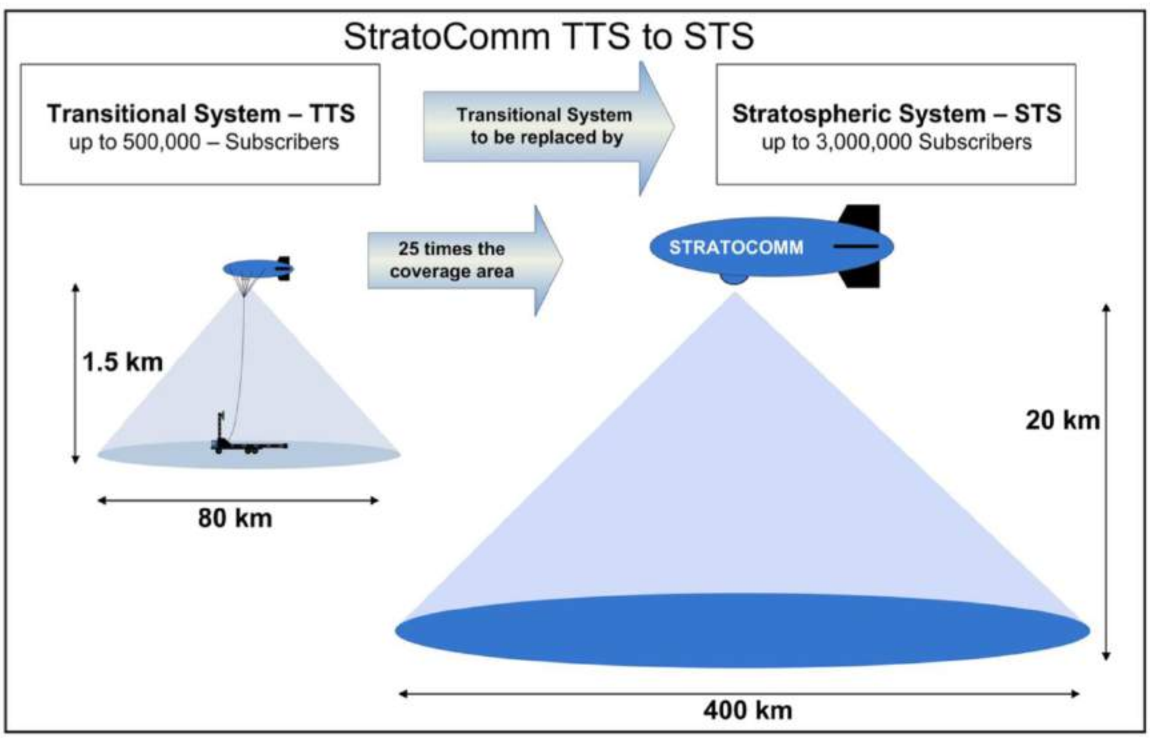
StratoComm Corp. – TTS & STS

Peter Lobner, 12 February 2022

1. Introduction

StratoComm Corp. was a US telecommunications company founded by Roger D. Shearer in 1997 in Albany, NY. The firm's mission was to design, build, deploy and operate aerostats and airships for delivering worldwide telecommunications services, focusing initially on developing nations with underserved populations. StratoComm offered two different systems:

- **Transitional Telecommunications System (TTS):** This was a tethered, low-altitude aerostat system that could be quickly deployed at low cost to provide interim, multi-mode wireless communication services within a modest service area.
- **Stratospheric Telecommunications System (STS):** This was a High Altitude Platform Station (HAPS) capable of delivering a variety of services to a larger service area using a more complex, higher cost system with a long operating life.



