

## AeroCan, Inc.

15000 Defense Plaza  
Planeville, AR 72000

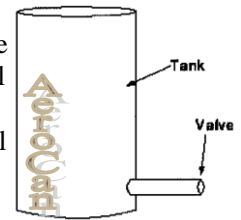
27 October 2009

Independent Mathematical Contractors, Inc.  
SC 343  
#1 College Drive  
Bentonville, AR 72712

Dear IMC:

As a primary contractor in defense and the aerospace industry, AeroCan maintains several industrial sites in and around Planeville. In the course of expanding one of these, we find it expedient to add a number of free standing vertical cylindrical fuel tanks, as shown in figure 1. These are filled and discharged through the valve at the base of tank. As the tanks are large (20' high with radii of 8'), there is a clear incentive to be sure that should they develop a leak the fuel release would be adequately contained, and we are therefore building a wall around each tank that will catch the fuel in this case. Simultaneously, we would like to avoid spending too much on a very large wall if a small one will suffice, and we are therefore contacting you to obtain an estimate for the amount of fuel that might be released.

The greatest risk of unintended discharge is when the tank is being filled or emptied through the valve (the diameter of which is approximately 9"), as through unintended contact or mechanical failure the valve could fail and allow unimpeded discharge through the pipe to which the valve is connected. In this case, it is known that the rate at which the height of the fuel in the tank will change is proportional to the ratio of the squares of the diameters of the valve and the tank and the square root of the height of the liquid in the tank, with constant of proportionality  $k=(2g)^{1/2}$  (where  $g$  is the acceleration due to gravity).



**Figure 1:** Fuel tank

Owing to our strong accident-containment procedures, any spill in these circumstances should be stopped within 10 minutes of its initiation. We need to know under these conditions how much fuel will need to be contained if the leak starts with a full tank and proceeds for either 5 or 10 minutes.

In order to push the industrial site into production as soon as possible, we need your 2-5 page professional report by the **1<sup>st</sup> of December**. Please show all details of your mathematical calculations using an equation editor as we do not wish to duplicate your work before presenting your findings to our construction team. After careful consideration, we have also contracted with the redoubtable Pamela Duck, an errant mathematician in your area, to field any questions you may have in the course of your work. However, Mrs. Duck is only available to consult with you regarding the contract until the 24<sup>th</sup> of November. Failure to meet the deadline will be grounds for no compensation for the project as we will be forced to seek another contractor at that point. We look forward to hearing from you.

Sincerely,  
Ralph Jones  
AeroCan, Inc.