

# ONWARD TECHNOLOGIES, LLC



Aerostats As Wireless Infrastructure

## Onward Aerostats As Wireless Infrastructure

- Provide high density telecom/broadband services up to an 80 Km Diameter fixed wireless service area and up to a 30 Km Diameter for mobile service area
- Onward telecom networks will employ custom sized aerostats operating between 300 to 1500 meters altitude
- Support wireless Internet Connectivity to schools, residences and offices with up to 20 Mbps per user with a Customer Premise Equipment (CPE)
- Support 3G, 4G or 5G services directly to fixed or mobile users
- Support Surveillance and Security services

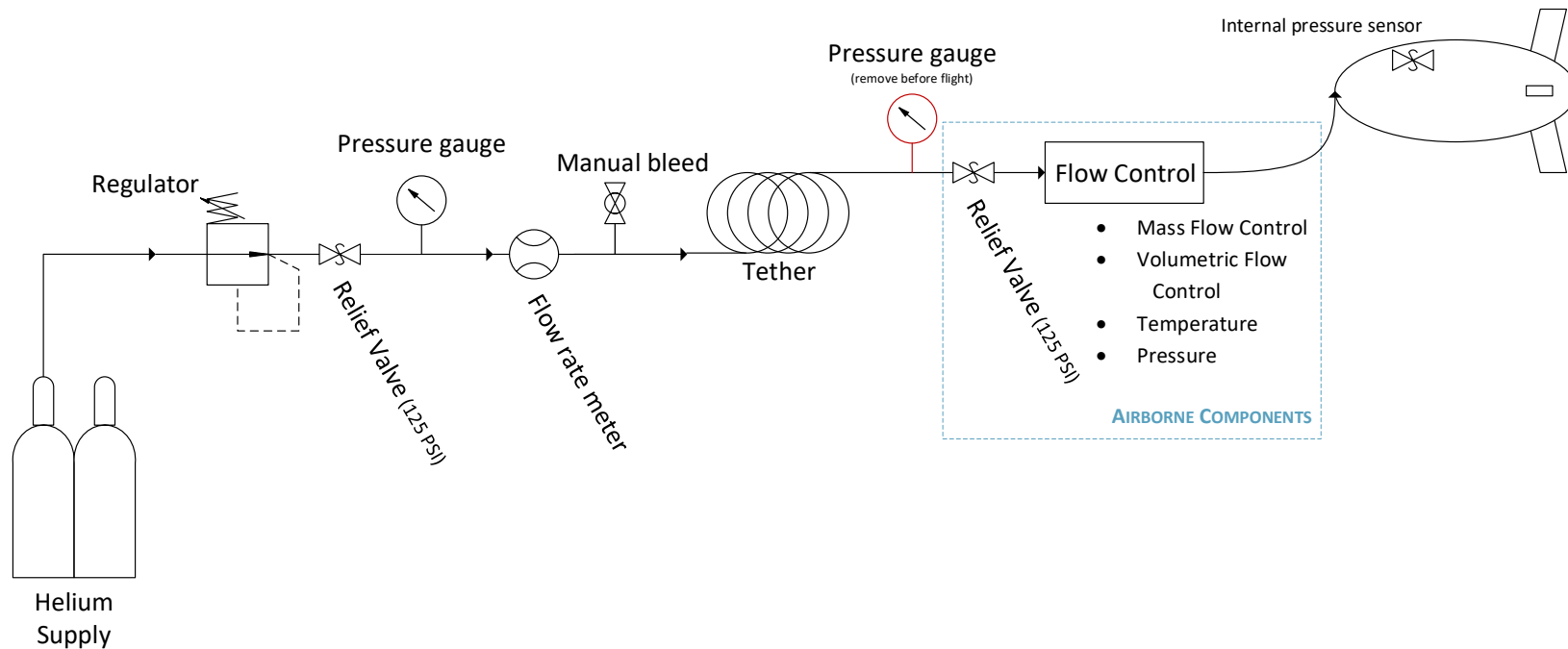
# Why Onward Aerostats

- Two most critical factors that previously inhibited aerostats as telecom infrastructure were low flight duration caused by unpredictable variations in wind speed and depletion of lift gas
- Onwards aerostat operational enhancement system capabilities has eliminated these inhibitors
- **Onward Wind Tolerance System (OWTS)** enables an aerostat to maintain operational integrity in stronger winds which equates to consistent and greater service availability
- **Onward Helium Replenishment System (OHRs)** supports sustained telecom services 24x7 for up to six months between scheduled maintenance

