Helium Balloon for the SHIP Decay Volume

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Recap

The story so far…..

The idea is to use a large balloon in the decay volume to allow air to be replaced by helium, the advantage being shown in the table.

The physics case is still under review but I have been in contact with the balloon manufacturer and obtained a quotation that is based on a preliminary set of requirements.
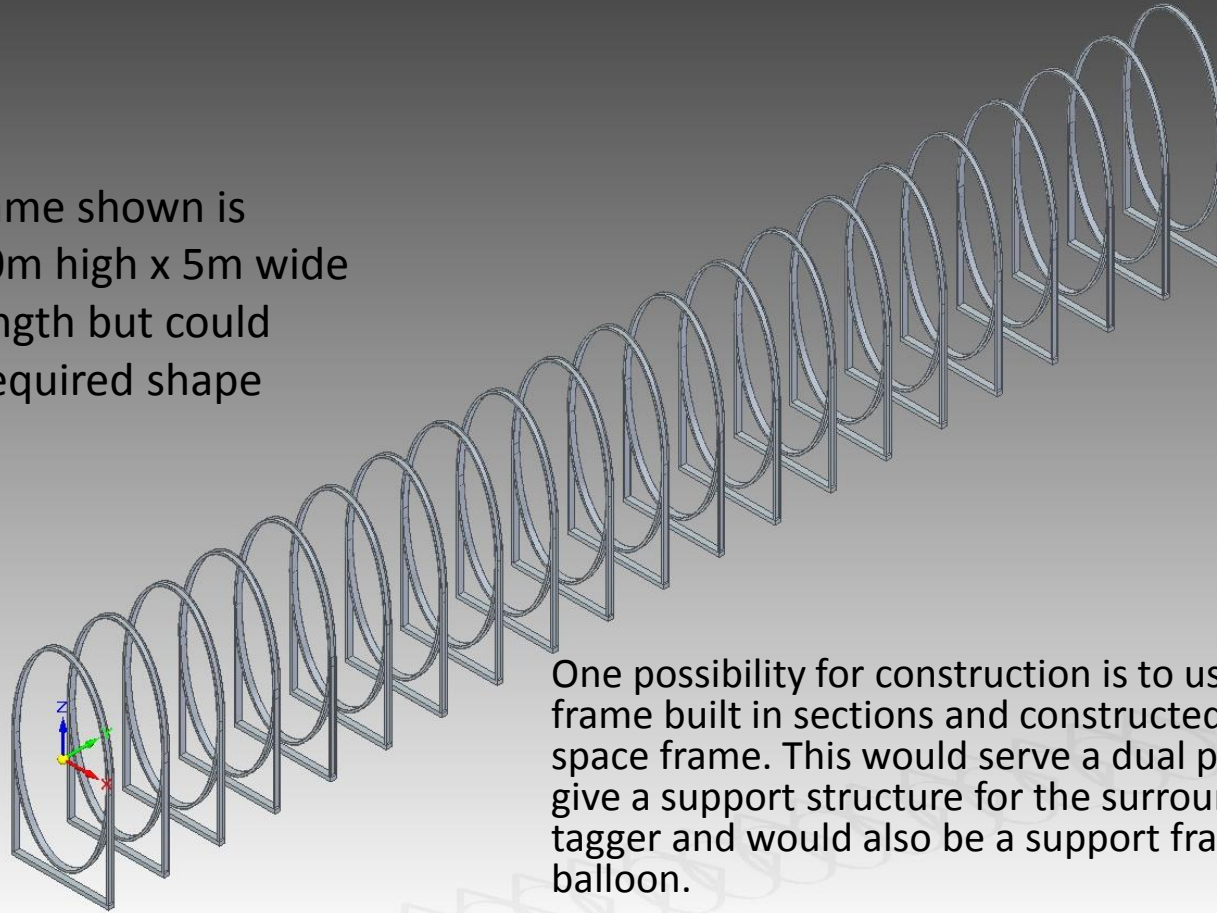
I have also been looking at how to implement the balloon, trying to find a safe way to inflate and deflate the balloon without tearing or damaging the balloon in any way

