Skysat Communications Network Corp. (SCNC) – Skysat HAPS

Peter Lobner, 12 January 2024

1. Introduction

Skysat Communications Network Corporation (SCNC) was a development stage company incorporated in Delaware in July 1992 and originally based in Palm Springs, CA with Howard A. Foote as President. The firm was engaged in research and development related to their planned deployment of high altitude unmanned aircraft systems for commercial applications, primarily in the telecommunications industry.

Their first endeavor involved development of a Skysat system based on a high-altitude, long-endurance, microwave-powered, fixed-wing aircraft that would orbit a designated geolocation to provide persistent communications relay and/or remote sensing services. This project was announced in 1993, with plans to roll out a conventionally-powered prototype aircraft in mid-1994. That aircraft was not completed.

In the 1994 to 1995 time frame, the firm revised its business plan to focus on developing a stratospheric airship to serve as their Skysat high altitude platform station (HAPS) for delivering persistent telecommunications and remote sensing services in less densely populated areas, including mountainous and island regions.

At about that time, the firm moved its headquarters to New York City, NY, with Martin Fife serving as Chairman and CEO. Fife also sat on the Board of Directors for Dreyfus mutual funds. The company went public with an IPO (initial public offering) in June and July 1994, which resulted in net proceeds for the firm of $6,090,000 from the sale of stock. Thereafter, the firm was obligated to file periodic reports with the Security and Exchange Commission (SEC).

In June 1995, Washington Technology reported:

> "'The Skysat platform will be able to provide an invaluable service in the telecommunications and imaging arenas,' said Martin Fife, Chairman and CEO of Skysat. Considering the two-year-old firm is already selling its stock to the public and it doesn't even have a prototype yet, observers are optimistic that Skysat has the business know-how to succeed……One major market that Fife says Skysat is targeting is the remote sensing business. Skysat is positioning itself to fill a gap between the detailed images that can be taken with aerial photography and the synoptic pictures from satellites."

Two years later, in their September 1997 quarterly report to the SEC, SCNC offered the following rather pessimistic report:

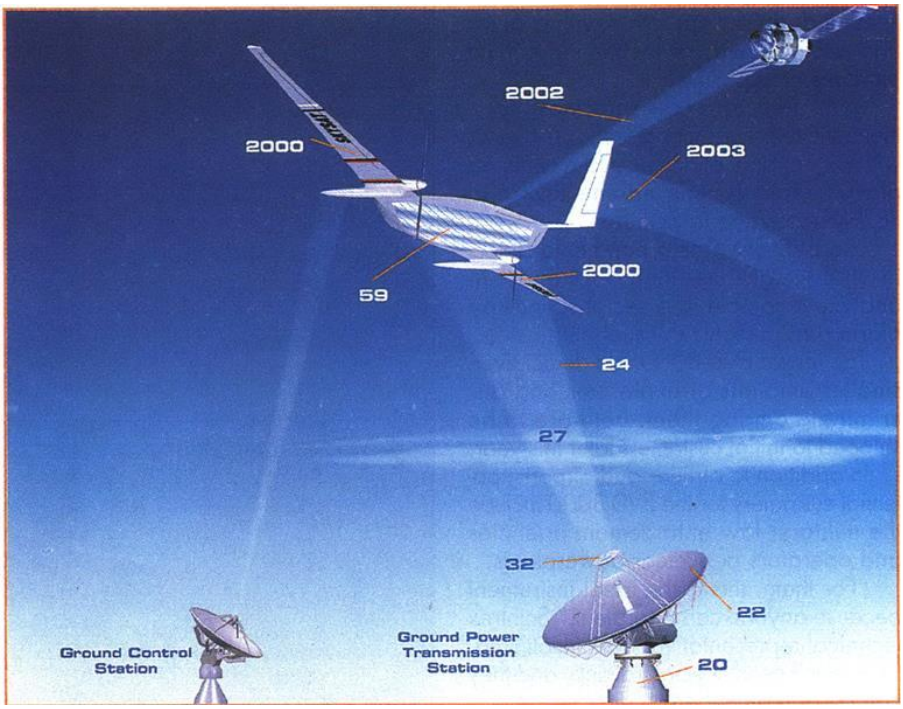
> "The Company has incurred significant losses to date and anticipates substantial additional losses before completion of Phase I of the Skysat System. There is no assurance that necessary financing will be available for completion of Phase I or that the Company will be in a position to proceed with Phase II. As of October 31, 1997, the Company has no operating capital. These factors raise substantial doubt about the ability of the Company to continue as a going concern……In the event that the Company fails to raise the funds it requires, it may be necessary for the Company to cease operations or severely limit growth."

