General Harold Ross Harris Bibliography:

One of the great delights in writing this essay focusing on the life and times of General Harold Ross Harris has been my contact with his daughter, Alta Mae Stevens, now living in Falmouth, Massachusetts. I am most grateful for the time Mrs. Stevens has taken in corresponding with me as well as information that has been shared focusing on her distinguished father that could never be obtained solely by researching in archival repositories. In addition, her permission to use family materials in this essay is also gratefully appreciated. The personal contact, albeit through e-mail correspondence, has been an enlightening and illuminating aspect in the creation of this article.

Two main locations housing the Harold R. Harris MSS (MS-214) are in the Fairborn-Dayton, Ohio area. Mr. John Armstrong made the files of General Harris available for my research in the Paul Laurence Dunbar Library on the campus of Wright State University which mainly focuses on his civilian activities with Pan American Grace Airways (Panagra), American Overseas Airlines, Pan American Airways, Northwest Airlines and other business enterprises.

The Harris collection at Wright-Patterson Air Force Base focuses primarily on his military career but permission is needed to gain access to the files. Therefore, the interested researcher is encouraged to contact Mr. Brett Stolle (Brett.Stolle@wpafb.af.mil) for visiting arrangements. The papers at both locations are open to the public with no restrictions.

The papers of General Harris were initially sent to Wright-Patterson Air Force Base and, after examination, the civilian portions were then transferred to Wright State University. So both repositories have boxes with the same numbers although the contents are different thus having the potential of causing some confusion when citing sources from the collections.

At Wright State University the collection is divided into eight series:

Series 1: Correspondence which is divided into two parts: business correspondence and private correspondence. The business correspondence consists of letters concerning Pan American Airways. The second part of this series is Harris' private correspondence consisting mainly of letters to old colleagues and friends.

Series II: Pan American Airlines contains Harris' travel diaries, reports, correspondence, newsletters, newspaper clippings, articles, and his unpublished book about Panagra. Mainly these materials span the years 1929-1952.

Series III: American Overseas Airlines: Contains articles, correspondence, and reports and one of the most interesting aspects of this series is the correspondence concerning the last operational days of the carrier.

Series IV: Northwest Airlines: This series contains presidential reports, supplementary reports, operating statement and financial reports, Board of Directors meetings and miscellaneous papers and reports.

Series V: This series is basically the personal logs of Harris from 1931-1937 and from 1948-1954. It reveals whom he met, where he traveled and what he did. There is a diary for the year 1979 contained in this grouping.

Series VI: Contains miscellaneous speeches given by Harris and is focused mainly on his personal experiences.

Series VII; This series contains photographs and awards and is a arranged into several categories including portraits, World War I, World War II, Huff Daland Dusters, Airplanes, and award ceremonies. One of the more interesting aspects of this series is the film of the Barling Bomber and of Panagra in Argentina and a Citation from King George VI of England.

At the National Air and Space Museum the reader is encouraged to view the AH-800242-01, "Huff-Daland LB-1 Pegasus," file as well as the AH-800240-01, "Huff-Daland XLB1 Pegasus," file.

Series VIII: Miscellaneous: Contains various files concerning aviation records, meetings, and his emergency parachute jump, Huff Daland Dusters Company, World War II and various newspaper clippings, articles and miscellaneous aviation material.

There are four boxes making up the Harris Collection at Wright-Patterson Air Force Base (MS-214); See Boxes 86, 317, 318 and 319. Within those boxes are the files relating to the military career and achievements of General Harris. In particular, Box 317 houses his induction into the Caterpillar Club as well as other information relating to his parachute experience. In the same box but found in Folder 7 is a list of pilot officers commissioned prior to 1919.

Also of importance is Folder 1 in Box 318 containing personal letters of Harold Harris during World War I, 1917-1919 while Folder 2 holds his personal letters from 1919-1933. In addition, there are some references to his career with commercial airlines scattered throughout the files but most of the civilian aspects of his life are housed at Wright State University.

Another source of important information pertaining to General Harris can be found at the National Air and Space Museum Library in Washington, D.C. The archivists are most helpful and the researcher will need to make an appointment to review files in that repository and it is suggested that you contact Mrs. Kate Igoe. Her kind and gracious assistance has assisted my research over the years with prompt service and sage advice.

In addition, a repository that should not be missed in Washington, D. C. is the Library of Congress. By contacting the librarians ahead of time they will have materials ready for the researcher upon his or her arrival either in the James Madison Building or the Thomas Jefferson Building on Capitol Hill. In either reading room the researcher will be served by a professional and knowledgeable staff. Unfortunately, there is no finding aid for General Harris so the ardent researcher must comb the files of other aviation personalities to find this nearly forgotten but important pioneering aviator.

Because of the involvement of General Harris in the creation and maturation of Panagra the interested researcher will find the The William Russell Grace (1832-1904) MSS and subsequent corporate files held in trust by Columbia University in New York City of major importance and open to the public. The records cover the years 1828-1986 with the majority of the papers pertaining to the years 1861-1960.

The collection contains 90 linear feet, approximately 32,000 items in 167 boxes and 35 oversize containers. The early correspondence concerns all aspects of the shipping business in New York and South America, mining interests in Peru and Chile, the railroad in Costa Rica and the inter-ocean canal planned for Nicaragua, as well as political interests throughout Central and South America. There are letter books, correspondence, and scrapbooks of clippings for all aspects of William Grace's career including being the first Catholic elected mayor of New York City as well as sources relating to subsidiary companies owned by W. R. Grace.

Furthermore, the collection focusing on the son of the founder of the company, Joseph Peter Grace (1872-1950), contains the business, family and philanthropy activities. In addition, there are 20 motion picture films about the Grace Company's South American interests throughout the 1950s. The grandson, usually referred to as J. Peter Grace (1913-1995) even though his first name was Joseph, continued the family tradition as the chief executive of the firm and served on various commissions for both Presidents John F. Kennedy and Ronald Reagan.

Information on the life of Collett Everman Wollman can be found in the University of Illinois Alumni Association, Urbana-Champaign, Illinois. Of particular interest are the General and Administrative Files, Box M-4 and folders entitled "Delta Air Lines, Inc," and "Meet Your Leaders". The main collection relating to his career is available in the Woolman Files, Delta General Offices in Atlanta, Georgia.

I would recommend a visit to the National Archives II in College Park, Maryland to view materials relating to General Harris found in the Office of the Director of the Air Service, Stack Area 190, Row 439, Compartment 7, Shelf 6 for a discussion of pre-Harris Peruvian aviation. It is housed in what is listed as the Washington, D. C. Collection, Division Information Group (1920). This can be read along with Record Group 18, "Army Air Forces: Division of Military Aeronautics,1918-1920, Box 13, Decimal 352-360.01, but especially 354.25. The courtesies shown to me over the years the competent staff at the archives has been greatly appreciated.

At the Franklin Delano Roosevelt Presidential Library, Hyde Park, New York the Official File of the Civil Aeronautics Board (File-2955), Pan American Airways, Inc. (File-2875) and Post Office: Miscellaneous: Air Mail Contracts (File-19) are open to researchers. Additional information can be obtained from the President's Personal File (File-96), FDR MSS and from the R. Walton Moore MSS: Aviation-International Civil (Box 2). In the National Archives in Washington, D. C. the Records of the Civil Aeronautics Board retains "Panagra" files which can be found in Record Group 197, 3.5. I wish to thank the exception staff at this presidential library who are never too busy to assist my research.

Relating to the involvement of Harris in South America the reader should consult the government publication, Papers Relating to the Foreign Relations of the United States, 1928 (3 vols: Washington, D. C.: Government Printing Office, 1942-1943). See in particular, "Good Offices of the Department of State in Behalf of American Interests Desiring to Establish Air Lines in Latin America," volume 1, pages 775-800. In the same volume other diplomatic information can be found in "Huff-Daland Dusters and Keystone Airplane Company," 800-805 while items relating to Pan American Airways can be found on pages 802-818. An index appears on page 1043.

Finally, there are some materials relating to Harold Harris in the Air Force Historical Research Agency (AFHRA) located at Maxwell Air Force Base, Montgomery, Alabama. In particular I should like to thank Mr. Joseph Caver, Mrs.

Tammy Horton and Mr. Sylvester Jackson for their professional courtesies and making my research at that repository of Air Force history such a fulfilling experience. They were never too busy to answer my questions and find materials that assisted my research. In particular, Mrs. Horton never lost her smile and graciousness in helping me find the relevant documents within the repository.

Around the circle at the nearby Muir S. Fairchild Research Information Center and Library Ms. Susan Lipscomb, Ms. Sandhya Malladi, Ms. Carrie Springer and Mr. Tony Waterman assisted me in finding the appropriate sources within the library and the courtesies extended are appreciated. In particular, I wish to thank especially Ms. Lipscomb and Ms. Malladi for helping me win the small battle against a recalcitrant copier and in the end we all agreed that we had won the "war".

At the AFHRA manuscript collection repository listed above see Oral History of Harold Harris, October 12, 1974 located in Call Number K239.0512-1328 which is part of the United States Air Force Oral History Program. In that oral history is a copy of the general's speech "Sixty Years of Aviation History: One Man's Remembrances," pages 1-22 given at the 10th Annual Northeast Aero Historical Meeting on October 12, 1974 which can be read in its entirety beginning on page 34 in this Bibliography. Also in the file is the letter from Florence Rossiter Fairchild dated January 20,1981 when she lived at 449 Fort Worth Street in Hampton, Virginia and the letter from James Doolittle dated December 29,1980 both supporting the claim by Harris of being the first to fly in a pressurized aircraft cabin.

The author wishes to thank Indiana University for its ongoing financial support of my research endeavors for the past forty-one years.

Biographical information regarding General Harris may also be obtained in the following: Who's Who in American Aeronautics, (2nd ed: New York: Aviation Publishing Company, 1925), 56 and also an entry in the same journal (3rd ed: New York: Aviation Publishing Company, 1928), 50; Blue Book of Aviation (Los Angeles, California: Hoagland Company,1932), 247; as well as Who's Who in World Aviation and Aeronautics (Washington, D. C.: American Aviation Publishing Company, 1958), 190.

For the interested reader biographical information focusing on General Doolittle can be found in Robert H. Shoemaker and Leonard A. Paris, Famous American Generals (New York: Thomas Y. Crowell, 1946), 173-184; Generals of the Army and the Air Force (Washington, D.C.: Dunleavy Publishing Company, 1954), 4-6; Flint O. Dupre, ed., U.S. Air Force Biographical Dictionary (New York: Franklin Watts,1965), 97; John Keegan and Andrew Wheatcroft, Who's Who in Military History From 1453 To the Present (New York: Routledge, 1976 and updated in 1996), 77. Roger J. Spiller, Joseph G. Dawson III and T. Harry Williams, Dictionary of American Military Biography (3 vols: Westport, Connecticut: Greenwood Press, 1984), Volume 1, "A-G", 274-279.

Selected Bibliography:

Monographs:

The main sources pertaining to General Harris including his civilian and military careers are vast. Thus in this bibliography there will be references to both aspects of his life with the main objective of assisting the interested reader in discovering more about this pioneering, innovative, creative and successful American patriot beginning with Ricardo J. Alfaro, Commentary on Pan American Problems (Cambridge: Harvard University Press, 1938); Oliver E. Allen, The Airline Builders (Alexandria, VA: Time-Life Books, 1981); Roy Allen, The Pan Am Clipper: The History of Pan American's Flying Boats 1931 to 1946 (New York: Barnes and Noble Books, 2000); Enzo Angelucci, The Rand McNally Encyclopedia of Military Aircraft, 1914-1980 (New York: Military Press,1981).

Other studies of interest and scholarship include Norman Archibald, Heaven High, Hell Deep (New York: Albert and Charles Boni, Inc., 1935); William Armistead, The Struggle For Airways in Latin America (New York: Council on Foreign Relations, 1943). See also, Marylin Bender and Selig Altschul, The Chosen Instrument: Pan Am, Juan Trippe: The Rise and Fall of an American Entrepreneur (New York: Simon and Schuster, 1982); Although not directly connected to Panagra the study by Erik Benson, Aviator of Fortune: Lowell Yerex and the Anglo-American Commercial Rivalry,1931-1946 (College Station, Texas: Texas A&M Press, 2006) provides another example of the development of aviation in Central and South America of which Harris played such an important role; in this case the founding of Honduras based TACA (Transportes Aereos Centro Americanos);

The reader is encouraged to read David Yerex, Verex of TACA: A Kiwi Conquistador (Carterton, New Zealand: Ampersand Publishing Associates, 1985). The New Zealand born Lowell Yerex (1904-1968) eventually lost control of his creation due to the obstructionist policies of Juan Trippe and Pan American Airways as well as the American and British governments, but TACA is still a viable company today serving 39 cities in 22 countries in the Western Hemisphere with hubs in San Jose, Costa Rica, San Salvador, El Salvador and Lima, Peru according to company's latest public information statement. Additionally, the reader should also consult, Alphonse Berget, The Conquest of

the Air (New York: Putnam, 1911); Marvin D. Bernstein, ed., Foreign Investments in Latin America (New York: Alfred E. Knopf, 1966); Charles Biddle, The Way of the Eagle (New York: Charles Scribner's Sons, 1919); Wayne Biddle, Barons of the Sky (New York: Simon and Schuster, 1991).

Roger E. Bilstein has presented the interested reader with three studies including, Flight Patterns:Trends of Aeronautical Development in the United States, 1918-1929 (Athens: University of Georgia Press, 1983); Flight in America, 1900-1983 (Baltimore: Johns Hopkins University Press 1984) with the revised edition entitled Flight in America From the Wrights to the Astronauts (Baltimore: Johns Hopkins University Press, 1994); "Air Travel and the Traveling Public: The American Experience, 1920-1970," in William Trimble, ed., From Airships to Airbus: The History of Civil and Commercial Aviation (Washington,
D. C.: The Smithsonian Institution Press, 1995), volume II entitled: "Pioneers and Operations," 91-111. Additional sources include: Hiram Bingham, An Explorer in the Air Service (New Haven: Yale University Press, 1920); Steve Birdsall, The
B-17 Flying Fortress (Dallas, Texas: Morgan Aviation Books, 1985); Walter T. Bonney, The Heritage of Kitty Hawk (New York: W. W. Norton, 1962); Peter M. Bowers, Forgotten Fighters and Experimental Aircraft, 1918-1941 (2 vols; New York: Arco Press, 1971); Walter J. Boyne, The Influence of Air Power Upon History (Gretna, Louisiana: Pelican Publishing Company, 2003).

Tim Brady, The American Aviation Experience: A History (Carbondale, Illinois: Southern Illinois University Press, 2000); William Bridgeman and Jacqueline Hazard, The Lonely Sky (New York: Henry Holt and Company, 1955). An interesting study is by the American Ambassador to Peru during the creation of Panagra, Ellis Ormsbee Briggs (1899-1976), Proud Servant: The Memoirs of a Career Ambassador (Kent, Ohio: Kent State University Press, 1998); See also, Horace Brock, Flying the Oceans: A Pilot's Story of Pan Am, 1935-1955 (Lunenburg, Vermont: Stinehour, 1979).

See also, Harry Bruno, Wings Over America: The Inside Story of American Aviation (New York: Robert M. McBride, 1942); William A. M. Burden, The Struggle for Airways in Latin America (New York: Council on Foreign Relations, 1943) with a reprint edition (New York: Council on Foreign Relations, 1974 and the Arno Press,1977); Martin Caidin, Test Pilot (New York: E. P. Dutton, 1961); Christopher Campbell, Aces and Aircraft of World War I (New York: Greenwich House, 1984); Sean Dennis Cashman, America in the Twenties and Thirties: The Olympian Age (New York: New York University Press, 1989). For Pan American World Airways and Panagra see pages 522-523. See also an interesting study by Hugh Barnett Cave, Wings Across The World: The Story of the Air Transport Command (New York: Dodd, Mead and Company, 1945). General Harris was intimately involved with this unit during the Second World War.

