



# Linear Propulsion

Mike Gamble  
7/30/15



## INTRODUCTION

This presentation on "Linear Propulsion" was generated from web based data, previous papers and contains no **Boeing** material.

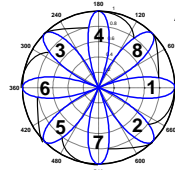
michael.a.gamble@boeing.com



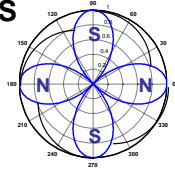
The two main sources of rotary power are the Heat Engine and Electric Motor.



## ANALYSIS



**ICE ENGINE**  
8 CYLINDER  
5,000RPM  
33% EFFICIENT



**ELECTRIC MOTOR**  
4 POLE  
1,800RPM  
95% EFFICIENT

Black lines are the flywheel (inertial) averaging of the power pulses. <sup>4</sup>



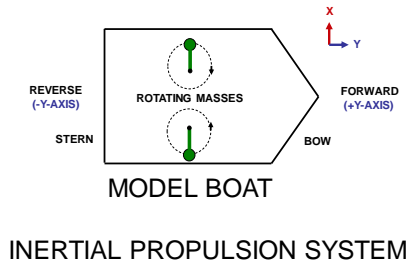
## CONCLUSIONS

- 1) With the use of gears, shafts, wheels and blades this rotary motion is then converted into linear propulsion with more loss in efficiency.
- 2) As rotary motion is generated by power (averaged) pulses, the same can be assumed for the direct generation of linear motion.

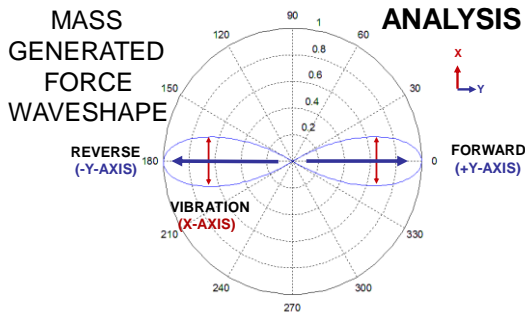
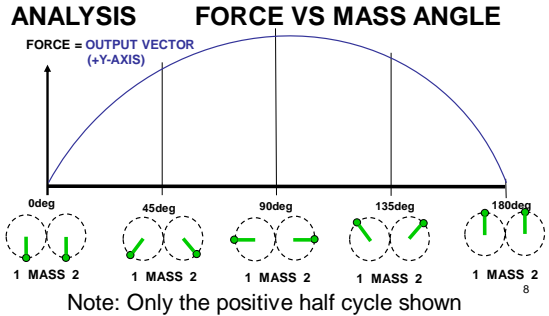


The following charts from a paper  
"On the Inertial Propulsion of  
Floating Objects Using  
Contra-Rotating Masses"

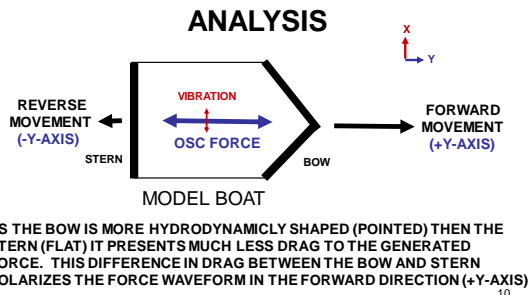
By  
Christopher Provatidis



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**CONCLUSIONS**

- 1) This inertial propulsion system relies 100% on the differential drag to polarize (rectify) the force waveshape.
- 2) A more efficient method is to add a second harmonic (2θ) frequency to help polarize the force waveshape rather than depending on drag alone.

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**Following Charts From “DEAN DRIVE” Presentation**

By  
Christopher Provatidis  
and  
Mike Gamble

SPESIF-COFE5

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Dual Mass System

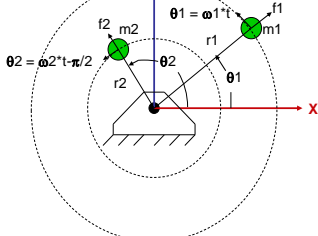


Figure 8: A two mass fixed radius rotating mechanical system. The radial force ( $F_r$ ) is generated by the harmonics of the masses ( $m$ ) rotating on fixed radiuses ( $r$ ).

