3D printed rocket - platform for student experiments

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Abstract.

Keywords

Rocket experiments, 3D printing, sounding rocket, experimental platform.

1. Introduction

Scientific rocket experiments was relatively common in atmospheric research over past decades. Although the rocket sounding is similar to use of hight-altitude balloons. The rocket can reach a high altitude very quickly in well defined time window and with relatively precise coordinates. Furthermore the rocket lunch itself can be passed in relatively unfriendly weather conditions. Therefore this type of sounding has several benefits over balloon sounding. It can be used for precise in situ measurement of interesting atmospheric events. Such events could be tornado measurements, storm measurements and other usually localised but very interesting and probably dangerous processes which needs an automated measuring systems.

Unfortunately the rocket sounding is quite inaccessible for widespread use, specifically in use as part of measurement networks. One of main reasons of that is price of the rocket lunch vehicle it is caused mainly by one-time use of relatively expensively machined device. As reason of that a different manufacturing and design process is needed for rocket construction. For appropriate range of rocket vehicles the state of the art but inexpensive FDM 3D printig process could be used. But specially designed rocket body is needed in case of use an additive manufacturing process instead of classical machining.

2. Design evolution

We decided to use the FDM additive manufacturing technology as best candidate for small and medium size of sounding rocket vehicle. The main reason for that decision is fact that this type of 3D printing technology is widely acessible and has quality enough to build rocket body which could windstad the mechanical and aero dynamical stress during the rocket lunch. The second reason is fact that this type of technology is relatively cheap in comparison of other additive manufacturing methods. But there also exist technological limits because not all shapes could be 3Dprinted

The design of rocket vehicle must respect a FDM te

2.1. Rocket body and recovery system

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10	**20**	**30**
40	**50**	**60**

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$$\frac{2\mathrm{B}\sin^2 + A\sin 2}{10g^2\kappa T + A\cos^2 + B\sin} = 2\gamma\delta. \tag{1}$$

No comma should be put before an explanation of symbols in the equation, e. g.

$$\lambda_g = \frac{1}{\sqrt{1 - \left(\frac{\lambda}{\lambda_m}\right)^2}} \tag{2}$$

where λ_g is the wavelength... etc.

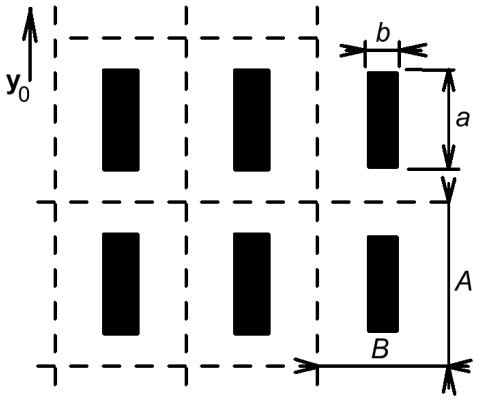

Fig. 1. The description of a figure is of the same style as the description of a table; the figure itself is of the environment `figure`.

2.2. 3D printable rocket engine

3. Conclusion

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