Comparison of TTS and STS. Source: StratoComm

2. The SEC's case against StratoComm, et al.

StratoComm never delivered a TTS or STS, and perhaps never intended to. In February 2014, the firm, its founder and a key employee were sued by the Security and Exchange Commission (SEC) in US District Court, with the SEC alleging:

> "The Commission asserts that the defendants committed securities fraud and registration violations in the offer and sale of StratoComm penny stock. In this regard, the Commission contends that StratoComm, under the control of Shearer and with the assistance of Danzig, disseminated fraudulent public statements designed to portray StratoComm as a successful company that had developed, manufactured and sold sophisticated telecommunications equipment for tens of millions of dollars. However, the Commission asserts that the undisputed facts reveal that StratoComm had no products, no paying customers, and no revenues; and that its very existence depended on its ability to sell its securities to investors. The Commissioner further asserts that StratoComm disseminated fraudulent statements to the public in three press releases and a marketing document posted on the internet and distributed to potential investors. During this same time period, the defendants sold millions of shares of StratoComm's stock to over 100 investors…… "

From late 2007 until April 2010, StratoComm received approximately $4 million from selling its stock to investors.

The SEC's case was decided in 2015, with the following outcome for StratoComm, Shearer and Danzig

- Permanently restrained from offering or selling any security.
- Permanently prohibited from acting as an officer or director of any issuer that has a class of securities.
- Permanently barred from participating in an offering of penny stock.
- Defendants were jointly and severally liable for disgorgement of $4,086,245.00 (plus interest), representing profits gained as a result of the conduct alleged in the SEC complaint.

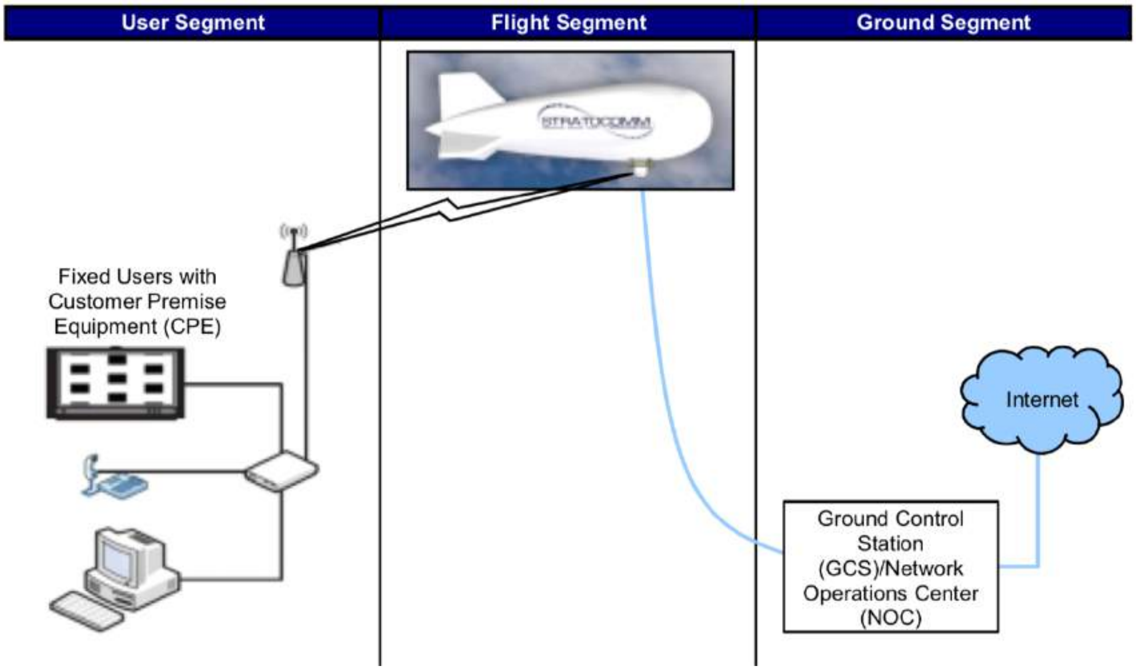
So, StratoComm's TTS and STS were not viable commercial products. Nonetheless, they appeared, at least on the surface, as credible systems. This article provides an overview of those "smoke and mirror" systems and related patents held by StratoComm.