One of the great pioneering aviators and thus a colleague of Harris was Charles De Forrest Chandler along with Frank P. Lahm, How Our Army Grew Wings (New York: Ronald, 1943). Chandler died in 1939 although the book was published four years later; Chris Chant, From 1914 To The Present Day: The World's Great Bombers (Edison, New Jersey: Chartwell Books, 2005); Lawrence A. Clayton, Peru and the United States: The Condor and the Eagle (Athens: University of Georgia Press, 1999); George Walker Clearley, Jr., Braniff: With A Dash of Color and a Touch of Elegance: An Illustrated History (Dallas: Robert Yaquinto Printing Company, 1980). Also of interest is Reginald McIntosh Cleveland, America Fledges Wings:The History of the Daniel Guggenheim Fund for the Promotion of Aeronautics with a fine chapter on the blind flying episodes of James Doolittle, Chapter 11, "Blind Flying", 20-49; (New York: Pitman Publishing Company, 1942); Edward M. Coffman, The War to End All Wars: The American Military Experience in World War I (Madison: University of Wisconsin Press, 1986); Jimmy Collins, Test Pilot (Garden City, New York: Doubleday, Doran and Company, 1935);

In addition, the reader is invited to review Barnaby Conrad III, Pan Am: An Aviation Legend (Emeryville, California: Woodford Press, 1999); David Cooke, Sky Battle: 1914-1918 (New York: Norton, 1970); DeWitt S. Copp, A Few Great Captains:The Men and Events That Shaped the Development of U.S. Air Power (Garden City, New York: Doubleday and Company, 1980) complemented by his Forged in Fire; Strategy and Decisions in the Air War Over Europe, 1940-1945 (Garden City, New York: Doubleday and Company, 1982); Joseph Corn, The Winged Gospel: America's Romance with Aviation, 1900-1950 (New York: Oxford University Press, 1983); David T. Courtwright, Sky As Frontier: Adventure, Aviation and Empire (College Station, Texas: Texas A&M University Press, 2005).

Tom D. Crouch has written among his many works two excellent studies including: A Dream of Wings: Americans and the Airplane, 1875-1905 (New York: W. W. Norton and Company, 1981) and Wings: A History of Aviation From Kites To The Space Age (New York: W. W. Norton and Company, 2003); Robert Daley, An American Saga: Juan Trippe and His Pan Am Empire (New York: Random House, 1980). Combined with the previous studies are six worthwhile studies by the eminent aviation historian Ronald Edward George Davies including , A History of the World's Airlines (London: Oxford University Press, 1964); Airlines of the United States Since 1914 (London: Putnam, 1972 and reprinted with revised updates in Washington, D.C.: Smithsonian Institution Press, 1982); In addition to creating an extensive study of the Airlines of Latin America Since 1919 (London: Putnam 1984 also printed in

Washington, D.C. Smithsonian Institution Press, 1984) the author also provided a listing of all the aircraft used by Panagra from 1928-1967 on pages 663-666.

Other works Davies include an essay focusing on the founder of New York-Rio-Buenos Aires Airways (NYRBA), Ralph O'Neill, entitled "Flying Down to Rio," and appears in Davies' Rebels and Reformers of the Airways (Washington, D. C.: Smithsonian Institution Press, 1987), 15-29; Pan Am: An Airline and its Aircraft (New York: Orion Books, 1987) as well as Falacies and Fantasies of Air Transport History (McLean, VA: Paladwr Press, 1994).

Alexander de Conde, Herbert Hoover's Latin-American Policy (Palo Alto: Stanford University Press, 1951); Alan P. Dobson, Peaceful Air Warfare:The United States, Britain, and the Politics of International Aviation (Oxford: Clarendon Press, 1991); R. Doganis, Off Course: The Economics of International Airlines (London: George Allen and Unwin, 1985); Frank Donovan, The Early Eagles (New York: Dodd, Mead, 1962); A most interesting study is Neville Duke and Edward Lanchbery, eds., The Saga of Flight from Leonardo da Vinci to the Guided Missile (New York: John Day Company, 1961); Flint O. DePre, Hap Arnold: Architect of American Air Power (New York: Macmillan, 1972); Edward Evans and Richard Hoyt, Air Transport as an Aid to Business (Columbus, Ohio: 1929).

Additional studies include Desmond Fairbairn, Pan Am: Gone But Not Forgotten (Polo, Illinois: Transportation Trails, 1996); Thomas G. Foxworth The Speed Seekers (Garden City, New York: Doubleday and Company, 1975); Two works by Roger A. Freeman are worthwhile including, Aircraft In Profile, Volume 9; Boeing B-17G Flying Fortress (Berkshire, England, Publications Limited, 1971) and B-17 Fortress At War (New York: Charles Scribner's Sons, 1977). A highly critical study of commercial aviation and its promoters appears in Elsbeth E. Freudenthal, The Aviation Business (New York: Vanguard Press, 1940) and another entry Flight Into History:The Wright Brothers and the Air Age (Norman: University of Oklahoma Press, 1949); Thomas R. Funderburk, The Early Birds of War (New York: Gossett and Dunlap, 1968); Robert Gandt, Skygods: The Fall of Pan Am (New York: William Morrow, 1995). See also, W. F. Gerhardt and L. V. Kerber, A Manual of Flight-Test Procedure (Ann Arbor, Michigan: University of Michigan Department of Engineering Research, 1927); Chares H. Gibbs-Smith has authored a number of excellent works on aviation including: The Aeroplane: The Historical Survey of Its Origins and Development (London: HMSO,1960), The Invention of the Aeroplane, 1799-1909 (London: Faber and Faber, 1965), Aviation: An Historical Survey from Its Origins to the End of World War II (London: HMSO, 1970), and Flight Through the Ages (New York: Thomas Y. Crowell, 1974); B. Gidwitz, The Politics of International Air Transport (Lexington, Massachusetts: Lexington Books, 1980); Carroll V. Glines Jimmy Doolittle (New York: Macmillan, 1972); Alfred Goldberg, ed., A History of the U. S. Air Force, 1907-1957 (Princeton, New Jersey: D. Van Nostrand, 1959); John Goldstrom, A Narrative History of Aviation (New York: Macmillan, 1942); William Green, Famous Bombers of the Second World War (Garden City, New York: Doubleday and Company, 1975).

A massive study includes: Bill Gunston, ed., Aviation: Year By Year (London: Darling Kindersley Limited, 2001); Hene Gurney, ed., Test Pilots (New York: Franklin Watts, 1962); Boone T. Guyton, This Exciting Air: The Experiences of a Test Pilot (New York: McGraw-Hill Book Company, 1943); No reader should miss the works by the noted aviation historian Richard P. Hallion including Legacy of Flight: The Guggenheim Contribution to American Aviation (Seattle: University of Washington Press, 1977), an edited version of The Wright Brothers: Heirs of Prometheus (Washington, D. C.: Smithsonian Institution Press, 1979) and Test Pilots: The Frontiersmen of Flight (New York: Doubleday, 1981 and later in Washington: The Smithsonian Institution Press, 1988). Information on Panagra appears on pages 260, 278 and 534.

See also, John N. Harris, Knights of the Air (New York: Macmillan, 1960); Sherwood Harris, The First to Fly-Aviation's Pioneer Days (New York: Simon and Schuster, 1970); Clive Hart, The Dream of Flight: Aeronautics from Classical Times to the Renaissance (New York: Winchester Press, 1972); Daniel L. Haulman, One Hundred Years of Flight: USAF Chronology of Significant Air and Space Events, 1903-2002 (Washington, D. C.: Air Force and Museum Program in association with the Air University Press, 2003); T. A. Heppenheimer, Turbulent Skies: The History of Commercial Aviation (New York: John Wiley and Sons, 1995); Maurice Holland and Thomas M. Smith, Architects of Aviation (New York: Duell, Sloan and Pearce, 1951); Frank Howard, The Conquest of the Air (New York: Random House, 1972); James J. Hudson, Hostile Skies: A Combat History of the American Air Service in World War I (Syracuse: Syracuse University Press, 1968); Douglas J. Ingells, The Tamed Sky: The Triumph of American Aviation (New York: D. Appleton Century Company, 1946). See also, Edward Jablonski, Flying Fortress (New York: Doubleday, 1968); Robert Jackson, Fighter Pilots of World War I (New York: St. Martin's Press, 1977); Frederick A. Johnsen, Boeing B-17 Flying Fortress (Stillwater, Minnesota: Voyageur Press, 2001).

Still having merit is Matthew Josephson, Empire of the Air: Juan Trippe and the Struggle For World Airways (New York: Harcourt, Brace, 1944). An excellent review of this study can be found in Allan Spalding, "Baron of the Airways," New Republic CX (June. 5, 1944), 768-769; A most illuminating study regarding the inner workings of Pan American World Airways can be found in Sanford B. Kauffman, Pan Am Pioneer: A Manager's Memoir, from Seaplane Clippers to Jumbo Jets, edited by George Hopkins, (Lubbock, Texas: Texas Tech University Press, 1995); Charles J. Kelly, Jr., The Sky's The Limit: The History of the Airlines (New York: Coward-McCann, 1963); Lee Kennett, The First Air War, 1914-1918 (New York: Free Press, 1991); Theodore M. Knappen, Wings of War (New

York: Putnam, 1920); Nick Komons, From Bonfires to Beacons: Federal Civil Aviation Policy Under the Air Commerce Act, 1926-1938 (Washington, D.C.: United States Department of Transportation, 1978).

William Krusen with Stephen Morrill, Flying the Andes: The Story of Pan American Grace Airways and Commercial Aviation in South America, 1926-1967 (Tampa, Florida: University of Tampa Press, 1997).The story is based on the journal of Harold R. Harris and the author had the cooperation of his daughter, Mrs. Alta Mae Stevens, who provided materials for the book. A copy of the monograph was then sent to the Air Force Archives at Wright-Patterson Air Force Base in Dayton, Ohio. The chief historian of the Air Transport Command, Lieutenant Colonel Oliver LaFarge, wrote on a topic he knew well entitled, The Eagle in the Egg with forwards by General Henry H. Arnold and Lieutenant General Harold L. George (Boston: Houghton Mifflin Company, 1949). Companion studies include, Hugh Barnett Cave, Wings Across The World:The Story of the Air Transport Command (New York: Dodd, Mead and Company, 1945) as well as an overview of the transport command in Leon Wolff, "The World's Greatest Airline," Fortune, XXXII (Aug. 1945), 158-164, passim.

See also, Jon Lake, The Great Book of Bombers: The World's Most Important Bombers From World War I to the Present Day (St. Paul, Minnesota: MBI Publishing Company, 2002) and for the Barling Bomber story see page 66; Howard M. Lehn, Seventy Years of Commercial Aviation in the United States (Fairfield, Washington: Ye Galleon Press, 1998); For the history of Delta Airlines see the excellent study by W. David Lewis and Wesley Phillips Newton, Delta: A History of an Airline (Athens: University of Georgia Press, 1979); Grover Loening, Takeoff into Greatness: How American Aviation Grew So Big So Fast (New York: G.P. Putnam's Sons, 1968). Additional works include, Ian Mackersey, Into the Silk: True Stores of the Caterpillar Club (London: Robert Hale, 1956); Francis A. March, History of the World War (Philadelphia: Winston, 1918); Two studies by the noted aviation author Maurer Maurer include, The U.S. Air Service in World War I (4 vols; Washington, D. C.: Office of Air Force History, 1978-1979) where he served as editor and Aviation in the U.S. Army, 1919-1939 (Washington, D.C.: Office of Air Force History, 1987).

Of interest is William Mitchell, Skyways (Philadelphia: J. P. Lippincott,1930); Stanley R. Mohler and Bobby H. Johnson, Wiley Post: His Winnie Mae and the World's First Pressure Suit (Washington, D. C.: Smithsonian Institution Press, 1971); Bennett A. Molter, Kings of the Air (New York: Appleton, 1918); David Mondey, A Concise Guide to American Aircraft of World War II (New York: Smithmark Publishers), John H. Morrow, Jr., The Great War in the Air: Military Aviation from 1909-1921 (Washington, D.C.: Smithsonian Institution Press, 1993); Wesley Phillips Newton, The Perilous Sky: United States Diplomacy and Latin America, 1919-1931 (Coral Gables, Florida: University of Miami Press, 1978); Aaron Norman, The Great Air War: The Men, The Planes, The Saga of Military Aviation, 1914-1918 (New York: Macmillan, 1968).

The story of New York-Rio-Buenos Aires Airways (NYRBA) can be found in Ralph O'Neill, with Joseph F. Hood, A Dream of Eagles (Boston: Houghton Mifflin Company,1973); Edwin C. Parsons, The Great Adventure (Garden City, New York: Doubleday, Doran, 1937); James Parton, Air Force Spoken Here: General Ira Eaker and the Command of the Air (Bethesda, Maryland: Adler and Adler Publishers, 1986); Quentin Reynolds left us with interesting writings including: The Amazing Mr. Doolittle: A Biography of Lieutenant General James H. Doolittle (New York: Appleton-Century, 1953) and They Fought for the Sky (New York: Holt, Rinehart and Winston, 1957); Charles S. Rhyne, Civil Aeronautics Act of 1938 Annotated (Washington, D. C. National Law Book Company, 1939); The American ace, Edward V. Rickenbacker, wrote a most interesting account of the aerial combat during the First World War, Fighting the Flying Circus (New York: Stokes,1919),

The eminent Latin American historian James Fred Rippy authored an interesting monograph, The Capitalists and Colombia (New York: Vanguard Press, 1931); Joseph B. Roberts and Paul L. Briand, The Sound of Wings: Readings for the Air Age (New York: Holt, 1957); C. R. Roseberry, Glenn Curtiss: Pioneer of Flight (Garden City, New York: Doubleday and Company, 1972); Basil L. Rowe, Under My Wings (Indianapolis: Bobbs-Merrill, 1956); Robert Saundby, Earl Aviation: Men Conquers the Air (London: Macdonald, 1971); Rosalie Schwartz, Flying Down To Rio: Hollywood-Tourists and Yankee Clippers (College Station, Texas: Texas A & M Press, 2004).

Further studies include, Phillip Scott, The Pioneers of Flight: A Documentary History (Princeton: Princeton University Press, 1999); Welman A. Shrader, Fifty Years of Flight: A Chronicle of the Aviation Industry in America,1903-1952 (Cleveland: Eaton, 1953); Andrew Bernard Shea, Panagra: Linking the Americas During 25 Years (New York: Newcomen Society, 1954); Edward H. Sims, American Aces (New York: Harper and Brothers, 1958); James J. Sloan, Wings of Honor (Atglen, Pennsylvania: Schiffer, 1994).

The somewhat dated work by Henry Ladd Smith, Airways: The History of Commercial Aviation in the United States (New York: Alfred A. Knopf, 1942 and Washington, D.C.: Smithsonian Press, 1991) had limited value for this study. It is curious that in a listing of "Air Lines of the United States," (Appendix V, pages 383-392) neither Pan American Airways nor Panagra are mentioned and in "Chronology," (Appendix VI, pages 393-404) neither Pan Am nor Panagra appear in a section that relates to the importance of aviation history. Pan American Airways System does appear,

however, in the index; See also Smith's, Airways Abroad: The Story of American World Air Routes (Madison, Wisconsin: University of Wisconsin Press, 1950).

A major and important study of commercial aviation can be found in Myron J. Smith, Jr., The Airline Encyclopedia, 1909-2000 (3 vols: Lanham, Maryland: Scarecrow Press, 2002); Although somewhat dated now Wesley Smith, Air Transport Operation (New York: MacGraw-Hill, Inc.1931); Carl Solberg, Conquest of the Skies: A History of Commercial Aviation in America (Boston: Little, Brown, 1979); M. H. Straszheim, International Airline Industry (Washington, D.C.: The Brookings Institution, 1969); Frank S. Stuart, Modern Air Transport (London: John Long, Ltd., 1946); James F. Sunderman, Early Air Pioneers, 1862-1935 (New York: Franklin Watts Company, 1961)—see in particular, Ian Mackersey, "Into the Grape Arbor", 13-16 which can be found in the Harris MSS, Box 317, Folder 8; F. G. Swanborough, United States Military Aircraft Since 1909 (New York: Putnam, 1963); An early study still having merit is, Arthur Sweetser, The American Air Service: A Record of its Problems, Its Difficulties, Its Failings, and Its Achievements (New York: D. Appleton, 1919).

Three books by Nawal K.Taneja are informative including, The Commercial Airline Industry: Managerial Practices and Regulatory Policies (Lexington, Massachusetts: Lexington Books, 1976); United States International Aviation Policy (Lexington, Massachusetts: Lexington Books, 1980) and Introduction to Civil Aviation (Lexington, Massachusetts: D.C. Heath and Company, 1987); H. A. Taylor, Test Pilots at War (London: Ian Allan, 1970); Lucien H. Thayer, America's First Eagles: The Official History of the U.S. Air Service, A.E.F. 1917-1919 (San Jose, California and Mesa Arizona: Bender Publishing and Champlin Fighter Aces Museum Press, 1983); Lowell Thomas and Edward Jablonski Edward Doolittle: A Biography (Garden City, New York: Doubleday and Company, 1976); Poynts Tyler, ed., Airways of America (New York: H. W. Wilson, 1958); F. Robert van der Linder, Airlines and Air Mail:The Post Office and the Birth of the Commercial Aviation Industry (Lexington: University of Kentucky Press, 2002).

