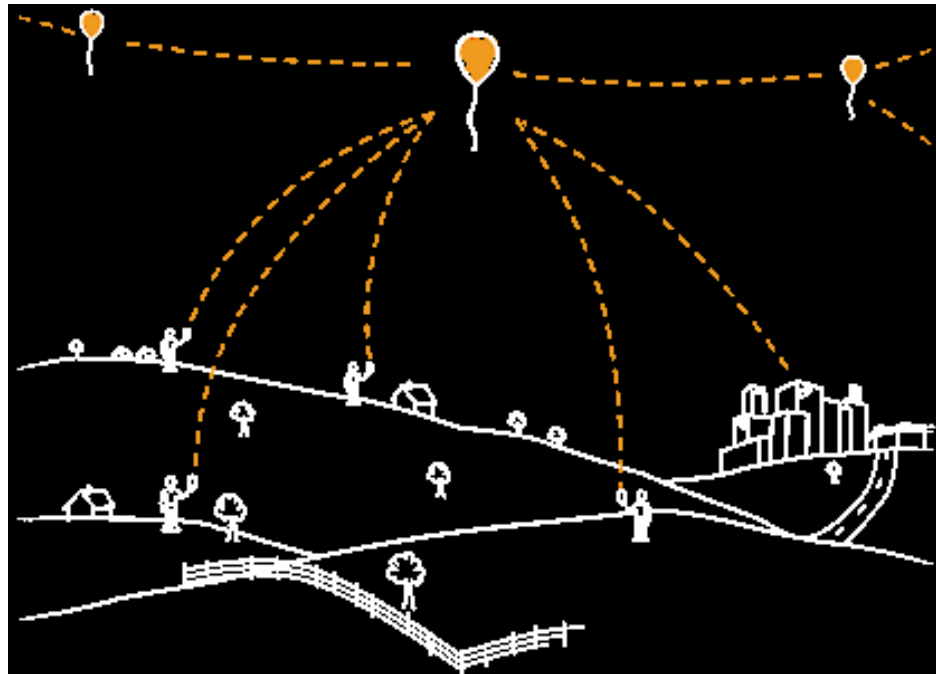# Google Loon

Evolution of Balloons

Late 2013 – First Launch takes place

Early 2014 – Launch of 20 Loons over 6 week period

Mid 2014 – Launch of 20 Loons over 1 month

December 2014 – Launch of 24 Loons over 2 weeks

February 2015 – Hiatus in launch until May

April/May – KuangChi Science and NASA to launch

Proposed – 40 Loons/month for 6 months in 2015

AIRWAYS
making your world possible

Evolution of Balloons

Loon:

        12 Metre Envelope

        18 kg Payload

KuangChi Science (China)

        30 Metre Envelope

        250kg Payload

Nasa

        80 Metre Envelope

        2,000 kg payload (potential)

AIRWAYS
making your world possible

Separations

BALLOON	AIRCRAFT
Transponder working	**10NM** from Balloon **Transiting** Above the Balloon :**5000ft** Below the Balloon: **10000ft**
Transponder **Not** Working	**20NM** from Balloon based on position from Toshiba Laptop. **Transiting** Above the Balloon : **5000ft** Below the Balloon: **Not permitted**.
Termination (Cut Down) (transponder working)	**10NM** from Balloon **Transiting** Above the Balloon : **5000ft** Below the Balloon: **Not permitted**
Termination (Cut Down) (transponder **NOT** working)	**20NM** from Balloon based on position from Toshiba Laptop. **Transiting** Above the Balloon : **5000ft** Below the Balloon: **Not permitted**.

Separations

BALLOON	AIRCRAFT
Clearance Limit given in OCA/A airspace (not cut down or dark procedures)	The circular area created using the balloon's last known position as the center point and the extrapolated + 1 hour position given by LMC as the radius. (OCS will add a 50nm buffer). **Transiting** Above the Balloon : **5000ft** Below the Balloon: **10000ft**
Planned/Unplanned Termination* (Cut Down)	The circular area created using the balloon's last known position as the center point and the extrapolated + 1 hour position given by LMC as the radius. (OCS will add a 50nm buffer). **Transiting** Above the Balloon : **5000ft** Below the balloon: **not permitted**