Dual Mass System

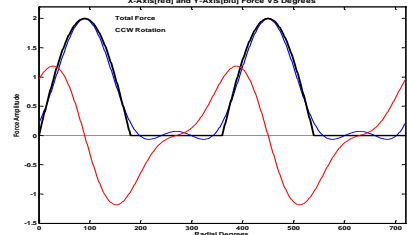


Figure 8A: Calculated X-axis (red) and Y-axis (blue) radial forces for a CCW rotating mass system. These are plotted against the theoretical waveshape (black).

CONCLUSIONS

- 1) As can be seen adding the second harmonic frequency ( $2\theta$ ) is a more efficient method of polarizing the force waveshape then just depending on drag.
- 2) However, both systems still have an unwanted (X-axis) force waveshape (vibration).

(CMG) CONTROL MOMENT GYROS

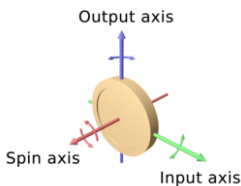


Small Lab Gyros



Space Station Gyros

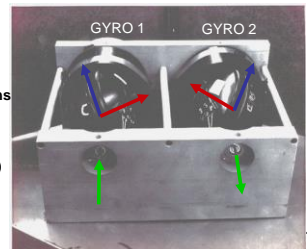
BASIC PRINCIPLES OF GYRO OPERATION



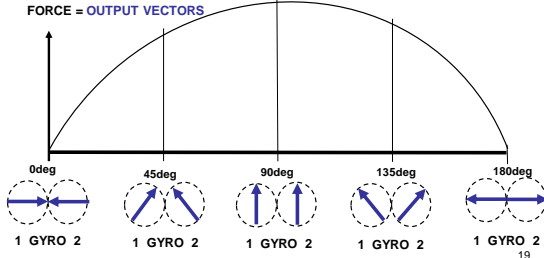
- 1) Gyroscope has three (3) orthogonal (90deg) vectors:
  - a) Rotor (spin)
  - b) Torquer (input)
  - c) Output (output)
- 2) Gyroscope's output is proportional to three (3) things:
  - a) Mass of rotor
  - b) Speed of rotor
  - c) Rate of torquing

PRINCIPLES OF DUAL GYRO OPERATION

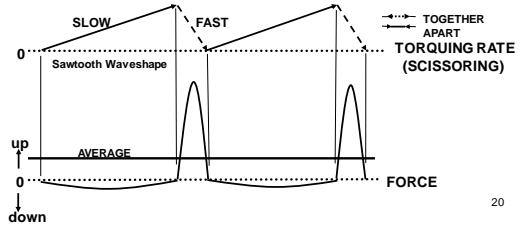
- Both gyros are the same  
 Mass (Rotor)  
 Spin (RPM)  
 Torqued in opposite directions  
 Grn = Input (Torquer)  
 Red = Spin (RPM)  
 Blu = Output (Force)  
 Output = vector function (2x)  
 Torquer rate  
 Differential angle



## GYRO OUTPUT ANGLE VS FORCE



## PRINCIPLES OF GYRO SCISSOR OPERATION



## CONCLUSIONS

### Gyro

- Pulsed sine wave
- Generates an average Y-axis output force
- Zero X-axis vibration

### Rotating Masses

- Pulsed sine wave
- Generates an average Y-axis output force
- And X-axis vibration

## FOR MORE GYRO INFORMATION

[www.gyroscopes.org](http://www.gyroscopes.org)

- Propulsion
- Papers
- Patents
- Products

In looking into the history of gyro propulsion two names from the mid-70s come up: Sandy Kidd and Eric Laithwaite. Both have done research, experiments and papers on gyros.

