

Comsat, Intelsat, and the Start of the Global Commercial Space Communications Industry

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Introduction

The story of the rise of a modern world commercial space industry could be started at almost any point in history. Dreamers, poets, astronomers, scientists, and science fiction writers have all contributed to our vision of the world of space, and its vast scope and potential for human growth and development. Leonardo da Vinci dreamt of creating flying machines and the wonders of possibly going into space. Galileo gave us the name of satellites when he first spied the moons of Jupiter. Isaac Newton even created illustrations of how an artificial satellite could be launched into space. (See Fig. 1) The reality is that the birth of a practical knowledge and the engineering skills for launching satellites into space grew out of military-related programs that spanned many centuries. Ancient Greeks used mirrors and the power of the sun to burn the sails of ships and Archytas used stream propulsion to make a mechanical bird fly. Chinese inventors developed the first explosive powered rockets. Middle aged craftsmen devised catapults that could fling objects to attack castles. American scientist Robert Goddard demonstrated that gas fueled rockets could fly and be navigated.

Nevertheless, in many ways, it was the deadly development of the V-1 and V-2 rocket by the German army in its attacks against Britain during World War II that is perhaps the most pertinent way to trace the development of the space science and technology that has led to today's multi-billion commercial space industry.

The deadly V-2 rockets that were armed with explosive bombs reigned terror on London and England proved that liquid fueled rockets could rise to great heights and carry payloads aloft with awesome capabilities. At the end of World War II, Russia and US forces both rushed in and spirited away the brain trust of scientists and engineers that developed these rockets. One team that included Wernher von Braun (leader of the project) and Siegfried Reiger (who became the first Vice President of Engineering of the Comsat Corporation) were relocated to the United States. They were situated in a remote part of northern Alabama where the Redstone Missile Arsenal was established to develop rocket technology.

Space Agencies and Military Departments Lead the Development of Rocket Launchers and Scientific and Applications Satellites

The Space Age officially began on 4 October 1957 with the launch of the *Sputnik* satellite by the Soviet Union. This first successful rocket launch of an artificial satellite to orbit led the way to a number of other successful satellite launches by the USSR.

The US response was much less successful. Several failed attempts were made until it finally launched *Explorer 1* on 31 January 1958. This start of satellite launches began in the context of scientific research. Both the US and Russian satellite launches were a part of a 67-nation effort known as the International Geophysical Year (IGY) that began in July 1957 and ran through December 1958. The worldwide scientific exploration activity fueled by the IGY led to a wide range of scientific breakthroughs and technological discoveries—including the discovery of the Van Allen radiation belt around the Earth.

Yet, in terms of the world of geopolitics, the IGY largely amounted to a race to show off to the world the respective technological and scientific capabilities of the world's top two Cold War adversaries—the US and the USSR. The relative strengths—and weaknesses—of the Soviet Union and America were on full display.

The US Congress hurriedly passed the NASA Space Act of 1958 to create the National Air and Space Administration with the clear intent to bolster the scientific image and standing of US technology. NASA was designed to conduct scientific exploration, but also the development of new space applications for telecommunications, remote sensing, and weather forecasting.

Various early failed attempts to launch a satellite to orbit by the US underscored an immediate sense that US space technology and missile capabilities were well behind the USSR. What was not immediately clear from this early start to the Cold War Space Race was that while the Soviet Union had a lead in developing rocket launchers capable of successfully launching large satellites, it was less capable in the design of high performance and sophisticated satellites with the highest levels of performance and potential scientific and technological commercial service capabilities.

On the occasion of the thirtieth anniversary of the *Sputnik 1* launch, I was a part of a delegation of 50 some astronauts, scientists, and commercial space industry attendees invited to visit Moscow and Star City to celebrate and explore the future of space development. At that time, I was escorted to a Russian space science and technology museum, where I was able to see the earliest telecommunications and application satellites; they resembled rather clunky “washing machines” that were massive in size, structurally heavy, and demonstrated heavy industrial wiring. The technology, when compared with the telecommunications satellites that were acquired by Intelsat from American manufacturers such as Hughes Aircraft, TRW, and Ford Aerospace in the late 1960s, 1970s, and 1980s, was significantly behind.

Many US aerospace companies that played role during World War II were ready to support the future development of the commercial space applications industry. This was especially true for the world of commercial satellite communications when Comsat and Intelsat came into being. These large commercial organizations had the expertise, engineering and manufacturing knowhow, testing labs, technical qualification equipment, and clean room assembly areas needed for to design and build commercial communications satellites.

