



Design and Manufacturing Feasibility Study Canberra

Introduction

The illustration presented to us by the artist Patricia Piccinini was in essence a reasonably practical shape for a balloon design giving us the straightforward task to interpret her design in a manner which, not only kept the character, but also made it a cost effective and practical aircraft to operate. A good dialogue has been established between our Graphics Team and Patricia thereby allowing us to understand the ethos behind her design and I believe Patricia now has a good understanding of the engineering constraints that a balloon manufacturer has to work by. The result of our technical interpretation of her design is illustrated in our visual V15.199 attached. From this we have been able to calculate the physical specification, performance and principle costs, defined below

Once the technical form had been agreed the definition of the colour scheme for the shape has taken somewhat longer, however today Patricia has sent us her proposal which I have attached, Ref GR 463. There needs to be some work done on this element of the balloon before a definitive final visual and cost is submitted.

Description of the proposed envelope design

Our designers will build a mathematical model of the balloon shape based on the final visual using our in-house 3D software. Using this, the curved surfaces are translated into fabric panels and the software will flatten these out to produce cutting patterns. This information is then fed to a computer-driven cutting table, which will produce the individual panels. In Patricia's design almost all panels will be of a unique shape.

Before construction begins, the balloon will also be analysed for strength. Safety factors will meet or exceed those required by the EASA design code CS31 that we work to. This balloon is a passenger-carrying aircraft and it will have a Certificate of

Airworthiness. At the final inspection stage our Quality Manager and Certification Engineer have to certify that this balloon meets those standards.

Operational requirements and restrictions

The envelope has been designed to carry a pilot plus two passengers to an altitude of 3000ft and a ground temperature of 15 deg C. This calculation is based on using our standard 77 basket, double burner and 135l of fuel.

The balloon envelope will weigh about 350 kg so it would be advisable to have a minimum of pilot + 2 crew to operate the balloon.

Other operating restrictions if required will be detailed in the flight manual following the Test Flight.

Envelope outline specification

Effective volume	3115m ³
Gross volume	3680m ³
Height	24m
Length	36m
Width	17m
Weight	350kg

Techniques to be utilised during the fabrication

Once the panel design has been calculated the information is fed into our flat bed plotter, which will nest the panels and cut out each individual panel in the appropriate coloured balloon fabric. While this process is going on, the Project Manager will be working with the Designer on the assembly instructions so that an efficient build and inspection programme can be developed.

Any elements of artwork detail are applied at the panel stage rather in the same way as a piece of a jigsaw puzzle has each piece decorated. This means that as the structure is assembled the artwork image becomes part of the balloon design.

Special dye fabrics will be ordered, where necessary, so that the colour of the balloon will match those defined by Patricia's design. All textured patterns will be ink jet printed onto the balloon fabric.

The nylon panels are sewn together using industrial twin-needle sewing machines, which produces a strong "French-felled" seam. Webbing tapes are incorporated in the design to provide strength, and control lines, rigging wires and deflation system are all added.

Final inspection and test flight

Once the envelope construction is complete our Inspection Team will check that all of the envelope systems and control lines have been correctly installed prior to making the test inflation.

The initial inflation and flight test is usually carried out in the early morning in calm and stable weather to give us the ideal conditions for a full and detailed internal inspection of all elements of the balloon construction. If the Chief Inspector is satisfied as to the condition of the balloon, then the balloon will be inflated and an external inspection and function test of all envelope controls conducted.

If the weather is still suitable the Test Pilot may well decide to undertake a short test flight to ensure the balloon meets the operating design criteria. This will involve a flight at the representative payload with a minimum climb and decent of 300 ft/min and include the testing of the venting and deflation mechanisms.

Following the assessment of the Test Flight our pilot will recommend limitations for maximum ascent and decent speeds, together with a maximum landing wind speed.

Fabrication schedule and shipping schedule

In order to meet the specified deadlines Cameron Balloons is reliant on the design input from the artist to be supplied within the allotted timescale.

Once the contract has been finalised there is about 6 weeks of technical design work to complete before the first panels are available for production. The job of plotting, cutting, and sewing will involve a team of up to six people and take up to 20 weeks to complete. Following the assembly there would typically be a further 2 weeks for rigging and inspection before a suitable weather slot for the test inflation became available.

Our outline performance calculations are always made on the conservative side thereby ensuring that the balloon will be capable of achieving the design performance specification.

The life of any balloon is purely dependent upon how the balloon is operated and maintained. If the balloon is primarily tethered then the life of the balloon will not be as long as if the balloon was mainly free flown. In all circumstances the life of the balloon will be maximised if it is operated according to the Flight and Maintenance manual.

The cost of the balloon is fixed once our design visual and specification are approved and by the signing of our Sales Agreement and the receipt of the 30% deposit. It is always possible to amend the design or the specification afterwards but this may incur additional charges and require a longer build-time.

The estimate of freight cost does not include any insurance although from our experience the risks of loss or damage to the shipment are minimal. I should also add that by the time the balloon is ready for shipment freight costs might well have to be revised.

Conclusion

Patricia has designed an unusual yet exciting Special Shape balloon, one which will not only turn heads but is sure to attract many comments in the media. From a technical point of view her design is at the upper end of the complexity scale from both an engineering and artwork perspective which as a result means that the cost to build this exciting balloon is somewhat higher than the proposed budget will allow.

Today we have received Patricia's proposal for the balloon's colours and art worked detail. This will require further work by our Graphics department to define the most cost effective interpretation of her colour scheme and once this has been agreed we will then be able to finalise on this element of the costs

Despite its unusual form and large size this balloon should be able to operate in very similar conditions to a normal balloon and so apart from being a very unique form of flying art it will also be quite a practical promotional balloon.

Attachments

Current Visual – V15.199

Proposed colour scheme – GR 463