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Airmail and the Evolution of the U.S. Aviation Industry in the 1920s and 1930s:
A Potential Model for the Space Industry in the Next Millennium

By Grant Cates

Abstract—During the 20s and 30s, aircraft contracts let by the War Department and airmail contracts from the Post Office Department were instrumental to advancing aviation technology and creating a commercial aviation industry. The Contract Air Mail Act of 1925, which directed the Post Office to contract out the flying of airmail enabled commercial aviation to be born, is discussed and shown to provide lessons for current and future space business markets. Boeing’s surprising victory over Western Air Transport during the 1927 competition for the Chicago-to-San Francisco airmail route is described. The “Spoils Conference” of 1930, whereby the airmail routes were doled out to the three biggest market participants, is shown to be somewhat analogous to NASA’s transition of the space shuttle to private industry. Excessive market concentration and profit-making on government contracts stemming from the Spoils Conference and the War Department’s aircraft contracts prompted congressional inquiries. The resulting legislation, e.g. the Air Mail Act of 1934, which restructured the aviation industry and limited profit making on government contracts, is described. That legislation provided a solid foundation for growth in the aviation industry during the rest of the century. Opinions expressed herein are those of the author’s.

At the 1996 Space Congress, Kent Black, CEO of the newly formed United Space Alliance offered a bold new paradigm for the space shuttle—“Think of NASA as the FAA, United Space Alliance as the operating airline company and the orbiter as a commercial airliner.” While there is a vast difference between the safety of a commercial airliner and the shuttle, there are historical parallels in the suggestion that offer useful lessons for the present and the future. One of the more interesting parallels is the similarity between the development of airmail and NASA’s restructuring of the space shuttle market in the mid-1990s.

With the advent of the airplane had come the possibility that mail could be transported more rapidly across the nation. The concept of airmail was first proposed in 1912 when the Post Office Department requested $50,000 to start that new service. Congress refused to appropriate the money. With the Post Office request denied, the military initially pioneered the transportation of mail via airplane. The first air mail route began operation between New York and Washington by the War Department in May of 1918. “The enthusiastic cooperation of Otto Praeger, then Second assistant Postmaster General, combined with the efficiency with which the military aviators carried on the work, quickly won public approval, and plans for extending the service were developed even during the war.” After the war, the Post Office Department assumed the responsibility of flying the mail.

The Contract Air Mail Act

In 1924, Congressman Kelly of Pennsylvania introduced legislation to have the Post Office contract out the airmail routes to industry. Congress passed the Contract Air Mail Act (a.k.a. the Kelly Act) on February 2, 1925. Writes Robert J. Sterling in his book Legend and Legacy: The Story of Boeing and its People, “It was an aviation Magna Carta, for it turned virtually the entire job of flying the mail over to private contractors who would bid for the mail routes.”

In 1927, the Post Office Department decided it was time to transition its Chicago to San Francisco airmail operation to private industry. The Post Office conducted a competition for the rights to fly the route. This resulted in innovative thinking on the part of industry that benefited everyone—industry, government, and taxpayers. Boeing put its bid in under the name of Edward Hubbard and the Boeing Airplane Company. They bid to fly the mail for $1.50 a pound for the first thousand miles plus 15 cents a pound for every additional 100 miles. Boeing won the contract hands down. The other competitor, Western Air Express, had bid $2.24 per pound for the first thousand miles and 24 cents a pound for each additional 100 miles. Boeing’s bid was so far under that of Western Air Express that Post Office officials and other observers felt it was too low.
Post Office required Boeing to post an $800,000 bond to guarantee operations, and the bid was officially accepted only after the Senator from Washington, Wesley Jones, personally vouched for William E. Boeing.\textsuperscript{4}