Aerospace and military-industrial complex companies such as Boeing, Lockheed Aircraft Corporation, the Martin Company, Grumman Aircraft Engineering Corp., General Dynamics, North American Aviation/ Rocketdyne, Douglas Aircraft, Aerojet General, Thiokol, TRW, Collins Radio, and Hughes Aircraft in the US were a key resource for Comsat and Intelsat to call on as the age of commercial communications satellite services was born in the 1960s.

When President Dwight D. Eisenhower left office in 1961, he gave a speech about the power and many capabilities of what he described as the Military-Industrial Complex. Eisenhower noted that this alliance had been critical to winning World War II and its success had largely come from the close and effective working relationship that had been forged between the Pentagon and American industry, especially those that manufactured aircraft, bombers and fighter jets and other high-tech instruments of war. His message was that this powerful alliance could lead to political abuse and an undue concentration of power in peace time and perhaps

even overspending on defense-related products and services.

What Eisenhower did not note, however, was that this military-industrial complex, that supported the building of armaments and weapons for the military, was also crucial to large-scale technology monopolies such as AT&T, Western Union, the electrical and power companies, and other vital infrastructure suppliers—all of which were essentially operated on the basis of investment “rate base regulation.” These companies operated under regulatory commissions and were generally allowed to earn a profit equivalent to a percentage of the size of their investment. Although they could cut costs through productivity increases and new technology that increased efficiency, they also knew that more capital they invested the more profit they could earn.

Likewise, aerospace companies of the military-industrial complex knew that their contracts with the military and with monopoly infrastructure suppliers worked best for them if they were based on cost-plus-fee arrangements. Only when deregulation and commercial competition began to occur in the 1980s did things begin to change. This impacted the future course of Comsat, Intelsat, and the development of competitive satellite services as, new companies emerged.

Going back to President John F. Kennedy, after assuming office he felt the need to act to respond to Soviet soft and hard military power and the powerful new capabilities presented by intercontinental missiles and space systems. He gave a speech on 12 September 1962 that called for the US to develop the capability to send astronaut explorers to the Moon and return them safely to Earth by the end of the 1960s. In this speech he also noted the other uses of space for scientific research, communications, weather forecasting and navigation. He understood that space would generate new research, new space applications, new companies, and new economic growth. In this speech he emphasized this potential as follows: “the space effort itself, while still in its infancy, has already created a great number of new companies, and tens of thousands of new jobs. Space and related industries are generating new demands in investment and skilled personnel....”²¹

Even before this historic “Moon Speech,” a year earlier on 25 September 1961 President Kennedy gave a speech at the United Nations General Assembly on the peaceful uses on outer space. In this

speech he formally called for the UN Charter to be extended to the peaceful uses of outer space, creation of global system for the monitoring of forecasting of weather, and the creation of a global telecommunications network. He specifically said in the midpoint of this UN Address: “We shall propose further cooperative efforts between all nations in weather prediction and eventually in weather control. We shall propose, finally, a global system of communications satellites linking the whole world in telegraph and telephone and radio and television. The day need not be far away when such a system will televise the proceedings of this body to every corner of the world for the benefit of peace.”ⁱⁱ

These two statements of US policy led to a massive expansion of the US Space Program and a gigantic increase in NASA expenditures to fund the Apollo Program—that at one point represented over 3% of the US government budget, as well as the creation of the Communications Satellite Corporation (Comsat) and the negotiations that resulted in the establishment of Intelsat in 1964. The space policies set forth in these two major speeches changed the course of history with regard to the future of NASA, but also the rapidly increased the growth and development of a US aerospace industry.

The newly formed NASA issued its contracts to an ever-widening number of aerospace corporations that included many of the previously named companies as well as computer companies (such as IBM), chemical companies (such as Dow), and other firms that would design spacesuits, design and build satellites, and more,

The effort to create a global communications system did not come to fruition as quickly as the Apollo Program to go to the Moon. This is because first, the US had to work out the details of how it would proceed to implement communication satellite services at the national level and second, it had to negotiate an international agreement for global satellite communications services. Although the Comsat and Intelsat story unfolded more slowly and was smaller in economic impact than the Apollo Program, it may have had an even greater longer-term impact on the future course of commercial space industries and their way of doing business,