	X^0	λ_T	λ_I
Air	303m	508m	748m
Helium	5681m	3120m	4277m
Above is at 20° / 1Atm			

Outer Support frame

Support frame shown is
Elliptical 10m high x 5m wide
~60m in length but could
form any required shape

One possibility for construction is to use a large hooped
frame built in sections and constructed on site as a
space frame. This would serve a dual purpose, it would
give a support structure for the surround background
tagger and would also be a support frame for the
balloon.

The Balloon

When speaking to the manufacturer I requested a long elliptical balloon, I was told that to a achieve this it would be necessary to put stringers inside as the natural form for a gas filled bag would be to try to take a spherical shape (rather like a bubble).

These stringers will not be needed as the idea would be to inflate the balloon inside the support frame for the Surround Background Tagger. It would be imperative that this support frame was free from any sharp edges protrusions etc.

The simplest way to deploy the balloon would be to "roll out" the balloon along the bottom of the frame enclosure, attach the helium system and slowly inflate the balloon. I have no experience of inflating anything larger than a party balloon so I am no expert but my fear would be that the balloon may become twisted inside the frame and at best not inflate correctly and at worst become damaged.
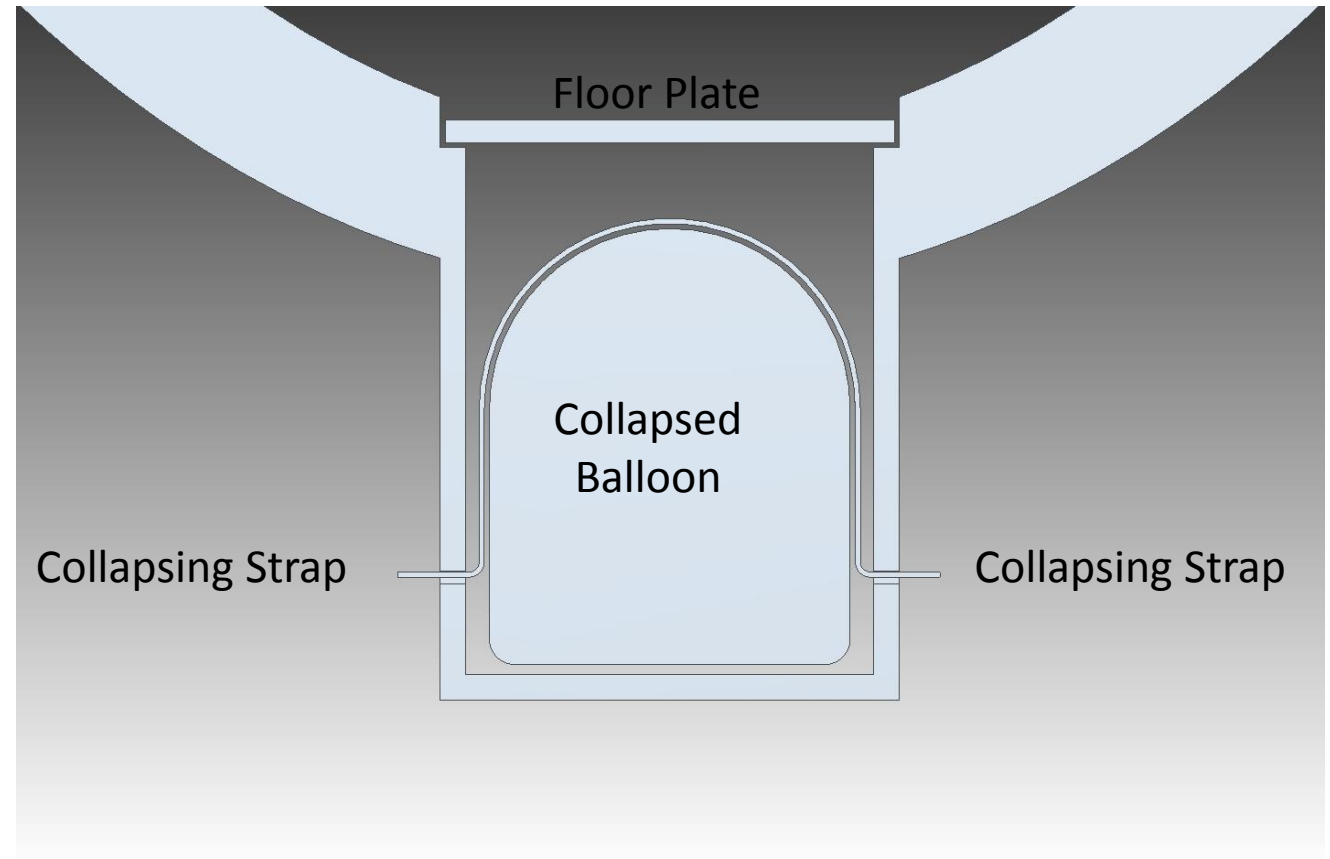
The Balloon (cont.)