Despite the doubts of the Post Office, the Boeing operation was a success.\textsuperscript{5} How did Boeing underbid Western Air Express by so much and then make their venture a financial success as well? It was a combination of better technology and business strategy. In 1925, Boeing had developed a new plane for the Post Office—the Model 40. In accordance with the demands of the Post Office, the 40 was outfitted with the water-cooled Liberty engine. The engine with its water-based radiator cooling system was too heavy for the airplane. The 40 became the 40A when it was later outfitted with a new 425-horsepower air-cooled radial Wasp engine built by Pratt & Whitney. When William Boeing was asked how he could fly the mail for $1.50 a pound and make money he replied, “Because we’re carrying mail over those mountains instead of radiators and water.”\textsuperscript{6}

Boeing’s novel business strategy was to transport the mail with a plane that could also carry paying passengers. Initially, the 40A could carry two passengers and it was subsequently outfitted with seating for 4 passengers. In the first year of operation, 1,863 passengers paid $400 each to fly the route.\textsuperscript{7} The high cost of air travel for the public was a fact of life during the early days of commercial aviation. “The rich could afford to fly, the adventurous took wing and business people saw the advantage of swift travel.”\textsuperscript{8} During the 20s and 30s the cost of flying across the country could be as much as $900. That would amount to approximately $8,000 today.\textsuperscript{9} While $400 dollars in the 1920s may have amounted to a small fortune, there clearly was a demand for the service as evidenced by the $745 thousand of added profit paid to Boeing by its commercial customers during that fledgling year. Boeing had found a way to have two different sources of income—one from the government and one from the wealthier flying public—for the same flight.

These are two wonderful lessons that can be learned from Boeing’s success in their airmail venture. First and foremost, is that competition reduces cost for the consumer, promotes creativity, and improves the public welfare. Competition is clearly in the public interest. The second lesson is that consumer costs can be lowered and profits can be increased when multiple sources of revenue can be realized. Look at a professional sports franchise for example. Revenue sources for the owners include gate receipts, television and radio sales, and commercial endorsement e.g. the wearing of a Nike logo on team uniforms. Back in 1927, the government did not restrict Boeing from allowing paying public passengers to fly on a plane that was chartered to fly the mail under contract to the government.

**Market Concentration Increases**

Not long after Boeing won the Chicago to San Francisco airmail route a series of mergers dramatically increased the concentration of the aviation market place. These mergers were not unlike the mergers seen in the 1990s by defense contractors. Out of hundreds of companies involved in the growing aviation industry, three giants emerged to dominate the industry and the government. Joined by a ‘pyramiding of companies and complicated maze of mutual stock holdings,’ the three behemoths were: General Motors-North American Aviation Group and Curtiss-Wright Corporation; United Aircraft and Transport Corporation; and Aviation Corporation of Delaware. The three groups and other lesser-important companies were even linked financially with each other. “There was, in fact, a widespread interconnection,” wrote Elsbeth E. Freudenthal in 1940, "so complex that it is impossible here to trace all links.”\textsuperscript{10}

By 1930, the government was faced with the reality that three companies dominated the aviation industry. Although the transition of the airmail contracts to private industry could have been a catalyst for the creation of many independent companies competing in a healthy market, such was not the case. Rather than take corrective action to enhance competition, the government entered into closed-door discussions with the three dominant conglomerates. While the agreements that resulted essentially completed the transition of carrying the airmail from government to private industry as required by law, they created a scandal that had far reaching and long lasting
consequences. That scandal provides an example of what can happen in a market that has one customer and is dominated by a few large competitors.

**The Spoils Conference**

In 1930, the Congress replaced the Kelly Act with the McNary-Watres Act. Although the bill was introduced by the two Republicans for which the bill is named, the “real author was Postmaster General Walter Folger Brown, a Harvard-educated lawyer and Ohio politician named to the post by President Hoover.” The new act lowered the mail rates and also specified “some vague restrictions on who was going to carry it.” The act gave Brown a “blank check for interpreting its language.”

