RT LTA Systems Ltd. – Skystar™ tethered aerostats

Peter Lobner, 19 June 2023

1. Introduction

RT LTA Systems Ltd. is a private Israeli company that was founded in 1996 by Rami Shmueli. The firm, with headquarters and manufacturing facilities in Yavne (about 10 miles south of Tel Aviv), is the designer, developer, and manufacturer of the Skystar family of small, ellipsoidal, tactical tethered aerostat systems, which were introduced in 2004, primarily for use in intelligence, surveillance, reconnaissance (ISR), and communications applications. The RT LTA Systems website is here: https://www.rt.co.il.

A Skystar aerostat system is a self-contained, transportable, cost-effective, versatile tactical system comprised of an ellipsoidal helium-filled balloon carrying a payload, a ground system module (for transport, launch & recovery), a tether, and a ground control station.

Skystar 180 (L) & 330 (Above) aerostat systems. Source: RT LTA Systems

RT LTA Systems reports, “Skystar systems are operationally deployed worldwide, supporting military and security users in five continents, performing persistent ISR, law enforcement, public safety, crowd control, search and rescue, communications continuity and recovery, force protection, border security, coastal and offshore platform security, strategic site protection, anti-smuggling surveillance, VIP security and protection and Safe City.” RT LTA Systems also reports that Skystar systems have delivered more than 5,000,000 operational hours in a wide range of operating conditions on civilian and military missions around the world and have a demonstrated availability of more than 85%.

In 2018, RT LTA Systems completed development of an improved light-weight elastic material for the aerostat’s gas envelope (the balloon). The new material improves helium retention and can increase airborne endurance by more than 100%, enabling Skystar aerostats to fly continuously for up to 150 hours.

In 2019, RT LTA Systems moved into a new facility in Yavne, which is three times the size of its previous offices. The new facility houses all of the company’s activities under one roof including the aerostat production hall and assembly line, an in-house training center, an R&D lab, and other facilities for employees. RT LTA Systems reported that more efficient and advanced manufacturing processes have been implemented at the new facility.

Yavne manufacturing hall with several Skystar aerostats.
Source: RT LTA Systems (2019)

U.S. subsidiary: RT Aerostat Systems, Inc.

The U.S. Army began using Skystar aerostats in Afghanistan in 2011, primarily in a force protection role. The firm's U.S. subsidiary, RT Aerostat Systems, Inc., demonstrated the Skystar 110 and 180 tactical aerostats to 23 U.S. agencies in 2018 at its training facility in College Station, Texas.

Israeli subsidiary: Aero-T

In 2016, RT LTA System established an Israeli subsidiary named Aero-T, which also is a joint venture with the Israeli airship and aerostat manufacturer Atlas LTA Advanced Technology. Rami Shmueli is the CEO of both RT LTA Systems and Aero-T.

Aero-T was formed with the goal of developing and manufacturing the SkyGuard family of larger, conventional, blimp-shaped tethered aerostats at a new production facility in Yavne. Aero-T completed and demonstrated the first production SkyGuard 1 medium-size aerostat system in 2021.

2. Skystar aerostat systems

RT LTA Systems has three Skystar systems currently in production: Skystar 100/110, 180 and 330.

This article provides an overview of the current production Skystar systems as well as several other variants with different payload capabilities.

- **Skystar 100 / 110** / 120 / 140
- **Skystar 180** / CROW1
- Skystar 220
- Skystar 250
- **Skystar** 300 / **330**
- Skystar 400

The author is grateful for RT LTA's input on this article. Details on the mid-size, conventional Aero-T SkyGuard aerostat are provided in a separate article.

General characteristics of RT LTA Systems' Skystar family of tethered aerostat systems

