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# LightSpeed Overview – JIFX 21-2

# *Light**Speed*** Non RF LED Comms

- Free-space optical communications
- Voice & Data up to 10km @ 1-10Mbps
- New capabilities with up to 80Mbps
- Relative location measurements
- LED or Laser sources
- Extreme LPI / LPD

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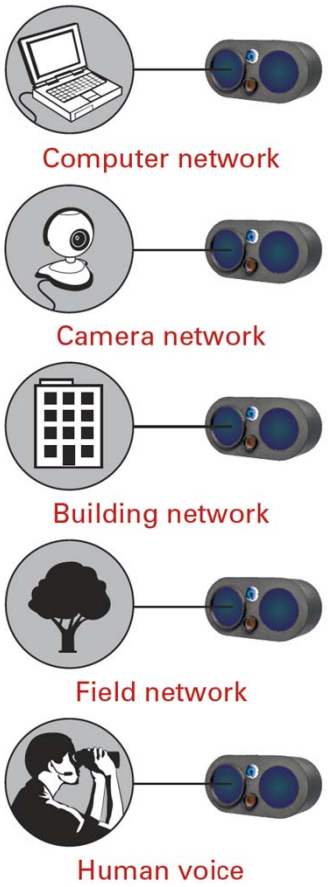
# *Light**Speed*** COTS Equipment

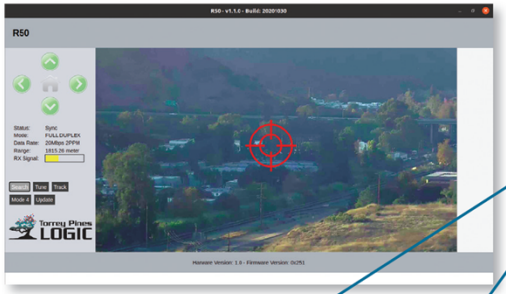



## R50 – Very long-range system

- Data rates up to 20Mpbs
- Data and voice up to 10+km
- Active finding and tracking
- NIR and Thermal

R50 long range versions on pan/tilt

Automated Link Finding Tracking Interface



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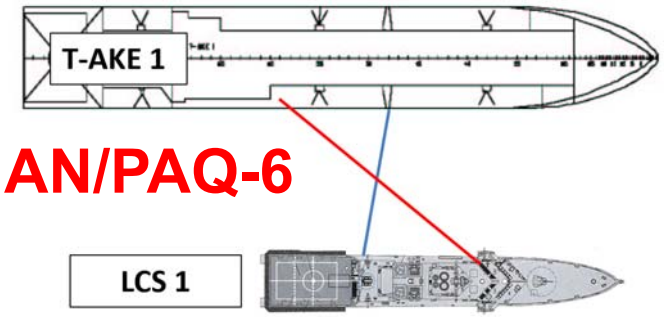
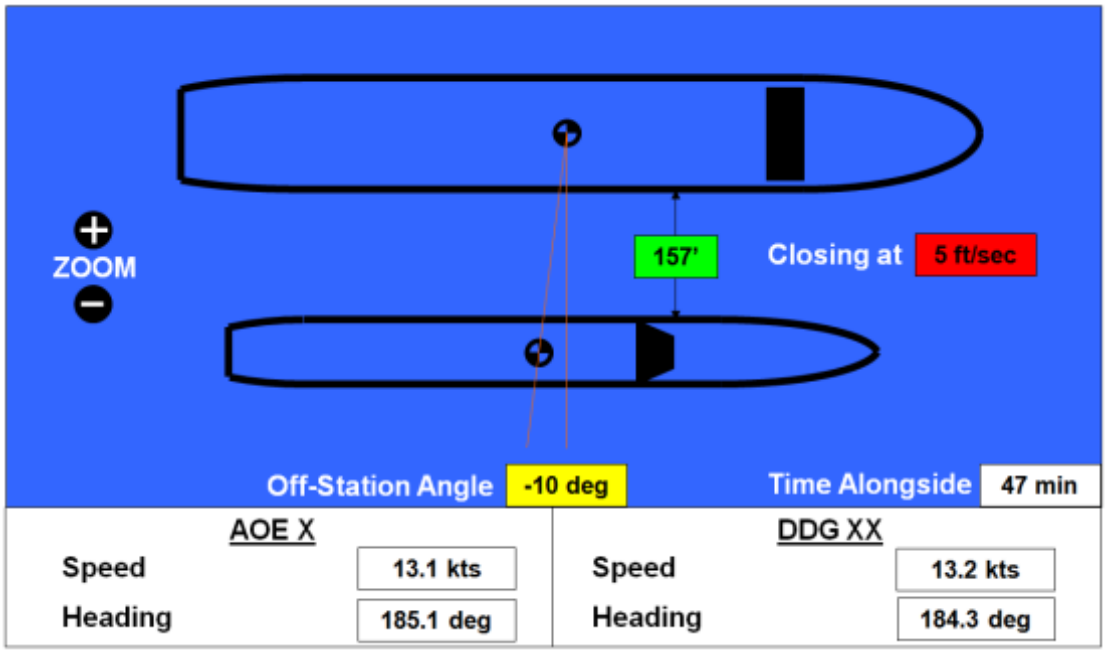
# Underway Replenishment (*Light**Speed*** UNREP)

