is palletized.

This information is relayed by the input/output set to a central control unit in the terminal and then via high speed telephone lines to the central processor, where it is stored. The data is transmitted at the rate of 2000 bits/second.

When it is time to begin assembling freight for a flight, cargo load control personnel utilize either an IBM high speed printer or a teletype unit to retrieve information from the computer.

A list of cargo holding reserved space for a particular flight is obtained from the computer. This includes information on each piece of freight which was initially fed into the computer. Cargo load control then requests a listing of all of the cargo for the flight destination. The data received by load control from the computer lists the order in which the cargo was delivered to the freight terminal and other pertinent data, including the location of the cargo in the terminal.

The load list is received from the computer in only a few minutes. This information in turn is dispatched to the various areas of the terminal where the cargo is stored. The individual freight pieces are then moved via one of the three handling systems to the loading area.

Some of the freight will proceed to the pallet make-up area, some directly to the loading finger for placement in the belly compartment of the freighter, while complete pallets are moved directly to the aircraft for loading.

Under this procedure, cargo load control, with the information obtained from the computer, is able to decide quickly on the best combination of space utilization for the flight and request a final manifest for the computer.

In regard to imports, as soon as a freighter arrives at the terminal, the cargo manifest is entered into the computer via a Bunker-Ramo input/output terminal. Then, as the cargo is unloaded, each piece is again recorded in the computer via a separate Bunker-Ramo input/output unit. In this way the manifest is checked against the actual cargo received with the computer pointing out any errors.

Thus, the computer retains complete storage of all pertinent data regarding every piece of cargo received or dispatched from the terminal.

Package Conveyor System

The package conveyor system handles both import and export shipments and utilizes both power and gravity conveyors. The maximum size package for the system is 36 inches long, 24 inches wide, 24 inches high with a weight of 75 pounds.

Packages smaller than eight inches long, eight inches wide and four inches long are stored in a small package area.

When placed in the package conveyor system, the package moves to a sorting station where it is coded by destination or flight. From the sorting station it is dispatched by conveyor to any one of 120 gravity flow rack storage lanes which are elevated 12 feet above the terminal floor: each lane represents a particular destination or flight.

In order to load the aircraft, the cargo is retrieved from the package conveyor system by triggering an escapement release. This permits the cargo to move out of its lane by gravity and then by conveyor to a check station. From there, it is dispatched by conveyor to the shuttle platform for transfer to the passenger terminal for loading in the belly compartment of a passenger jet; to the AirPak pallet build-up area; or to one of the loading fingers for placement in the all-cargo aircraft.

Towline Cart System

A floor-level towline cart arrangement is generally used when a package is too large for the package conveyor system. When the towline cart is loaded at the truck dock, it proceeds on a floor track to (1) the export holding area, (2) the AirPak make-up area, (3) the loading fingers for direct access to departing aircraft, or (4) the shuttle platform for dispatch to the passenger terminal and loading of the cargo into the passenger jet.

If a package is stored prior to aircraft loading, the cargo is dispatched to the tow cart export holding area. This area consists of 51 gravity spurs sloped toward a central take-away line with each spur holding up to seven tow carts.

Inbound cargo unloaded from the passenger jets is placed in containers which are transported by truck to the cargo terminal. There the cargo is either routed to the tow cart import holding area, or is readied for ultimate delivery to the customer. The import tow cart holding area consists of twenty-four spurs. However, both the import and export tow cart holding areas may be used interchangeably.

Import cargo unloaded from a jet freighter at the cargo terminal is also stored in the tow cart holding area or is directed to customs for ultimate delivery to the consignee.



FIFTY-ONE PALLETS, EACH 88 IN. BY 125 IN. , MAY BE STORED IN HOLDING STATIONS AT CARGO TERMINAL.

AirPak Pallet System

Cargo exported via the AirPak pallet system is usually assembled on pallets at the terminal. However, completely loaded pallets may be received at the terminal via truck.

Essentially, cargo arrives in the pallet make-up area from either the tow cart system or the package conveyor network. When the pallets are made up, they are raised to an upper level where all storage and aircraft loading activities take place. Average pallet make-up time is 30 minutes.

Completely loaded pallets received via truck are placed directly on a vertical lift, elevated to the upper level, and moved by live roller conveyors to storage or directly to the aircraft.

Large pieces of cargo received at the truck dock, depending on size are placed on one or two pallets and introduced into the AirPak system in the same manner.

Completed pallets are stored in any of 51 holding stations prior to being loaded on the aircraft. The loading system is designed to permit placing 13 pallets in an aircraft in a 20-minute period.

Import cargo received on pallets from the aircraft is broken down with the individual units being placed in towline carts or on package shelves. The tow carts are moved to the import holding area or to the customs station for ultimate delivery to the customer.

The computer system linked to each of the three individual freight handling systems provides Pan American Airways with instantaneous information regarding a particular shipment at any time after it is received by the airline.

RESULTS

The passenger reservations system permits agents to reserve and sell space more accurately than before, resulting in more efficient use of available aircraft space. It also has greatly reduced the possibility of human errors occurring in the handling of the many variable quantities inherent with international travel, such as tariffs, time differences, etc.

The automated cargo system, in addition to speeding the flow of cargo through the terminal by retaining all of the information on the individual cargo movements, provides Pan American with a vast source of record data. For example, a shipper may call the cargo telephone sales department in the Pan Am building and request information regarding his shipment. By utilizing any of five input/output units located in the Pan Am building, the cargo sales agent can retrieve the entire record of the shipment and relay this information to the shipper in a matter of minutes.

Reservations for cargo space are able to be confirmed in a matter of seconds with the computer.

Economies resulting from reduced handling time, the application of electronic data processing to paperwork and an efficient flow of freight in large tonnage will result in faster services and a continuation of downward trend in freight rates for shippers. It is estimated that the automated terminal will save Pan American Airways nearly one million dollars a year. At present, exact figures are not available.

In addition, the system carries out a number of other airline functions such as aircraft engine analysis, sales studies and forecasts, crew and aircraft scheduling, maintenance planning, and accounting and statistical requirements.