Separations

Balloon	OCS Procedure
Controlled Entry into OCA/A (repositioning) Clearance to descend into OCA/A shall **only** be issued if there are **No** imminent conflicts within 10,000ft of the balloons lower clearance limit.	**Create** a circular reservation area using the lowest cleared level of the balloon, then subtract a further 9000ft off that figure (separation is 10000ft) to F600; use the balloon's last known position as the center point and the + 1 hour extrapolated position given by LMC as the radius. The area shall be updated at least hourly. **Orange – advisory conflict** • If OCS displays a advisory conflict consider instructing google to climb the balloon to at least 10,000' above the traffic or re-route / descend aircraft clear of the reservation area.
Google notify "**Balloon has gone Dark'** (considered an emergency situation)	**Create** a circular reservation area from F000 to F600; use the balloon's last known position as the center point and the + 1 hour extrapolated position given by LMC as the radius. The area shall be updated at least hourly, continue to use the last known position as the center of the reservation area (the area will get bigger each update). **RED - Imminent conflict** • Issue essential traffic information". **Orange – advisory conflict** • If feasible consider re-routing aircraft clear of the reservation area until the balloon has reported or estimated to have landed.

Balloon	OCS Procedure
Unplanned Termination or Cut Down Advise from google balloon has or will terminate within an hour (considered an emergency situation). Balloon self terminates after going "dark" 2 hours if over land or 6 hours if over water.	**Create** a circular reservation area from F000 to F600; use the balloon's last known position as the center point and the +1 hour extrapolated position given by LMC as the radius. The reservation area shall be updated at least hourly. The separation above the balloon is 5000ft, as the balloon descends the reservation area may be updated to determine separation/traffic information requirements (Altitude readout + 4000ft). Flight level data may be obtained from LMC or the Google laptop. **RED - Imminent conflict** • Issue essential traffic information. **Orange – advisory conflict** • If feasible, consider re-routing aircraft clear of the reservation area until the balloon has reported 5000" below affected aircraft or information received that the balloon has landed.
Planned Termination or Cut Down Google seek permission to terminate balloon at a future time.	**Create** a circular reservation area from F000 to F600; use the balloon's last known position as the center point and the +1 hour extrapolated position given by LMC as the radius. The reservation area shall be updated at least hourly. The separation above the balloon is 5000ft, as the balloon descends the reservation area may be updated to determine separation/traffic information requirements (Altitude readout + 4000ft). Flight level data may be obtained from LMC or the Google laptop. **RED - Imminent conflict** • **Deny the request to terminate balloon.** **Orange – advisory conflict** • Resolve conflict prior to it becoming a Imminent conflict or if unable or unexpeditious to resolve **Deny** the request to terminate until traffic permits.

Separations

Balloon	OCS Procedure
Balloon unable to maintain height requesting descent/termination with in traffic in near vicinity (considered an emergency situation)	**Deny termination/clearance into controlled airspace and obtain the balloons intentions.** **Do not issue a clearance** to enter controlled airspace but acknowledge the fact that the balloon is descending and request that google advise as soon as it becomes apparent that the balloon will not be able to remain above its clearance limit. **Create** a circular reservation area from the lowest descent level of the balloon obtained from LMC then subtract a further 9000ft off that figure (separation is 10000ft) to F600; use the balloon's last known position as the center point and the + 1 hour extrapolated position given by LMC as the radius. The area shall be updated at least hourly. **RED - Imminent conflict** • Issue essential traffic information to affected flights. **Orange – advisory conflict** • If possible consider re-routing aircraft around the reservation area. *Once traffic is clear, assess if the balloon shall be terminated or clearance into controlled airspace granted.*

Message Set

The LRQ (Loon Request) message will be used to request a balloons entry into the CTA from its float level above controlled airspace.

The LRS (Loon Response) will be used to indicate either a clearance or denial for entry to the CTA in response to a LRQ message from Google.

The LRP (Loon Report) message will be used to provide updates on any balloon entering the CTA.

The LTE (Loon Terminate) message will be used to indicate that a balloon has landed or vacated controlled airspace above F600 and the airspace reservation can be cancelled.

The LDK (Loon Dark) message will be used to indicate that communication has been lost with a balloon.
The LAK (Loon Acknowledge) message will be automatically sent by OCS on receipt of a valid LRQ, LRP, LDK, or LTE message.