3. Transitional Telecommunications System (TTS)

StratoComm claimed that the TTS was designed for easy deployment with the intent of quickly enhancing telecommunications capacity in developing countries, on a shorter timescale than was possible with StratoComm's STS or competing stratospheric HAPS. StratoComm claimed they had TTS sales opportunities in Cameroon and Madagascar.

The TTS tethered aerostat was designed to deliver fixed wireless communications services within an 80-kilometer (50-mile) diameter service area. A single TTS aerostat deployed at an altitude of 1,524 meters (5,000 ft) has the capacity to support broadband Internet, wireless voice, or various broadcast services for up to 500,000 customers. The aerostat tether provides electric power, fiber optic data lines that connected to terrestrial telecommunications networks, and operational control from a command station on the ground.

Rendering of a TTS tethered aerostat above a metropolitan area. Source: StratoComm Corp.



TTS concept of operation
Sources: StratoComm Corp. & Crystal Research Associates, LLC

General characteristics of the StratoComm TTS

Parameter	**TTS**
Vehicle type	Tethered aerostat
Length	37 m (121.4 ft)
Volume	2,500 m^3 (88,287 ft^3)
Operating altitude	1,524 m (5,000 ft)
Service area diameter	80 km (50 miles)
Payload capacity	225 kg (496 lb)
Payload power	3 kW
Service	IP-based services (VoIP, internet, IP-TV, etc., up to 100 video channels, 500,000 VoIP users, 500,000 broadband users, or any combination)
Endurance	About 180 days
Pointing	360 degree yaw (slew at base) and +/– 3 degree pitch
Maximum operating wind	90 kph (56 mph) continuous with momentary gusts (< 3 sec) up to 125 kph (77.8 mph)

The tethered aerostat patents

In 2010 and 2011, StratoComm was awarded three patents for their tethered aerostat: US7708222B2, US20080265086A1, and US20100264259A1, all titled “Long mission tethered aerostat and method of accomplishing.” These patents describe how the tethered aerostat was designed and would have been operated during daytime and nighttime conditions on long duration missions. The basic aerostat system is shown in patent Fig. 7. For TTS, the tether would have been about 1,524 m (5,000 ft) long.

