SUMMERizing YOUR VEHICLE

In the ***WFQ*** Vol. 2. No 1. issue, we had the article *WINterizing YOUR VEHICLE*. Now that the temperature outside is climbing, it is a good time to **SUMMERize** your vehicle.

High summer temperatures are tough on automobiles. Specific components prone to excessive wear and tear include the cooling system, tires and electrical system. Therefore, it is suggested that these and other systems should be checked periodically throughout the summer months to help avoid breakdowns and car problems. Several of these components should be checked by your car dealer or local repair shop. For the good news, you can perform many of these checks at home. Also of note, many of the system checks are similar to the system checks for **WINterizing** your vehicle.

Cooling System (Coolant)
Check the level and condition. Checking the level can be done at home following the directions in your vehicle manual. If the coolant needs flushing and refilling, now is a good time.

Battery
Inspect and clean battery posts to insure good connection. In addition, remove any deposits that have accumulated on the top of the battery.

Tires
Check for good tread and proper inflation. Have your tires rotated on a periodic basis. This will help to increase the life of your tires by maintaining even tread wear.

Oil
Check the level and condition. Refer to the vehicle manual if higher viscosity “weight” is recommended for hot weather.

Wipers
Inspect the wipers for wear and tear. If wipers are worn/degraded, replace with new blades.

Wiper fluid
Check the wiper fluid level. If low, fill reservoir with vehicle specified wiper fluid.

Brakes
Have your brakes inspected periodically. By doing so, you can help to optimize your vehicles braking performance.

These suggested maintenance steps can be performed by the Do-It-Yourself method. However, a mechanic can perform these checks. The added benefits of having a mechanic perform these checks is that they can perform extended testing, such as battery testing, brake inspection, charge system checks, and exhaust checks.

To round out the summerization of your car, an emergency kit can be placed in the vehicle as well.

Emergency Kit
Several items can be added to your winter Emergency Kit in order to be prepared for the summer. These items include but not limited to: an extra fan belt, small tool kit, duct tape, and tire pressure gauge.

Note:
It is recommended that any person use proper safety gear when performing any maintenance to a vehicle. This includes the use of gloves and protective eye wear.

For further and more detailed summerizing suggestions, visit Edmunds.com or search the internet using the search terms “summer car care”.

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Winthrop Forensics
is the engineering firm specializing in:

Accident Reconstruction
Biomechanical / Injury Causation Analysis
Premises Liability
Product Defect
Forensic Exhibits
Forensic Animations

Inside this issue of *WFQ*:

In this installment, the article *SUMMERizing YOUR VEHICLE* provides tips on getting your vehicle ready for the hot summer months. The information presented integrates with the information from the article *WINterizing YOUR VEHICLE* from WFQ Vol. 2 No. 1.

In addition, the newest article to be added to ***WFQ*** is *Physics In ACTION*. This article is the first of a three part series that describes Projectile Motion. This first installment will deal specifically with the case of no air resistance (drag) imparted to the projectile.

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WINTHROP FORENSICS

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EDUCATION

Winthrop has a Ph.D. in Biomechanical Engineering from Vanderbilt University.

In addition, he holds an M.S. in Aerospace Engineering from the University of Tennessee and a B.S. in Aerospace Engineering from (NCSU) North Carolina State University, respectively.

EXPERTISE

Win qualifies as an expert witness in both accident reconstruction ***and*** biomechanical engineering / injury causation analysis.

This combination affords him the ability to seamlessly integrate the accident reconstruction analysis to that of the biomechanical / injury causation analysis while holding down costs for his clients.

Specifically, he can explain to the trier of fact how the physics of the accident tie into the mechanism of injury (or lack of).

EXPERIENCE

During his career as a forensic engineer, Win has worked on over 700 cases.

Typical case load includes, but not limited to: automobile-automobile accidents, automobile-pedestrian accidents, trucking accidents, rail-road accidents, product defects, and premises liability cases.

TYPICAL CLIENTS

His civil litigation clients include major insurance carriers, large and small attorney firms, and individual attorneys.

His clients in the area of criminal litigation have included District Attorneys, U.S. Attorneys, Public Defenders, and criminal defense attorneys.