Additional studies include Sydne (spelled correctly) E. Veale, Airlines and Airways Today (London: Pilot Press, 1947); Henry Serrano Villard, Contact: The Story of the Early Birds (New York: Crowell, 1968); Ray Wagner, American Combat Planes (Garden City, New York: Doubleday and Company, 1960); Edward Pearson Warner, Early History of Air Transportation (York, Pennsylvania: Maple Press Company, 1937) under the James Jackson Cabot Professorship of Air Traffic Regulation and Air Transportation at Norwich University in Northfield, Vermont. Warner was then vice-chairman of the Civil Aeronautics Board, formerly on the faculty staff at the Massachusetts Institute of Technology and editor of the publication Aviation. Interestingly he mentions Juan Trippe and Pan American Airways (pages 70-72) but no acknowledgement of Panagra flying the west coast of South America. Warner only refers to Pan American Airways as if it were serving the Canal Zone to Chile beginning in January 1929.

Arch Whitehouse, a gunner as well as a fighter pilot in World War I was credited with sixteen air victories, has left some interesting studies including, The Years of the Sky Kings (Garden City, NY: Doubleday, Doran and Company, Inc.,1959); Decisive Air Battles of World War I (New York: Duell, Sloan and Pearce, 1963); Heroes and Legends of War I (Garden City, NY: Doubleday, Doran and Company, Inc., 1964); Heroes of the Sunlit Sky (Garden City, NY: Doubleday, Doran and Company, Inc., 1967); See also, H. P. Wilmott, B-17 Flying Fortress (London: Bison Books, 1980); Denis Winter, The First of the Few (Athens: University of Georgia Press, 1982).

Periodicals:

Because Harris was so closely connected to military and civilian aviation I have included essays relating to both endeavors in this bibliography. Three early essays relating to aviation in the Western Hemisphere appeared the Bulletin of the Pan American Union including: "Flying and Latin America," XXXVII (Dec. 1913), 856-858, "Aviation in South America," IIL (Apr. 1919), 440-442 and "Aviation in Chile and the Crossing of the Andes," IL (Sept. 1919), 298-301; A interesting essay is by Bert R. Coad, "Killing Boll Weevils with Poison Dust," United States Department of Agriculture Year Book (Washington, D. C.: Government Printing Office,1920), 241-252; C. R. Neillie and J. S. Houser, "Fighting Insects with Airplanes," National Geographic Magazine, XIL (Mar. 1922), 333-338; Bert R. Coad, E. Johnson and G. L. McNeil, "Dusting Cotton from Airplanes," United States Department of Agriculture Bulletin, no. 1204 (Washington, D. C.: Government Printing Office, Jan. 1924), 1-40; Peter Paul von Bauer, "Commercial Aviation in Colombia," Bulletin of the Pan American Union, LVIII (Nov. 1924), 1130-1137.

Also see, Roger William Riis, "Commercial Crop Dusting," Aviation, XVIII (May. 25, 1925), 573; "Colombia to Key West Air Route," Aviation, IXX (Oct. 12, 1925), 504; "Portrait," Fortune, XXXXVI (Nov. 1927), 52; Charles Lindbergh, "To Bogota and Back by Air," National Geographic Magazine, LIII (May. 1928), 529-601; John H. van Deventer, Jr., "The Story of Keystone," Air Transportation, VI (Jan. 19, 1929), 54-55; William Young Boyd, "Airways over Latin America," Literary Age, CCXXXVI (Mar. 1929), 47-50, passim; George N. Woolcott, "The Status of Economic Entomology in Peru," Bulletin of Entomological Research, XX (Aug. 1929), 225-231.

In the next decade consult, John K. Montgomery, "The Wings of South America," Aero Digest, XVI (Feb. 1930), 55-58, passim and by the same author "Chile's Aviation Progress," Aero Digest, XVI (Mar. 1930), 72-73, passim; Frederick Simpich, "Skypaths Through Latin America," National Geographic Magazine, LXXIX (Jan. 1931), 1-79;

John S. Allard, “American Airplanes in the Latin American Republics,” Aero Digest, XVIII (Apr. 1931), 230-232; “Colossus of the Caribbean,” Fortune, III (Apr. 1931), 46-48, passim; Albert W. Stevens, “Flying The “Hump” in the Andes,” National Geographic Magazine, LIX (May. 1931), 595-636; V. E. Chenca, “Skyways that Link the Americas,” Scientific American, CXXXXVII (Dec. 1932), 342-344; “Pan American Airways,” Fortune, XIII (Apr. 1936), 78-93, passim.

Toward the end of the decade other interesting essays appeared including, Carl Hanns Pollog, “Commercial Aviation in the American Mediterranean,” Geographic Review, XXVII (Apr. 1937), 255-268; W. B. Courtney, “The Seven Skies,” Colliers, C (Aug. 14, 1937), 16-17, passim; Cy Caldwell, “The Dynamic Decade,” Aero Digest, XXXII (Jan. 1938), 42-43, passim; Anyda Marchant, “Aviation in Colombia,” Air Law Review, IX (Jan. 1938), 45-64: Also of interest is “Good Neighbor Skyways,” Aviation, No volume number listed (Mar. 1939), 18-21, passim; For the next decade see, “Sedta Cuts The Rates,” Time, XXXVII (Jan. 27,1941), 59; Matthew Josephson, “Columbus of the Airways,” Saturday Evening Post, CCXVI (Aug. 14, 1943), 9-11, passim and in the same journal and volume number another essay with the same title published on Aug. 21, 1943, 28-29, passim; “Round The World Express,” Time, XLVIII (Aug. 12, 1946), 81; “Airborne,” Time, XLVIII (Aug. 12, 1946), 81-82; An interesting portrait of Muir Fairchild can be found in Life, XXV (Nov.1,1948), 8 and his interesting theory regarding future aviation in “How Harris Sees 1955 Transport,” Aviation Week, LI (Nov.14,1949), 57-58

For the 1950s the reader should consult, ”Pan Am and Grace Split Over Panagra,” Business Week, (Mar. 30, 1951), 20; “Panagra Stands By NAL Interchange,” Aviation Week, LIV (Mar. 1951), 41; W. Kroger, “New Battle Flares Over Panagra,” Aviation Week, LIV (May, 14, 1951), 59-60; “Panagra Dispute to Appellate Court,” Aviation Week, LVI (Apr. 7, 1952), 68; “Long Cold War of Panagra,” Fortune, VL (June. 1952), 117-118; Collie Small, “Juan Trippe: King of the Skyways,” Coronet, XXXIII (Dec. 1952), 194-209; “Antitrust Suit Names PAA, Panagra, Grace,” Aviation Week, LX (Jan. 25, 1954), 92; F.J. Shea, “Braniff Weighs $5 Million Panagra Offer,” Aviation Week, LX (June. 21, 1954), 87; “Balboa Impasse,” Aviation Week, LXI (July. 5, 1954), 90.

Also see two articles by G. McAllister, “Airborne Radar Speeds Panagra Flights,” Aviation Week, LXIII (Aug. 8, 1955), 101 and “United States Latin America Interchange Approved,” Aviation Week, LXIII ((Aug. 15, 1955), 121-122; “Pan Am Accused of Restraining Panagra,” Aviation Week, LXVI (Mar. 4, 1957), 45; “Family Row,” Newsweek, IL (Mar. 4, 1957), 79-80; “Panagra In Middle,” Business Week, (Mar. 16, 1957), 52; F. Eastman, “Pan Am Proposes To Sell Panagra,” Aviation Week, LXVI (Mar. 18, 1957), 37; “Bumpy,” Newsweek, IL (Mar. 25, 1957), 86; “Pan Am and Grace Battle For A South American Airline Empire,” Business Week, (Mar. 30, 1957), 46-48; “Panagra Makes Subsidy Request,” Aviation Week, LXIX (Oct. 12, 1958), 39; G. Garrison, “Panagra Antitrust Trial Reaches End,” Aviation Week, LXX (June. 1, 1959), 48-49 ; “CAB Examiner Raps Duplicate Cost Reports,” Aviation Week, LXXI (Dec. 21, 1959), 33.

Essays focusing on General Harris becoming president of Northwest Airlines can be found in “Businessmen in the News,” Fortune, XXXXVI (Nov. 1952), 52; “Harris of Northwest,” Newsweek, XL (Oct. 20, 1952), 97-98; “New Pilot for Northwest,” Time, LX (Oct. 20, 1952), 101-102; “Portrait,” Aviation Week, LVII (Oct. 20, 1952), 17; “Changing Course For Northwest Airlines,” Business Week, (June. 20, 1953), 70-72, passim; “Northwest Squall,” Business Week, (Mar. 13, 1954), 110; “Northwest Exit,” Time, LXIII (Mar. 15, 1954), 96-97.

In the 1960s the following were informative and of interest: Robert Hotz, “South America Swing,” Aviation Week and Space Technology, LXXII (Feb. 29, 1960), 21; Panagra Jet Flight to Lima,” Saturday Review, XXXIII (July. 16, 1960), 30-32; “End to Family Feud,” Time, LXXVII (Mar. 17, 1961), 88-90; G. Garrison, ”Pan Am Divestiture Portends Wide Efforts,” Aviation Week and Space Technology, LXXIV (Mar. 20, 1961), 41+; ”CAB Must Rule On Panagra Ownership,” Aviation Week and Space Technology, LXXVIII (Jan. 21, 1963), 42; “Pan Am-Panagra Move Opposed,” Aviation Week and Space Technology, LXXVIII (Apr. 29, 1963), 37; “Total Pan Am-Panagra Merger is Proposed,” Aviation Week and Space Technology, LXXIX (Dec. 30, 1963), 30; Eldon Downs, and George F. Lemmer, “Origins of Aerial Crop Dusting,” Agricultural History, XXXIV (July. 1965), 123-135; Wesley Phillips Newton, “International Aviation Rivalry in Latin America, 1919-1927,” Journal of Inter-American Studies, VII (July. 1965), 345-356 and another essay by Newton entitled “The Role of Aviation in Mexican-United States Relations, 1912-1929,” that appeared in Eugene R. Huck and Edward H. Mosly, eds., Militarists, Merchants, and Missionaries, (Tuscaloosa: University of Alabama Press, 1970), 107-130.

Other articles include: “Panagra Disputes CAB Bureau on South American Route Awards,” Aviation Week and Space Technology, LXXXIII (Nov. 8, 1965), 39; Gary G. Kuhn, “Aviation Pioneers in Peru and Chile,” American Aviation Historical Society Journal, XI (Summer. 1966), 102-104; “Panagra Acquisition Approved,” Aviation Week and Space Technology, LXXXV (Oct. 24, 1966), 40; Roger E. Bilstein, “Technology and Commerce: Aviation in the Conduct of American Business, 1918-1929,” Technology and Culture, X (July. 1969), 392-411; Stephen James Randall, “Colombia, the United States, and InterAmerican Aviation Rivalry, 1927-1940,” Journal of Inter-American Studies and World Affairs, XIV (Aug. 1972), 297-324. Not related to the South American days was an interesting essay by retired Major General Leigh Wade, “Wood, Wire, and Canvass-Testing the Early Planes,” Air Force Magazine, LVII (Sept. 1974),

92-97. Then Lieutenant Harris is mentioned on page 95 while his colleagues, Oakley Kelly, John Macready and Rudolph Schroeder, are mentioned on pages 96-97.

Further essays include Lynwood Mark Rhodes, "Those Magnificent Clipper Flying Boats," American Legion Magazine, IC (Aug. 1975), 22-24, passim; Richard K. Smith, "The Intercontinental Airliner and the Essence of Airplane Performance, 1929-1939," Technology and Culture, XXIV (July. 1983), 428-449; David Haglund, "De-Lousing SCADTA: The Role of Pan American Airways in U.S. Aviation Diplomacy in Colombia, 1939-1940," Aerospace Historian, XXX (Fall/Sept.1983), 177-182, passim.

The reader is also invited to view three essays by Erik Benson including "Suspicious Allies: Wartime Aviation Developments and the Anglo-American International Airline Rivalry, 1939-1945," History and Technology, XVII (2000), 24-26 and two articles appearing in Essays in Economic and Business History, are entitled: "The Man Without A Country: Lowell Yerex, His Airline and U.S. Policy Concerning International Commercial Aviation, 1939-1944," XVIII (2000), 17-32 and "The Chosen Instrument? Reconsidering the Early Relationship Between Pan American Airways and the U.S. Government," XXII (2004), 97-110; A most interesting story relating to Pan American Airways is Carroll V. Glines, "Clippers Circle The Globe," Aviation History , XVII (Mar. 2007), 34-43.

Out of chronological sequence yet important in the life and career of General Harris were the following essays in Air Force Magazine, LX (Sept. 1977) including Herman S. Wolk, "The Birth of the US Air Force," 68-78 and Lieutenant General Ira C. Eaker (RET.), "Hap Arnold: The Anatomy of Leadership," 83-86, passim; See also, Captain Earl H. Tilford, Jr., "The Short, Unhappy Life of the Barling Bomber," Air Force Magazine, LXI (Feb. 1978), 68-70 of which Harris was involved; a fine essay on Billy Mitchell by John L. Frisbee, "Warrior, Prophet, Martyr," Air Force Magazine, LXVIII (Sept. 1985), 158-166 and Carroll V. Glines, "The Long Road to an Independent Air Force," Aviation History, XVIII (Sept. 2007), 30-33

The New York Times:

"Saves Himself by Leaping From Falling Airplane with Parachute," October 21, 1922, 1; "Editorial," October 23, 1922, 14; Harold B. Grow, "Opening an Air Route through Wildest Peru," January 6, 1929, IX, 5; "Colombian Airline Dismisses Germans," June 12, 1940, 10; "A promotion given to Harold Harris to general staff appeared in the following story: "Nominated Officers Reserve Corps, General Officers," February 8, 1947, 7; "U.S. Brigadier General Lands Comet," September 7, 1949, 59; "H. R. Harris Says Great Britain Leads U.S. in Jet Craft Development," September 18, 1951; " H. R. Harris Sees First Jet Transports Turbo-Props; Says U.S. Lags Behind G.B. in Jetliner Development; Reports No Funds So Far For Building Test Model," October 5, 1951, 53 and continuing his theme on developing jetliners another story appeared in the paper for the same day on the same page entitled, "Holds Craft May Become Standard for Short Haul,".

In addition, consult, "Pan Am Representative H. R. Harris Testifies TWA Seeks to Exclude Competition," January 9, 1952, 59; "Northwest Orders 6 Super Constellations With Wright Turbo-compound Engines on Belief Korean Peace Will Bring New Business: President General Harris Comments," April 23, 1953, 59; "Career," May 14, 1953, 43; "H. R. Harris Scores Pan Am and TWA Far East Route Proposals are Injurious to Northwest, CAB Hearing Urges Balanced Competition. Route Requests Listed," June 24, 1953, 53; "President Eisenhower Backs Corporation Gifts to Nonprofit Organizations, Letter to H. R. Harris," October 3, 1953, 2; "President Harris Gets Sick Leave," January 12, 1954, 47;

There is some interesting information relating to Rudolph W. Schroeder in the Pare Lorentz MSS, Franklin Delano Roosevelt Presidential Library, "Historical Chronology-U.S. in General," and "Agriculture, 1891-1933 to Economics, 1931-1935," folders, Box 11. See also, "Rudolph William Schroeder," Maxine Block, editor, Current Biography, 1941 (New York: W. W. Wilson Company, 1941), 761-762.