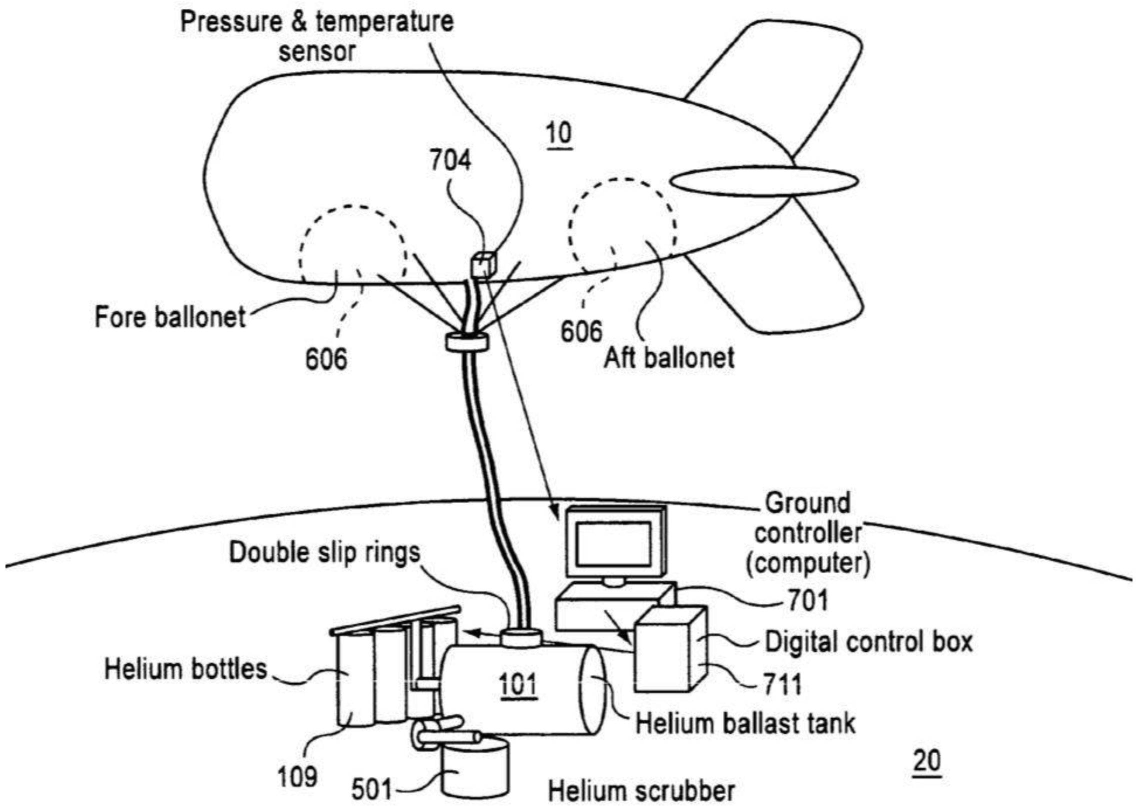
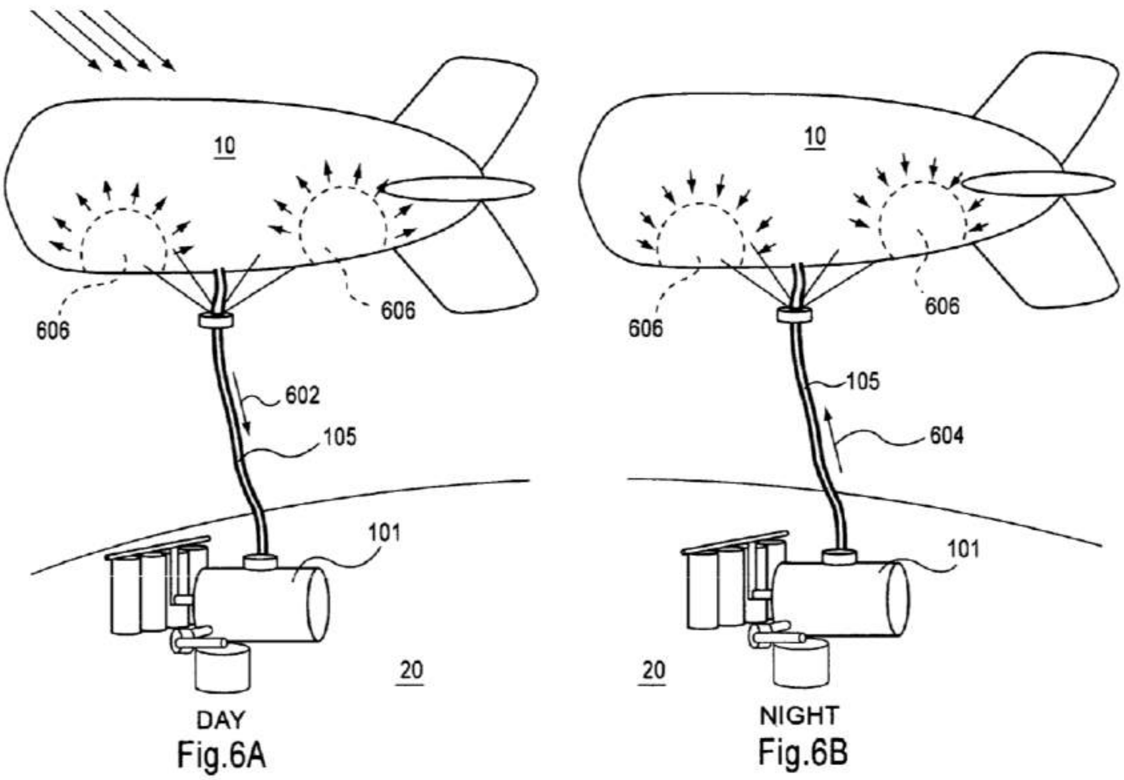


Fig.7

Source: US7708222

Patent Figs 6A and 6B illustrate the process for regulating the helium pressure and lift force in the aerostat in response to diurnal changes of ambient conditions.