Another possibility is that the balloon is guided using a complete set of 'rigging cords'. With a little bit of thought it may be possible inflate/deflate the balloon from a gully that runs along the bottom of support frame and during any maintenance the balloon could be returned to this gully and protective covers fitted to give a floor to work from. Another advantage would be that if the weight of the balloon were taken up partially by the rigging cords there may be less gas pressure required therefore further reducing the X_0. The following sketches tries to explain the idea….
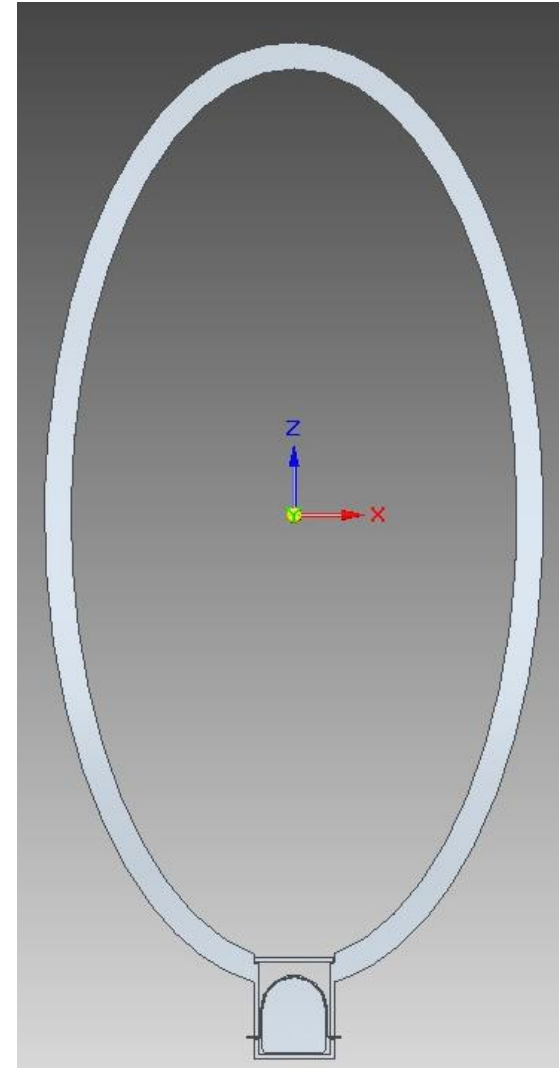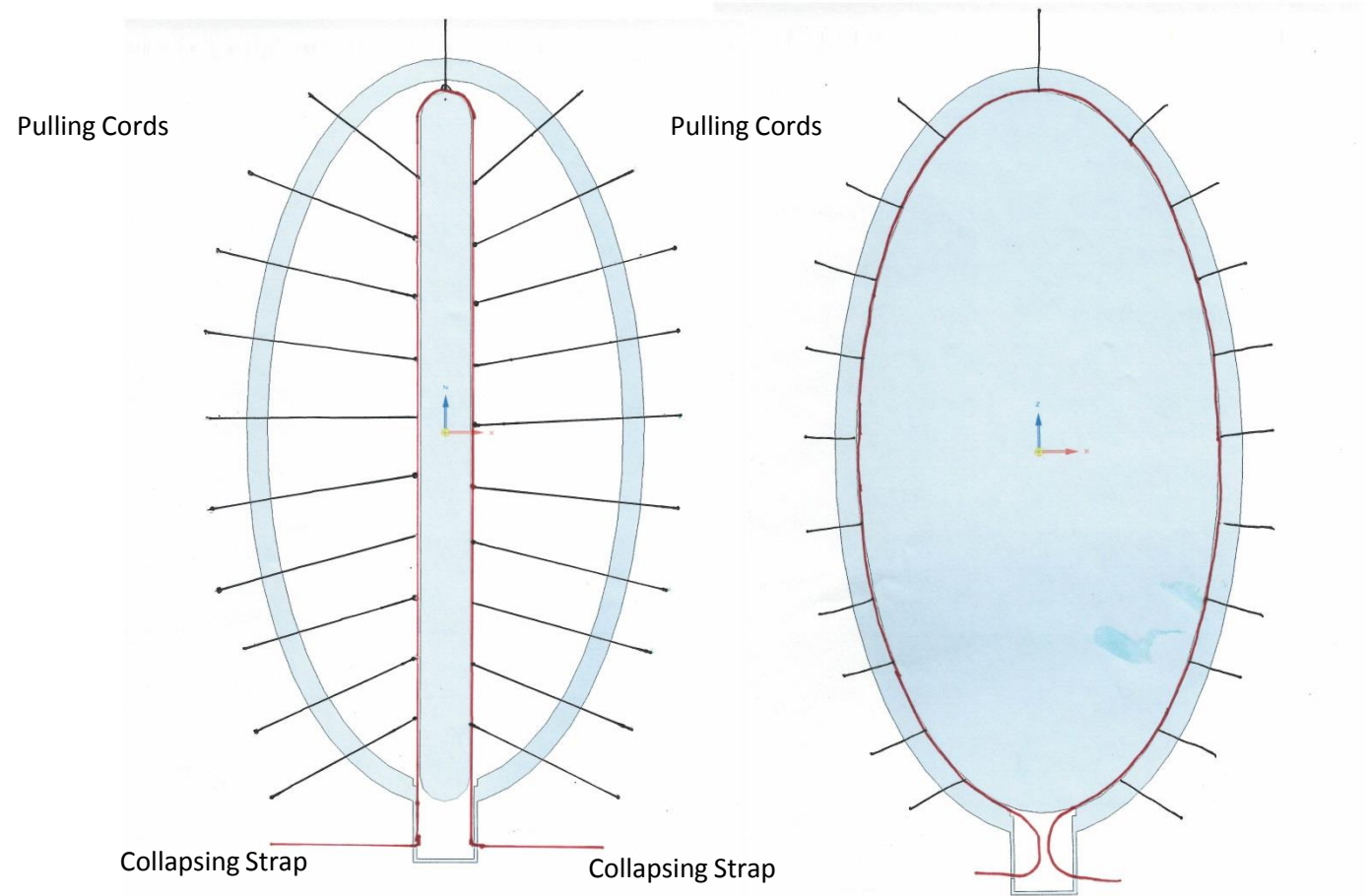
The Balloon (cont.)