	Mechanical Systems	Electromagnetic Systems
Lumped systems	Mass + Spring $U_s = \frac{1}{2}mv^2$ $U_s = \frac{1}{2}kx^2$ $\omega = \sqrt{k/m}$	LC Circuit $U_s = \frac{1}{2}Li^2$ $U_s = \frac{1}{2}(1/C)q^2$ $\omega = \sqrt{1/LC}$
Distributed systems	Acoustic cavity $u_s = \frac{1}{2}\rho v^2$ $u_s = \frac{1}{2}\rho(\Delta r/\rho_s)^2$ $\omega = \frac{2.14}{L}; c = \sqrt{B/\rho_s}$	Electromagnetic cavity $u_s = \frac{1}{2}(1/\mu_0)B^2$ $u_s = \frac{1}{2}\epsilon_0 E^2$ $\omega = \frac{1.19 \times 10^8}{L}; c_{\text{em}} = \sqrt{1/\epsilon_0 \mu_0}$

Oscillating systems [Physics Book (Halliday and Resnick)]

A closer look at the previous "Physics Book" chart shows almost a direct one to one correspondence between mechanical and electrical system terms.

- $\omega$  (mechanical freq) =  $\omega$  (electrical freq)
- k (spring constant) = 1/C (inverse of capacitance)
- m (mass) = L (inductance) = Magnetic (B-Field) (rotating masses = rotating magnetic fields?)

Therefore: It should be possible to design the electrical equivalent of a mechanical system.



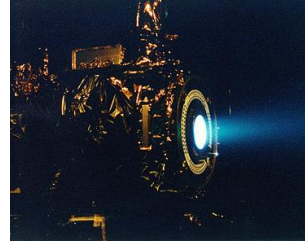
## Conference On Future Energy

# ELECTROSTATIC (ION) PROPULSION

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NASA ION THRUSTER

### SPECS:

Type: Electrostatic  
1Kv DC

Velocity: 100K miles/hr  
(44.7Km/Sec)

Force: 100mNT

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### PROPULSION PROBLEM

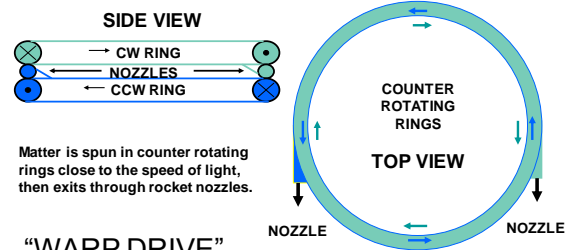
When working with VERY small ( $1.7E-27$ kg - ions) mass, you have to sling it VERY fast to get a usable force.

Here's where the "Rocketeers" could use a little help from the "Atom Smasher" guys. Many years ago (1932) the nuclear physicists discovered that linear accelerators (DC electrostatics) were not fast enough so they built cyclotrons and synchrotrons (AC electromagnetics). These machines generate velocities almost that of light (0.98C).

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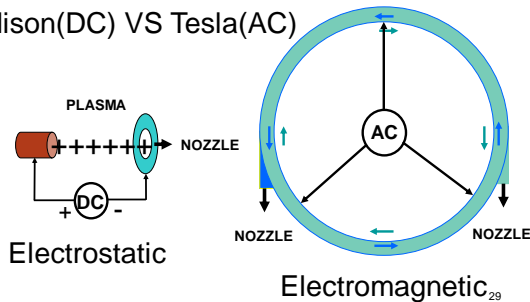
SPEISIF-COFE5

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### Edison(DC) VS Tesla(AC)



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### ANALYSIS

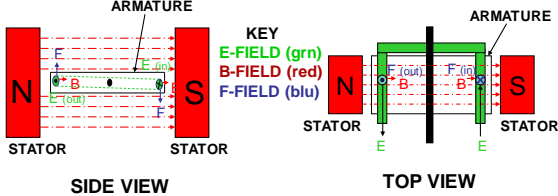
- 1) As both use the same sub-atomic (ions) mass the only other variable is to (greatly) increase the output velocity
- 2) 150K miles/Sec is a big improvement over 100K miles/Hr ( $1.5 \times 60 \times 60 = 5400$  gain)
- 3) Therefore: Output Force: 540NT = (5400x) 100mNT