Parameter	**Skystar 100 / 110 / 120 / 140**	**Skystar 180 / CROW1**	**Skystar 220**	**Skystar 250**	**Skystar 300 / 330**	**Skystar 400**
Year introduced	2015 ***(100)***, 2016 ***(110)***, 2018 ***(120)*** 2023 ***(140)***	2004 (180), 2018 (CROW1)			2008 (300), 2016 (330)	2014
Aerostat diameter	3.4 m (11 ft)	5.9 m (19.5 ft)	6.4 m (21 ft)	6.9 m (22.5 ft)	7.7 m (25.5 ft)	
Aerostat volume	9 m^3 (318 ft^3) est.	45 m^3 (1,589 ft^3) est.	57.5 m^3 (2,030 ft^3) est.	72.3 m^3 (2,553 ft^3) est.	100 m^3 (3,531 ft^3)	
Operating altitude (AGL)	up to 305 m (1,000 ft)	up to 305 m (1,000 ft)	up to 305 m (1,000 ft)	up to 305 m (1,000 ft)	up to 457 m (1,500 ft)	up to 457 m (1,500 ft)
Wind limit	35 knots	40 knots	40 knots	40 knots	40 knots	
Temperature range		-35º to 60º C	-35º to 60º C	-35º to 60º C	-35º to 60º C	
Payload weight, max.		18 kg (39.7 lb)	9.5 kg (20.9 lb)	11 kg (24.3 lb)	***(300)***: 30 kg (66.1 lb) ***(330)***: 50 kg (110 lb)	65 kg (143 lb)
Payload, typical	360º day/night gyro stabilized EO/IR payload with target coordinate indication	360º day/night gyro stabilized EO/IR payload with GPS/INS navigation, optional laser designator	360º day/night gyro stabilized EO/IR payload with GPS/INS navigation, optional laser designator	360º day/night gyro stabilized EO/IR payload with GPS/INS navigation, optional laser designator	360º day/night gyro stabilized EO/IR payload with GPS/INS navigation, ***(330 only):*** + Phased array pulse Doppler ground surveillance radar	

Tether	Simple	Powered tether	Simple	Simple	Powered tether, ***(330):*** + fiber optic data links	Powered tether + fiber optic data links
Data transfer to ground	Radio	Radio / tether	Radio	Radio	Radio, ***(330):*** + fiber optic data links	4 x fiber optic data links in tether + radio backup
Portability	Backpack or pick-up truck, ***(120)***: installed on an All-Terrain Vehicle (ATV)	Towable trailer	Towable trailer	Towable trailer or container-sized platform for truck or air transport	Towable trailer or container-sized platform for truck or air transport	Towable trailer or container-sized platform for truck or air transport
Ground crew	2 to launch / maintain, 1 during ISR ops	2 to launch / maintain, 1 during ISR ops		3 to launch / maintain, 1 during ISR ops		
Initial setup / deployment time	15 to 20 min	20 min	20 min	30 min	45 min	
Turn-around time (helium refill, maintain)	15 to 20 min	20 min	20 min	20 min	30 min	
Ground control station	Handheld Personal Ground Control Station (PGCS), 1 km (0.62 mile) range.	Portable GCS	Portable GCS	Portable GCS	Portable GCS	Portable GCS
Endurance	up to 8 hours	up to 72 hours	up to 72 hours	up to 72 hours	up to 72 hours	

Source: RT LTA Systems product brochures & online specifications.
Note: Skystar 300 and 400 are not current products.

2.1 Skystar 100 / 110 / 120 / 140

Skystar 100

Introduced in 2015, this mini-aerostat system is designed for real-time, close-in and “over the hill” tactical surveillance with a day / night electro-optical / infra-red (EO/IR) payload that has a surveillance range of about 305 meters (1,000 ft). The system is compact, robust, can be transported via backpack or pickup truck, can be assembled and launched by a crew of two persons in 15 minutes, and can be operated by a single person with minimal training. A handheld Personal Ground Control Station (PGCS) is used to control the aerostat’s gyro-stabilized EO/IR payload via a radio data link from a distance of up to 1 km (0.62 miles). In 2017, an updated version of the Skystar 100 with enhanced ISR capabilities was introduced

Skystar 100 tactical aerostat system carried in two backpacks, set up, launched and then controlled from a handheld Personal Ground Control Station (PGCS). Source: Screenshots from RT LTA Systems video (2016)

Skystar 110

Introduced in 2016, the Skystar 110 is based on Skystar 100 platform. Both are designed to provide real-time, close-in and “over the hill” tactical surveillance, are backpack or pickup truck transportable, and can be assembled and launched in 15 minutes.

Skystar 110 aerostat with the suspended Epsilon 140 payload.
Sources: RT LTA Systems (above), Octopus ISR Systems (below, left)

The Skystar 110 carries an Epsilon 140 dual-sensor, gyro-stabilized EO/IR turret manufactured by the U.S. firm Octopus ISR Systems. This payload offers improved night-time surveillance capabilities, includes a built-in target tracker and moving target indicator, and has a longer surveillance range of 457 meters (1,500 ft).

