ANSWERS TO COMMENTS ON THE MANUSCRIPT [17]
(“Car”, BELARUSIAN IYPT TEAM)

Answers to reviewer 1:

Q1. What was the highest efficiency in your design?
A1. About 0.3%. The trouble is that most energy (about 99%, actually) is carried away as kinetic energy of the air stream (it has significantly higher speed).

Q2. Why there is a small maximum near V = 0.0002 m3 on the Fig. 3.?
A2. The plot shows dependence of rubber energy on the *total* volume; and for the volumes less than initial volume of the balloon it will describe energy of the compressed rubber (certainly, it will be done incorrectly). This explanation was also added to the revised article.

Q3. Do your estimations for the elastic properties and for the energy of a balloon depend on its shape?
A3. Certainly; all estimations in the task are done for spherically shaped balloons. However, it’s exactly the type of balloons we had used. This choice is now explained in the article.

Q4. What was the longest traveled distance for your car?
A4. About 52 meters.

Q5&6. What are the limitations of your approach? Attach a chapter (five sentences approx.) with a discussion of the limitations of your solution
A5&6. These limitations are mainly my approximations about non-linear behavior of the rubber. Also there are some self-established limitations: we were working only with rocket-type models, and we assumed that “car” has to have wheels. I’ve expanded explanations about rubber behavior, and use of rocket-type car is explained in the “Introduction” part now. So I’m not sure if this “Limitations” part is still necessary.

Q7. Check all the captions under pictures. They are sometimes misplaced or missing (Fig. 1, Fig. 4)
A7. Extremely sorry, these are some MS Office bugs. I hope now everything is OK.

Q8. Divide the text into parts (abstract, conclusions, etc.)
A8. Tried to do this in the revised article.

Q9. It would be better to consider two symmetrical elastic forces acting on a small piece of the membrane, due to the symmetry of the problem (Fig. 1)
A9. Well, in my opinion it doesn’t change anything in the solution; at the same time drawing additional force on the picture makes it significantly less understandable.

Q10. Please consider revising any parts of the text that are unspecific and do not clarify on what results are obtained and what conclusions are drawn.
A10. I hope I’ve managed to do this in the revised article.

Answers to reviewer 2:

Q1. This paper has no structure at all. Much of the text is irrelevant, and the author tries to use a joking style that is quite misplaced in the context.
A1. I've tried to remove all such things from the revised article, as well as to improve it's structure.

Q2. There is no clear plan of the investigation and no conclusion except for an extremely general and not very illumination one. There is complete lack of references, and the question asked in the problem is not answered.
A2. Again, tried to correct it in the revised article. However, talking about references, I should say, that we just don't have them: we certainly have read some articles related to our task, but all approaches, formulas and calculations are our own, and based only on basic laws of physics.

Q3. The theoretical formula beside Figure 2 is not correct, only valid (maybe) for a very small part of the range of balloon volume. There are easily accessible references on the web for a correct formula.
A3. I admit that there are numerous researches on the web were air balloons are described. And that's the problem: they all have different concepts and different views on what effects can and what can't be ignored. At the same time, they all require knowing various parameters of the used rubber; and we have no idea about these parameters, or even ingredients of the balloon's material. That is why we decided to present our own view on the problem. I agree that it has very poor explanation of what happens after rubber reaches its proportionality limit. However, even with such a simple description other reviewers had noted that biggest part of the research is dedicated to the physics of stretched air balloon; therefore, I don't think it is possible to further expand this part.
And talking about correctness of formula: I'm sure that it is correct for volumes below 1.8 liters (where rubber doesn't reach proportionality limit). And our approximations for further volumes are close enough to the real values, especially taking into account accuracy of our measurements. From this point of view improvement of the formula also doesn't seem to be really necessary.

Answers to reviewer 3:

Q1. Report in sufficient detail how the pressures were measured. Is the y-axis showing the extra pressure ΔP? Is the x-axis showing the total volume V or the extra volume ΔV?.
A1. Y-axis is extra pressure, x-axis is total volume. Sorry, if it wasn't clear in the article; I've tried to fix it.

Q2. If ΔP is the value considered at the y-axis, it this true that the atmospheric pressure of ca. 100 kPa is increased up to ca. 103 kPa, i.e. by 3%? Is it true that the maximum inflation of the balloon was 35 liters?
A2. Yes, pressure is actually increased by 3% compared to atmospheric. And our balloons were capable of holding volume of 40 liters.

Q3. Is the theoretical line is a fit or a direct calculation? If a calculation, how the input parameters were found?
A3. It's direct calculation. Young's modulus and Poison's ratio were found through an experiment, where part of the balloons shell was being stretched by number of weights.

Q4. Figure 3 : report in sufficient detail how the energy is measured. What manipulations have been performed with the reference plastic bag and with the balloon?
A4. Tried to explain it in the revised article.

Q5. Is the theoretical line is a fit or a direct calculation? If a calculation, how the input parameters were found?
A5. It's direct calculation. Young's modulus and Poison's ratio were found through an experiment, where part of the balloons shell was being stretched by number of weights.

Q6. Figure 5 : What is the x-axis? Seconds? Whatsoever consider plotting both data sets on one graph as only the difference between the two datasets is relevant.
A6. X-axis is seconds (sorry, figure's description accidentally jumped upwards and covered piece of the plot, where title of the axis was). Well, I've tried to do this but points are just too close to each other, and they get mixed if plotted on one graph. At the same time, both data sets also prove that in both situations force, acting on the car, is constant.

Q7. Figure 7 : What is the curve? A fit or a direct calculation? If a calculation, how the input parameters were found?
A7. It's direct calculation. Finding of the friction coefficients is now described in the article.

Q8&9&10. The experimental setup, as presented in the manuscript, delivers some possibly interesting results. Clarify all essential experimental details.
Address each of the investigated topics (influence of the nozzles, influence of the wheel diameter, measurement of the extra energy with a reference plastic bag etc.) in small structurally separated chapters.
The manuscript is now a continuous narrative where the logical sections are not immediately seen. Devise a structural plan and add sub-sections to the text. For example, the phrase, "so now I can write conclusions", should be removed and the section "Conclusions" added.
A8&9&10. Tried to do all these changes to the article.