### CONCLUSION

- 1) A propulsion system with an output:
  - a) Velocity of 0.8C and
  - b) Force of 540NT
 That's REAL usable power

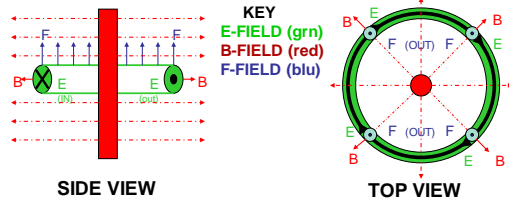
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## AC MOTOR (TESLA)



Note: Positive (AC) Half Cycle  
SPESIF-COFES

## TESLA DRIVE



ELECTROMAGNETIC PROPULSION  
SPESIF-COFES

## TESLA DRIVE SPECS

- 1) Rotating masses convert to rotating electromagnetic fields
- 2) Design is basically an AC motor turned on end
- 3) "Left Hand Motor Rule" still valid as the three field vectors are orthogonal (90deg)
  - a) B-field (Magnetic) [R-axis]
  - b) E-field (Electric) [θ-axis]
  - c) F-field (Force) [Z-axis]
- 4) System only has two main elements (parts):
  - a) Magnetic pole – length: (half wavelengths:  $\lambda/2, \lambda$ )
  - b) Electric ring – circumference: (whole wavelengths:  $\lambda, 2\lambda, 3\lambda, 4\lambda$ )
  - c) Ring location - close to pole end:  $(0, 1/8\lambda, 1/4\lambda)$



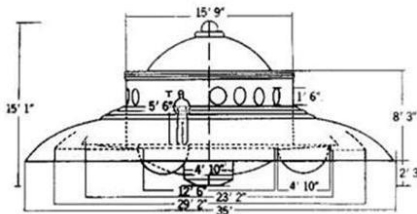
Universal Pictures

OR

## TOMORROW IS YESTERDAY

Star Trek, Paramount Pictures

## THE GERMAN HAUNEBU I (circa 1940's)



REAL OR HOAX?

## HAUNEBU (1940) SPECS

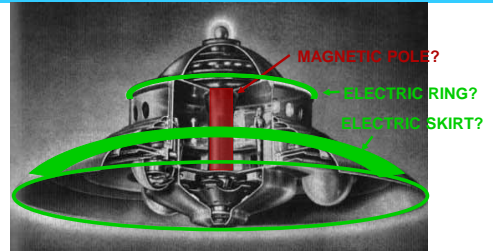
- 1) EM Field Propulsion
- 2) Hover to supersonic speed in both:
  - a) Horizontal flight
  - b) Vertical flight
- 3) Operating environment:
  - a) Inside the atmosphere
  - b) Outside the atmosphere (space)  
[single stage to orbit?]

Those specs would be good even at today's date!

## QUESTIONS

- 1) Does it have any of the necessary machinery (parts) required for an EM drive?
  - a) Magnetic "POLE"
  - b) Electric "RING"
  
- 2) If it had EM field propulsion (as advertised), it would run on "Maxwell's (field) Equations"? [James C Maxwell (1862)]

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Haunebu Cutaway View

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## ANALYSIS (Numbers from craft's drawing)

**Center Pole** =  $\lambda$

Length: 15' 1" (4.6m)

**Dipole Pole** =  $\lambda/2$

Length: 7' 6.5" (2.3m)

**THEREFORE:** Freq =  $3e8 / 4.6m = 65.2Mhz$

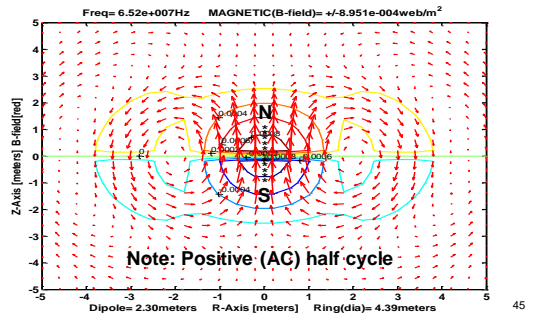
**Electric Ring** =  $n\lambda$

OD = 15' 9" (4.8m)