While Harris was with American Export Airlines (AM-EX) according to the company records the fleet consisted of the following:

Type	Name	Registration
Consolidated PBY-4.	Transatlantic	NC18997
Douglas C-54 Skymaster		42-107452
Vought-Sikorsy VS-44	Excalibur	NX41880; later listed as NC41880)
As American Overseas Airlines (AOA):		
Vought-Sikorsky VS-44	Excambian	NC41881
Vought-Sikorsky VS-44	Exeter	NC41882

Douglas DC-3	.Helsinki	N25686
Douglas C-47 Skytrain	Nairobi	N90908
Douglas C-54 Skymaster	Flagship America	.N90901
Also designated as the Flagship Stockhom.		
Douglas C-54 Skymaster	Flagship Frankfurt	N90902
Douglas C-54 Skymaster	.Flagship Oslo	N90903
Douglas C-54 Skymaster	Flagship New England	N90904
Douglas C-54 Skymaster	.Flagship Glasgow	N90905
Also designated as the Flagship Berlin.		
Douglas C-54 Skymaster	Flagship Copenhagen	N90906
Also designated as the Flagship Chicago.		
Douglas DC-4 Skymaster	.Flaghip Keflavik	N90909
Douglas DC-4 Skymaster	.Flagship Shannon	N-90910
Douglas DC-4 Skymaster	Flagship Reykjavik	N90911
Douglas DC-4 Skymaster	Flagship Washington	N90912
Also designated as the Prestwick.		
Douglas DC-4 Skymaster.	Flagship Amsterdam	N90913
Douglas DC-4 Skymaster		N90914
Douglas DC-4 Skymaster	Flagship Gander	N90915
Lockheed L-049 Constellation	Flagship Sweden	N90921
Also designated as the Flagship Stockhom.		
Lockheed L-049-Constellation	Flagship Denmark	N90922
Also designated as the Flagship Copenhagen and the Flagship Oslo.		
Lockheed L-049-Constellation	Flagship Great Britain	N90923
Also designated as the Flagship Scotland and the Flagship Oslo.		
Lockheed L-049-Constellation	Flagship Holland	N90924
Also designated as the Flagship Amsterdam and the Flagship Shannon.		
Lockheed L-049-Constellation	Flagship America	N90925
	Also designated as the Flagship Philadelphia and the Flagship Copenhagen.	
Lockheed L-049-Constellation	Flagship Eire	N90926
Also designated as the Flagship Amsterdam and the Flagship Chicago.		
Lockheed L-049-Constellation	Flagship Norway	N90927
Also designated as the Flagship Detroit and the Flagship Glasgow.		
Boeing 377 Stratocruiser	Flagship Sweden	N90921
Also designated as the Flagship Stockholm.		
Boeing 377 Stratocruiser	Flagship Scandinavia	N90941
Also designated as the Flagship Europe and the Flagship Great Britain.		
Boeing 377 Stratocruiser	.Flagship Europe	N90942
Also designated as the Flagship Great Britain.		
Boeing 377 Stratocruiser	Flagship Holland	N90943
Also designated as the Flagship Europe.		
Boeing 377 Stratocruiser	Flagship Ireland	N90944
Boeing 377 Stratocruiser	.Flagship Norway	N90945
Boeing 377 Stratocruiser	Flagship Sweden	N90946
Boeing 377 Stratocruiser	Flagship Denmark	N90947
Boeing 377 Stratocruiser	.Flagship Scotland	N90948

It seems relevant and honorable to this author to recapitulate the life of this extraordinary Army officer and pioneering pilot, businessman and executive by offering the following:

Born, Chicago, Illinois, December 20,1895.

Parents: Ross Allen Harris (MD) and Mae E. (Plumb) Harris.

The source for the information listed below comes from his application for examination for appointment in the Regular Army and can be found at Wright-Patterson Air Force Base Archives, Box 317, Folder 1, “Military Documents Belonging to Harold Harris”.

Harris was also enrolled in Throop College of Technology, Pasadena, California, 1916-1917 where he participated in the ROTC program. Throop College was founded in 1891 by Amos Throop and the school has had several names including Throop University, Throop Polytechnic Institute and later became known as the California Institute of Technology (CALTEC). In addition to attending Throop College of Technology before his formal enlistment in 1917

Harris gained military experience at the training camp of the United States Army at Monterey, California as an engineering officer of the First Provisional Aero Squadron a year earlier.

When the United States entered World War I in 1917 Harris enlisted in the Army Signal Reserve Corps in San Diego (in his collection at Wright Patterson Air Force Base, Harris noted on a formal biographical form that he enlisted in San Francisco) and was sent to the first ground school class at the University of California-Berkeley and graduated on July 14, 1917, the same day he married Grace Clark. They had two children: Harold Ross Harris and Alta Mae (Harris) Stevens and in time four grandchildren.

He was then assigned to Fort Wood, New York and sailed from New York City for Europe on August 13, 1917.

First Lieutenant Aviation Section Signal Corps, United States Army, 1917, later transferred to the United States Army Air Service and remained in that branch until his resignation from the Army in February 1926.

Assigned for flight training in Farman and Caproni aircraft at Foggia, Italy arriving September 28,1917. He soloed after a mere 181 minutes of dual instruction.

Commissioned, 2nd Lieutenant, December 20, 1917.

Promoted to 1st Lieutenant, January 5, 1918.

March 1, 1918 to July 15, 1918, chief instructor of day and night flying in Farman and Caproni aircraft at the 8th Aviation Center, Foggia, Italy.

On 16 July, 1918 Harris left Foggia and reported for duty as a test pilot at the Caproni factory in Milan, Italy.

He subsequently helped establish an aerial ferry route from Milan to Paris for the United States Navy and then was ordered back to the United States for assignment as a test pilot.

With orders to return to the United States he sailed from Brest, France on September 4, 1918 and landed in New York on September 11, 1918.
He was then assigned to the Test Pilot Engineering Division, Army Air Service at Wilbur Wright Field, Dayton, Ohio, September1918-January 1, 1919 and subsequently was appointed Chief, Flight Test Branch, Engineering Division, United States Air Service, October 1, 1920-February, 1925.

> (Author's Note: In Box 317 of the Harris collection at Wright Patterson Air Force Base there is a discrepancy regarding his tenure as Chief of the Flight Test Branch, Engineering Division. In folder 1 entitled "Tall Braggers and Props: Some Aviation Developments of Both, 1917-1925," there is the entry that lists October 1,1919 as the date he became the chief of the branch with a termination date of January 30, 1925).

The official record at Wright Patterson Air Force Base Archives remains unclear although most sources list his beginning as Chief of the Flight Test Branch, Engineering Division, commencing on October 1, 1920. At first the author considered the 1919 date as a typographical error until reviewing the list of chiefs of the division who preceded Harris in the Wright Patterson files:

> Major Rudolph W. "Shorty" Schroeder
> August 1918-December 31, 1918-Wilbur Wright Field
> January 1, 1919-April 30, 1919-McCook Field.
>
> Captain C. H. Walsh
> May 1, 1919-September 30, 1919-McCook Field.
>
> Lieutenant Harold R. Harris
> October 1, 1919-January 30, 1925-McCook Field.

He achieved a Bachelor in Science in Mechanical Engineering, the California Institute of Technology, 1922.

Graduate United States Army Air Service Engineering School,1922.
First in the world forced to use a free fall parachute after his plane collapsed in flight, 1922.

First member of the Caterpillar Club,1922.

In 1925 Harris took a leave of absence for one year from the Air Service to test commercial crop dusting by airplane and subsequently resigned his Air Service Commission in February 1926.

Appointed Vice President and General Manager of Huff-Daland-Dusters Company in Peru,1925.

Appointed Vice President and General Manager of Peruvian Airways,1927.

General Manager, Peruvian Airways, 1928-1930.

Appointed Vice President and Operations Manager, Pan American Grace Airways (Panagra), 1929-1942.

Appointed Colonel in the United States Army Air Transport Command in which he served in from 1942-1946.

Brigadier General, United States Army Air Force, May 1945.

Appointed Vice President and General Manager of American Overseas Airlines, September 1945 and serviced until 1950 when the carrier was absorbed into Pan American World Airways.

In 1950 he was appointed Vice President of the Atlantic Division, Pan American World Airways and served until December 31, 1952.

On January 1,1953 he was elected President and Chief Executive Officer of Northwest Orient Airlines and served in that capacity until March 1954.

Member Aviation Facilities Study Groups for the United States Bureau of the Budget, 1955.

Elected President of Aviation Financial Services in January 1955 and retired 1965.

Member of the Board of the Flight Safety Foundation, Chairman, 1959-1966.

Among his notable aviation achievements:

He was in command of the first United States Army flight across the Alps comprised of four Caproni bombers on July 25,1918.

First pilot to fly in a pressurized cockpit, May 24,1920.

First pilot of twin motored ground attack airplane (GAX), April 3,1920.

First pilot to fly a Barling Bomber which at one time was the world's largest aircraft, September 1, 1923.

First pilot to make a roundtrip flight from Guayaquil, Peru to Quito, Ecuador, August,1929.

First pilot to fly non-stop from Antofagasta, Chile to Salta, Argentina, November 22, 1931.

Decorations include: Distinguish Service Medal; Legion of Merit; Air Medal (United States); Commander British Empire (CBE-Great Britain); Corona di Italia, Cavalire al Merito del la Republico, Fatiche de Guerra (Italy); Abdon Calderon (Ecuador); Gran Official Orden del Sol (Peru); Honorary Fellow, Society of Experimental Test Pilots, 1980; Distinguished Graduate United States Air Force Institute of Technology, 1985; Gathering of Eagles, 1986; Fellow, Institute, Aero Science; Awarded 10 world flying records by Federatjon Aeronautique Internationale founded in 1905 as the governing body for air sports and aeronautical world records;

In addition, he was a Life Member of the American Legion; Member, Society of Automotive Engineers, Vice President, 1940; Founder and Life Member of the Order of Daedalians; Switlik Trophy, 1945; Wings Club (President, 1958-1959); Quiet Birdmen, Hyannis, Massachusetts.

World Records of Harold Ross Harris as confirmed by the Federation of Aeronautique Internationale: All flights by Harris unless otherwise noted.

Useful load of 551.15 pounds:

Duration: Douglas DT-2, Liberty 400 horse power engine, Wilbur Wright Field, June 28, 1924, 9 hours 11 minutes and 53.4 seconds.

Distance: Douglas DT-2 Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 590.3 miles

Altitude: TP-1, Liberty 400 horsepower engine, McCook Field, March 27,1924, 29,462 feet.

Useful load of 1102.31 pounds:

Duration: Douglas DT-2, Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 9 hours, 11 minutes, 53.4 seconds.

Distance: Douglas DT-2, Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 590.3 miles.

Altitude: Army TP-1, Liberty 400 horsepower engine, McCook Field, May 26, 1924, 28,143 feet.

Useful load of 4409.24 pounds:

Duration: Harris with Mechanic Douglas Culver, Barling Bomber, 6 Liberty engines 400 horsepower, Wilbur Wright Field, October 3, 1924,
1 hour, 47 minutes and 10.5 seconds.

Useful load of 6613.86 pounds:

Duration: Harris with Mechanic Douglas Culver, Barling Bomber 6 Liberty 400 horsepower engines, October 3, 1924, Wilbur Wright Field, 1 hour, 47 minutes and 10.5 seconds.

Useful load of 8818.48 pounds:

Duration: Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Field, October 3, 1924,
1 hour, 47 minutes, 10.5 seconds.

Altitude; Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty
400 horsepower engines, Wilbur Wright Field, October 3,1924, 4,472 feet.

American Air Records and confirmed by the Contest Committee, 1925:

Speed for Specified Distances:

Speed for 1,000 kilometers, Harris with Ralph Lockwood, DH-4L, Liberty 400 horsepower engine, Wilbur Wright Field, March 29, 1923, 127.42 miles per hour.

Speed for 1500 kilometers, DH-4L, Liberty 400 horsepower engine, Wilbur Wright Field, April 17, 1923, 114.35 miles per hour.

Speed for 2000 kilometers, DH-4L Liberty 400 horsepower engine, Wilbur Wright Field, April 17, 1923, 114.22 miles per hour.

Useful Load of 551.15 pounds: Returning to point of departure:

Duration: Douglas DT-2, Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 9 hours, 11 minutes, 53.4 seconds.

Distance: Douglas DT-2, Liberty 400 horsepower engine, June 28, 1928, 590.3 miles.

Altitude: TP-1, Liberty 400 horsepower engine, McCook Field, March 27, 1924, 29,462 feet.

Useful load of 1102.31 pounds: Returning to point of departure:

Duration: Douglas DT-2, Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 9 hours,11 minutes, 53.4 seconds.

Distance: Douglas DT-2, Liberty 400 horsepower engine, Wilbur Wright Field, June 28, 1924, 590.3 miles.

Altitude: Army TP-1, Liberty 400 horsepower engine, McCook Field, May 21,1924, 28,143 feet.

Useful load of 2204.62 pounds: Returning to point of departure:

Altitude: Army TP-1, Liberty 400 horsepower engine, Wilbur Wright Field, May 22,1924, 16,732 feet.

Useful load of 4409.24 pounds: Returning to point of departure:

Duration: Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Field, October 3, 1924, 1 hour, 47 minutes, 10.5 seconds.

Altitude: Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Field, October 25, 1923, 6,722 feet.

Useful load of 6613.86 pounds: Returning to point of departure:

Duration: Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Field, October 3,1924, 1 hour, 47 minutes, 10.5 seconds.

Altitude; Barling Bomber, 67 Liberty 400 horsepower engines, Wilbur Wright Field, October 27,1923, 5,344 feet.

Useful load of 8818.48 pounds: Returning to point of departure:

Duration: Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Field, October 3, 1924, 1 hour, 47 minutes, 10.5 seconds.

Altitude: Harris and Mechanic Douglas Culver, Barling Bomber, 6 Liberty 400 horsepower engines, Wilbur Wright Filed, October 3, 1924, 4, 472 feet.

As the story of Harold Harris ends the author is reminded of a great poem surely befitting the life and times of this pioneering aviator:

Appendix 1:

Harris left for posterity an account of his pressurized flight and is repeated here in part due to the interest it generated at the time and the controversy it engendered in later years. What appears below came from a speech General Harris gave on October 12, 1974 to the Connecticut Aeronautical Historical Association which reflects a personal touch to his pioneering effort. He was introduced by Robert H. Stepanek.

In June 1921, I made what I believe to have been the first pressurized cab in flight in the world. We learned a great deal about that possibility in one short flight—and I lived to tell the tale.

The plane was a U.S. D-9-A, which was a single Liberty-engined observation plane built from the designs of the British DeHaviland DH-9. It was a two-seater, but for the purpose of this experiment the seats were removed and the area filled with an oval pressurized compartment made of steel. As I recall it (after 53 years), it was riveted and joints were brazed. The minimum of controls was brought into this tank—the spark advance, throttle, mixture control, ignition switch, the control stick for elevator and ailerons, and the rudder cables. Packing glands surrounded all controls where they went through the sides of the tank.

The only instrument inside the tank was altimeter. All other instruments were on a special board just forward of the 8-inch porthole in the front of the tank so that they would be readily visible to the pilot. No controls were furnished for the pressurized unit.

There were five 8-inch glass portholes in the tank, at the bottom, the top, one on the left side, one forward, and the fifth in the removable door on the right; the door was about two feet in diameter. In unpressurized flight the door was suspended on hooks on the right rear interior wall of the tank. This door was steel of considerable weight and had to be lifted off the suspending hooks and placed in the retaining tracks on the inside of the opening, then rotated about one-eight of a turn to make a tight seal against a rubber gasket for pressurization. A normal pilot seat was installed in the tank.

In the ceiling was a three-quarter inch globe valve, with a manual control easily reached from the pilot's position, presumably to make pressure control easily available to the pilot through adjustment of the rate of exhaust of the pressurized air. A propeller driven blower, I believe of the Rootes type, was installed in the leading edge of the lower left wing with a 1-1/2 or 2-inch pressure line running from the blower to the lower forward part of the tank. Other than the above, no special changes were made in the standard U.S. D-9-A airplane.

It might be pertinent to add that there was no super-charger installed on the Liberty engine, since this was strictly an experimental installation to try out a pressurized cabin. If the tests had been successful, the super-charged engine could have been installed at any time.

I do not know who invented the idea of the pressurized cabin, but I suspect it was Major L. L. Hoffman, who was head of the Equipment Section and very much interested and working intently on problems of high altitude photography, for which an aircraft of this type would be very useful.

The pilot assigned to the first flight was Art Smith, a very well known pre-World War I exhibition pilot, who was employed as a civilian flight test pilot by the Air Corps (actually the Air Service at that time). Smith was in my department. He was about 5 feet 3 inches, quite husky, but not as tall as the average pilot. He took the experimental plane up with the door mounted in the rack aft of the opening through which the pilot entered the tank. Smith climbed to 3,000 feet and tried to lift the door into place to pressurize. Because of his poor leverage he was unable to maneuver the heavy steel door into its closed position, so he brought the plane back. Since I am taller than Smith and would have better leverage, I took the plane up myself. At 3,000 feet I lifted the door into place and rotated it to its locked position.