McNary-Watres contained one provision that gave the postmaster general authority to extend or consolidate routes “when in his judgement the public interest will be promoted thereby.” These eleven words were all Brown needed. Only two weeks after Hoover signed McNary-Watres into law, Brown summoned the top executives to Washington for a meeting that would go down in history as the infamous Spoils Conference.

‘The Spoils Conference were meetings that were held in Washington D.C. between May 15th and June 4th, 1930 to divide up the air-mail routes,’ Brown’s purported goal at this conference was to advance the cause of developing passenger air traffic. He only wanted “solidly financed carriers with their bigger planes to fly the mail routes.” The terms Brown laid down—such as not awarding a mail contract to any airline that wasn’t already operating night flights over routes of at least 250 miles—effectively eliminated the smaller operators. He only invited selected leaders of industry—those that represented the largest aviation amalgamations—to attend the meetings.

During the conference, Brown outlined his vision for the industry. “His main pitch was the establishment of three competing transcontinental routes: the northern one—already operated by United—and central and southern routes.” While Brown had already made up his mind as to which companies should be awarded the central and southern routes, he allowed the industry to try to come to agreement amongst themselves. He warned them that if they couldn’t, then he would make the decisions. Industry could not reach agreement and Brown stepped in and made the selections based on his desires. He awarded the central route to Transcontinental Air Transport (TAT), which was controlled by the General Motors/North American Aviation Group. Per the letter of McNary-Watres, TAT did not meet the requirement of having flown at night. To solve that problem, Brown essentially brokered a merger between TAT and the night flying experienced Western Air Express. Brown gave the southern route to American Airways—controlled by the Aviation Corporation, which had the former Postmaster as one of its directors. “The result was that the three largest carriers (United Aircraft, Aviation Corporation, and the North American-General Motors group) emerged with all but two of the twenty air-mail contracts.”

The principal criticism of Postmaster General Brown’s action was that he had not acted in the public interest when he did not advertise for bids on each route and award contracts on a basis of low bids. On the other hand, Brown contended that he had acted in the public interest, under the authority of the McNary-Watres Act, by inviting only the most experienced companies in aviation to negotiate because the most extensive aviation experience was essential to passenger safety. Brown wanted to establish a network of interconnecting airlines that carried passengers. By making passenger hauling a condition for the award of air-mail contracts he hoped to achieve this aim, and did.

The three major winners at the Spoils Conference profited handsomely. However, when the details of the conference began to publicly emerge in the following year, the days of the major aviation conglomerates were numbered. Not everyone believed that the end of the three conglomerates was a good thing. Some, such as those that were sympathetic to one or more of the three businesses, called the end a “disaster.” Eugene Rodgers describes the events that precipitated the demise of the conglomerates.
The disaster began when a tiny airline, one of a mishmash of forty-four airlines then operating in the United States, told reporter Fulton Lewis Jr. (later a controversial radio commentator) that it was the low bidder on an airmail contract that went to a much larger and more powerful airline, Eastern, whose bid cost taxpayers three times as much. Lewis discovered that the postmaster general not only had ignored the bids of the small carriers, but had conducted a twelve-day meeting of the large airline—American, TWA, eastern, and United—to apportion all the airmail routes among them, leaving out the small companies. Lewis tipped off U.S. Senator Hugo Black of Alabama (later a U.S. Supreme Court Justice).  

As the details of what had happened at the Spoils Conference began to emerge, congressional anger began to grow. “A congressional committee began hearings in March, 1932, on a bill directing the postmaster General to revoke all contracts, route certificates, and so forth, which had been awarded by him without public advertisement.” Those committee hearings did not result in any sanctions in 1932 primarily because the “Republican Congress made barren soil for any inquiry into the actions of the party’s No. 1 Politico, always the Postmaster General.”

The nation, gripped by depression, decided it was time for a change in leadership. In 1932, Democrat Franklin D. Roosevelt won the presidential election. Control of the Senate also shifted strongly to the Democrats and the House became overwhelmingly Democratic.