The firm reported it had incurred a cumulative loss through September 30, 1997 of $8,496,419. In 1998, the firm ceased operations. A prototype Skysat stratospheric airship HAPS was not developed.

This article provides an overview of both HAPS concepts developed by Skysat Communications Network Corporation: the microwave-powered, fixed-wing aircraft and the Skysat stratospheric airship.

2. Microwave-powered, fixed-wing aircraft HAPS (1992 – 1995)

SCNC filed a patent application in 1993 for a microwave-powered, fixed wing HAPS system consisting of the four major components: the microwave-powered air vehicle, a mission payload aboard the air vehicle, a ground microwave power transmission station, and a ground control station. The HAPS could be used for communications relay, surveillance, laser beam direction and other purposes.



Elements of microwave-powered, fixed wing HAPS system.
Source: SCNC via AW&ST, 18 Oct 1993

Fixed-wing aircraft HAPS general characteristics

As described in patent US5503350A, the “preferred embodiment” of the aircraft has a span of 120 feet (37 m) and a length of 38 feet (11.6 m). The inner wing has a surface area of approximately 890 ft^2 (83 m^2) with an array of rectenna elements mounted on the underside in a generally circular pattern having an equivalent diameter of about 38 feet (10 m). The aircraft is constructed substantially of lightweight composite materials and has a structural weight of about 3,000 lb (1,361 kg). The reduced weight of the structural components, in conjunction with high aerodynamic efficiency, enables the aircraft to carry a payload equal to about 30 to 40% of the aircraft empty weight.