Immediately things began to happen. The cabin super-charger had been designed on the assumption that there would be a large leakage through all the packing glands carrying the cables for the control mechanisms, and that the regulation of pressurization would be easily taken care of by the manually operated glob valve in the roof. For an effective test, the designers had increased the compressor capacity by 100 percent. Almost immediately after the door was closed, pressure built up within the tank until the altimeter inside the tank registered 3,000 feet below sea level, although the altimeter outside the tank showed that the plane was flying at 3,000 feet above.

My first action was to make sure that the manually operated exhaust valve in the roof was wide open. It was, and I could feel the rush of air flow through the opening in the valve. Then I searched for something with which to break a window. But I had nothing, not even a pocket knife, and since I did most of my flight

testing wearing tennis shoes (because of a better feel on the controls), I didn't even have a heel of a shoe. Opening the inward-opening door was impossible because of the tons of pressure inside the steel tank. There was no way to stop the wind-driven compressor from operating as long as the plane was flying, because it was being driven by its own propeller, separate and distinct from the engine propeller.

The only thing left to do then was to assume as slow speed a glide as I dared, and land as quickly as possible. At no time, from shortly after closing the door until after the plane came to a stop, was the cabin pressure above 3,000 feet below sea level.

There was no possible escape from this ever-increasing pressure. I do not recall any particular area of discomfort, although it has been reported that I complained of pain in my ears. The air in the tank was uncomfortably warm from the action of the compressor, and I was wringing wet from perspiration on landing. However, this was probably due in some degree to my anxiety about the outcome of this test, and irritation with myself for having gotten into such a situation without having intelligently considered the possible difficulties and taken the necessary precautions.

Although many years passed before pressurized aircraft were perfected, that strange failure contributed to ultimate success.

Below is an important speech given by General Harris regarding his life, the First World War years, the pressurization flight and his time with Pan American Grace Airways (Panagra) and appears as written without any corrections. General Harris was extremely proud of his work with Panagra and wished to leave this testimony to his service with the carrier, an airline not well known to most Americans.

TENTH ANNUAL NORTHEAST HISTORIANS MEETING
WINDSOR LOCKS, CONNECTICUT
OCTOBER 12, 1974

SIXTY YEARS OF AVIATION HISTORY
ONE MAN'S REMEMBRANCE

Harold R. Harris
Brig. Gen. USAF (Ret.)

(A note to the reader: this speech appears In the Harris record on the same day as the address reproduced just above. The theme is similar but this speech is more detailed).

Any history is a combination of incidents, true, nearly or practically true (and sometimes false), plus the spoken and written rumors and folk tales covering the many facets of that particular subject. Many of the histories of civilization, wars, religions, geology, astronomy -- are based upon centuries of investigations by experts, hopefully unbiased, of all available sources. Facts are set forth in written form for the information and guidance of present and future generations.

Aviation history, however, is yet too young to have had empirical yardsticks delineated and large or small details set into proper order. Distance, in time, will improve our perspective, but many accounts will be essential to the establishment of true valuations.

Your historical society has undertaken a worthwhile task, that of organizing spoken and written recollections and remembrances of living experts and specialists in many facets of aviation, and preserving them for future research. Many men with unique and invaluable experience in aviation development have already died, leaving only sketchy, or no, record of their trials, failures, and triumphs in quest of what aviation is all about: "Transportation above the surface of the earth."

Facts are viewed differently by different people. And that reminds me of a story of a couple who, after several years of childless marriage, divorced, each blaming the other for the lack of off-spring. A few years later, each having married again, the ex-husband telegraphed his ex-wife, "My wife just gave birth to a boy. Now, whose fault was it?" She wired back, "I have just given birth to twin girls --and I know they are mine."

The history of aviation is going to be composed of some facts -- and many recollections, usually of those things which turned out well. Errors, mistakes and failures are easily forgotten, but they are frequently the giant steps toward new developments. This evening I would like to tell you especially about some of these failures and errors which were milestones on the way to the great commercial air network which circles the earth today.

Let me skip lightly over the early years in which my interest in things mechanical developed, from the two-cylinder Maxwell runabout of my rich Aunt, whose chauffeur taught me to drive in 1909, to the first Aviation Meet in California in January, 1910, at Long Beach.

Needless to say, the best flying was done by Roy Knabenshue in a lighter than air dirigible, but short take off and spot landings of the heavier than air machines were interesting.

At another meet held the following year at the same place, the World's Altitude Record was set at 4,300 feet! The most interesting flying was done by Hubert Latham in a French "Antoinette" monoplane. But my most vivid impression resulted when Arch Hoxie, in a "Wright Flyer," descended from an altitude attempt, went into a vertical dive, and was killed. I was horrified when the crowd rushed out to the crashed plane and tore the clothing off his body for souvenirs!

Since there were no aviation courses then, upon graduation from Manual Arts High School in Los Angeles, I enrolled in the College for Mechanical Engineering. My high school class was one year ahead of that of Jimmie Doolittle and Josephine Daniels, whom he later married. And thereby hang many tales!

But WWI began in Europe in 1914 and Washington set up, in the summer of 1916, Citizens' Military Training Camps. I enrolled at the one at Monterey, California, where there was an aviation unit. Here I became "Engineering Officer of the First Provisional Aero Squadron." We had two biplanes and one monoplane loaned to the Army by their private owners. Whether one of these planes could fly was determined by tying a spring balance to a fence post and the other side of the balance to the tail skid. At full throttle, if the balance showed 50 lb. pull, the plane could take off!

When the U.S. entered the war, I rushed to San Diego and enlisted in the Army Signal Reserve Corps and was sent to the first class in ground school at the University of California at Berkeley. Upon graduation, July 10, 1917, I was among those sent to Europe for flight training. At Foggia, in Italy, we set up the 8th Aviation Instruction Center of the A.E.F. Major William Ord Ryan was our CO. Shortly after our arrival, the second detachment, under the command of Captain Fiorello La Guardia, reached Foggia.

After 181 minutes of dual instruction from the Italian officers and petty officer pilots in the Italian-built Maurice Farman with a pusher 10-cylinder radial 80 h.p. air-cooled Anzani engine, I soloed. We *early* solo pilots gradually replaced the Italian instructors and in due course I was named "Chief Instructor."

The advanced planes were Caproni Bombers with three Isotta Fraschini water-cooled 150 h.p. each, two tractors and one pusher.

Of the many interesting incidents, one comes to mind. It was an amusing but near-tragic occurrence which happened late in 1917. La Guardia was getting instruction in a Farman from an Italian pilot. We watched the plane come in for a landing, very slow and flat, and about to spin. It finally hit the ground flat, bounced several times, and finally stopped. The two men jumped out screaming at each other in Italian. It turned out that each thought the other was making the landing. New York nearly lost a future Mayor that day!

My own most intriguing, and educating, experience with a Farman occurred after I had heard that a pilot could not safely fly in a cloud. An overcast day tempted me to try and I flew through the solid cloud cover to the sunlight, collecting ice in a "Vee" on the front of all the brace wires. After half an hour above the clouds, I looked for a hole just where I knew the air field should be. No cloud hole. So I flew toward a mountain top I had never seen before.

The clouds were parted by the mountain and I could see a stream below. This was fine; I could follow the river to the sea and orient myself. However, I had not noted that the strong wind had blown me across Italy -- and the river was flowing to the western sea. As I got into the lee of the mountain, the mountain wave turbulence took charge, turning the plane upside down. I knew it was the end for me! In those days no airplane parachutes existed.

Fortunately, I had my half-inch seat belt fastened and there was plenty of time in my descent from 12,000 feet to consider my situation -- hands gripping the scissors control, stomach straining against the seat belt, heels locked against the rudder pedals -- and my lower lip trembling with fright! Close to the ground I regained control and landed in a cultivated field.

In July, 1918, I was in command of eight other U.S. pilots to deliver four Capronis from the factory at Milan to Paris. This was the first flight of U.S. Army personnel across the Alps.

Two other pilots and I were ordered back to the U.S. in September of 1918 as test pilots and instructors for the Capronis then being built in the U.S. But construction was delayed, so we were sent to the U.S. Army Test Center at Wright Field, Dayton, Ohio. This field was where the original Wright Brothers' hanger (barn) still stood, about three

miles east of the present Wright Field.

Let's talk about some of those bad endings. Test work is just a series of them. At the end of WWI, the Engineering Division of the Air Service was set up at McCook Field, at Dayton and I remained stationed there until my resignation as an officer in 1926. In November,1920, I was appointed "Chief, Flight Test Branch, Engineering Division."

Along with other developmental work, I did considerable testing of Emil Berliner's and later his son, Henry's, helicopter at Washington. And the U. S. Army had de Rothezat build a four lifting-screw (six blades each) helicopter and I did most of the flying (if you could call it flying) at this experiment. It was built with one 180 h. p. Gnome rotary, set horizontally along side the pilot. Later a 200 h. p. Bentley rotary replaced the Gnome. One of my British friends said, "Yes, the Bentley Rotary is an interesting engine—but it has a bad habit of shedding cylinders!".

The de Rothezat helicopter had a unique, and at the time probably the most accurate altimeter in the world—one end of a rope was tied to the frame, with markers at every foot. And it was adequate for the job. Those early helicopters could get about ½ rotor diameter above the ground. Until Sikorsky perfected the swiveling blade, no successful helicopter operation was attained. But our "bad endings" helped to point the way.

In June, 1921, I made what I believe to have been the first pressurized cabin flight in the world. We learned a great deal about that possibility in one short flight—and I lived to tell the tale! The plane was the U.S. D-9-A, which was a single Liberty-engined observation plane built from the designs of the British DeHaviland DH-9. It was a two-seater, but for the purpose of this experiment the seats were removed and the area filled with an oval pressurized compartment made of steel. As I recall it (after 53 years), it was riveted and the joints were brazed. The minimum of controls was brought into this tank -- the spark advance, throttle, mixture control, ignition switch, the control stick for elevator and ailerons, and the rudder cables. Packing glands surrounded all controls where they went through the sides of the tank.

The only instrument inside the tank was an altimeter. All other instruments were on a special board just forward of the 8-inch porthole in the front of the tank so that they would be readily visible to the pilot. No controls were furnished for the pressurizing unit.

There were five 6-inch glass portholes in the tank, at the bottom, the top, one on the left side, one forward, and the fifth in the removable door on the right; the door was about two feet in diameter. In unpressurized flight the door was suspended on hooks on the right rear interior wall of the tank. This door was steel of considerable weight and had to be lifted off the suspending hooks and placed in the retaining tracks on the inside of the opening, then rotated about one-eighth of a turn to make a tight seal against a rubber gasket for pressurization.

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Godfrey Cabot had a twin engined plane built to carry out his experiments for picking up mail sacks from the ground by a plane in flight. I flew the first test, August ii, 1921, with the grapnel hook on the end of a flexible cable. The hook hit the mail-bag support and looped over the plane, jammed the elevator and ended up in the left engine, tearing it from its mount. Although the plane was destroyed, I emerged undamaged. Later when a rigid pole was substituted for the cable, everything went well as demonstrated so successfully for many years by All American Aviation.

General Billy Mitchell took on the U.S. Navy in 1921 and assembled all his planes and pilots at Langley Field for the bombardment of the surrendered German warships. As the world knows, airpower was proven by these tests. My glamorous personal part was bombing the cruiser with 500 lb. bombs. I missed!

Soon after I was graduated from the Air Corp Engineering School at McCook Field I was involved in another "first" which made me Number One in the Caterpillar Club.

Several flying officers were gathered at McCook Field on October 20,1922, when a visiting officer asked about the parachute. We explained the way the parachute worked, and the visitor seemed impressed. Several others expressed doubt of a pilot's being able to release himself from an airplane and operate the parachute in an emergency. Little thinking my words would so soon be put to the test, I remarked that it was surprising what a man could do when put to it. Although parachutes were being tested, and were worn, no pilot had yet used one to save his life.

Subsequently I suggested to Muir Fairchild that he fly a machine for further test of new tail surfaces while I took a monoplane up to test some new and experimental types of ailerons.

Lieutenant Fairchild got his parachute and went out to the ship. I had just had a new seat cushion installed on my parachute and after I took it out to my airplane, found that the harness was a trifle tight; I sent the timekeeper to get another parachute for me. The one he brought had an even smaller harness. After wasting considerable time, I almost yielded to the temptation to conduct my test flight without a parachute, but eventually decided to wear my own chute.

Fairchild meantime took off and I followed. At an altitude of about 2,500 feet the other machine was waiting for me. We had maneuverability tests to carry out on both airplanes; therefore, it was logical for us to practice a little combat.

After some combat maneuvers, Fairchild began a slight left turn. Fairchild told me afterward that his indicator then showed slightly more than 150 miles an hour; I was therefore going about that speed when he began his turn. I also began a very gradual turn to the left. As soon as the turn started, all hell broke loose!

I do not know how many of my listeners have ever felt a really severe earthquake, but the first vibrations of the airplane were exactly like the heavy tremors of a quake. The whole airplane shook violently laterally and the control stick began to oscillate rapidly from side to side. I knew immediately what the trouble was -- the experimental

ailerons.

As soon as the motion of the ailerons at high speed was started they began to operate themselves, due to overbalance, making it impossible for the pilot to control their action. As the aileron on one wing goes up, the aileron on the other wing comes down; and that was exactly what was happening at an extremely high rate of reversal speed.

The only way I could control this oscillation was to slow the speed of the airplane, so I immediately closed the throttle and started to climb. By this time, however, the aileron whip had become so great that the wing structure had been torn apart internally. The control stick oscillations became extremely violent and were being stopped on each side by my legs. If you can imagine receiving terrific blows on the flesh part of your leg between the hip and the knee, at the rate of 1,000 a minute, you will realize why three days after the accident I could not walk and for days suffered from severe bruises. My right hand, with which I was trying to control the airplane, was also badly bruised by the lateral oscillations of the stick.

I knew it was impossible to regain control of the airplane. There was only one thing to do to save my life. I had seen a good many airplane crashes. I had helped pick up a good many pilots who had been killed. In a collapse of the sort I was experiencing, if I stayed in the airplane, I would undoubtedly be killed. The next thing for me to do was to leave the airplane and trust my parachute.

This was not hard to do, because the airplane was falling at an angle of about 25 or 30 degrees with the horizontal, and portions of the wing structure were beginning to blow off. I had only to release my safety belt and climb on top of the fuselage. The tremendous wind pressure, probably 250 miles an hour, blew me clear of the airplane. Now to pull the ripcord of my parachute.

I had vowed that I would never, except in case of an emergency, make a parachute jump; I had piloted airplanes for about fifty live parachute jumps and as I watched the expression on the man's face when he was about to jump, I decided that it looked like too much of a mental strain to suit me. A surprising thing about the jump that I made was that during the whole experience, I did not become fearful, nor feel any faintness or failure of my faculties.

After leaving the airplane, I looked down at my feet and realized that my feet were pointing to the sky! I located what I thought was my ring and pulled. Nothing happened. I was spinning like a top, head down and .et up. Three times I located what I thought was the release ring, but each time, I was pulling on a leg strap. Finally, I pulled the right ring.

As soon as the release cord was operated, I felt something snap within me and found that I was looking down at the ground. I then looked up at my parachute -- not with any sense of relief because I had none. It all seemed part of the program that the parachute should open without argument, and I can remember admiring the beautiful silk. I could not understand how silk could be kept so white and clean around an airplane hanger.

I then looked down again to see just where I was going to land. I saw a grape arbor and was well-satisfied. I knew the frail laths would easily give way and break my fall to the ground. This is exactly what happened. The only damage I suffered was a tear in the best pair of pants I owned and some cuts on my shoes as I went through the arbor. The brick sidewalk below the arbor was not particularly resilient, but I was not rendered unconscious by the fall although my physical condition was low on account of the terrific beating I had received on the legs from the control stick.

My first thought on finding that I was all right was the possibility of injury or death to anyone from the falling airplane. It was not until a couple of hours later that I learned that the airplane was completely demolished without injury to anyone and with little damage to surrounding property.

Lieutenant Fairchild, during all these exciting seconds, had a considerably worse mental experience than I because he did not see me leave the airplane or see the parachute open. He had seen the beginning of the wing collapse.