This detail shows the bottom of the frame, there is a gully in which the balloon can be stowed for safe keeping when not deployed. The gully is covered by protective floor plates which are removed to deploy the balloon. The balloon is 'folded' and held in place in the gully using a collapsing strap which draws the balloon together and helps to keep it tidy. The gully is likely to be the place for helium pipework and connections to the balloon etc.

Floor Plate

Collapsed Balloon

Collapsing Strap

Collapsing Strap

The Balloon (cont.)

With the floorplates removed the balloon can be drawn from the gully. This is done using pulling cords that attach to cleats fixed to the balloon surface. The cleats not only allow for the attachment of the pulling cords at intervals around the balloon but also act as guides for the collapsing straps. During the balloon inflation the collapsing straps need to be released at a steady rate and at the same time the pulling cords need to have any slack taken up. This helps to maintain the shape of the balloon in the frame during inflation and hopefully reduce stress on the balloon

Pulling Cords

Pulling Cords

Collapsing Strap

Collapsing Strap

The Balloon (cont.)

This detail shows the Pulling chord attachment. As already stated these are attached around the circumference of the balloon at regular intervals along its length and they also guide the collapsing straps.

Cleat

Balloon Attachment

Collapsing Strap
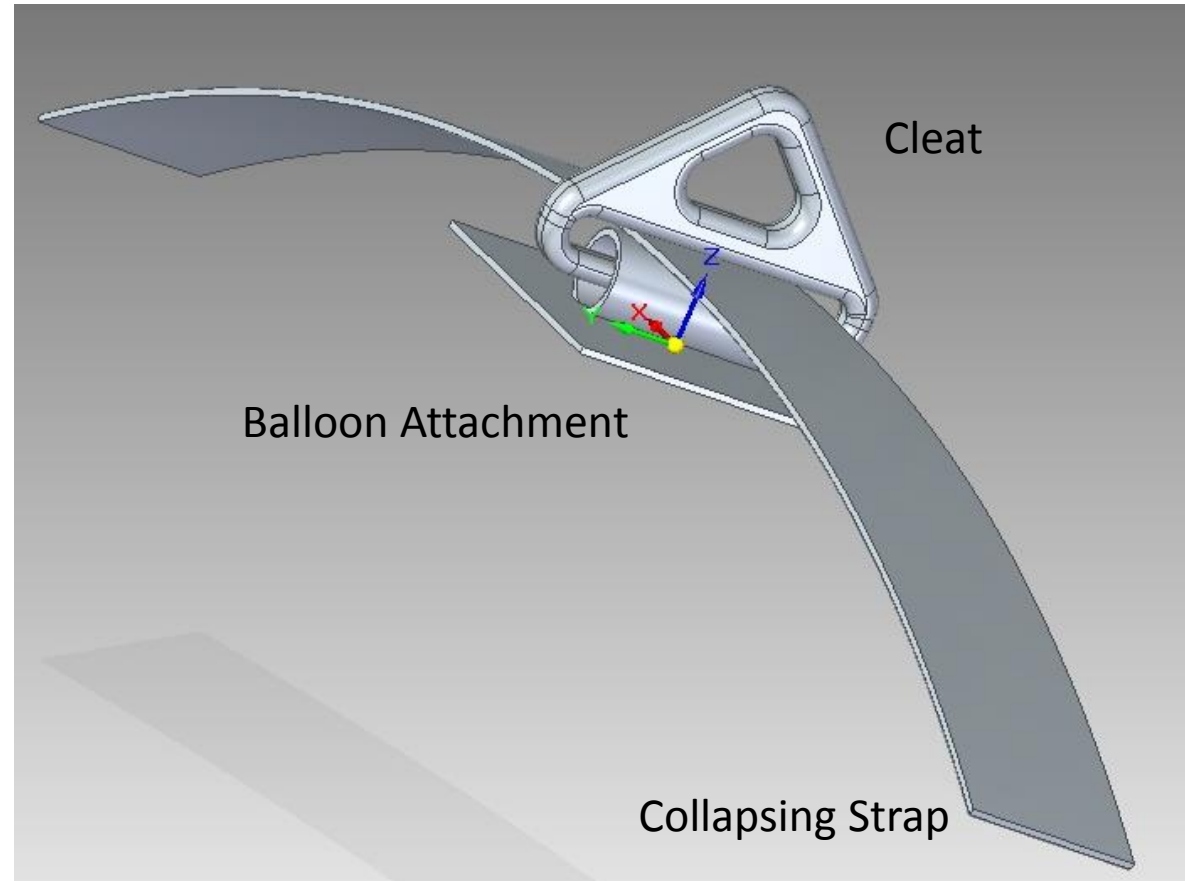
The Cost of the Balloon