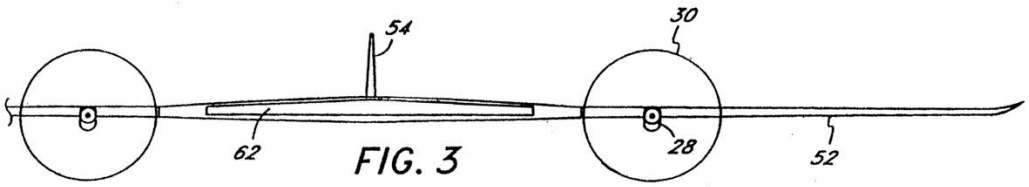


FIG. 3

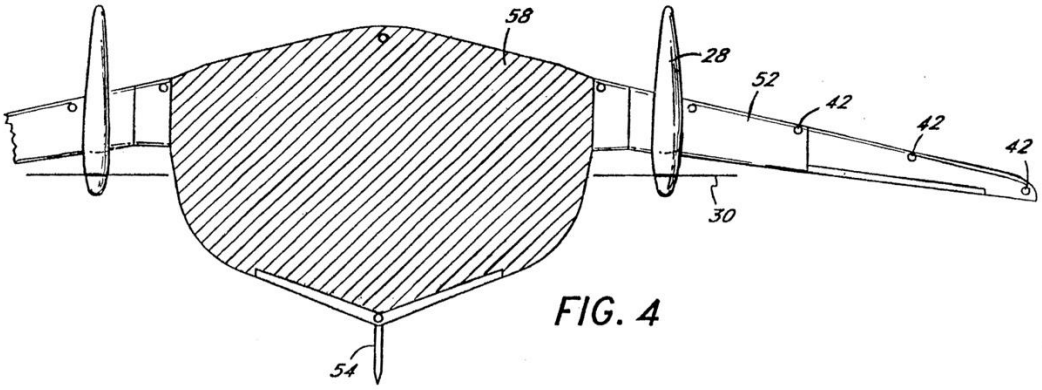


FIG. 4

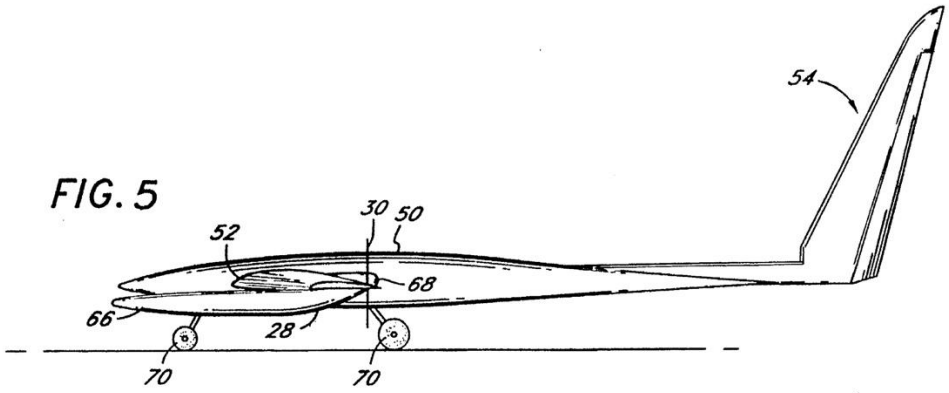


FIG. 5

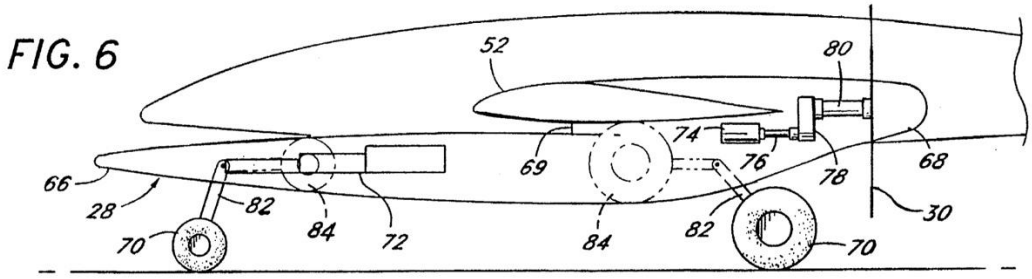


FIG. 6

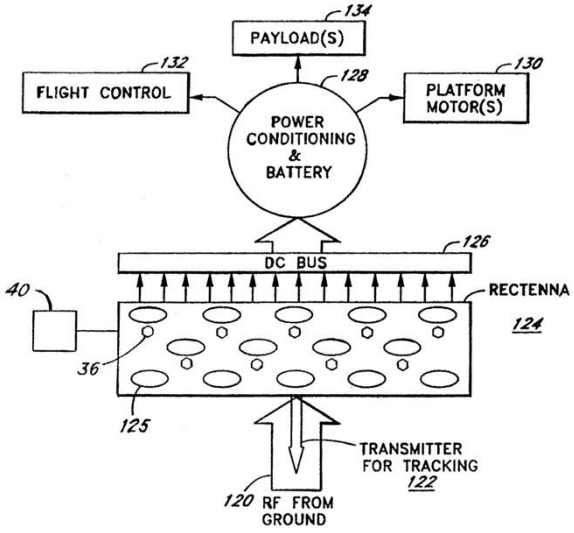
Legend: nacelles housing propulsion motors and landing gear (28), propellers (30), wings (52), tail assembly (54), rectenna (larger than 10 m in diameter), (58), communications system antennas (62),

General arrangement of the SCNC microwave-powered, fixed wing HAPS. Source: US5503350A

Microwave power system

The ground power transmission station described in patent US5503350A will produce a microwave power output of about 400 kW at a frequency of 35 GHz, which is transmitted in a focused beam from a 111.5 ft (34 m) diameter antenna dish. The extremely narrow main lobe of the microwave beam is expected to have a diameter of 26 ft (8 m) at 70,000 ft (21,336 m) and should be fully received by a 38 ft (10 m) equivalent diameter rectenna on the underside of the aircraft.