He supposed, until he landed at the airdrome, that I was in the wreck and that I was dead. This was a tremendous shock to him as we had known each other since May, 1917, when we entered the University of California Ground School together. He arrived at the Field Hospital about ten minutes after I was brought there and I'm sure he was whiter and more frightened than I was myself.

August 16, 1923, saw the first flight of the Barling Bomber. This six-engined triplane was very large for its time. While it did not "advance the art" in a positive sense, our experience with it certainly prevented additional efforts in a wrong direction; therefore, it had beneficial negative results.

One of the problems of early flight testing showed up at the top of a Barling test climb to absolute ceiling with full load. Descending from the top, a stream of liquid was observed coming out the trailing edge of the top wing. All fuel was in

the fuselage, so that wasn't it. Investigation on the ground showed that the wing had been full of rain water and the test was valueless since the actual total aircraft weight at takeoff was unknown. The testing had to be stopped until a hanger large enough to house the plane could be built.

Meanwhile, the “art” advanced in many other directions. I set several World and American records with the Barling Bomber. And speaking of records, anytime the U. S. wants to spend the time and money, new records can be set. As we have recently seen, present international tensions notwithstanding, the Lockheed “spy plane” has just shaved two hours and fifty-one minutes from the trans-Atlantic speed record. At any rate, the taxpayers paid for the 10 World and 16 American records I held at the end of 1925.

Early in 1923, the Post Office Department which operated the only U. S. mail airmail service, decided that they wanted to operate at night as well as in the day. We were requested to develop aircraft and ground lights suitable for regular night operations. An electrical engineer was assigned to develop the lights and beacons and we worked intensively on their application. We set up the world’s first night scheduled cross-country operation between Dayton and Columbus, Ohio. Sixty miles.The first flight was on July 16,1923.

That date was little noted then, but will long be remembered as the date of the launch of the Saturn V for the world’s first lunar landing, July 16, 1969, forty-six years later. Surely no more dramatic contrast exists in all of aviation’s spectacular history!

In our development of the night flying service, each of the test pilots made scheduled round-trips at night, reporting on the aircraft performance and the lighting conditions. (The experiment was written up by me and the electrical engineer in one of the early U. S. Air Service magazines). Perhaps one of you has the article. If so, please let me make a copy, the date must have been late 1923 or early 1924. That was about the time of another important development.

Donald Douglas and the U.S. Navy were responsible for the installation and rapid development of brakes on aircraft, after1923, although I doubt that they realize it. At McCook, we tested all service parachutes before they were issued to the air service pilots. The chute to be tested was strapped on a dummy and it was dropped at about 1,000 feet. Since the De Havillands used for this flying could carry not more than two dummies on each flight, we borrowed a Douglas Navy torpedo, which could carry four or more.

This was fine, except that McCook Field was relatively narrow and on each flight two men on the field had to hold the wing tips for a taxi turn of this single engine plane. This was because Douglas, at Navy insistence, had built a rigid tail skid. It occurred to me that a hard wood stick, properly leveraged and operated from the cockpit, could bear down on the top of the inboard tire, as a drag, thus eliminating the wing tip men. I. M. Laddon, an aeronautical engineer at McCook, later a famous Engineering Vice President of Consolidated Aircraft Co., studied the problem and decided that brakes, similar to auto brakes, were the answer. These proved so successful the the tricycle landing gear, with its many advantages, could be safely introduced.

By 1925 we had come a long way toward our goal of safe and dependable flight -or at least, in contrast to the state of the art we had in 1918. It was early in 1925 that Tom Huff of Huff Daland, Ogdensburg, New York, who manufactured planes for the Navy, asked me to leave the Army. He wanted me to join an airplane crop dusting company he was setting up. This unique field appealed to me and General Patrick, Chief of the Air Corps, gave me a year's leave of absence to see whether I liked it. I resigned my commission a year later.
Crop dusting was one of the earliest uses of aviation supporting an activity other than transportation and little was known about it. Naturally, one of the problems of this new outfit was to secure pilots, so I went to Kelly Field at graduation time, since graduates were not then retained on active duty with the Army. Among those I interviewed was a lad named Lindbergh. He listened carefully to my sales pitch and asked for time to think it over. When he returned he said, "No. I am not interested. I own a Jenny (Curtiss JN4D) and will barnstorm and make a lot of money." And so he did, as we all know. All of us who have known and loved aviation, mourn his recent death.

Since crop dusting is necessarily seasonal, we did vegetable dusting in Mexico and, later, cotton in Peru. After the 1927 season was over in Peru, I had learned the hard way how long it took to get parts, mail and supplies from the U.S. by sea. I traveled overland from Peru to Bolivia, Argentina, Uruguay and Brazil looking not only for more possible dusting markets, but also studying air mail route possibilities. Everywhere local embassies, bankers and business men were enthused with the idea. So I drew a map, showing how to get started, and describing later expansion. Remember, planes then had only about a 600 mile range. That map, now truly historic as regards U.S. air service in Latin America, is in my possession today.

While I was in South America, Huff Daland was taken over by Hayden, Stone § Co., an important Wall Street brokerage firm. When I returned to New York from the 1927 South American tour, I reported to Richard Hoyt, the Hayden Stone partner in charge of their aviation activities, I showed him my map and my write-up of how to start an airline. He turned to his secretary and said, "Get Trippe on the phone." When Trippe came on, Hoyte said, "Come over here, There's someone here who's two years ahead of us." I had never heard Trippe's name before.

A small company, "Peruvian Airways Corp.," $50,000 capital, was set up. C. E. Woolman, Chief Entomologist of the dusting company, was a fantastically good salesman. He was sent to Peru to secure an air mail concession. Meanwhile, I ordered and watched over the construction of a Fairchild cabin plane with a 200 h.p. Whirlwind engine which would carry four passengers and a pilot. At my insistence, a toilet was installed, the first in any U.S. commercial airplane. This historic plane is now in the Smithsonian Museum.

In those early days, cruising altitude was about 2,000 feet above the ground. The air can be very rough at that altitude, particularly over the desert which comprises much of the Peruvian coast. Anachronistic though it seems, the side windows of this plane could be lowered in flight. One day a lady passenger became airsick and made a real mess of the cabin (we hadn't graduated to airsick bags yet). On landing, the pilot asked her why she hadn't used the toilet. She'd forgotten about it. And why hadn't she lowered the window? "I was afraid I would lose my false teeth." Richard Hoyt learned that W. R. Grace & Co., then a business power on the west coast of South America, was interested in the possibility of an airline there. They joined forces on a fifty-fifty basis.

September 13,1928, forty-six years ago last month, saw the first commercial U.S. airline in South America in operation. One round trip per week -- Lima to Talara, Peru --600 miles north. The flight was scheduled to meet the Grace steamers at each end, to pick up and deliver late mail and passengers.

President-elect Hoover made a trip via U.S. Navy cruiser down the west coast of South America before his inauguration. He assured me that he would give us full support in our efforts to grow and expand internationally. So we bought several larger Fairchilds -- 400 h, p. engines carrying six passengers, plus pilot. I took one of the first of these larger planes to Ecuador, our first expansion goal, and piloted the first round trip by air ever made between Guayaquil and Quito. Since the next door neighbor is not usually well thought of, no concession for Peruvian Airways was possible in Ecuador, so the first concession was granted to me personally, with the right to transfer to a corporation.

"Pan American Grace Airways," "Panagra," was founded in 1929, taking over the Peruvian Airways activity and owned 50 percent by Grace, and 50 percent by Pan American, Juan Trippe's company. Later purchases of Ford trimotors, Sikorsky amphibians and DC2s and DC3s made possible expansion north from Ecuador (across Colombia) to the Canal Zone, south to Chile and across the Andes to Buenos Aires and Montivideo.

Since the Uscallata Pass, the direct route between Santiago, Chile, and Buenos Aires, Argentina, is very weather-prone, I surveyed the northern pass between Antofagasta and Salta. This was the first flight ever made over this route -- and it turned out to be quite a problem. As I climbed above the clouds after take-off from Antofagasta, bubbles began to form in the compass liquid and the compass card spun as each bubble hit it. No compass! In those days no radio, no direction finder, and no aviation maps. So I estimated my progress by time and sun direction. Gingerly, I let down through the clouds on what I hoped was the east slope of the Andes. I was lucky --it was, but I was far south of my goal so headed north to Salta.

As we expanded across Bolivia, from Peru to Argentina, we encountered difficult, but soluble, problems for the airports at La Paz, Oruro and Uyuni are all above 12,000 feet above sea level.

Our Bolivian concession had a time limit before which we had to start service. All landing fields, radio installations and passenger stations were for our account and had to be constructed and installed by us. Uyuni is the junction of the railroads to Chile and Argentina from Bolivia. The field at Uyuni and the station and radio had to be built and operational before the deadline. The Chaco War was in progress between Bolivia and Paraguay and no manpower was available; however, one of our airport engineers was assigned the job.

Nerves were getting a bit frayed as we heard nothing from him until the day before the deadline. Then his radio station went on the air advising us to proceed with the planned flight schedule for the next day.

When he returned to Lima I asked how much the Uyuni job had cost. "Two bottles of Scotch," he replied. When he arrived there he had sought out the Chief of Police, handed him a bottle of Scotch, and outlined his airport problem. The Chief got out his truck and started across the pampas, lassoing every Indian man he saw. He brought them back to a barbed wire enclosure -- the site of the new airport. Indian women follow their men with all necessary cooking gear. The women parked outside the wire and fed their men through the wire. All day the men picked up rocks from the airport surface, piled them into the truck, and picked more rocks as an empty truck arrived. Within a few days the field was cleared and the Indians were turned loose. Whereupon the Chief of Police received the second bottle of Scotch! Try that for an airport construction job today.

Doing business in foreign countries is not always easy, even if some of the wars and revolutions are not really well-organized. Arequipa is some 600 miles south of Lima. The military garrison at Arequipa decided to rebel against the Lima Government, so when our southbound Ford carrying the U.S. m landed at Arequipa to refuel, the pilot, Byron

Richard, found a company of soldiers with guns, lining the landing area. They seized him and his plane. The telegraph line to Lima was functioning, and we learned that our plane and pilot were in the hands of the revolutionaries.

We made a vigorous protest about the seizure and the delay of the U.S. mail, and they finally agreed that we could send a single engine plane, a Lockheed, to pick up the mail for onward flight, but the revolutionary forces retained the Ford and its crew for the few days that the revolution lasted. The leaders of the unsuccessful coup then boarded our plane and, in what was surely one of the earliest political hijackings, had themselves flown to Arica, Chile, where they would be safe from reprisal. And all ended well, as we got our plane and crew back unharmed.

Just as some people are accident-prone, Rickard must be hijack-prone. A few years ago, piloting a Continental Airlines jet, he was hijacked again. He came out of that experience unharmed too.
The United States cut its international aviation teeth in South America, and it is singularly unfortunate that no comprehensive history of that activity has been compiled. My own notes and memorabilia provide a great deal of the background. For we learned in so many areas at the same time, It was not only important to be able to take off from a hot airport at 12,000 feet above sea level; it was just as important to be able to deal well and fairly with the officials in the various countries -- so that we could fly again tomorrow -- and into the years ahead. That we did learn is attested by the fact that service continues after 46 years.

In 1939, as Operations Manager of the airline, I moved from the Lima office to the New York office, but in 1941 was sent to Bolivia to take over the local German airline, Lloyd Aero Boliviano, for the U.S. Returning to Washington, I set up, as a civilian, the Plans Section of the U.S. Army Air Transport Command. Soon in uniform as a Colonel, I was later made a Brigadier General with the ATE and at the end of the War was Chief of Staff of that Command.

The history of the ATC and its fine work in WW II has been well- documented so I need not add to that story. The Command was most fortunate in being under Lieutenant General H. L. George, who handled the Army problems, and C. R. Smith, of American Airlines, who handled the operating problems.

You have heard, briefly, in the very generous introduction of your President, of my additional aviation activity in American Overseas, Pan Am and Northwest, and the later work in Aviation Financial Services and as aviation consultant.
I consider myself one of the most privileged people in this great industry since
I have, over the years, been fortunate to participate along the leading edge of the technology, in the early learning and experimental work, in administrative and entrepreneurial activity in South America, in the management of major international carriers, in the formulation of U.S. policy, and, finally, in providing essential finance at the outset of the jet age.

My own history has paralleled the history of commercial aviation. But the history of the airlines is only slowly being recorded. And much of the writing is slanted to glorify some individual or company, although most of the information is valuable. Perhaps your organization could make a survey of all airlines headquarters and print a catalogue of available material, as a starter. One of the oil companies has been covering the history of the airlines of the world as a feature of its monthly trade magazine.

There are those who say that aviation is no longer an adventure -- that airlines are a business. Somehow, I don't agree. While most of the major companies were begun by pilots, the majority of the companies are today headed by accountants, lawyers, salesmen and administrators. But these are the people who are still adventuring -- not at the risk of life and limb -- but at the risk of goods and reputation. They are also treading new ground as they innovate and experiment with new systems, new procedures, to continue to perform that essential service which is what aviation is all about -- to provide the most rapid, safe and economical transfer of goods and people from Point A to Point B.

Can we say that there is no more adventure when supersonic flight can carry men from New York to London in one hour, fifty-five minutes as the Lockheed SR-71 did recently -- or the space shuttle, now under initial construction, which could fly from New York to Tokyo -- or any place else on the earth's surface -- in forty-five minutes? I don't think the adventure is over -- I think it's just beginning.

Speaking of Adventures, try this. All the Astronaut launchings have been eastward, toward the rising sun. What happens if you launch westward, ¦to yesterday's setting sun? You continue orbiting westward into last week, last year, etc. How many orbits must you make westbound to be your own grandfather?

If ever there was a hymn commemorating the life and times of General Harold Ross Harris in advancing aviation in general and aircraft development specifically it is the following:

PANAGRA SUBMITTED TO THE CIVIL AERONAUTICS BOARD
For Dockets #623 and #716
VERY INTERESTING AND WORTHWHILE INFORMATION ON
PANAGRA'S EARLY YEARS

NOTE "This STATEMENT OF EVIDENCE and the accompanying Exhibits were originally submitted to the Trial Examiner and Public Counsel on an informal basis by Panagra on October 15, 1941. Since that date the Statement has been substantially revised to meet objections raised by Public Counsel and to supply the additional information he requested."

(Author's note: This document is reproduced as it appears in the Harold Harris collection at the Wright State University Dunbar Library Archives. The company's submission to the Civil Aeronautics Board can be located in the Harold R. Harris MSS, Box 4, "Miscellaneous Information on Panagra Articles", Folder 8).

KEY DATA FROM THIS SUBMISSION ON VARIOUS SUBJECTS FOLLOWS:

Organization of Panagra and Development of Panagra Route:
Pan American-Grace Airways, Inc., hereinafter called Panagra, was incorporated under the laws of Delaware on February 21, 1929 for the primary purpose of operating a commercial air transport company in South America. Operating headquarters of Panagra and the offices of its principal operating officials are located at Lima, Peru. Small executive, financial and accounting control offices are maintained in New York. At the present time, the company carries passengers, mail and express by air over routes totalling about 8,000 miles, a longer route mileage than any United States domestic airline except the combined route mileage of the Pan American Airways System. The Panagra routes provide international air transport service between the Panama Canal Zone, Colombia, Ecuador, Peru, Bolivia, Brazil, Chile and Argentina. At the Panama Canal Zone connection is made with the United States via Miami and Brownsville. As of June 30, 1941 the company's gross assets equaled $7,461,054.

Panagra was jointly sponsored by W. R. Grace & Co. and Pan American Airways Corporation. Each of these organizations has held a 50% interest in the company's outstanding shares since its incorporation. In March 1929 Panagra was awarded Foreign Air Mail Contract No. 9 by the United States Post Office Department. This contract has been modified and compensation there under adjusted on several occasions. The contract was obtained on the basis of competitive bidding. There were 5 bids submitted for the route. Panagra's bid was $1.80 per mile for three round trips per week, this figure being twenty cents per mile lower than that at which all other foreign airmail contracts had up to that time and for several years thereafter been let. Despite the fact that the contract called for three trips per week subject to a determination by the Postmaster General that a greater or lesser number of trips was desirable in the needs of the service, the Post Office Department directed that service commence with one trip per week.

A second trip was authorized on July 1, 1930 at a reduced rate per mile and not until July 1, 1940 was the third trip authorized. In the meantime, the rate had been again reduced. A fourth trip was inaugurated August 26, 1941. As the result of various reductions in mail pay agreed upon between Panagra and the Postmaster General and because the mileage flown without mail pay has steadily increased, the compensation Panagra has received is substantially below the contract rate.