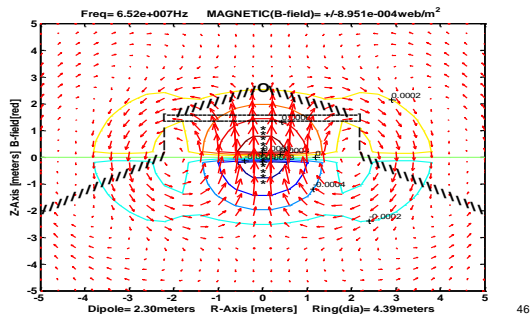
ID =  $(3\lambda) * 4.6m / \pi = 4.39m$  [point#1 - exact wave#]

Location =  $0\lambda$  (end of dipole pole)

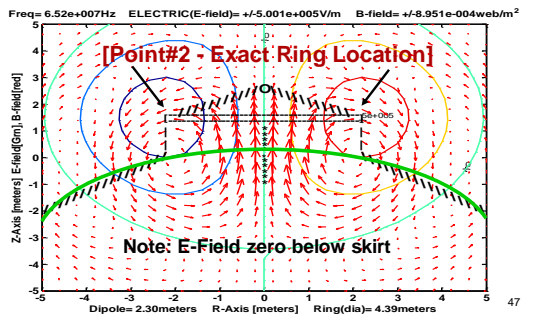
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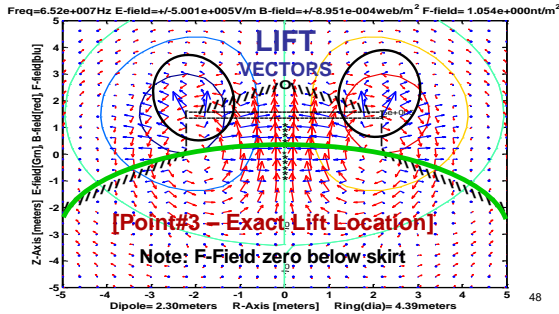
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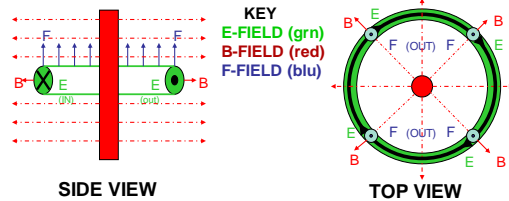


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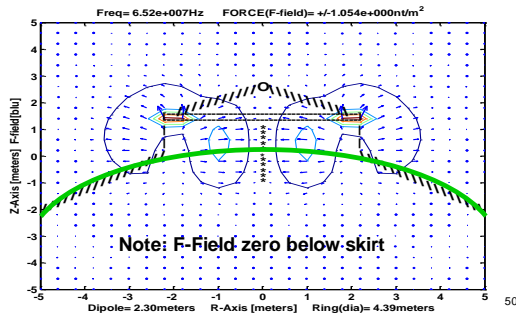
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## TESLA DRIVE



## ELECTROMAGNETIC PROPULSION

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## ANALYSIS (CONT)

- 1) The electromagnetic field plots and force vectors shows it could generate vertical (lift) forces
- 2) Primary lift is from the AC electromagnetic pole and ring system
- 3) The skirt shields the E-field from the lower B-field thereby reducing the negative force (F-field) generation
- 4) However there is a possibility of additional electrostatic (DC) force generated from the electric skirt
- 5) Craft exterior completely encircled in a repulsing force (F-field) reducing drag?
- 6) !! SOMEONE WAS VERY GOOD AT GUESSING (Engineered?) THE "EXACT" DIMENSIONS!!

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## CONCLUSIONS

If those drawings and pictures were a figment of someone's imagination **THEY CERTAINLY KNEW WHAT THEY WERE DOING** in the field of electromagnetics as the numbers line up "Exactly"! This is the same "Wow Moment" I had doing my "Study of Gravity" research when all those numbers also lined up right on the money. One remaining "LOOSE END" **how did they do it in 1940?**

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## THANK YOU

### CONTACT INFO

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