In February of 1933, the “Crane Committee” of the House of Representatives continued the investigation of the aviation industry. That committee reported that “interlocking interests directorates had definitely prevented the free development of aviation and had resulted in the waste of public funds.” The Senate took up the issue by convening a Senate Special Committee on Investigation of Air Mail and Ocean Mail Contracts. Hugo Black chaired this committee. It was Black’s committee that exhumed the details of the Spoils Conference of 1930 and brought to light “other acts of Postmasters General New and Brown, as well as the huge grants of government money to favored companies.”

**Excess Profits on Military Contracts**

In parallel with the Senate’s investigation, the House was continuing to probe the matter. Representative William D. McFarlane was focusing attention on the extremely large profits that were being made by the manufacturing companies on government orders. Two acts passed in the mid-1920s—referred to as five-year programs—had been intended to support the embryonic aviation industry by increasing demand for military aircraft. Those two acts authorized the Navy and Army to obtain 1,614 and 1,800 aircraft respectively during the five-year period of 1927 to 1931. Appropriations for the five-year programs ultimately amounted to $435,980,000 over the years 1927 to 1934. The manner in which this money was spent by the government and used by the various companies receiving it provides some examples of pitfalls that should be avoided. There was a decided lack of competition, a trending towards monopolization, extravagant profits, and dubious oversight by the government. McFarlane’s inquiry also revealed that “the manufacturers monopolizing Army and Navy business were subsidiaries of the same large groups that monopolized air-mail contracts.”

The aircraft manufacturing companies who benefited the most from the two well-intended government five-year programs were the biggest companies—those that needed the help the least. About ten companies received approximately 90 percent of the Army and Navy’s five-year program business. Aviation author Elsbeth Freudenthal in his 1940 book—*The Aviation Business: From Kitty Hawk to Wall Street*—wrote, “Their profits soared and they had an enormous share of the available business. The small companies were doomed from their start: on one hand by the limited market for their products, and on the other by the domination of the large groups. Their fate was sealed by the fact that there was little, if any, competitive bidding on contracts.” During that time period there were nearly 300 other companies manufacturing airplanes struggling to survive. Most did not.

The market was even more monopolized in terms of numbers of companies manufacturing engines for the Army and Navy’s planes. There were only two—Wright Aeronautical and Pratt &
Whitney. This situation came to public light as a result of the Delaney Report and Delaney Hearings before the House Subcommittee on Aeronautics in 1934 (U.S. House Naval Affairs Committee). David S. Ingalls, the Assistant Secretary of the Navy in charge of Aeronautics from 1929 to 1932 provided his opinion to the Delaney Hearings on the aircraft engine market monopoly. “The whole difficulty is in the engines, and this is a different kind of field, and there is reason, because there has been a monopoly in the engine field, and there is nothing we could do about it.”

High levels of market concentration can lead to collusion among the market participants according to antitrust dogma. The aircraft engine marketers provide an example of just that. Freudenthal described the following behavior by Wright and P&W.

These two companies not only monopolized the engine field but also arranged their products so that some of them would not be in the same classes. In the low-horsepower class only Wright Aeronautical had an engine; in the intermediate class there was only Pratt and Whitney; in the high-power class there were the “Hornet” (Pratt and Whitney) and the “Cyclone” (Wright). Of this last class, Admiral King said, “There you find that the power is about the same and the prices are about the same.”

To make matters even worse, both engine manufacturers were affiliated with the two most powerful aircraft manufacturing amalgamations. Wright was an entity of Curtiss-Wright-Keystone, which held the number two position in the combined plane and engines manufacturing business. Curtiss-Wright-Keystone was a part of the larger General Motors-North American Aviation conglomerate. Pratt & Whitney, which exists to this day by that name, was a part of the United Aircraft and Transport (UA&T) amalgamation. UA&T held the top position in terms of combined plane and engine manufacturing business.