Source: US7708222

Patent Fig. 6A depicts daytime heating conditions. To limit internal pressure, lift gas is removed from the aerostat (10) through the feed tube (105) into the lift gas ballast tank (101) on the ground, as represented by the arrow (602). Optional ballonets (606) may be inflated to assist in pushing lift gas out of the aerostat and in maintaining altitude. On the ground, the removed helium can be purified or treated before being returned to the aerostat

Patent Fig. 6B depicts nighttime cooling conditions. To maintain buoyancy, lift gas is returned to the aerostat (10) via then feed tube (105) from the lift gas ballast tank (101). Optional ballonets (606) may be deflated to assist in receiving lifting gas and in maintaining altitude.

4. Stratospheric Telecommunications System (STS)

StratoComm claimed that they had plans to deploy a fleet of stratospheric airships capable of carrying “technology-agnostic payloads” that could be configured to meet a wide variety of customer needs, including: telecommunications, security, surveillance, mineral and petroleum exploration, agricultural management, and more. As with the TTS, the initial target market focused on developing nations.

Each airship, known as an STS, was capable of maintaining a stationary geo-location in the stratosphere at an altitude of 20 km (65,617 feet), above controlled airspace and inclement weather patterns. The STS would have been equipped with autonomous / remote flight control and navigation systems and telecommunications payload stabilization systems.

A hybrid solar photovoltaic system with batteries or fuel cells for energy storage would have powered the STS airship systems and payload during the planned five-year deployment to the stratosphere.

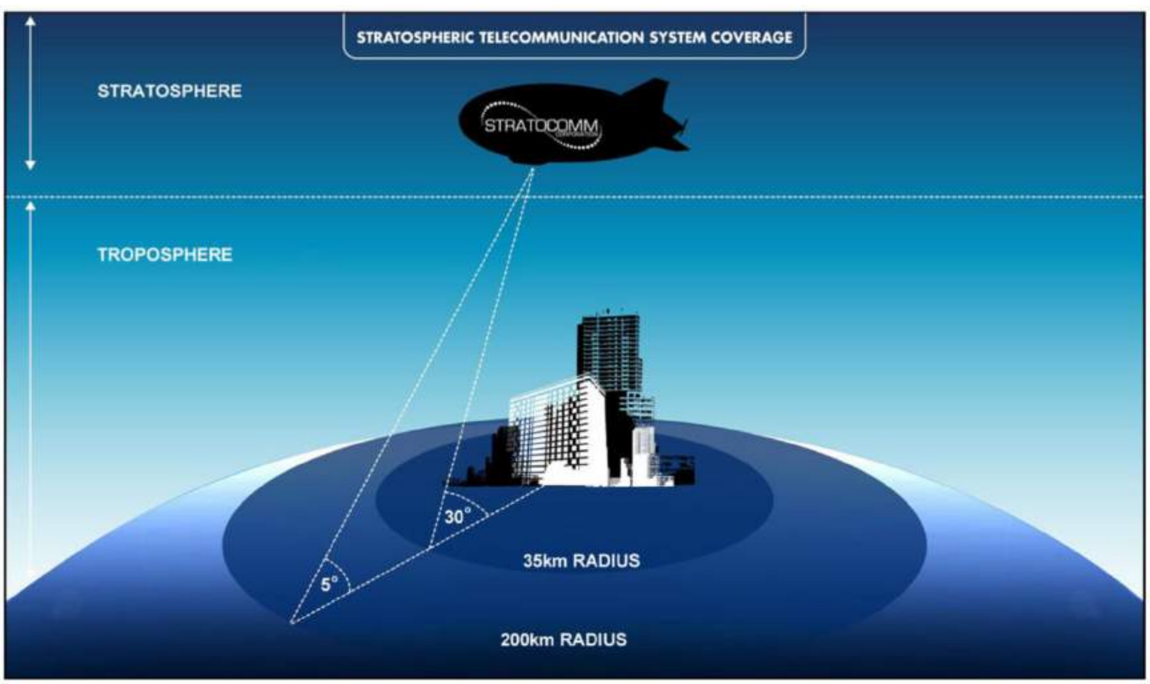
Rendering of an STS on station in the Stratosphere.
Source: StratoComm