System provides multiple voice, data lines and real-time distance measurement via optical comms



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# LIGHTNING LT26

## Non-RF Team Communication System

- Voice and data communications inside or outside vehicles
- Conference call up to 16 users
- Noisy engine rooms/spaces

| Lightning LT26 | |
|---|---|
| Size | 6"x6"x3" (hub), 1"x2" (button)" |
| Weight Hub | up to 2 lbs |
| Weight Button | 100g w/o batteries |
| Hub Power | 8-28 VDC |
| Button Power | 2 AA batteries |
| Material | Aluminum, Carbon |
| Hub I/O Ports | RF-45 Ethernet, Voice |
| Field-of-View | 360° Horizontally, Hemispheric vertically |
| Distance | up to 5 meters |

HUBs can be linked to cover multiple areas

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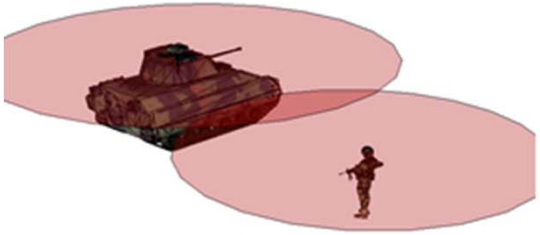
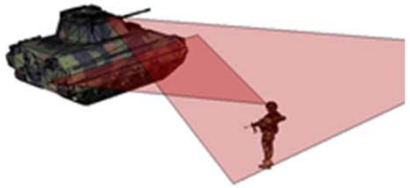
# LIGHTNING LT 26 Extensions - Soldier to Vehicle

- Omni-directional on the vehicle, omni-directional on the soldier
- Omni-directional on the vehicle, directional on the soldier
- Directional on the vehicle, directional on the soldier
- Longer range





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# Flashlights: *L1 – Voice* and *L2 – Voice and Data*

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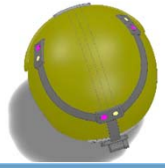
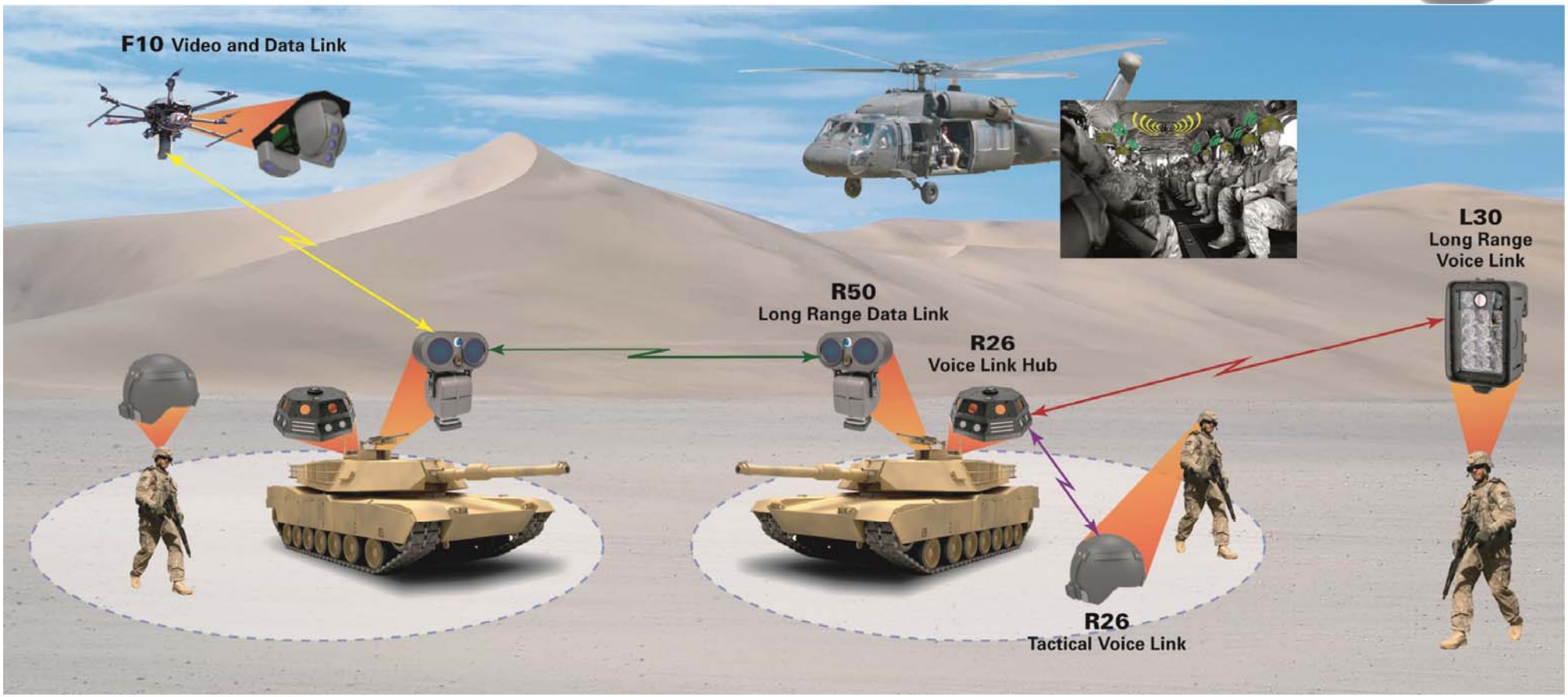
# LIGHTNING LT 26 Configurations