As shown in patent Figure 11, the ground power transmission system is designed to deliver microwave power to a rectenna array (124) on the bottom surface of the aircraft, with sensors (36), a control unit (40) and rectifying panels (125) for conversion to DC power (126), which is conditioned (128) and then distributed to flight controls, platform motors, payload systems, with any surplus power used to charge batteries.



Source: US5503350A, Fig. 11

The rectenna and associated power conversion system are expected to produces about 150 kW of DC power, 10 kW of which are used to power the on-board payload system, and the rest for propulsion. Each propulsion electric motor is rated at 75 kW and is expected to require a power input of approximately 54 kW during maximum climb. At the preferred cruise altitude of 70,000 feet and cruise speed of 163 knots (187.6 mph / 302 kph / 84 meters per second), each propulsion motor is expected to require about 35 kW of power to maintain the aircraft at speed and altitude.

Demonstration fixed-wing air vehicle

In October 1993, Aviation Week & Space Technology reported that Skysat planned to develop a demonstrator aircraft that would prove the viability of the airframe, but not of the microwave link or electric

propulsion. The demonstrator aircraft would be powered by a pair of turbo-charged Rotax 912 engines. At the time, Skysat had not decided whether to make the demonstrator manned or unmanned and operating ceiling could range from 35,000 to 70,000 feet (10,668 to 21,336 m). Rollout was planned for mid-1994.

Teaming partners for the fixed-wing aircraft HAPS

In its 31 December 1996 annual report for the SEC, SCNC described the work being performed by its major subcontractors:

- **Jet Propulsion Laboratory (JPL)**: In April 1994, SCNC entered into an agreement with JPL to develop a preliminary design of the Skysat system and determine its technical feasibility. The California Institute of Technology operates JPL under contract from NASA.
- **B&R Designs, Inc.:** "In July 1994, the Company entered into an agreement with B&R Designs, Inc. …. pursuant to which B&R Designs agreed to construct a platform based on (fixed-wing) glider technology…... Skysat will retain all intellectual property rights ….. Due to cost overruns, work by B&R Designs….. was scaled back and ultimately suspended entirely during 1995. In March 1997, the Company and B&R Designs entered into a settlement agreement under which B&R will provide to Skysat a comprehensive report detailing the research and development at B&R."

Change of course

Also in their 31 December 1996 Annual Report, SCNC a change in their choice of HAPS technologies.

> "Based on its research and development, the Company's primary focus has evolved from its initial research and development of a microwave powered aircraft Platform to a conventionally powered aircraft Platform to a conventionally powered airship Platform. It is the Company's belief that the use of an airship as the primary Platform is the most economically viable approach and the one which will be the first to be deployed commercially."