Skystar 120

Introduced in 2018, the Skystar 120 essentially is a Skystar 110 platform integrated on a small All-Terrain Vehicle (ATV) that can drive through most kinds of terrain with the aerostat inflated and ready to launch or already launched and trailing the ATV on its tether. The Ground Control Station is mounted in the ATV, which can be maneuvered as needed to keep up with and support an operating force that itself may be maneuvering on a battlefield. The Skystar 120 has a surveillance range of up to 457 meters (1,500 ft).

Skystar 120 integrated with ATV. Source: RT LTA Systems

Skystar 140

RT Aerostat Systems introduced this mini-aerostat system in March 2023 at DESI Japan. The Skystar 140 incorporates a unique cellular geo-location search and rescue (SAR) system that enables the rapid location of missing and trapped people following any natural disaster or terror incident, and in combat zones. Carried in backpacks by a team of two or by any vehicle, including pickup trucks or ATVs, the system can be ready for deployment within 10 minutes after arrival.

Defense News described the SAR system as follows: “The SkyStar 140 system includes an active multi-band, multi-technology IMSI-catcher (International Mobile Subscriber Identity-catcher) to trigger idle cellular phones, an advanced Direction Finding/Geo-Location system to detect and locate mobile signals, three low-SWaP (Size, Weight, and Power) passive sensors carried by three mini-tactical SkyStar 140 aerostat systems, and a ground control application.

Information is processed and transmitted to the ground unit which calculates and displays a 3D geo-location of the cell phone. Soaring to an altitude of 1500 ft (457 m), the high-precision system is accurate within only a few meters, and provides long operational endurance. The system is independent, not requiring the use of local mobile networks, and supports all types of cellular networks."

Skystar 140 3D geo-location. Source: RT Aerostat Systems

2.2. Skystar 180 / CROW1

The Skystar 180 tactical, mid-range surveillance aerostat is intended for Army company-level to brigade-level applications. It was one of the first Skystar models when it was introduced in about 2004. The CROW1, introduced in 2018, is the civilian model intended for security, critical infrastructure protection, public safety, VIP protection and crowd control.

RT LTA Systems describes this system as follows: "The Skystar 180 tactical aerostat system enables continuous day and night ISR operations at 1000 feet (305 meters). It enables high quality information gathering and accurate target allocation, utilizing gyro-stabilized payloads and GPS/INS navigation. The downlink video and interactive digital map are displayed in real-time at the system ground control station. The system is highly mobile and rapidly deployed."

The Skystar 180 carries a TR-STAMP Multi Sensor Miniature Stabilized EO / IR payload with optional laser designator manufactured by Israeli company CONTROP, and a communications relay manufactured by both Harris and Thales.

(L) Skystar 180 trailer being towed with aerostat inflated.
Source: Screenshot from RT LTA Systems video (2016)
(R) TR-STAMP gimballed turret. Source: CONTROP

(L) Skystar 180 deployed from its trailer. Source: Military Africa
(R) Single station Portable Ground Control Station. Source: RT LTA Systems

The Skystar 180 aerostat has been deployed as sea on small littoral vessels and larger naval vessels. Maximum operating altitude is 305 meters (1,000 ft).

Skystar 180 stowed on a small vessel and ready for deployment.

Skystar 180 deployed and trailing behind a small vessel.
Source, both photos: Screenshots from RT LTA Systems video (2016)

Skystar 180 deployed from a large naval vessel.
Source: Screenshot from RT LTA Systems video (2016)

2.3. Skystar 220

The Skystar 220 tactical aerostat system is a medium-size, highly mobile aerostat suitable for tactical mid-range surveillance for defense and security applications, as well as for public safety, police and other applications. The aerostat can lift payloads up to 9.5 kg (20.9 lb) and operate at altitudes up to 305 meters (1,000 feet) above ground level in winds up to 40 knots for up to three days (72 hours), at which time the aerostat must be recovered for a helium recharge before being re-deployed. The payload transmits its surveillance video and data to the ground control station via radio.

Skystar 220 ready to deploy from its trailer. Source: RT LTA Systems

2.4. Skystar 250

The Skystar 250 is slightly larger and is able to carry a heavier payload than the Skystar 220 (11 kg / 24.3 lb vs. 9.5 kg / 20.9 lb). Otherwise, the design and operating parameters for the two aerostat systems are quite similar.