Bow quarter view (top) and stern quarter view (bottom) of the STS. Note the payload pod under the gas envelope. Source: StratoComm

General characteristics of the StratoComm STS

Parameter	STS
Vehicle type	Free-flying stratospheric airship
Operating altitude	20 km (65,617 ft)
Service area diameter	400 km (249 miles)
Power source	Hybrid solar photovoltaic system with batteries or fuel cells for energy storage
Service capacity	Up to 1,000 dynamically configurable spot beams (highly concentrated signals that are used to target a specific geographic area), sufficient to support 3 million users for 3G wireless voice, internet, and broadcast services.
Endurance	5 years

The STS would provide better coverage with less signal shadowing in the core of its service area, where the signal path from the STS to a receiver on the ground had a steeper angle-of-arrival. At the fringes of its 400 km (249 miles) diameter service area, the signal from the STS would have had a very shallow 5º angle-of-arrival.



STS coverage per angle-of-arrival. Source: StratoComm Corp.

5. Advanced boundary layer control & propulsion for an airship

In 2012, StratoComm was awarded patents US8286909B2 and US20090200416A1, “Boundary layer propulsion airship with related system and method,” which are summarized in the following abstract:

> “Systems, method, devices and apparatus are provided for reducing drag and increasing the flight efficiency characteristics of aircraft and airships including hybrid aircraft utilizing distributed boundary layer control and propulsion devices. Boundary layer control includes passive systems such as riblet films and boundary layer propulsion devices having a divided and distributed propulsion system disposed in the curved aft sections of aircraft and airships, including hybrid aircraft susceptible to boundary layer drag due to degree of curvatures, speed and density of the surrounding air. Distributed propulsion devices include constructing propellers and riblets from shape memory alloys, piezoelectric materials and electroactive polymer (EAP) materials to change the shape and length of the distributed propulsion device.”

The goal is to reduce the turbulent drag-inducing region in the tapering stern of the airship (Fig. 6, below) by maintaining smooth laminar airflow through that region and reenergizing the boundary layer with a distributed hull- and tail-mounted propulsion system that minimizes the turbulent wake behind the airship (Fig. 9, below).

Before:

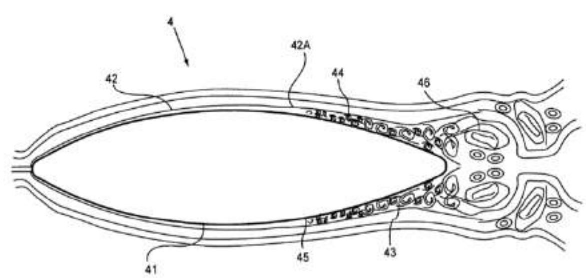


FIG.6
PRIOR ART

After:

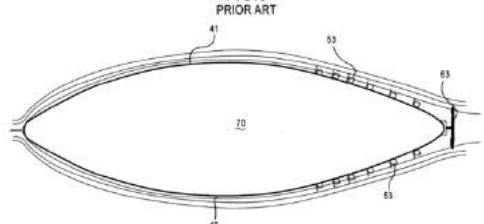


FIG.9

The patent identifies several measures that can be taken to reduce drag, depending on the thickness of the boundary layer.