Panagra was the first American airline to operate a regularly scheduled commercial air transport service with connections to the United States along the West Coast of South America and to Buenos Aires. As such it has been engaged in a pioneer undertaking.

Some time after the first "World "War, Captain Harold R. Harris, now Vice President of Panagra, became connected with a concern known as Huff-Daland Dusters. This concern carried on a business of dusting crops from small airplanes in Peru. In June 1928 Huff-Daland Dusters obtained authorization of the Peruvian Government to carry mail and passengers in Peru. Some months later, W. R. Grace & Co. and Pan American Airways, both of which had been for some time studying the possibilities of a commercial airline on the West Coast of South America, formed Peruvian Airways Corporation with capital contributed half by each of these interests, and Peruvian Airways Corporation purchased the franchise of Huff-Daland Dusters.

In September of that year, flying a small Fairchild single motor plane, Peruvian Airways Corporation inaugurated the first scheduled flight of a commercial plane on the West Coast of South America by making a passenger and mail flight from Lima, Peru, to Talara, Peru. In February 1929 Pan American-Grace Airways was formed and took over Peruvian Airways Corporation. Operations in Peru, however, were continued through the latter company for several years thereafter.

An energetic and rapid development ensued following the organization of Pan American-Grace Airways and the award to it of the Mail Contract for Route No. 9. Organized February 21, 1929, by July 19, 1929 it had extended its

route to Cristobal, Canal Zone in the north and to Santiago, Chile, in the south. By October 12, 1929, the service had been extended over the Andes and across the Argentine to Buenos Aires. In less than a year a weekly airmail service over a 4,500-mile route covering six South American countries and involving operations over difficult terrain and over long stretches of very thinly populated country had been inaugurated and was in regular operation on stated schedules. The operation did not consist of flight from one large city to another. At most of the necessary fueling stops, even providing fuel was a sizeable operation. There was, of course, no radio and over this route no long-distance telephone service and to most places, no quick cable service.

Business was being done in foreign countries and in a foreign language. Survey flights and studies of weather conditions and terrain had to be made as well as arrangements for airports, emergency landing fields and maintenance. Virtually every requirement for operations had to be provided and the existing facilities which could be availed of were almost negligible.

Actual operating difficulties were only a part of the problem of inaugurating this service. Operating rights had to be obtained from six different countries along the route to fly over and land on their territory and to carry mail, passengers and express in and out. Postal contracts had also to be arranged with these countries. These permissions and post office contracts were not obtained automatically. Many of them required long and difficult negotiation before mutually satisfactory terms could be arranged. Customs regulations had for centuries been designed to meet the requirements of steamship operations. A wholly new technique had to be devised and put into effect to make feasible the quick dispatch in port which was necessary for fast air service.

The results achieved were possible only because the company had at its disposal the skilled men and the efficient organization which its two parent companies, W. R. Grace & Co. and Pan American Airways, represented. Panagra was organized and the operations undertaken upon the understanding from the outset that services of these two parent company organizations would be availed of and extensive services have been furnished by both parents from the outset to the present time.

DESCRIPTION OF TERRAIN, FLIGHT CONDITIONS AND PRINCIPAL AIRPORTS.

CRISTOBAL-GUAYAQUIL:

Cristobal, Panama Canal Zone, is the most northern terminal on the Panagra route. The airport known as France Field has proved to be inadequate for the Boeing 307 planes used by Pan American Airways, Inc. between Miami and the Canal Zone. Accordingly, in recent months Pan American Airways, Inc. has been making connections with Panagra at Balboa. Balboa will soon be the northern terminal on the Panagra route, as it is anticipated that operations into Cristobal will be discontinued some time during 1942 provided necessary authority for abandonment of this stop is obtained from the C. A. B. The Balboa and Cristobal airports are administered by Pan American Airways, Inc. Operations, maintenance and communication facilities are provided and administered by Pan American Airways, Inc. Panagra shares the expense of these facilities through a joint facilities agreement with Pan American Airways, Inc.

Flying south from Balboa, the Panagra route follows the Isthmus of Panama for some distance and then crosses the first range of the Andes at an approximate height of 12,000 feet, entering the Cauca Valley, somewhat west of Medellin, Colombia. The route then follows the valley to Cali, and shortly south of Cali crosses a low divide into the Paitia Eiver Valley. At the south end of this valley the western range which is low at this point, is recrossed to the coastal jungle plain east of Tumaco, and the route then proceeds over this plain to the west of the Andes as far as Guayaquil. In order to enter and depart from Quito, it is necessary to cross and recross the Andes through passes at an approximate height of 12,000 feet.

The route between Cristobal and Guayaquil is generally flown at a normal cruising altitude of not in excess of 12,000 feet. There are some peaks substantially higher than this altitude not far from the route at some points. The weather is tropical,—local cloud, rain and thunderhead areas are sometimes encountered. The combination of this type of weather with the terrain described

With the completion of the service from Cristobal to Buenos Aires, via Santiago, Chile, the main route was established. A period of steady improvement in organization, equipment, facilities and service generally followed, without, however, any extension of the route until 1935. In that year, arrangements were made with the Bolivian Government for putting Bolivia on the international airway by an extension of the route from Arica, Chile, to La Paz, Bolivia.

In July 1937 the route between Santiago, Chile, and Buenos Aires which had theretofore operated on a straight line was diverted somewhat to include the large and important Argentine city of Cordoba. In April 1937 the so-called Diagonal Route was inaugurated, being an extension from La Paz through the central portion of the Argentine to Buenos Aires via Cordoba, serving en route the important cities of Salta and Tucuman.

In July 1938 the route which had theretofore been operated between Cristobal and Guayaquil over water was diverted inland with land plane operation to serve Cali, the principal commercial city in western Colombia. In March 1938 the route between Cali and Guayaquil was further modified to include Quito, the capital of Ecuador. In 1941 in connection with the elimination of German services on the West Coast of South America, Panagra has added to its route extensive local services in Ecuador, a new international service across Bolivia to the Brazilian border where it makes connection with Panair do Brazil at Corumba, to provide a trans-continental service, and by management agreement with Lloyd Aereo Boliviano has assumed management responsibility for the important local services of that company in Bolivia.

Not only has Panagra's route been constantly expanded and the number of its schedules increased but its services have been steadily speeded up. In October 1929, for example, the trip from Cristobal to Buenos Aires required seven days. Today mail is carried between these same points in three days.

DESCRIPTION OF TERRAIN:
Flight Conditions and Principal Airports above make it necessary to establish numerous radio navigation facilities, both on and off the course, to insure regularity of schedules on conservative safety standards. Pilots must have unusually high degree of familiarity with the terrain and weather conditions. In order to operate sections of this route on conservative margin of safety, large fuel loads are carried, which enable the planes to proceed to or return to alternate fields if weather conditions require. This, of course, substantially reduces the pay load. The field at Cali is a military field owned by the Government of Colombia and is not adequate. As a result it will be necessary for Panagra and Avianca to construct a new airport for their own use at this point.

The field at Quito is also a military field. Since 1938 its length has been increased by approximately 50%, the surface improved, and it has been drained and fenced. Panagra has financed or absorbed the expense of these improvements and, in addition, has built passenger, radio and store room facilities. The field at Guayaquil is likewise a military field. It is situated at sea level on swampy ground, requiring a rock-filled runway. In 1938 the runway was widened and extended and terminal buildings were constructed by Panagra under a contract with the government, which provided that Panagra would advance about $50,000, to be repaid by Ecuador over a long period of years.

Panagra's use of fields owned and controlled by local governments throughout the route may require a brief explanation. The use of such fields is not so much a matter of choice as of necessity. Generally, in the countries where Panagra operates, privately owned and operated airports are either definitely not looked upon with favor or specifically prohibited.

Panagra has entered into contracts with the governments of Colombia and Ecuador which provide for the financing by the company of airport construction work on behalf of such governments. The contract with Colombia, entered into in April, 1940, provides for technical and financial assistance by the company for the construction of an airport at Tumaco, Colombia. The technical assistance comprises furnishing without charge the services of an airport engineer and the loan without charge of certain construction equipment. The financial assistance provides for the loan without interest of $40,000 Colombian currency to be reimbursed to Panagra in equal installments of $20,000 Colombian currency on April 1, 1941, and April 1, 1942. The first installment was paid on the due date. The balance of $20,000 Colombian currency, due April 1, 1942, is carried on the books of the company as an account receivable.
In Ecuador, Panagra has entered into the following contracts with the government for airport construction financing:

Date of Contract	*Airport*	*Amount*	*Expiration Date*
July, 1937	Guayaquil	700,000 Sucres	July, 1944
July, 1938	Quito	100,000 Sucres	July, 1944
December, 1940	Esmeraldas, Manta, Salinas, Cuenca, Loja	830,000 Sucres	February, 1949

The contracts provide that Panagra will construct specific airport facilities and invest the sums listed above. The government agrees to reimburse Panagra for the amounts involved, plus interest on the 800,000 sucres corresponding to the Guayaquil and Quito airports, in annual installments comprising retentions for duties and landing- charges, plus cash payments for any differential. To date no cash payments have been made. The contracts provide that in the event full reimbursement is not made at the expiration dates cited, the provisions of the contracts remain in force until this is done. On the basis of experience to date, it appears that if the government of Ecuador continues to limit reimbursement to the retentions for duties and landing fees, it will take at least twelve years before the total indebtedness is liquidated.

The net indebtedness for the Guayaquil and Quito airports is carried on the Balance Sheet as a Prepaid Expense in view of the time element and the consequent risk of non-collection. As the work at the other airports is not yet complete, the investment to date is carried on the Balance Sheet as "Construction Work in Progress." It is expected

that upon completion of the work the amount involved will be treated as a Prepaid Expense.

GUAYAQUIL-LIMA:
The route from Guayaquil to Lima follows the coast line well west of the first range of the Andes at most points. Excellent weather conditions prevail, except that in the neighborhood of Lima operations are hampered at certain seasons by low ceilings and fogs, which are encountered with some regularity during six months of the year. In order to maintain regular scheduled operations in and out of Lima during this season, accurate weather forecasting- and well organized radio navigation facilities are required. En route Guayaquil to Lima, Panagra 's planes stop at both Talara and Chiclayo. The first of these fields is owned by the International Petroleum Company, and the second by the Peruvian Air Force. Both fields are cleared, level areas of arid land, with a fairly hard but dusty surface.

At Lima the airport is owned and operated by Compania Administradora de Aeropuertos (Cada), a wholly- owned subsidiary of Panagra, formed some years ago in cooperation with the Peruvian Government and with Peruvian Government representatives on the Board of Directors. This company has a franchise to maintain the commercial airports at Lima and Arequipa. The Lima airport, known as Limatambo, is the official commercial airport of Lima. Under the existing arrangement the Government may take over the field at any time for the unamortized investment, plus any losses which have been incurred in its operation. The field here is a modern one which was built nominally by Cada but in fact by Panagra about five or six years ago. The field is adequate for day operation and is lighted. It is conveniently located approximately ten minutes from the center of the city by asphalt road. Panagra, on land leased from Cada, has erected on this field a large hangar which houses its principal maintenance base for the entire line. There is also provided at the field an attractive passenger and administration building. On land adjoining the airport, partly rented and partly owned by Panagra, there is a building housing Panagra's radio maintenance facilities, Link Trainer, and other operating equipment. Panagra is about to erect at this point an office and administration building.

LIMA-SANTIAGO:
From Lima to Santiago Panagra's route follows the coast line to a large extent with planes cruising at altitudes in excess of 10,000 feet. In order to enter Arequipa it is necessary to fly toward the interior over rough terrain. Leaving Arequipa the route runs to Arica on the coast over a gradually sloping terrain. Proceeding south to Santiago the route runs near the coastline until a point approximately two hundred miles north of Santiago where the plane proceeds through a series of valleys, in one of which Santiago is located. The weather from Lima south as far as Antofagasta is excellent throughout the year.

The weather between Antofagasta and Santiago, however, is frequently unfavorable in the winter time on account of rain and fog, often making it impossible to land at the points along the way. As a result, serious schedule delays are not unusual, in some instances amounting to as much as 24 to 48 hours. The planes frequently encounter high winds, and the pilots must know the terrain and weather conditions well. Along the entire distance from Antofagasta to Santiago one can see from the plane on the horizon a snow-capped range stretching along a thousand miles of the route.

At Arequipa there is an airport constructed by Panagra through Cada. This field though not lighted is a good modern two-way field situated on a slight grade with an attractive passenger station. At Arica the airport is owned by the Chilean Air Force and is located on arid natural soil. The field is lighted and the cost of this facility was split between Panagra and the Chilean Government. A hangar is rented by Panagra at this point, but facilities, both for passengers and radio, are quite inadequate.
At Antofagasta there is a new airport, constructed in 1938 and 1939 by Panagra engineers with funds provided by Panagra and the government of Chile. The airport is owned by the Chilean Air Force. It is situated on arid, desert land which has been made firm by grinding in sea shells. There is a small passenger station and radio building.

The field at Santiago is a large, well-drained, lighted, sod-surfaced field, which is the property of the Chilean Air Force. Panagra rents a hangar for servicing and maintenance work and uses the excellent modern terminal building for its passenger facilities and the offices of the airport manager and meteorologist. Weather conditions and surrounding terrain make flying difficult in this area. It is planned to expand office space to provide, among other things, better facilities for radio operators and for meteorologists.

SANTIAGO-BUENOS AIRES:
The route from Santiago to Buenos Aires crosses over the Andes through a pass where two canyons join. This is a spectacular ascent through a pass at the top of which is located the famous Christ of the Andes. To make the crossing, planes must fly at from 14,000 to 15,000 feet, and occasionally higher. At the very top of the pass, situated where a full view may be obtained of both canyons, Panagra has constructed a radio and weather reporting station known as the La Cumbre station. Weather conditions at times interrupt regularly scheduled operations over the Andes. In the winter time it is normal to have two or three long delays each winter, piling up traffic for several days at a time. This is due to the heavy snows and headwinds encountered. An alternate pass over the Andes in the vicinity of Curico is possible. This pass can sometimes be used when the main pass is blocked, but an additional hour's flying time is necessary to make this trip.

Along the route, but not in it, there are numerous high peaks. After crossing the Andes the plane reaches Mendoza at the foot of the mountains, where a flat plain commences. The route then continues across the plain and a ridge of mountains to reach Cordoba. Between Cordoba and Buenos Aires the route is over flat agricultural land. The weather in the area between Mendoza and ' Buenos Aires is sometimes difficult for flying activity in the winter time due to occasional storms, clouds and rain and to fog in the area around Buenos Aires and Cordoba. In the summer, winds and dust storms and occasional high velocity pomperos are encountered. The wind reaches such velocity that it has on occasions caused considerable damage to buildings and equipment on the ground.

The field at Mendoza is the property of the local Aero Club. In 1938 its dimensions were increased by the purchase of property which was financed by Panagra. There are two rolled stone runways which have been put in at Panagra's expense. The field is soft after heavy rain in spite of these precautions, and it is sometimes necessary to use the concrete runway of an adjacent military field. The buildings at this point are also owned by the Aero Club and rented by Panagra. The airport at Cordoba is a military airport which is ample in size, lighted and sod-surfaced, though rough.

The airport for Buenos Aires is located at Moron, a point about an hour and a quarter away from the city by motor. The field was recently extended, drained and generally improved at Panagra's expense. The airport is lighted. Panagra maintains at the airport, hangars, shop facilities and passenger station which are operated by it and used jointly by it and Pan American Airways. Buenos Aires has had under consideration for a number of years the question of an airport located nearer to the city and the constant possibility of this change has made it inexpedient to provide the type of permanent passenger station which the importance of the city warrants. Panagra will be required to bear considerable expense in connection with any improvement of facilities at this point.

DIAGONAL ROUTE:
The Panagra Diagonal Route runs from Arica to Buenos Aires. Starting at Arica, where there is a military airport owned by the Chilean government, the plane climbs to 15,000 feet, crossing a range of mountains and going then along a plateau to La Paz, the highest airport commercially operated in the world, at 13,400 feet. This airport has three long runways which have been extended, graded and improved in the last six years at Panagra's expense. The surface of the airport is hard and partially sodded. The city of La Paz is situated about one- half hour's drive away from the airport in a canyon 1,000 feet below. There is a passenger station, concrete platform, fueling pit, and other facilities erected by Panagra.