The monopolization of the aircraft industry resulted in decreased competition and excess profits for the monopolists, at the taxpayers’ expense. Since the passage of the 1926 five-year acts, ostensibly meant to stimulate the aviation industry, less than 9 percent of the $108 million spent by the Army and Navy had been by competitive procurements. For the years 1927 to 1933, Pratt & Whitney made 36% and 23% profit on its Navy and Army business respectively. P&W was so incredibly profitable that it was able to post a 79-for-1 stock dividend. Boeing was making 21% and 25% on Navy and Army aircraft business respectively during that time period. A rather significant percentage of the taxpayers’ dollars were going directly into corporate profits.

The response of the military brass overseeing these profit-maximizing procurements caused concern. “Faced with these profits at a committee hearing, Rear Admiral King of the Navy built up an ingenious argument for permitting them: if the Navy cut P&W’s profit, then Wright (which he claimed made only 5 percent profit) would be forced out of business. From this it followed that the Navy would then be at the mercy of a monopoly, instead of having two competing companies on which it could rely.” King later tried to clarify his dubious logic, which only served to cast further doubt upon his ability to protect the public interest. “What I meant was this: If the Navy had forced P&W’s price to a very low level so that its profits were, say, of the order of 15 percent, then Wright, to stay in business, would have had to reduce its prices correspondingly; …”

The discoveries of the congressional investigations in the early-1930s made headlines across the nation. Public confidence in the government and the aviation industrialist had eroded. Hoover and his Postmaster had allowed the aviation industrialists to maximize profits when what was needed was increased employment. Unemployment was a critical issue of the day, with it peaking at 25% in 1933, the worst year of the Great Depression. The public ousted Hoover in the election of 1932 and expected changes.

Solutions

The most expedient remedy to the airmail situation appeared to be to revoke all the air mail contracts. The industrialists stated that such a move would be a disaster, arguing that the Army would not be able to step up to such a large task. Postmaster General Jim Farley and Attorney General Cummings tended to agree with the industrialists. They both preferred to allow industry
to continue flying the mail in parallel with establishing new competitive contracts. However, “General Benjamin F. Foulois of the Army Air Corps said the Army was ready to take over,” writes Farley, “and the President favored giving the service an opportunity to distinguish itself.”

The president decided to go ahead and cancel the contracts. Roosevelt signed White House Order 6591 in February of 1934, thereby canceling the private airmail contracts and directing that Army fliers take over the route. On Feb. 9, 1934, Postmaster General Farley issued an order to be effective 10 days later that canceled all domestic airmail contracts. At that time, the Army would take over. Unfortunately, the Army was unable to step up to this sudden and unexpected task. The Army was doomed by two factors—lack of time to prepare and poor winter weather. They were only given 10 days to prepare. During the months of February and March, poor weather caused fatal accidents by both Army flyers and commercial airlines. Four Army pilots were killed while transporting the mail. Another 6 were killed during training or while proceeding to an air mail route. Although commercial aviation crashes during this same time period claimed more lives, the media was “headlining the inadequacy of the Army to fly the mail.” On March 10th, Roosevelt was compelled to cancel his order. Although the Army did continue to fly the mail on a restricted basis for several months, clearly commercial aviation industry and airmail were inseparably linked.

Meanwhile, the Congress was searching for legislative solutions to the airmail issues and the excess profit making on the Army and Navy contracts. With regard to the Navy aviation contracts, Congress passed the Vinson-Trammell Act of 1934 (48 Statutes at Large, 503), which limited profits on Navy orders to no more than 10 percent. Inexplicably, profits on Army aircraft were not limited. Thus, in 1935 Consolidated Aircraft was able to make over 34 percent profit on its Army contracts in 1935. In 1939, the Congress finally passed legislation for the Army, limiting profits on their orders to no more than 12 percent. With the legislation, the fee limit on Navy orders was also set at 12 percent.