TRIAL PROVEN

To date, Win's case load has been equally divided between plaintiff and defense. He has testified well over 100 times at trial, arbitration, and deposition.

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Physics in ACTION

Projectile Motion - Part 1 of 3

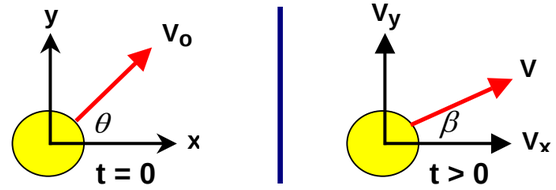
This article is the first of a three part series that describes Projectile Motion. This first installment will deal specifically with the case of no air resistance (drag) imparted to the projectile.

For this case, a projectile is defined as an object that moves in two dimensions (planar motion) with no means of propulsion or drag. The object's path is defined as the trajectory of the projectile.

Classic Example: Two Dimensional Golf Ball flight

The two dimensional projectile trajectory can be fully analyzed by breaking the planar motion up into two cases of one dimensional motion. The first case is motion along the x-axis, the second case is motion along the y-axis.

The projectile motion equations are derived for the case of Angular projection. Angular projection is when the object has an initial velocity (Vo) and an initial angle (θ) to the x-axis (horizon).



DERVIATIONS

V_X : Component of x direction velocity at any time t:

$$V_X = u_X + a_X t \quad \text{where}$$

u_X = x direction initial velocity $= V_O \cos(\theta)$

a_X = x direction acceleration $= 0$

$$V_X = V_O \cos(\theta) \tag{1}$$

Displacement in the x direction at any time t:

$$x = \int V_X dt = V_O \cos(\theta) t \tag{2}$$

V_Y : Component of y direction velocity at any time t:

$$V_Y = u_Y + a_Y t \quad \text{where}$$

u_Y = y direction initial velocity $= V_O \sin(\theta)$

a_Y = y direction acceleration $= -g = -32.2\ ft/s^2$

$$V_Y = V_O \sin(\theta) - gt \tag{3}$$

Displacement in the y direction at any time t:

$$y = \int V_Y dt = V_O \sin(\theta) t - \frac{1}{2} g t^2 \tag{4}$$

Total Flight Time (T):
At t=T/2, Vy=0 & Eqn. 3:

$$V_Y = 0 = V_O \sin(\theta) - g\frac{T}{2} \tag{5}$$

$$T = \frac{2V_O \sin(\theta)}{g} \tag{6}$$

Maximum Height (H):
At t=T/2, y=H & Eqn. 4:

$$y = H = V_O \sin(\theta)\frac{T}{2} - \frac{1}{2} g \left(\frac{T}{2}\right)^2 \tag{7}$$

Substitute Eqn. 6 into Eqn. 7 and solve for H:

$$H = \frac{V_O^2 \sin^2(\theta)}{2g} \tag{8}$$

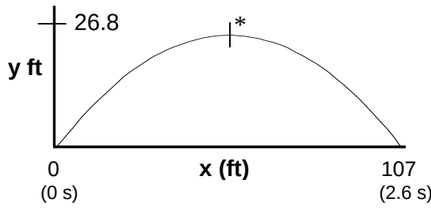
EXAMPLE CALCULATION

Initial velocity = 40 mph = 58.7 ft/s
Initial angle = 45 degrees

$$\text{Total Flight Time} = \frac{(2)(58.7)\sin(45)}{32.2} = 2.58\ s$$

$$\text{Maximum Height} = \frac{(58.7)^2 \sin^2(45)}{(2)(32.2)} = 26.75\ ft$$

x and y positions during the flight:



t (s)	x (ft)	y (ft)
0	0	0
0.5	20.7	16.7
1	41.5	25.4
1.3*	53.5	26.8
1.5	62.2	26.0
2	83.0	18.6
2.6	107	0

APPLICATIONS

This two dimensional trajectory model is an ideal analysis tool for any case where air resistance can be assumed to be negligible.

LIMITATIONS

For cases where the drag on an object cannot be assumed to be negligible, a two dimensional trajectory model that incorporates modeling of the air resistance should be used. This is the topic of **Part 2 -** the second installment in this series which will be presented in the next issue of *WFQ*.