The First Experimental Communications Satellites, the Communications Satellite Act of 1962, and the Formation of Intelsat and the Start of Commercial Satellite Services

The first two experimental communications satellites were rather primitive in nature. The US Signal Corps designed a simple satellite known as *SCORE* that was launched on 18 December 1958 and simply transmitted a recorded message from President Eisenhower. This satellite broadcast his greetings to the world that said “Peace on Earth and Goodwill to Men.” This was followed by *Courier 1B* launched in October 1960 and was the first active communications satellites that could both receive and transmit messages even though this satellite could only transmitted teletype data messages.ⁱⁱⁱ

By 1962 more sophisticated communications satellites were developed by NASA and US aerospace. On 13 December 1962 NASA launched an experimental communications satellite, *Relay 1*, manufactured by RCA. This new low Earth orbit satellite had the ability to receive and actively relay multiple telephone calls and even television signals from space in low Earth orbit. This satellite had a much greater telecommunications throughput capacity than existing trans-Atlantic telecommunication submarine cables. This was followed by another NASA launch by a Delta rocket of the *Relay 2* satellite.^{iv}

But the most important of these early experimental satellites came next. A brilliant satellite systems engineer named Dr. Harold Rosen, assisted by Dr. David Williams and Dr. Thomas Hudspeth, managed to convince the leadership of his company, Hughes Aircraft, to give him a speculative grant to develop a geosynchronous satellite.

Rosen claimed that his team could design a device to realize what Arthur C. Clarke had famously proposed in his famous 1945 article in *Wireless World*. Clarke’s startling proposal was that it would be possible to launch and operate a global satellite network, based on the use of just three satellites in geosynchronous orbit over the Atlantic, Pacific, and Indian Oceans. The key was to be able to launch such a satellite into a difficult-to-achieve at the time, circular equatorial orbit with a unique altitude of 22,300 miles or 35,780 kilometers above the Earth.

As explained to me by Hal Rosen in conversation, this speculative design work that began in 1959, allowed

his team to be primed to win a contract from NASA to design and build 3 prototype geosynchronous satellites that could be placed into this very special circular orbit in the Equatorial plane. In such a key orbit, the satellite would seem to hover over one spot in the sky when viewed from Earth.

This contract was awarded by NASA in 1961 to build three Syncom satellites for some \$4 million. The *Syncom 1* satellite by Hughes Aircraft, when launched by NASA on 14 February 1963, was declared a launch failure. When the apogee rocket motor fired to place the satellite into its final circular orbit in the equatorial plane, the motor firing apparently damaged the onboard electronics.

Syncom 2, launched on 26 July 1963, however, successfully positioned in GEO orbit and the satellite functioned as intended. The single voice channel, or 16 teletype channels, were relayed across the Atlantic Ocean and proved that a space telecommunications capability was possible. Even a very low-quality television relay test was accomplished. *Syncom 3* was launched on 19 August 1964 with an orbit near the International Date Line over the Pacific Ocean, had a higher throughput capability that was able to relay low quality television signals from the Tokyo Olympics. All three of these launches were provided by Delta rocket launchers and took place from Cape Canaveral. The first two were aboard Delta B rockets and the third, larger and more capable *Syncom 3*, was launched on a Delta D. The US Department of Defense provided the earth stations and the telemetry, command and control services need to operate these satellites.^v

The Syncom satellites demonstrated a key new capability by remaining continuously above the same longitudinal position above the Earth's equator in order to provide continuous coverage of a vast area equivalent to almost a third of the Earth's surface. This communications satellite in this geosynchronous orbit—sometimes called a Clarke orbit after Arthur C. Clarke, could provide links across the Atlantic Ocean, connect North and South America, and also link to Europe. In this “stationary location” with respect to the Earth, space antennas on the ground did not have to be equipped for tracking the satellite in orbit.

As noted earlier, President Kennedy had proposed the creation of a global satellite system at the United Nations in 1961. At the time, there was not only the technical challenge of how to design and launch satellites to accomplish such a system, but also the

question as to what type of entity or mechanism would operate such a system on a global basis.