# Onward Helium Replenishment System (OHRS)

- **Long Mission Tethered Aerostat and Method of Accomplishing**  
US Patent 7,708,222 Issued May 4, 2010
- **Slip Ring & Double Slip Ring**  
US Patent 8,083,174 Issued December 27, 2011
- **Method of Providing a Long Duration Tethered Aerostat**  
US Patent 8,485,465 Issued July 16, 2013
- **Helium Replenishment Tether**  
US Patent 9,708,049 Issued July 18, 2017

# OHRs Architecture



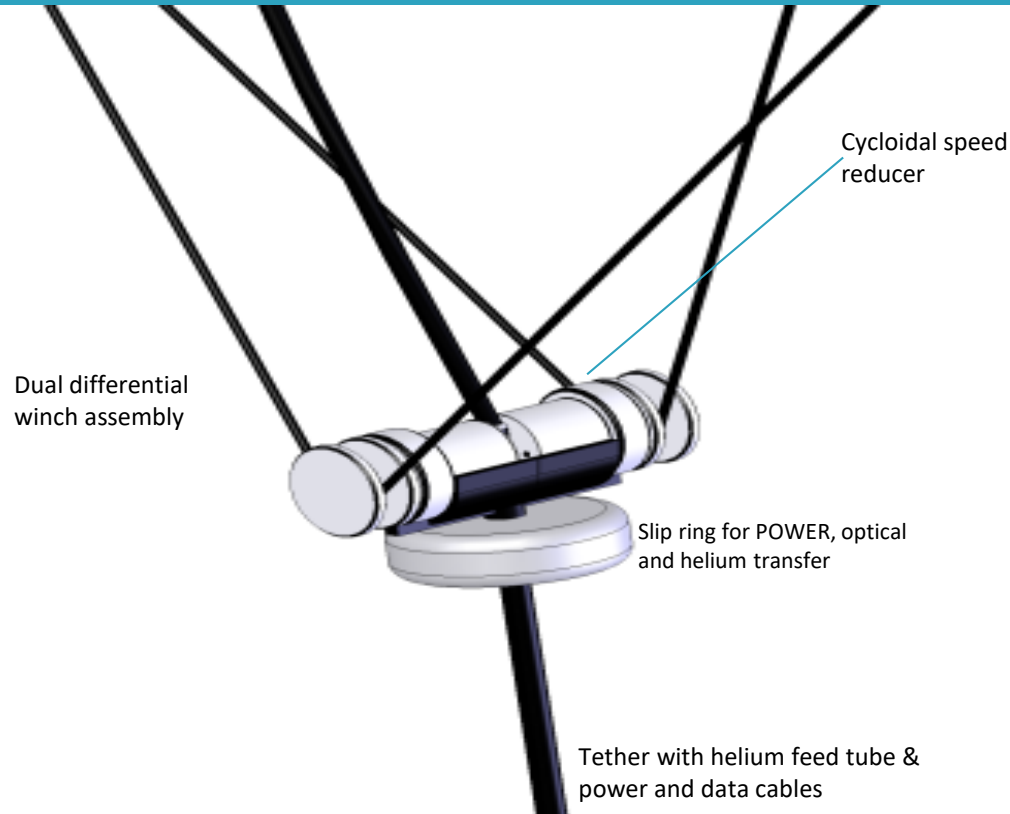
# Onward Wind Tolerance Systems (OWTS)

OWTS pertains to a dynamic adaptive harness to stabilize tethered aerostats by controlling pitch within a stability zone geometric suspension control system. More particularly the inventions relate to the application of an adaptive adjustable cable harness with a pitch control cable winch and/or a canard connected to the aerostat and pitch control cables alone or together with a lift gas replenishment system to provide a dynamic adaptability to high wind conditions for long term deployment