From La Paz the route runs to Oruro, an airport situated at 12,000 feet. It is necessary to fly over a high plateau, known as the Altiplano, at a cruising altitude of about 15,000 feet. A new airport has just been constructed at Oruro which permits landing under all conditions. Winds of great velocity are occasionally encountered here. The next stop on the Diagonal is Uyuni, at 12,000 feet altitude, and planes fly at an altitude of somewhat over 15,000 feet in the trip from Oruro to Uyuni. The field at this point is on a large flat plateau and Panagra has provided a semi-portable building to handle passenger arrangements, and provision has been made for fuel intake.

From Uyuni the route continues over the Altiplano. Planes must cross a 16,000-foot rim of the Altiplano and then descend to the plain below, where an emergency field and radio station have been established at Tabacal. Here the route turns sharply toward Salta. This dogleg, involving about one hundred additional miles, is necessitated in order to avoid turbulent air and adverse weather conditions often encountered in the direct route between Uyuni and Salta. The airport at Salta is situated in a valley surrounded by low mountains. It is a military airport owned by the Argentine government and improved by Panagra, which shared the expense with that government. The runways are of hard soil and there is an attractive passenger and radio station.

From Salta the route proceeds through a valley and over a range of mountains into the main Argentine plain. The next stop is Tucuman. Here the airport has been constructed at some considerable expense to Panagra, with the assistance of the city park authorities. Panagra uses the Aero Club for passenger facilities on a rental basis. From Tucuman to Cordoba the route proceeds over a plain and low hilly areas.

The weather on the diagonal route from Arica to Salta is excellent during the period from April to November, except for occasional high winds and dust storms, which cause schedule delays. In the period from December to March rainstorms are frequently encountered and the conditions south of Salta are similar to those encountered between Mendoza and Buenos Aires. The foregoing completes a discussion of the main international route. Of course, in addition to this main route Panagra operates one local and one express trip per week in Bolivia from Oruro to Corumba (Brazil) and numerous local schedules in Ecuador.

Both of these operations were undertaken during the current year as part of the program to eliminate German controlled airlines. Panagra has been obliged to commence services in these areas on short notice and this involved the necessity of rapidly making extensive improvements at very substantial expense to airports and other facilities to make them adequate for an operation up to the standard of Panagra.

TRANS-BOLIVIAN SERVICE:
From Oruro, an airport located at approximately 12,000 feet altitude, the plane climbs to 14,000 and flies over rough mountainous country to Cochabamba, an airport located at 8,400 feet in a cup surrounded by moun- tains. This is the first leg of the Bolivian operation mentioned above. At Cochabamba Panagra uses the facilities of Lloyd Aereo Boliviano. There are hangars, a maintenance base, and some passenger facilities. The airport itself is satisfactory for DC-3 operation during most of the year, but substantial improvements are necessary for all year around weather protection and safety. From Cochabamba the route proceeds over rough mountainous country, with planes flying at approximately 14,000 feet to Santa Cruz.
Approximately 20 miles before reaching this point the terrain drops off to a flat jungle plain. At Santa Cruz Panagra again uses the former LAB airport, which requires, however, increases in size, draining, rolled rock runways and other improvements to be safe for all weather conditions. These improvements are in process. The records of LAB show that the rainy season at this point requires it to suspend operations because of the soft conditions of the sod for periods as long as 23 days. There is a large combination building for passengers, radio men, and also accommodations for overnighting crews and passengers, all of which need improvement.

From Santa Cruz the route goes over a flat, solid jungle plain—a sea of trees with no landmarks—to San Jose, which lies in the midst of a group of low hills, and from there over low hills to Puerto Suarez. There is a marginal airport at this point which is being expanded, drained and surfaced with rolled rock. There are no buildings, but a shed has been erected for gasoline. The next and final stop is Corumba, which lies at the beginning of rolling, hilly country. The Corumba airport is now under construction by Panair and when completed should be adequate for all weather operations.

The local Bolivian operation touches many of the above points and, in addition, Sucre, Valle Grande, Concepcion, San Ignacio and Robore. Between Cochabamba, Sucre, and Valle Grande the route is over marginal fields which require substantial improvement. There are no passenger facilities worth mentioning. At Sucre a complete new airport is required. Between Sucre and Valle Grande the route is over mountainous terrain and rough country, which requires cruising at approximately 14,000 feet. The area around Concepcion and San Ignacio is jungle plain.

Because of the terrain east of Santa Cruz, the lack of landmarks and prevailing weather conditions, *i. e.,* rain, turbulent air and disturbances passing from south to north across the route, it is essential to provide extensive radio navigation and forecast facilities. Plans for making these arrangements are under way.

ECUADOREAN LOCAL SERVICES:
The local operation in Ecuador touches not only Guayaquil and Quito, but five other points as well namely, Salinas, Manta and Esmeraldas on the coast and Cuenca and Loja in the interior southeast of Guayaquil. Adequate airports were constructed at the three coastal points by Panagra. At Salinas grading and levelling of the natural hard sand surface was required At Manta it was necessary, in addition to grading and levelling, to construct two rolled rock runways in order to make the airport usable during the rainy season. At Esmeraldas it was necessary to take similar precautions to assure all-weather operations.

Low ceilings and rain conditions are present often at Salinas and Manta. These do not present serious operating obstacles except on occasions. At Esmeraldas the rains are so severe during the period from January to May that the opera turns are considerably hampered in this season. Esmeraldas is an extremely difficult point from which to operate for other reasons as well. Malaria and tropical fevers are prevalent and it is necessary to rotate personnel making sure that no employee remains at th s poL except for a relatively short time. Ground transportation between the airport and the city is difficult, necessitating the crossing of a river by launch or dugout canoe. At all three coastal towns Panagra has erected passengers and radio facilities.

The airport at Cuenca is 8,500 feet high and has been newly constructed by Panagra under a contract with the government whereby Panagra provided the funds and technical supervision, with an agreement for reimburse over a period of time. The runways are of natural soil, but the airport is good for all-weather use. Passenger and radio buildings were constructed by Panagra. The airport at Loja was also constructed by Panagra on natural soil. It is a one-way field with a slope. Between Cuenca and Guayaquil the terrain is high, rough, mountainous country, usually necessitating a circuitous route to avoid weather disturbances, there being a tendency for clouds to form on the mountains and for the valley to stay open.

Between Loja and Cuenca the route also runs over high mountains, the airport at Cuenca being a cup with a mountainous rim 4,000 to 6,000 feet higher than the airport. This airport, incidentally, is on the other side of the ridge from the town, necessitating a 1.5 hour drive by auto or truck over a 5,000-foot ridge to reach the community. Much, longer time is consumed in cases of fog or weather disturbances. "Weather conditions between the coastal points and Quito and Quayaquil are usually satisfactory. It is not infrequent, however, for clouds to build up on the coastal plains to great altitudes, preventing entrance to interior points by contact flying from the coast. Blind flying is, of course, highly undesirable and out of the question into Quito. It is necessary to use only pilots who have great

familiarity with the terrain and who are able to anticipate weather conditions. Numerous radio and navigation aids must be provided.

(Author's note: this document appeared in a biographical overview of Harold Harris and his career with Panagra).

Harold R. Harris, Vice President:
Mr. Harris has been with Panagra since its organization in 1929. He is an engineer by training, having graduated from the California Institute of Technology and the United States Army Air Corps Engineering School. Mr. Harris received his first intensive aviation experience during the World War. In 1916 he was engineer officer of the First Provisional Air Squadron formed at the Citizens Military Training Corps at Monterey, California. In April, 1917, he enlisted in the Signal Reserve Corps, and three months later he went overseas as a flying cadet. He soon became Flight Instructor on Caproni aircraft with the United States Army in Italy, where he remained until 1918, when he returned to the United States. He continued in the Army as a test pilot and later became Chief of the Flight Test Section, occupying that position until his resignation from the Army in 1927. After resigning from the Army, Captain Harris became Vice President and General Manager of the Huff-Daland Dusters, a commercial company operating in the United States and Peru and engaged in using aircraft to kill insect pests on commercial crops.

While in Peru, Captain Harris studied the possibility of an airline to connect the United States with Latin American countries, and in 1927 made a survey trip of both the east and west coasts of South America. At this time he assisted in the formation of the first scheduled air transport operation on the west coast of South America. This operation was conducted under the name of Peruvian Airways Corporation, and Mr. Harris was Vice President and General Manager of that company, which later was absorbed and expanded into the organization which is now known as Panagra.

From the time Captain Harris took charge of Peruvian Airways Corporation and later Pan American- Grace Airways as Vice President and Operations Manager, he was in personal charge of the pioneering and development of the Panagra operation from Cristobal to Buenos Aires. Until 1939 he resided permanently in South America and spent his entire time on the line. His ten years devoted to the development and one may even say the creation of the line, has, of course, given him the most intimate knowledge of every detail of the operation and every phase of the business. In 1939 his headquarters were transferred to New York where he has continued in the active administration of the company's affairs.

Gustavo Vidal, Vice President and Comptroller:
Mr. Vidal became associated with Panagra in 1929, being the first Comptroller of the Company, and later its Vice President and Comptroller. Prior to that time, for the period from 1918 to 1928, he was with W. R. Grace & Co. While with W. R. Grace & Co. he worked in the company's New York Accounting Department, and later was sent to Havana to assist in the handling of some of W. R. Grace & Co.'s business activities there. During the next few years he made trips to Colombia, Venezuela and Bolivia on various business matters for W. R. Grace & Co., which required constant contact with government officials. From 1927 to 1928 he was again in the New York Office of W. R. Grace & Co. occupied with financial and control work.

As stated, Mr. Vidal joined Panagra when the Company was first organized and he has been its chief financial officer. In this capacity he has supervised the preparation of cost estimates, financial forecasts and budgets in connection with current operations, as well as projects and new ventures. He is thoroughly conversant with the Company's concessions, franchises and postal contracts in all countries served by Panagra in South America as originally obtained and as renewed from time to time. Naturalized in the United States, Mr. Vidal was born in Chile and is familiar in detail with the customs, habits and language of the South American countries through which the Company operates. For many years he has handled delicate negotiations with the South American Governments involved, and during the past twelve months has conducted successful negotiations in Ecuador and Bolivia in the interest of hemisphere defense.

In 1931 he became a pilot on the Panagra operation acting also as division superintendent at Cristobal. In 1934 he was transferred to Lima as assistant to Mr. Harris, then Vice President in charge, having responsibility for Panagra's operations in Mr. Harris' absence. In March 1939 he was appointed Operations Manager, and in January 1941 was promoted to the position of Vice President.

Route Mileage:
As has already been indicated, Panagra has steadily increased the route mileage of its operations. At the end of 1929 this mileage totaled 4,463 miles. By the end of 1940 it amounted to 6,096.6 miles.

This does not include the mileage of Aerovias Peruanas, S. A., a local Peruvian operation, amounting to slightly more than 1,000 miles, which was discontinued by Panagra in April, 1938.

Since December 31, 1940, there has been a further substantial increase in Panagra's route mileage. Three principal operations are involved:

(1) Expansion of local operations in Ecuador accounting for 197 additional miles.

(2) The important extension of Panagra's Bolivian operations extending from Oruro to Corumba and accounting for an additional 1,467 miles.

(3) Re-routing of the Diagonal Service from Arica/La Paz to Arequipa/La Paz, accounting for 219.9 miles.

Thus, as of September 1, 1941, Panagra's total route mileage equals 7,980.5 miles.

Contributions to Aeronautical Science:
Over the period of Panagra's operations since 1928 unique navigational and aeronautical conditions have been met, and problems solved, in conducting operations peculiar to the Panagra route. The methods developed by Panagra have contributed in part to the growth of the science and practice of aeronautics. The following examples are worthy of special note.

Several years ago in the company's operation of amphibian aircraft in the tropics, the problem of take-off became very acute. This was due not only to the type of aircraft then available for such service but also to the necessity of the amphibians (S-38's) taking off from jungle rivers and over a route where unusually high temperatures were encountered.

This problem was at its height during the era when the only propellers available commercially were of fixed pitch type. The controllable pitch propeller was then in the experimental state. Panagra's problem could not be satisfactorily solved by using the fixed pitch propeller adjusted permanently for best condition of take-off performance. It therefore became necessary to use controllable pitch propellers which would permit obtaining the best blade setting for take-off and, at the same time, obtain the most efficient setting for cruising, so as to accomplish the long range flights involved.

Numerous experiments were made by Panagra pilots at various altitudes,
temperatures and take-off conditions to determine proper propeller settings. When these were completed, the

company equipped all its amphibian aircraft with controllable pitch propellers, having first obtained the proper approved type certificate for installation on passenger carrying aircraft.

Pioneer work on propeller control was also done by Panagra pilots in connection with the first Douglas DC-2 planes. Tests made established that these planes would operate better with separate propeller control for each propeller. The Panagra pilots demonstrated to the satisfaction of the technicians at the Douglas factory and to that of all other users of the DC-2 that the ceiling for such a plane with one motor inoperative was increased by at least 2,000 feet if the inoperative propeller could be put in high pitch while the operative propeller was in low pitch. As a result of this experimental work, the Douglas factory decided to place individual propeller controls for each propeller on the later models of its DC-2 equipment.

Panagra was the first commercial passenger carrying airline to use extensively the controllable pitch propeller. These early type propellers were successfully used on all of the company's amphibian aircraft operating under the aforementioned conditions from 1933 until this particular development became universally accepted. Experience obtained by the company in the early stages of the development of the controllable pitch propeller suggested improvements and contributed in part to the refinements and gradual development of the presently used hydromatic, full feathering type propeller.

It is felt that Panagra can in no small part be credited with practical demonstration of the possibility and commercial advantages of extensive freight operations at high altitudes and into relatively inaccessible places. In the early '30 's the company, in conjunction with mining concerns in Peru, made extensive studies in connection with what might be done with the airplane in carrying machinery to inaccessible points in the mountains for development of gold mines. There were a number of such points where the terrain and altitude required from 20 to 30 days to reach by mule back from the nearest road or rail head, and even the heaviest piece of machinery which could be carried was limited in weight and size to the carrying capacity of individual mules in pack trains.

As an outgrowth of these studies one of the first contracts undertaken involved the development of a mine at Huanacopampa, Peru, of the Cotabambas Mining Co., an operation which has been described in more detail elsewhere. A reasonably safe landing field was constructed at the mine site on table land 13,000 feet above sea level. While this was only a 40-minute flight from Cuzco, Peru, 10,000 feet high, it was necessary to fly over a 15,000 foot range separating these two points.

One of the problems was the carriage of some 30 mill stamps averaging 4,500 pounds each. To do this as well as handle every piece of machinery and electrical equipment, it was necessary to especially design a hatch in the fuselage of the airplanes, and to design specifically for proper distribution of the load in the fuselage.The machinery and equipment ordered was designed within all possible limitations to meet the limits of the carrying capacity and hatch capacity of the aircraft. Seven hundred and fifty tons of such machinery and equipment was transported by Panagra, using three Ford aircraft (with controllable pitch propellers), which was achieved without incident. Subsequent work of similar nature and tonnage involving the same problems of high altitude operation was completed by the company for the Parcoy Mine in Peru and for the Aramayo Mining Company in Bolivia.

Panagra’s high altitude operation in a normally scheduled service has in itself been unusual. The company has successfully operated aircraft in its high altitude operations, including four regular stops located at altitudes between 11,000 and 13,300 feet above sea level. The airport at La Paz is still said to be the highest commercial airport used in regularly scheduled passenger service in the world.

In establishing these operations, it was necessary to test performance of available equipment at the altitudes and locations concerned. The company's experience involved the first actual operation of such equipment at comparable altitudes. Panagra's pilots made extensive tests with DC-2 and DC-3 aircraft with various engine combinations in order to establish the safest and most efficient combination for conducting high altitude operations. Among other work of a pioneer nature done in this connection has been Panagra's cooperation with eminent doctors on the question of altitude and its effect on various bodily functions. From the results of studies made to date, Panagra has been able to add materially to the comfort and safety of its passengers.

Meteorological information has been furnished by Panagra to the United States weather bureau for three or four years. Weather reports are made twice daily from every radio station operated by Panagra. These reports cover the most diverse terrain and climatic conditions, and frequently come from stations remote from any other meteorological reporting service. An inspector has recently been permanently stationed at Lima.

The maps developed by Panagra have been particularly important to military and naval aviators of all American countries. The availability of these maps, together with Panagra's airports and fuel supplies, made possible good-will flights by military planes of the United States and South American countries.