Big Air Gun

New Mexico Adventures in
Supercomputing Challenge
Final Report
April 2, 2003

Team 033
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Statement of the Problem

During our research and study we found out that there isn't much information or mathematical equations for burst of air and air waves. We then decided that we could use either light or sound waves to simulate what a burst of air or waves would be like. Further more it was very complex and an extreme project to start with.

Executive Summary:

During World War II the Germans attempted to make an air vortex cannon capable of firing vortices that could take allied aircrafts out of the sky. The goal of this project was to model an air burst capable of taking down a B-17 Bomber. To do this we modeled the force that will be necessary to stop a B-17 from flying. After we made these calculations we calculated the forces necessary to create this on the ground. Physics was used to calculate the force of the air burst and the force it exerts on the plane. Intensity of light, intensity of sound, and Navier-Stokes equations were considered.

Method to Solve

We figured out equations using the internet and old physics books. We then placed in numbers that we thought and teachers thought would be the most logical. We created a program that was designed to take these numbers through and equation which is the inverse square of light and with that it gave us the number of psi that we needed to break the plane and or create the disturbance of the plane in which it will through it off coarse or make it crash.

The Results

Our results show that there needs to be at least 51.23 psi under 20000 Newtons of force exerted on the plane in order to disrupt of cause failure to the aircraft.

Conclusion

It is difficult to draw any conclusions from our results because there is no real world example of what we were trying to do. We were able to find the amount of force necessary to damage the plane, but what the results of the force exerted would be on an actual plane are difficult to determine. A field study would have to be done to prove any of our results.

Achievement

Our group's most significant achievement in tackling this project was attempting to prove through mathematics something that has never been proven in the real world. This was extremely difficult because we had very few constants in our equations. It was also difficult to find equations that produced realistic numbers. Attempting a unique and innovative problem was a major accomplishment for our team.

```
import java.awt.*;
import java.awt.event.*;
import BreezySwing.*;
import javax.swing.*;
public class GroundForce extends GBFrame{

	private JLabel			newtonLabel;
	private JLabel			pascalLabel;
	private JLabel			programLabel;
	private JButton			calcButton;
	private DoubleField		newtonField;
	private DoubleField		pascalField;

	public GroundForce(){

	newtonLabel		= addLabel		("How many newtons of
force?", 2,1,1,1);
	pascalLabel		= addLabel		("The total force of Pascals",
3,1,1,1);
	programLabel		= addLabel		("Force over area",
1,2,1,1);
	calcButton		= addButton		("Calculate",
3,2,1,1);
	newtonField		= addDoubleField	(0,
2,3,1,1);
	pascalField		= addDoubleField	(0,
3,3,3,4);
	}

	public void buttonClicked (JButton buttonObj) {
		if (buttonObj == calcButton)	{
			processInputs();
	}
	}

	private void processInputs()	{
		double pascals;
		double newtons;
		double wingArea = 710;//Area of the wing of the b17
```

```
        newtons = newtonField.getNumber();

        pascals = newtons/(wingArea);

        pascalField.setNumber(pascals);
    }



    public static void main(String args[]) {
        System.out.println("Starting GroundForce...");
        GroundForce mainFrame = new GroundForce();
        mainFrame.setSize(600, 300);
        mainFrame.setTitle("GroundForce");
        mainFrame.setVisible(true);
    }
}
```

```
import java.awt.*;
import java.awt.event.*;
import BreezySwing.*;
import javax.swing.*;
public class inverseSquare extends GBFrame{

	private JLabel		lpascalLabel;
	private JLabel		pascalLabel;
	private JLabel		programLabel;
	private JLabel		distanceLabel;
	private JButton		 calcButton;
	private DoubleField	    lpascalField;
	private DoubleField	    pascalField;
	private DoubleField	    distanceField;

	public inverseSquare(){

	lpascalLabel    = addLabel             ("How many Pascals?",
2,1,1,1);
	pascalLabel            = addLabel             ("The total force of Pascals",
4,1,1,1);
	programLabel    = addLabel             ("Inverse Square Law",
1,2,1,1);
	calcButton             = addButton            ("Calculate",
5,1,1,1);
	distanceLabel   = addLabel             ("Distance in meters",
3,1,1,1);
	lpascalField    = addDoubleField       (0,
2,3,1,1);
	pascalField            = addDoubleField       (0,
4,3,1,1);
	distanceField   = addDoubleField       (0,
3,3,1,1);
	}

	public void buttonClicked (JButton buttonObj) {
		if (buttonObj == calcButton)    {
			processInputs();
	}
	}
```

```
	private void processInputs()	{
		double pascals;
		double lpascal;
		double distance;

		lpascal  = lpascalField.getNumber();
		distance = distanceField.getNumber();
		pascals  = (lpascal)/(4*3.141592653*distance*distance);

		pascalField.setNumber(pascals);
	}



	public static void main(String args[]) {
		System.out.println("Starting inverseSquare...");
		inverseSquare mainFrame = new inverseSquare();
		mainFrame.setSize(600, 300);
		mainFrame.setTitle("inverseSquare");
		mainFrame.setVisible(true);
	}
}
```