- **Passive riblet films with flow-aligned miniature ribs:** The fixed riblets control the growth of small eddies in the near wall boundary structure of the layer. These can be advantageously applied over a broad area near the beginning of the boundary layer separation region (at the start of the reverse curvature region of the hull). 3M has manufactured riblet films with 20 to 100 micron tall riblets.
- **Piezoelectric bi-morph fins (EAP movable riblets):** These moving, controllable ribs can be used to advantage in regions where the boundary layer has grown to 2 to 10 cm thick. Controlled in unison, rows of EAP riblets (patent Fig. 10C) mimic the motion of a fish tail and provide propulsion.

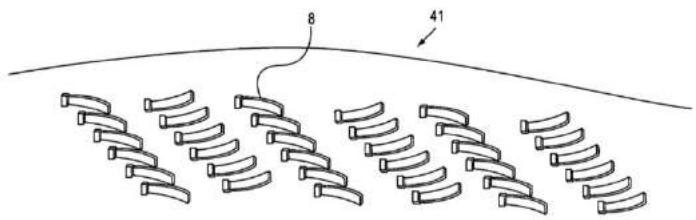


FIG.10C

- **Micropropeller propulsion units:** These units can be used further aft, where the boundary layer has grown to a thickness of 10 cm or more. The reenergized boundary layer flow downstream of a unit is much better able to handle a strong negative pressure gradient, at least for a short distance. A distributed propulsion system with tandem spacing of micropropulsion units (patent Fig. 8) can prevent the boundary layer from thickening any further.

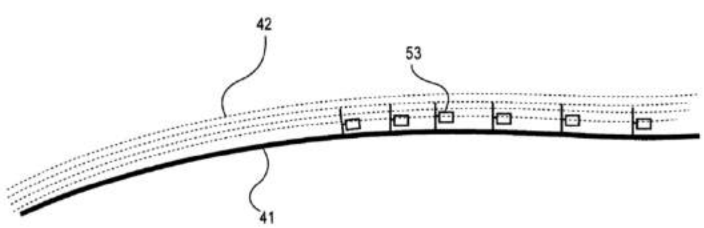


FIG.8

- **Tail-mounted propeller:** The efficiency in maintaining the constant boundary layer thickness is aided by a tail-mounted propeller that is reduced in size relative to a conventional propeller, but sufficient in size to “ingest” the smaller boundary layer exiting the last row of micropropellers.

By applying all of these measures to an airship hull, a nearly constant boundary layer thickness can be maintained throughout the adverse pressure gradient region in the aft section of the airship. Such an airship hull with a distributed boundary layer propulsion system is shown in patent Fig. 11A. This airship would have significantly less drag than a comparable airship without such a system. StratoComm’s STS did not implement this patent.

