United States Naval Laser Weapons

Alphas - Presentation 1

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United States Naval Laser Weapons

Engineering Works

Star Wars afloat?
http://engineeringworks.tamu.edu/?power press_pinw=2329-podcast

Test Footage
http://www.youtube.com/watch?v=VQWK1pbAQgw&feature=related

[3], [4]
Justification

Laser systems currently being developed by the United States Navy will not only help defend our country in the future, they are awesome.

These systems also involve many of the fields familiar to a mechanical engineer.

- Electricity
- Materials & Mechanics
- Heat Transfer
- Systems and Controls
Outline of Content

• Departmental Creation
• Laser Weaponry History
• How Laser Weapon Systems Work
• Laser System Platforms
• The Future
United States Naval Laser Weapons

**Creator**

- 1923 Naval Research Laboratory
- 1939 Uranium, A-Bomb
- 1946 ONR is established
  - Under President Harry S. Truman
- ONR
  - Executive Branch Agency
  - Supports President’s budget
- Advises
  - Chief of Naval Operations
  - Secretary of Navy

[5], [6]
United States Naval Laser Weapons

History

• Directed-energy weapons since 1960’s
• Survivability and self defense contract
• Office of Naval Research
• Tested April 6, 2011
  – Solid-State, high energy laser
• Full system to be working by end of decade

[5], [6]
How it works

• Direct energy weapon
• No chemical reactions or kinetic energy like in conventional weapons
• 150 kilowatt solid-state high-energy laser
• Have recently developed up to megawatts
Inner workings

• 'stimulated emission' - an atom or molecule which has been excited to a given energy level, will emit that energy as a photon in the visible light or microwave bands

• Produces a cascading effect

• These photons are then sent through a series of crystals and mirrors
Power

- Travels at the speed of light
- Carries a tremendous amount of heat
- Was tested from boat to boat
- Lit the test boat on fire within seconds
Naval Anti-Air Defense Weapons

- Currently in prototype phase (Naval).
- Cheap alternative to expensive missiles
- Rapid Retargeting
- Attacks targets at the speed of light.
Additional Military Laser Systems

NKC-135A to... BOEING YAL-1

- Aircraft Laser technology has existed since the 1970’s
- Chemical Oxygen Iodine Laser (COIL)
- Designed by US Military as a missile defense system
- Successfully tested in 2007 while in flight, destroying a target aircraft

[11], [12]
Conclusions

• Navy Laser weaponry has proven to be highly effective on stationary targets.
• Engine is set alight by the laser and burns through to the engine block.
• Engines are permanently disabled by weapon allowing appropriate actions to be taken against the crew.
The Road Ahead

• Improvements
  – The fire from the laser could be put out by the crew, thus rendering the weapon useless.
  – What happens if this weapon hits a human target?
  – Needs to be tested on a moving target with rough seas.

• This could find potential usage in the South China Sea, Persian Gulf, or Mediterranean Sea.
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Support Material