The first step to this process was the passage of the Communications Satellite Act of 1962. In Congress, competing ideas were put forth. One idea was to create a governmental entity that would provide such a service and operate as a governmental entity. Another idea proposed this to be a commercial operation that telecommunications companies would somehow arrange for the satellites to be designed, manufactured, and operated. Senator Estes Kefauver advocated public ownership. Senator Robert S. Kerr and others wanted telecommunications entities to take the lead. President Kennedy sought to forge a more complex arrangement whereby a new commercial entity, known as the Communications Satellite Corporation would be the designated entity for the US, but there would be a number of public governmental constraints and oversight provisions by the Federal Communications Commission, the State Department, and later the National Telecommunications and Information Administration (NTIA) that would advise Comsat on decisions relating to national policies and with the President appointing some of the directors to the Comsat board.

My top boss, when I worked for the Comsat in the second half of 1960s, was an attorney named Mr. John Johnson. He actually ended up drafting to versions of that bill, including the one that ultimately passed after a filibuster by Senator Estes Kefauver ended. Johnson then went on to become Vice President of Comsat, and Chairman of the Interim Communications Satellite Committee that made the top decisions for the new Intelsat Consortium. These Intelsat Interim Agreements were negotiated and agreed to in 1963 and 1964 after the Comsat Act of 1962 was ultimately signed into law.

The US government first thought that Comsat might negotiate a series of bilateral agreements to carry out international satellite communications. The European countries, however, came together as a coalition under the Committee on European Posts and Telecommunications, and insisted on creating an entity that would be an international organization for satellite communications. After a lot of negotiation, it was agreed that there would be two international agreements—The first would be signed by only official governments. The second would be a so-called “Special Agreement” that would be for designated operating entities for strictly governmental entities such as the General Post Office

(UK) or the Bundespost (Germany), crown companies such as existed in some countries such as Canada, or private companies as designated by government authorities such as was the case with Telespazio (Italy), KDD (Japan), or Comsat (United States.)

On 20 August 1964 Interim Arrangements were agreed to for both the Intelsat Agreement and the Special Agreement. Under these documents Intelsat came into existence, with the Comsat Corporation as the interim manager and US top-designated owner of the American shares and as provider of the communications satellite services for the US.

As these international organizational arrangements were being negotiated, Comsat proceeded to negotiate an agreement with the Hughes Aircraft Company for a communications satellite that was an upgraded version of the Syncom satellite. This improved version included a so-called “squinted-beam” antenna that allowed more effective coverage and to have a capacity of 240 voice circuits or one black and white television channel.^{vi}

This decision to create Comsat as a commercial entity. Intelsat was to be structured to operate on a commercial basis with competitive bids for satellite facilities, equipment, and services and it would select contractors on the basis of best bids; this would ultimately have an impact on the future development of a wide range of commercial satellite applications. One of the key elements here is that Comsat, from the outset, worked on the basis of working with fixed cost contracts from commercial aerospace vendors. This was in contrast to how the US government, especially the Department of Defense, used cost-plus-fee contracts when they were developing new aircraft or advanced weapons systems.

Further, the formation of Intelsat was seen in Europe as an opportunity to spur European aerospace and telecommunications growth and in other countries such as Japan, Canada, and Australia. Even developing countries such as Brazil, Nigeria, Algeria, and others saw this as way to improve their telecommunications and aerospace enterprises and led to these nations starting efforts to create commercial capabilities that designed and built Earth Stations. The French-European effort to create the aerospace entity known as Arianespace that led to the development of the Ariane family of rockets, can be traced back to the desire to sell commercial launch services to Intelsat. Indeed, in the years that followed,

European and UK aerospace and telecommunications contractors won a number of contracts to build Earth Stations, Tracking, Telemetry, and Command facilities, satellite subsystems, and in the case of Arianespace full-service launch agreements.

In these early days of commercial satellite services, however, it was the large and well-established aerospace and telecom firms that predominated. Firms such as Hughes Aircraft, TRW, Ford Aerospace, IT&T, AT&T, Scientific Atlanta, Aerojet General, etc. were predominant in the US, while smaller contractors tended to win subcontracts. The same was true around the world. British Aerospace, Marconi-Matra, Thales Alenia, and others in Europe, or the National Electronics Corporation (NEC) and Mitsubishi in Japan were predominant in their regions. Each of these large corporations had research laboratories, test facilities, and scientific expertise.

The Communications Satellite Corporation (COMSAT) became the largest percentage owner of the newly created International Telecommunications Satellite Consortium (INTELSAT) when it came into being in August 1964. As the Manager of this international satellite services entity, the pressure to act decisively was clearly present and it turned to the Hughes Aircraft Company for help.