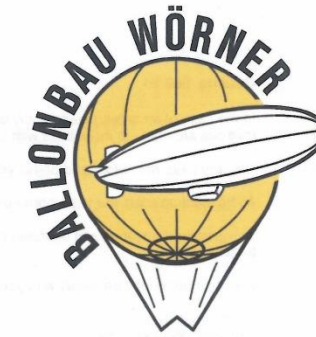The following quote was received from Ballonbau Worner GMBH

BALLONBAU WÖRNER GMBH
Zirbelstrasse 57c, 86154 Augsburg

Ballonbau Wörner GmbH,Zirbelstrasse 57c,86154 Augsburg

Imperial College London
Geoff Barber

Dear Mr. Barber,

we thank you for your interest in our products. We are pleased to submit the following quotation for your approval:

Item	Qty.Unit	Art.No.	Description	Unit Price	Value
1	1,00 piece	5519b-€	Gas Bag for Helium - 9425 m³ Special size - cylindric form with flat oval endings - length: 60.00 m, diameter: 10.00 m x 5.00 m - volume: approx. 9,425 m³ - presureless using - welded production technology, polyester fabric, weight around 400 g/m² - double-sided PU coating - outside color depending on fabric availability - two nozzles for inflation and deflation (e.g. clamping flange) - two openings ø = 62 cm - leakage rate < 0.5 Litre / m² / 24 hours	207.880,00 €	207.880,00 €
Net amount					207.880,00 €
plus 19,00 % USt. on				207.880,00 €	39.497,20 €
Total value					**247.377,20 €**

Page: 1
Customer No.: 10735
Processed by: S. Matt
Tax-No.:
VAT-Id: DE 127474972
Date: 06.04.2016

Offer No. 089 16

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Total value					**247.377,20 €**

The quotation is valid for 8 weeks!

All prices are quoted e x w o r k s and are subject to statutory VAT, if the balloon should be stationed in Germany .

Terms of payment:
1/3 on receipt of confirmation of order
1/3 on commencement of manufacture
1/3 on acceptance of the balloon, but not later than 4 weeks after completion of the balloon!
All amounts are payable a t o n c e w i t h o u t any discount!

The time of delivery begins with the receipt of the first down payment.

The goods remain the property of Ballonbau Wörner GmbH until final payment!

HR Augsburg HRB Nr. 9908
Geschäftsführer Michael Wörner,Sebastian Matt
Tel.: 0821/ 450406 -0
Fax.. 0821/419641

Bankverbingung:
VR-Bank Lech-Zusam eG BLZ 72062152
Kto No. 3451089
IBAN: DE 38 7206 2152 0003 4510 89

E-Mail: info@ballonbau.de
webside: www.ballonbau.de

BIC Code GENODEF1MTG

What Next (still to do)

- The main task is to see if helium is an acceptable medium for the decay volume.
- Work out the methods for keeping the helium 'fresh' and how it can be recovered.
- ?
- ?

Please Note :

As always, these ideas are open to any comments, suggestions, ideas, etc. and will be very welcome.