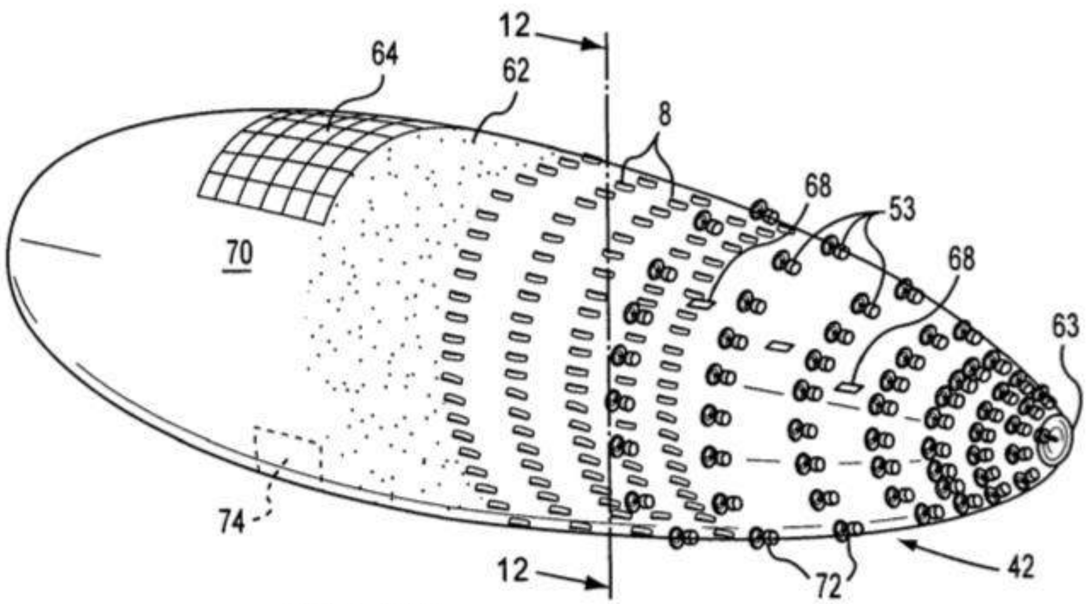


FIG.11A

Legend:

8: piezoelectric bi-morph fins (EAP movable riblets)
53: micropropeller propulsion units
62: passive riblet film
63: small diameter tail propeller
64: solar cell array
68: distributed sensors
70: the airship
72: micropropeller (part of 53)
74: boundary layer control computer

Source: US20090200416A1

6. For more information

- StratoComm Corporation – Advanced Telecommunications Systems for Developing Countries," Crystal Research Associates, LLC, 2008: http://www.baystreet.ca/articles/research_reports/crystal/STCO_EIO_09-02-08.pdf
- L. Davey, R. Butler, R. Buchanan, R. Phillips, & Y.C. Lee, "High altitude platform stations for Australia," Telecommunications Journal of Australia 58 (2- 3): pp. 29.1 to 29.8. DOI: 10.2104/tja08029, 2008: https://researchbank.swinburne.edu.au/file/42713f9d-6946-4cfc-87c7-d226e7a59aae/1/tja_2008_vol58_no2_3_12-davey_etal.pdf
- SEC report, "Corporate Disclosure, 9-30-09, Section One: Issuer's Initial Disclosure Obligations," 30 September 2009: https://sec.report/otc/financial-report/29981/StratoComm-Corporation-Disclosure-9-30-09.pdf
- "Securities and Exchange Commission, Plaintiff, v. StratoComm Corporation, Roger D. Shearer and Craig Danzig, Defendants," Case 1:11-cv-01188-TJM-CFH Document 61 Filed 02/19/14: https://www.govinfo.gov/content/pkg/USCOURTS-nynd-1_11-cv-01188/pdf/USCOURTS-nynd-1_11-cv-01188-1.pdf
- Case 1:11-cv-01188-TJM-CFH Document 80 Filed 03/26/15: https://investorshub.advfn.com/boards/read_msg.aspx?message_id=155522207

Patents

- US7708222B2, "Long mission tethered aerostat and method of accomplishing," Filed 27 April 2007, Granted 4 May 2010, Assigned to StratoComm Corp.: https://patents.google.com/patent/US7708222B2/en?oq=US7708222
- US20080265086A1, "Long mission tethered aerostat and method of accomplishing," Filed 27 April 2007, Granted 4 May 2010, Assigned to StratoComm Corp.: https://patents.google.com/patent/US20080265086A1/en?oq=US20080265086

- US20100264259A1, “Long mission tethered aerostat and method of accomplishing,” Filed 21 April 2010, Granted 27 December 2011: https://patents.google.com/patent/US20100264259A1/en?oq=US20100264259
- US8286909B2, “Boundary layer propulsion airship with related system and method,” Filed 8 February 2008, Granted 16 October 2012, Assigned to StratoComm Corp.: https://patents.google.com/patent/US8286909B2/en
- US20090200416A1, “Boundary layer propulsion airship with related system and method,” Filed 8 February 2008, Granted 16 October 2012, Assigned to StratoComm Corp.: https://patents.google.com/patent/US20090200416A1/en?oq=• US20090200416A1

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