Comsat technical staff, based on the success of the Syncom satellites, negotiated a contract for Hughes Aircraft in 1963 to build a communications satellite. The specification for this geosynchronous satellite required a specially designed “squinted beam” to maximize the coverage area in order to provide an enlarged service across the Atlantic with initial Earth Station facilities in Andover Maine and Goonhilly, England. These sites were chosen because they were in isolated RF usage areas. This satellite, designed to transmit 240 voice channels or one television channel, and was designated as the Hughes 303 project.

This satellite was successfully launched on 6 April 1965, but quickly became known around the world as *Early Bird*. (See Fig 2)

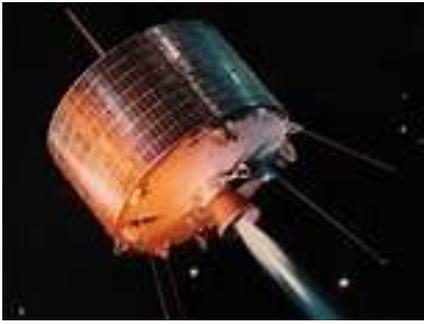


Fig 2: Early Bird Satellite: World's First Commercial Communications Satellite. Courtesy: Comara Photo History Archive

The fact that this one geosynchronous telecommunications satellite could transmit 240 voice circuits across the Atlantic, or even send a relatively viable television signal, was in its day a sensation. The transatlantic submarine cables had a capacity of only 30 some voice circuits that was increased to about 70 voice circuits using so-called “Time Assigned Speech Interpolation” (TASI). This cable capacity increasing technique, clipped speakers off as someone on the other end began speaking, and it made conversation over submarine cables awkward. Comparatively, the quarter of a second delay due to transmitting satellite signals out to space almost a tenth of the way to the Moon and back, also required some adjustment for people who sought to use the *Early Bird* satellite.^{vii} Still satellite transmission represented a tremendous breakthrough in performance and cost efficiency.

The Comsat Corporation, which came into being via the Comsat Act on 1962, had been capitalized at \$200 million dollars. In current money valuations this would be about \$2.14 billion using an average annual inflation rate of 3.83%. Its initial capitalization, through stock sales set at \$20 a share, was based on the idea of creating a low Earth orbit constellation of many scores of satellites, rather than a global network that could be created with only three satellites. This breakthrough allowed the Intelsat Interim Communications Satellite Committee to set the price of an international voice circuit to be established at a rate of \$64,000 a year.

The success of *Early Bird* was a source of enthusiasm to move to the next big thing, and systems design engineers started to put together performance design specification for a new satellite that would have as much capacity as 1,200 voice circuits—two television channels—and perhaps most importantly, the ability to provide multi-destination service between many different antennas on both sides of the Atlantic. *Early*

Bird, which was almost an experimental satellite, was designed to transmit signals between two specific locations and thus it could be described as a cable in the sky.

As this design effort moved ahead, NASA and the US effort to send astronauts to the Moon via Projects Mercury, Gemini, and ultimately Apollo, entered the picture. NASA needed to have shipboard communications from the Atlantic Ocean to provide telemetry, tracking, and control services for the upcoming Mercury and Gemini launches and *Early Bird* as a two-way cable in the sky could not support it without taking it out of commercial service. NASA offered to pay for a slightly upgraded satellite with this capability if it could be quickly designed and built and if Intelsat would agree to provide this capability.

The INTELSAT decision-making forum, known as the ICSC, and chaired by my boss John Johnson (who had drafted two versions of the Comsat Act) had to present the proposition and advocate for this action—but also had to chair a discussion that became controversial and heated.

Dr. Reinhold Steiner, representing Switzerland, maintained that this interim satellite, essentially to meet US and NASA needs was a distraction from moving ahead with a much larger and more capable satellite. That design, featuring a de-spun antenna with a much greater antenna gain, could be more than five times larger in throughput capacity and allow many European countries, including Switzerland, to access this next generation satellite. Were a satellite to meet NASA needs undertaken, this upgraded satellite would be delayed.