The thornier issue was what to do about the airmail contracts. Congress struck upon a partial solution that ultimately has stood the test of time. Their innovative strategy was imbedded in the Air Mail Act of 1934, which was passed into law via the Black-McKellar Bill in June. The new law forbade the same company from being both an airline and a manufacturer of aircraft or aircraft engines. The law had a rather sudden and dramatic affect on the make-up of the aviation industry. The three giant conglomerates were dissected and divided into much smaller independent companies.

The Air Mail Act of 1934 and subsequent legislation has prevented monopolization of both aircraft manufacturing and commercial flying by any single firm. Today we see one of the long-term results in that Boeing does not have ownership of an airline such as Delta or Continental. The Act increased the possibility of competition in the aviation industry by separating airline operations, aircraft manufacturing, and engine manufacturing. The products that these three separate but interrelated industries produced evolved to become world class. The aircraft engines produced by Pratt & Whitney and GE and the aircraft produced by Boeing, McDonnell Douglas, General Dynamics and Lockheed have been state of the art and of the highest quality. The competitive airline industry allows us to fly all over the United States at very reasonable costs. Today’s $350 round trip ticket from Orlando to Seattle equates to $41 in 1930. Comparing that $41 figure to the $900 actual cost of a trip across the country back then shows just how much we have all benefited from competition in the aviation industry.

Summary of Lessons from the 1920s and 1930s

The emerging aircraft industry had to rely on its government customers—the Post Office and the Military—to survive since there was not enough demand outside the government. The government did a rather poor job of promoting a healthy competitive market. A few powerful conglomerates quickly dominated the market. The occurrence of monopolization, collusion, excess profits, and scandals points to the need for proactive vigilance on the part of the government, public, media, and congress. The congress needed to take firm regulatory action—as it did by
passing the Air Mail and Vinson-Trammell Acts of 1934—to help the new aviation industry develop in a healthy manner.

Parallels to Space

There are clearly similarities in the development of the airmail and military aviation industries to the development of the human rated space vehicle market. The primary customer of Mercury, Gemini, Apollo and the shuttle market has been the government, i.e. NASA and to a lesser extent the Department of Defense. Over time, there has been an increase in market concentration and a decrease in competitions for major contracts. The Mercury Capsule contract was competed but the Gemini contract was not. Most of the Apollo contracts were competed, but market concentration increased as a result of NASA awarding multiple major contracts to North American. The initial shuttle contracts were competed in the early 1970s, but there have been few competitions since. The Shuttle Processing Competition of 1982/83 whereby Lockheed gained a foothold in the shuttle market being a notable exception.

Figure 1: Increasing Fee Percentages

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Similar to the merger mania that led to the three conglomerates of the 1930s, today we have two giants, Boeing and Lockheed Martin, which dominate the military-aerospace industrial complex. Those two Goliath’s are joined in a joint venture company, United Space Alliance, which command the lion’s share of the $3 billion shuttle market.

The restructuring of the shuttle market by NASA in the mid-1990s has striking similarities to the manner in which Postmaster General Brown restructured the airmail routes. 65 years after Brown used the Spoils Conference to divide up the airmail market amongst the existing major competitors, NASA used the 1994/1995 Space Shuttle Management Independent Review Team a.k.a. the Kraft Committee to advance a single-prime contract concept for managing the space shuttle. Under the single-prime concept, NASA was to consolidate the major shuttle operations contracts held by several major aerospace corporations into one giant contract. The Kraft Committee along with the Space Shuttle Restructure Committee of 1995 was also used to determine how to award the lucrative single-prime contract to the existing members of the space shuttle market place. Only the existing shuttle contractors were able to participate in those discussions. It was widely anticipated that Rockwell and Lockheed would compete with other interested companies for the rights to operate the shuttle as the single-prime contractor. However, following the Space Shuttle Restructure Committee, those two long time rivals announced a joint venture agreement. Similar to Brown’s brokering of the merger between TAT and Western Air
Express, there is evidence suggesting that NASA officials influenced Rockwell and Lockheed Martin to work together and this pressure may have resulted in the creation of the joint venture known as United Space Alliance. Similar to Brown's use of "in the public interest" language to justify his actions, NASA's administrator justified cancellation of the competition for the single-prime based on its being "in the public interest."