# Onward Wind Tolerance System (OWTS) IP

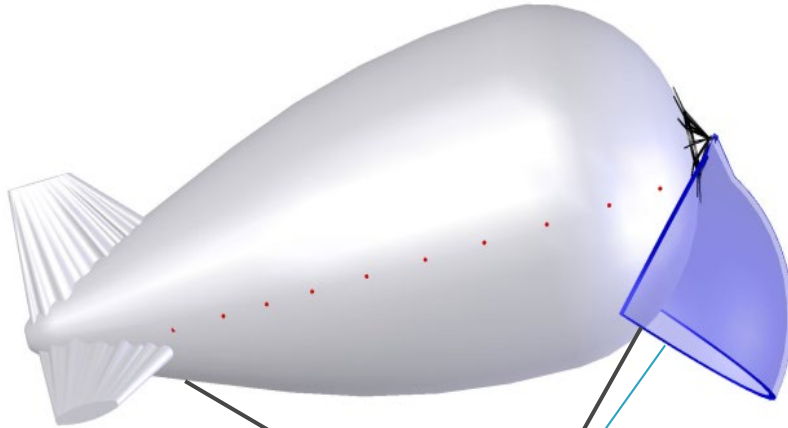
- **Adaptive Harness To Stabilize Aerostats In High Winds and Method**  
Filed October 9, 2018  
Utility Patent (Active Control)  
US # 16/155852
- **Aerostat Canard**  
Filed October 9, 2018  
Design Patent (Passive Control)  
US #29/651594

# Dual Differential Winch Actuator Assembly

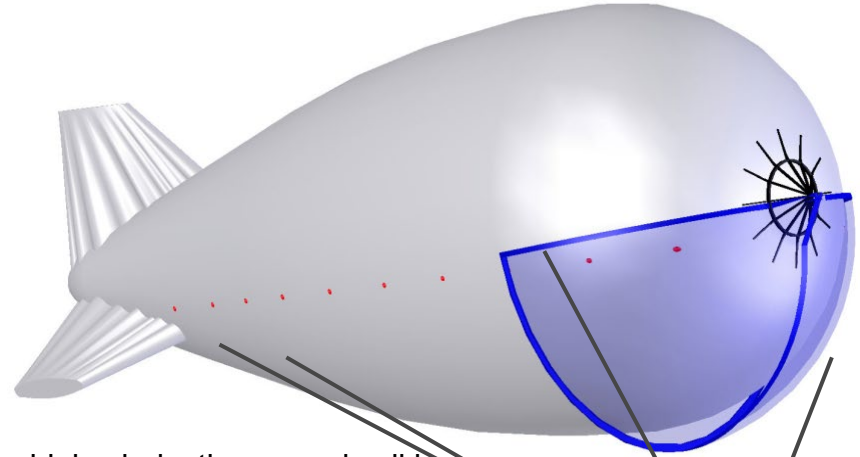




# Passive Canard Bridle Stabilization



For low winds, the canard sail is not pushed back by the wind, hence the front bridles keep the canard in the up position



For high winds, the canard sail is pushed back strongly by the wind until it is pressed hard against the lower front envelop skin. This pulls the fore bridles all the way up to bring TAP further to the fore and closer to the fore bottom section of the hull skin.

# Aerostat Attitude Stability Challenge

The force center (CBM) or center of mass and buoyancy of an operating aerostat must stay in line with the Tether Attach Point (TAP) to maintain a level pitch or within a geometrical polygon defined by the number of support cables in order to maintain survivability in high wind conditions

# Onward's IP Meets The Challenge

Keeping TAP at or near center line of CBM and within a stability zone is possible only with an aerostat integrated with OWTS operating the geometric suspension control system by changing tension and length of harness cables in relation to TAP

- Actively - motorized winches can move TAP toward nose of the aerostat to reduce the pitch altitude and keep the TAP in alignment with the CBM in the stability zone in the geometric suspension control system
- Passively - canard on front or between front cables will use the wind to increase tension on the front cables by moving the front cables and canard upwardly toward the bottom and keep the angle of the TAP in alignment with the CBM

Thank you

[www.onwardtechnologies.net](http://www.onwardtechnologies.net)