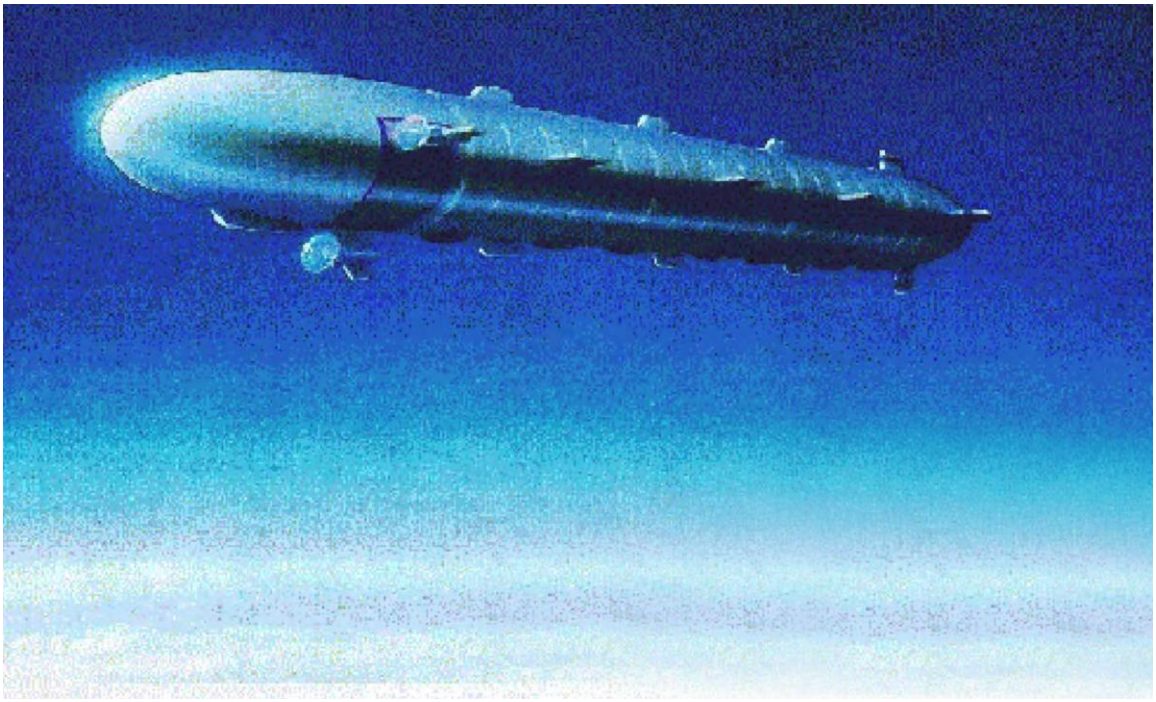
3. Skysat stratospheric airship HAPS (1994 – 1998)

SCNC's airship-based Skysat System was comprised of three primary components:

- An unmanned, conventionally powered, stratospheric Skysat airship able to remain on station for long periods of time at an operating altitude of 70,000 ft (21,336 m)
- A wireless telecommunications payload aboard the airship
    - Primarily for use with mobile cellular or personal communication services ("PCS"), fixed wireless services, and eventually with television and radio broadcasting.
- A ground control station to perform the following three functions:
    - Relay communication signals to and from the ground communications network
    - Provide command and control functions to the HAPS
    - Monitor the systems and components of the HAPS to ensure efficient operations and avoid malfunctions

SCNS expected the following market applications for the Skysat System:

- Could be used by telecom providers as a means to deliver service to areas that were currently not accessible, either because there are an insufficient number of users to justify the construction of a telecom infrastructure utilizing currently available technology or the geographic terrain inhibits the effectiveness of the currently available technology.
- Could be used as an airborne repeater point (a device that automatically retransmits received signals generally in an amplified form) for high capacity telecom service providers.
- Could be used as part of a Fast-Start program, allowing service providers an opportunity for quicker implementation and penetration into certain markets.



General arrangement of the Skysat stratospheric airship HAPS.
Source: SCNC via Walden Aerospace

SCNC's teaming partners for the airship HAPS included:

- **Jet Propulsion Laboratory (JPL)**: The JPL Agreement initiated in 1994 continued in effect into 1997, with a revised focus on the stratospheric airship HAPS.
- **AV-Intel**: In April 1996, SCNC entered into an agreement with Av-Intel Inc., a research and development company based in Ottawa, Ontario, Canada with experience in developing lighter-than-air (LTA) technology applicable to HAPS designed to fly at an altitude of 70,000 ft (21,336 m) for periods of several months. Skysat and Av-Intel collaborated to verify the viability and cost-effectiveness of the Skysat HAPS concept and develop a detailed design intended to be the basis for constructing a prototype telecommunications airship. The AV-Intel work also involved their subsidiary Pan Atlantic Aerospace Corporation, also located in Ottawa. The Av-Intel agreement expired in June 1997, was extended through 29 October 1997, and SCNS was seeking a further extension before it had to terminate operations.

A prototype Skysat stratospheric airship HAPS was not built.