Although Comsat, as the US shareholder of Intelsat at the time, owned over a majority share, the agreed voting arrangements indicated that consensus should always be sought and that there had to be at least three other voting members of the ICSC to agree on the vote to pass—regardless of the size of their ownership shares. This was the first major controversy for the ICSC. An agreement was reached to proceed with this interim *Intelsat II* satellite before proceeding with the *Intelsat III* featuring a larger antenna that could be constantly pointed toward Earth and greatly enhance its throughput capabilities. This would not be the last time that the outspoken Dr. Steiner would act as a thorn in the side of Chairman Johnson who was able to convince the Board that the *Intelsat II* decision would be the best course of action.^{viii}

The *Intelsat III* satellite, with its greatly expanded capacity, multi-destination capability, de-spun high gain antenna and enhance television capability was launched in 1968. Matt Gordon, who was head of public relations was enthused with the prospect that this satellite could provide television service to support the Olympic games in Mexico City, and convinced management that this new *Intelsat III* should be named “Olympio.” When the first *Intelsat III* satellite ended as a launch failure, Dr. Joseph Charyk ruled that each satellite would be known by their number only and this would be assigned after its successful launch.

Following the launch of *Intelsat II* and then the successful launch of the next *Intelsat III*, the ICSC was able to cut the annual cost of a voice circuit in half to \$32,000 a year. When the *Intelsat IV* was launched with its 4000 voice circuits plus additional TV channel capacity in 1971, a steady series of rate reductions on almost a year basis began. This was not just because of increased frequency bands and greater power onboard the satellites, but also because of new more efficient digital modulation systems known as SPADE and Time Division Multiple Access (TDMA) as well as new coding efficiencies.^{ix}

By the early 1980s, the annual rate has dropped to \$10,000 a year per voice circuit. During this same period inflation had more than doubled. Over the course of 18 years, the cost of Intelsat satellite service, as charged to its various national owners and users, had dropped by almost 6.5 times or to only about 15% of the initial rate. During this period the cost of living due to inflation had increased some 125%. In real adjusted dollar costs, the net annual charge for Intelsat service in 1983 was about 6% of what was in 1965. In contrast, the cost of petroleum per barrel and gone from \$3 to \$40, and if you adjust for inflation, an increase in net cost of oil by a factor of about 30 times.

During these boom times of growth and development, Intelsat member countries went from 15 to 170. The number of antennas operating in the Intelsat system went from 2 to 600.

When Intelsat came into being, there was a total worldwide submarine telephone circuit capability of about of a hundred, that with TASI (time-assignment speech interpolation) assistance might total about 200 circuits. In 1982 Intelsat was supporting well over 25,000—a truly remarkable exponential and revolutionary growth that included traffic—not just

between the US and Europe but that opened up thousands of pathways between all the countries of the world and direct communications between South America and Africa. Satellites eliminated the previous routing telecommunications that required all such previous submarine cable traffic to go through transit systems that flowed through the US and Canada to Europe before traffic between these two continents could connect. This growth of global connectivity has continued apace in the decades that followed.^x

Telecommunications Competition and the Shift away from Monopoly Systems

Intelsat was created as a global consortium of national partners with some operating entities acting as private companies and crown corporations and others as official post and telecommunications agencies. All were at the time considered to be what economists called “natural monopolies.” The thought was that a consolidated telecommunications system to serve an entire nation would benefit from economies of scale in building and operating infrastructure and that competing entities would duplicate needed infrastructure and drive up costs. In the US, the Federal Communications Commission had the regulatory responsibility to oversee the rates that telecommunications companies such as AT&T, RCA, Western Union, and now Comsat would be allowed to charge for their services. Thus, as noted earlier, governmental regulatory authorities around the world, such as the FCC in the US, oversaw the capital investments these companies made in their equipment, monitored their operating costs, and used “rate regulation” to set a “fair rate of return” on their investment.

It was during the Ronald Reagan Administration in the 1980s that the world of telecom monopolies began to be challenged. A number of banks, especially The Bank of America, who paid high fees around the world for communications services supported making these services competitive. There were calls for the breakup of the AT&T monopoly and to allow competition. This came to a head in 1983 with the so-called divestiture decision issued by Judge Harold H. Green that ordered the breakup of AT&T in 1984. This move to support commercial competition in the telecommunications sector was supported by the Reagan Administration. Deregulation and commercial competition became the word of the day.

Intelsat had no rate base regulation oversight, and certainly had owner entities that favored technical innovation. Intelsat management, of which I was a part, proceeded to adopt new satellite efficiencies and employ the latest digital and encoding techniques in order to reduce the rates that Intelsat owners from around the world had to pay for the satellite services provided.