After electing to forego the competition for the single-prime spaced shuttle contract, NASA was forced during the 1996 contract negotiations to waive the Federal Acquisition Regulation limiting fee on cost-plus contracts to 10%. That waiver ultimately allowed NASA to enter into a contract—the Space Flight Operations Contract—that allows United Space Alliance to be awarded as much as 15% fee.

At the present time, the original manufacturer of the orbiter and shuttle main engine (Rockwell's Space System Division) has been acquired by the same company (Boeing) that operates the shuttle in partnership with the manufacturer of the shuttle's External Tank. Boeing appears to have acquired a near monopoly of the taxpayer-funded shuttle. Additionally, Boeing is also the prime contractor for building the International Space Station. That contract was awarded sans competition.

**Actions for the Future**

As the nation moves forward into the new millennium, either with the space shuttle or new replacement reusable human space vehicles, it seems appropriate to consider applying the lessons from the 1920s and 1930s. Action should be taken to ensure that there are ample opportunities for competition, a lessening of market concentration, and a reduction in the percentage of profit that can be made on government contracts.

When it comes to the shuttle, the government restricts the shuttle contractors from having multiple revenue sources from outside the government such as paying passengers, commercial payloads, and advertisers. The success of the Boeing bid for the Chicago to San Francisco airmail route suggest that industry, the government, and the public might all benefit if the shuttle or future space vehicles were allowed to generate alternate revenue streams.

In order to decrease the present high level of concentration in the shuttle market, perhaps the legislation stemming from the Air Mail Act of 1934 should be extended to apply to the shuttle. In terms of the law, there does not appear to be any real difference between an airplane and the shuttle orbiter. The orbiter certainly flies like an airplane during the reentry and landing phase. Likewise the function of the Shuttle Main Engine is essentially the same as that of an aircraft engine—to provide thrust for powered flight. If the Air Mail Act were to be extended to the shuttle, then it would almost certainly cause a major restructuring of the shuttle market. Based on the success of the Air Mail Act relative to the airline industry, the space industry should see a similar positive effect. The result could be a robust space transportation infrastructure providing reduced cost of transportation to and from space and improved safety of operations.

With respect to the increased profits that are being allowed on the Space Flight Operations Contract, perhaps the Congress should consider passing legislation that prohibits NASA from waiving the Federal Acquisition Regulation that limits fee to 10%. This legislation could be similar to the Vinson-Trammell Act.

In conclusion, the business and legislative solutions applied to problems encountered by the emerging aviation industry at the beginning of the past century provided a sound foundation on which a healthy and robust industry was built. The similarities between the transition of airmail to private industry and the space shuttle market restructuring suggest that those same solutions would also provide a model upon which the current shuttle market could be improved. The soon-to-be emerging market of commercial reusable human-rated space transportation vehicles could also benefit from these lessons.
At the time that Black proposed the commercial airliner analogy for the orbiter, the risk of loss-of-vehicle during ascent was approximately one in 248. Estimates for the risk of being killed on any given flight on a commercial airline are in the one in 1 million range.

5. Redding, Robert, and Bill Yenne, Boeing: Planemaker to the World, Revised and Updated, page 38.
7. Using an Aug. 8, 1998 extract from the Consumer Price Index (a value of 50 for the year 1930 and a value of 481 for the year 1997).
9. Freudenthal, Elsbeth E., page 93. Freudenthal was quoting from a May 1934 issue of Fortune.
24. Using an Aug. 8, 1998 extract from the Consumer Price Index (a value of 50 for the year 1930 and a value of 481 for the year 1997).