The Skystar 250 aerostat can be launched and recovered in less than 30 minutes by a crew of three persons with minimal training. When the aerostat is deployed, only one person is needed in the ground control station. After a three day (72 hour) deployment, the aerostat needs to be recovered for a helium re-charge. This operation can be accomplished in about 20 minutes.

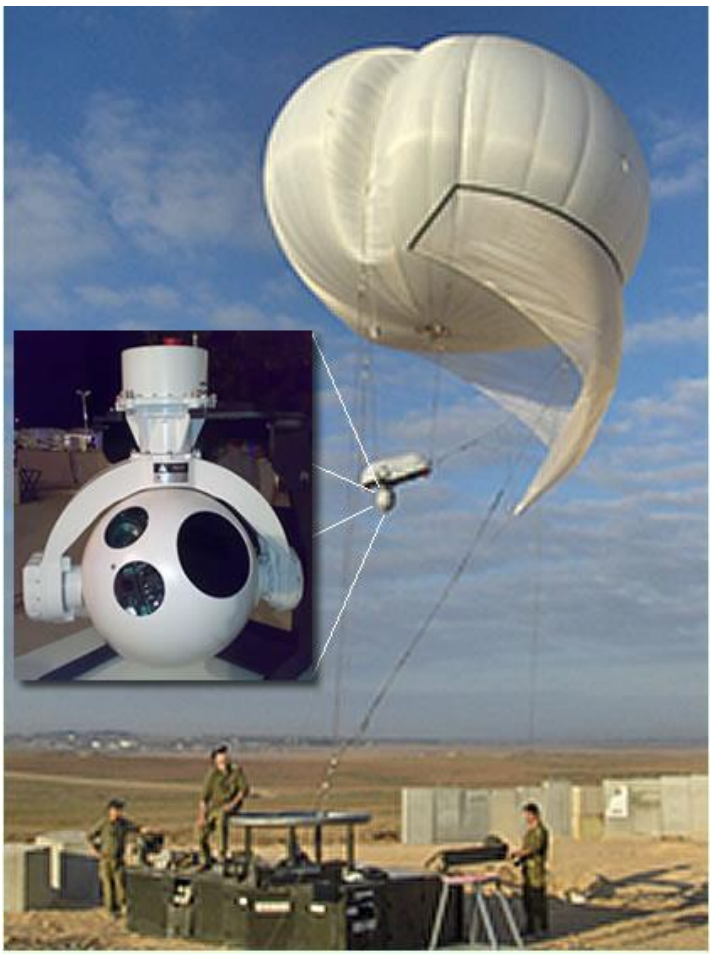
Skystar 250 deploying from its trailer. Source: RT LTA Systems

2.5. Skystar 300 / 330

The Skystar 300 was one of the first Skystar models when it was introduced in about 2008. It has been superseded by the more capable Skystar 330, which was introduced in 2016.

<u>Skystar 300</u>

The Skystar 300 system can carry payloads of up to 30 kg (66.1 lb) suspended beneath the aerostat balloon. A typical payload is a Controp Precision Technologies (CONTROP) EO/IR multi-sensor payload system designed specifically for aerostat applications. The lightweight (23 kg / 50.7 lb) payload designated “Speed-A” uses three-axis stabilization to compensate for typical aerostat movements and provide continuous stable and sharp imaging under all weather conditions. The “Speed-A” sensor payload includes a daylight color and thermal imager (FLIR), both equipped with continuous zoom, a laser rangefinder and a laser target designator. The CONTROP Speed-A payload was first displayed during an RT LTA event in September 2008.



Skystar 300 with suspended CONTROP Speed-A payload being launched. Source: Defense Update (2008)

The Skystar 300 also could be equipped for improvised explosive device (IED) detection and/or a variety of communications functions.

Skystar 300 with suspended payload.
Source: Skystar 300 product brochure via AeroExpo.online

Skystar 300 systems are operated by the Israeli Defense Forces' (IDF) Combat Intelligence Collections Corps unit, which can deploy them within six hours' notice, and keep them operational for three days, before bringing the aerostat down for a helium refill.

Skystar 330

The Skystar 330 aerostat system as a development of the Skystar 300 and is capable of carrying payloads weighing up to 50 kg (110.2 lb). In 2016, the Skystar 330 was introduced with the ELI-3332 ISR payload developed by Israel Aerospace Industries (IAI).