There was, however, another key part of the costing and payment system for the Intelsat satellite services. The monopolies that owned Intelsat, had no particular motivation to cut rates to their millions of individual customers and business users around the world. The cost reductions that occurred by Intelsat utilizing new technologies such as digital processing, modulation, and coding improvements, did not necessarily flow directly to the end consumer. Rates for international telephone, telex, data, and television services charged by the monopoly Post, Telegraph, and Telephone (PTTs) Ministries, crown corporations, and private corporations, such as the Comsat Corporation, retained relatively high commercial rates. The PTTs used satellite cost reductions and efficiency improvements to subsidize the cost of other telecommunications services and many developing countries with monopoly PTTs found that keeping rates high aided the flow of hard currency into their economies.

The result was new telecommunications companies being formed with the intent to challenge Comsat and its associated Intelsat monopoly. These firms proposed to build and arrange to launch their own independent satellite systems and filed with the FCC for permission to build and operate competitive systems.

The first of these systems were filed with the FCC at the time the Intelsat Board of Governors meeting was being held in Australia. This was the new name for the decision-making body of Intelsat since the so-called definitive arrangements had been internationally negotiated, agreed to, and gone into effect in the 1970s. I had also shifted over from being a Manager in the International Affairs Division at Comsat to become Executive Assistant to the Secretary General of Intelsat. Since Intelsat was now an International Organization with well over a hundred members, President Reagan and his advisors had to decide how to respond to the FCC filings made by the Pan American Satellite Corporation (PanAmSat), headed by the colorful entrepreneur Rene Anselmo and four other start-up companies

(Orion Satellite Corporation, International Satellite Inc., RCA American Communications, and Cygnus Satellite Corporation) that also filed for such permission.

The Reagan telecommunications team and specifically the head of the new Telecommunications Policy Office in the White House, Clay Whitehead, came up with proposed way forward. The White House proposed that they would move to sanction so-called “private business” competitive satellite services for international business services, but not to contravene the Intelsat Agreements with regard to allowing competition for public telecommunications services. This proposed policy, however, was not clear-cut as to what services would be impacted. The problem was the issue of what was called the “leaky PBX exchanges.”

Technically, it is possible to let large amounts of public telecommunications services follow into a company with a public exchange or PBX system to connect to an extension. If there were a host of extension lines that were connected to a private satellite network that then connected to another such PBX in other business offices around the world, then any type of public consumer telephone service could go on the so-called private business telecom satellite. Thus, the restriction on telecommunications competition for public consumer traffic could easily be circumvented. In 2025 terms, this is how companies such as Whatsapp, Skype, Microsoft Teams, Zoom, etc. use the Internet to avoid international cell and telephone rate charges.

The effort to establish competition to Intelsat, and supported by the Reagan Presidency, was ultimately resolved in the 1990s. Enabling legislation passed in the US Congress and negotiated agreements with Intelsat partners and owners created a pathway to sell the Intelsat Satellite Network to private equity firms in 2001. This result converted this once international intergovernmental organization into a private, multinational entity.

Over time, the private equity owners of Intelsat loaded up the firm with debt and then resold their investment. In July 2006, the latest group of private equity owners of Intelsat acquired PanAmSat and merged their satellite resources; this created a larger company with even larger debt. Eventually, the debt load threatened a potential bankruptcy that eventually came. Most recently, on 17 July 2025, SES S.A., a key

rival to Intelsat headquartered in Luxembourg, — acquired ownership of the integrated PanAmSat and Intelsat satellite system and combined all of the resources under consolidated management. This consolidated network of geosynchronous satellites and mSat (medium orbit satellite constellation) currently consists of a network of 120 satellites.^{xi}

Intelsat was always motivated to improve satellite design and modulation efficiencies to meet its mandate to help develop world connectivity and serve developed and developing countries alike. It had a charge to promote public safety and promote world peace as advanced by President Kennedy in his UN address. It was brought into being by international negotiation and chartered to operate under commercial competitive principles, to be cost effective, to embrace new and better technology, and to acquire the best systems and research results from around the world. It was challenged to reduce the cost of service, recruit the best talent from around the world, and to realize its enormous potential. But despite all these lofty goals, were the aspirations of those that came together to create a single global satellite system. Yet, there remained a key regulatory flaw in its structure; it was to be owned by a global collection of monopoly post and telecom ministries and companies. The owners of Intelsat that resold the various satellite services this entity developed and operated on their behalf were not equally motivated—largely as a consequence of rate base regulation. Intelsat opened up global telecommunications to the developing world and offered promotional free services for health and education as part of Project SHARE, which I had the honor to lead. Despite its innovations, wide spread global membership, and successful development of a dozen generations of ever more efficient satellites, its organizational structure, based on telecom monopolies, proven to be an institutional weakness.