4. Epilogue

From the beginning, SCNC did not expect to generate any revenues until the Skysat System became commercially available. If enough funding had been available in late 1997, the "optimistic" business prospects for the firm were described as follows:

> "During the one-year period following September 30, 1997, the Company intends to continue to conduct significant additional research, development and testing activities in connection with the development of the Skysat System, including the completion of, and/or the acquisition and testing of, a platform, and the exploration of the technical and economic feasibility and viability of additional and alternative aerial vehicles, which, together with other general and administrative expenses, are expected to result in substantially higher operating losses."

In 1998, the firm ceased operations.

On 23 July 2010, the SEC revoked Skysat's registration and noted:

> "Skysat Communications Network Corp. ("SKATA") (CIK No. 919374) is a void Delaware corporation located in New York, New York with a class of securities registered with the Commission ……. SKATA is delinquent on its periodic filings with the Commission, having not filed any periodic reports…..since the period ending September 30, 1997."

5. For more information

- “Skysat Proposing Microwave Drone,” Aviation Week & Space Technology (subscription required), p. 101, 18 October 1993: https://archive.aviationweek.com/search?QueryTerm=Skysat+Communications+Network+Corp
- “Firm Markets Drones for Commercial Use,” Washington Technology, 22 June 1995: https://washingtontechnology.com/1995/06/firm-markets-drones-for-commercial-use/333125/
- “Firms propose high altitude airships as communications platforms,” Aviation Week Intelligence Network (subscription required), 16 May 1996: https://aviationweek.com/firms-propose-high-altitude-airships-communications-platforms

SEC reports

- SKYSAT COMMUNICATIONS NETWORK CORPORATION - SEC Quarterly Report Under Section 13 or 15(d) of the Securities Exchange Act of 1934 - For Quarter Ended: March 31, 1996: https://www.sec.gov/Archives/edgar/data/919374/0000950123-96-002391.txt
- SKYSAT COMMUNICATIONS NETWORK CORPORATION – SEC ANNUAL REPORT UNDER SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934 - For the fiscal year ended December 31, 1996: https://www.sec.gov/Archives/edgar/data/919374/0001005477-97-001082.txt
- SKYSAT COMMUNICATIONS NETWORK CORPORATION - SEC Quarterly Report Under Section 13 or 15(d) of the Securities Exchange Act of 1934 - For Quarter Ended: September 30, 1997: https://www.sec.gov/Archives/edgar/data/919374/0001047469-97-005434.txt
- SEC Administrative Proceeding File No. 3-13950, 28 June 2010: https://www.sec.gov/files/litigation/admin/2010/34-62388.pdf

- EDGAR Company Search Results - Skysat Communications Network Corp., 17 entries: https://www.sec.gov/edgar/browse/?CIK=0000919374

Patents

- US5503350A, "Microwave-powered aircraft," Inventor: Howard Foote, Filed: 28 October 1993, Granted: 2 April 1996, Assigned to: Skysat Communications Network Corp.: https://patents.google.com/patent/US5503350A/en
- WO1995/012237A1, "Long-duration, remotely powered aircraft system," Filed: 25 October 1994 by Skysat Communications Network Corp., Published 4 May 1995: https://patents.google.com/patent/WO1995012237A1/en

Other *Modern Airships* articles

- *Modern Airships - Part 1*: https://lynceans.org/all-posts/modern-airships-part-1/
    - ATG – StratSat HAPS
    - CNRS – Pégase HAPS
    - Japan – SPF SkyNet HAPS
    - KARI (South Korea) – VIA-200 HAPS
    - Sky Station International Inc. – Sky Station HAPS
    - Walden LTAS – S.O.S.C.S.
- *Modern Airships - Part 2*: https://lynceans.org/all-posts/modern-airships-part-2/
    - ESA / Lindstrand - HALE
    - EU CAPANINA – HAPS
    - Galileo Systems - Graf Galileo HAPS
    - Sanswire & WSGI – Argus 1 HAPS
    - Sceye - HAPS
    - Stratosat – Skyrider HAPS
    - TAO Group – SkyDragon HAPS
    - Thales Alenia Space – Stratobus HAPS
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/