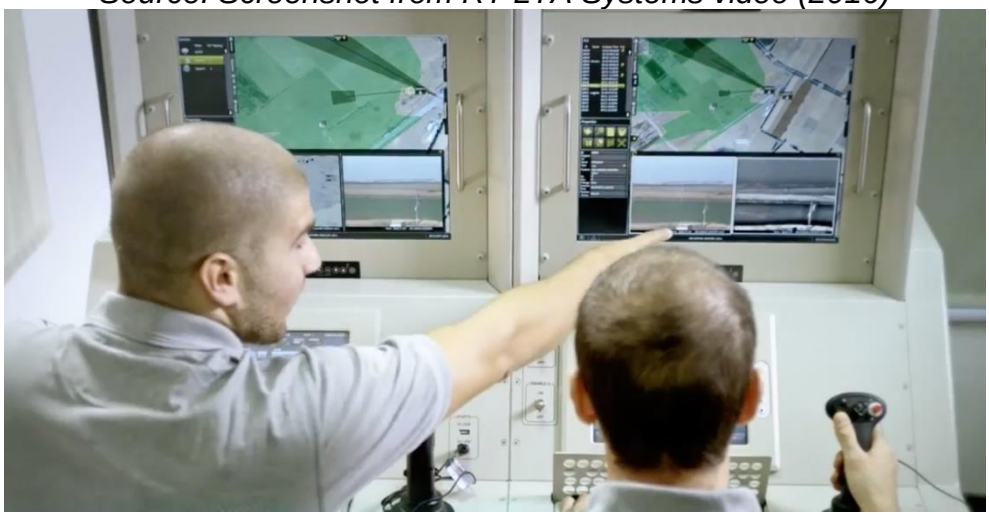
RT LTA describes the Skystar 330 as follows: "Designed to provide its users with persistent, medium-long range, real-time tactical Intelligence, Surveillance, Target-Acquisition and Reconnaissance (ISTAR), the system transmits surveillance video and data outputs to a ground control station. Lifting the system's sensor to an average altitude of up to 1,500 ft (457 m) AGL, Skystar 330 is an optimal system for camp and force protection, counter IED, area capture and situational awareness."

ELI-3332 as carried by a Skystar 330. The phased array radar is the rectangular box above the EO/IR turret. Source: IAI

The ELI-3332 payload is comprised of a day/night EO/IR turret with INS/GPS navigation and a phased array pulse Doppler ground surveillance radar. This payload has a detection range of 15 km (9.3 miles) for a vehicle and 9 km (5.6 miles) for a person. The payload consumes less than 500 watts of power, which is delivered via the tether from a power source on the ground. Four fiber optic cables in the powered tether handle the data flow between the payload and the ground control station, with a radio link for backup and for remote control. A single operator can manage the ELI-3332 payload in shifts during a mission that can last up to three days (72 hours) between brief 30 minute servicing intervals to recharge helium.

Skystar 330 tactical aerostat.
Source: RT LTA Systems

A Skystar launch / mooring platform being set up.
Source: Screenshot from RT LTA Systems video (2016)



Two position Portable Ground Control Station.
Source: Screenshot from RT LTA Systems video (2016)

In 2022, RT LTA Systems introduced a new remote control capability that provided better protection for operators by allowing them to be away from the aerostat while it is in deployment, as well as reducing the cost of operation.

2.6. Skystar 400

When the Skystar 400 was introduced in 2014, it was the largest aerostat in the Skystar family, capable of carrying payloads of up to 65 kg (143 lbs) to altitudes up to 457 m (1,500 ft). It also was the first Skystar model to incorporate four optical fiber data lines in a powered tether. With these fiber optic data links in the tether, the aerostat system is capable of delivering premium quality broadband data transmission at high data rates.

The Skystar 400 launch / mooring platform is similar to the platform used by the Skystar 300 introduced one year earlier, enabling a similar level of mobility and rapid deployment, even in extreme weather conditions.

Skystar 400 is not a current product.

Skystar 400 tactical aerostat.
Source: RT LTA Systems via Unmanned Systems Technology (7 Oct 2014)

3. For more information

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Other *Modern Airships* articles

- *Modern Airships - Part 1*: https://lynceans.org/all-posts/modern-airships-part-1/
- *Modern Airships - Part 2*: https://lynceans.org/all-posts/modern-airships-part-2/
    - Aero-T aerostats
    - Atlas LTA Advanced Technology - aerostats
- *Modern Airships - Part 3*: https://lynceans.org/all-posts/modern-airships-part-3/