Conclusion

As a final thought on this subject of commercial satellite services, “natural monopolies,” and the downward price pressures of active corporate competition. I vividly recall a moment from decades ago when I worked at Comsat. This was a brief interchange on an elevator and this exchange reveals

the crux of the problem faced by monopolies that have come face-to-face with new efficiencies that lowered costs and forced price reductions—and then as a consequence, lowered overall corporate income.

At the time I was working at Comsat to implement two new digital satellite technologies known as SPADE and TDMA—mentioned earlier in this article. I was chairing what was known as the *Intelsat IV* Charging Policy Group. The assignment was to expand the range and types of satellite services—including full transponder leases for television and domestic communications— and lower Intelsat charges. This was as a consequence of new technologies and especially the latest digital modulation and coding techniques. My colleague got on the elevator and said: “Hey Joe, have you heard of this new system from Comsat Labs. It is called “Bust Us” and it will improve throughput on our satellites over ten times and make us ten times more cost efficient. We will suddenly be able to cut our rates for our services by a factor of ten. Boy oh boy! Then, we will be in great shape. I can’t thank that crew out at the Clarksburg Labs for making us so productive and profitable.” He then departed the elevator as everyone laughed at my expense.

The truth is technological progress is indeed driven by competition. Any dominant technology company, whether IBM, AT&T, US Steel, Intel, Apple, or Microsoft, if they do not innovate and produce new lower cost products or services, will ultimately fall victim to the equivalent of a better mousetrap or a new idea or innovation that is superior to the technology it replaces.

The story of what happened to Comsat and to Intelsat has been repeated time after time in history. Intelsat and its aspirations were meaningful and noble, but the telecommunications regulatory systems of the 20th century based on monopolies telecom systems and rate-based competition had an inherent weakness in not being effective in encouraging technical innovation and competitive pricing within the public marketplace.

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ⁱ “We Choose to Go to the Moon” 12 September 1962, https://speeches-usa.com/Transcripts/john_f_kennedy-moon.html

ⁱⁱ “Test of President Kennedy’s Address to the UN General Assembly” *New York Times*, 26 September 1961,

<https://www.nytimes.com/1961/09/26/archives/text-of-president-kennedys-address-to-the-united-nations-general.html>

ⁱⁱⁱ “History of Satellite Communications,” Joseph N. Pelton, Scott Madry, and Sergio Camacho-Lara, editors, *Handbook of Satellite Applications*, Springer Press, 2018, Switzerland, 33-36.

^{iv} “Relay 1 Communications Satellite” Smithsonian National Air and Space Museum, https://airandspace.si.edu/collection-objects/communications-satellite-relay-1/nasm_A19670216000 Accessed August, 2025.

^v Joseph N. Pelton, “History of Satellite Communications,” Chapter 3, 27-66. in Joseph N. Pelton, Scott Madry, and Sergio Camacholara, *Handbook of Satellite Applications*, (2013) 2nd edition, Springer Press, Switzerland.

^{vi} Joseph Pelton *Global Satellite Telecommunications Policy: INTELSAT, Politics and Functionalism*, Mt. Airy, MD: Lomond Systems, 1974.

^{vii} US Launches “Early Bird” Communications Satellite 60 Years Ago This Hour (April 6, 1965), RetroNewser, <https://retronewser.com/2025/04/06/u-s-launches-early-bird-communications-satellite/> (Accessed Aug 26, 2025)

^{viii} Summary minutes of the ICSC.

^{ix} *The Intelsat Global Satellite System*, Joseph N. Pelton and Joel Alper, AIAA, Washington, DC, 1983.

^x Joseph N. Pelton, Marcel Perras, Ashok Sinha. “Intelsat: The Global Telecommunications Network,” Pacific Telecommunications Conference. Honolulu, Hawaii. January 1983. 1-60.

^{xi} SES Completes Acquisition of Intelsat—Creating a Global Multi-Orbit Connectivity Powerhouse” 17 July 2025 <https://www.ses.com/press-release/ses-completes-acquisition-intelsat-creating-global-multi-orbit-connectivity>