- Inside / around vehicles or Connected vehicles



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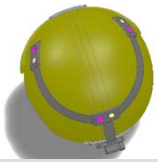
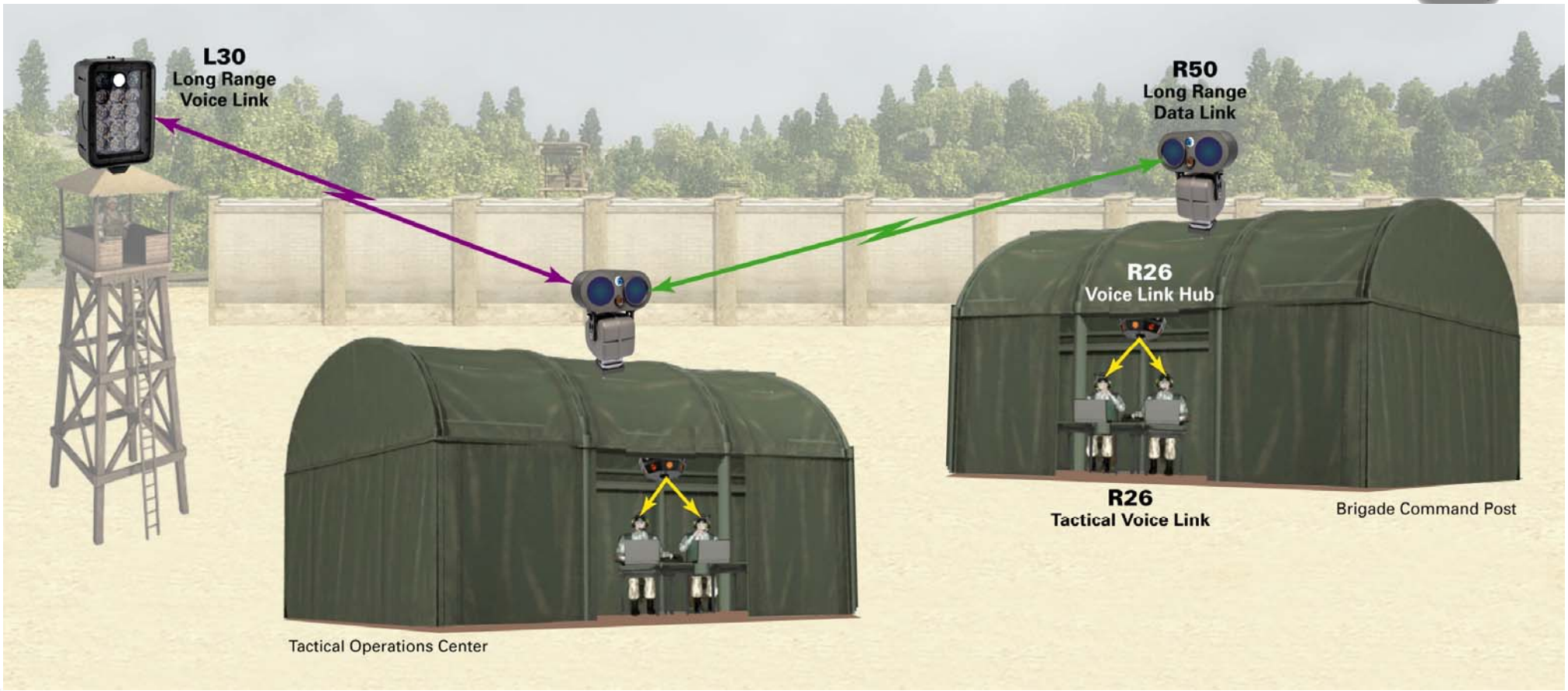
# LIGHTNING LT 26 Configurations



- Inside / around base locations



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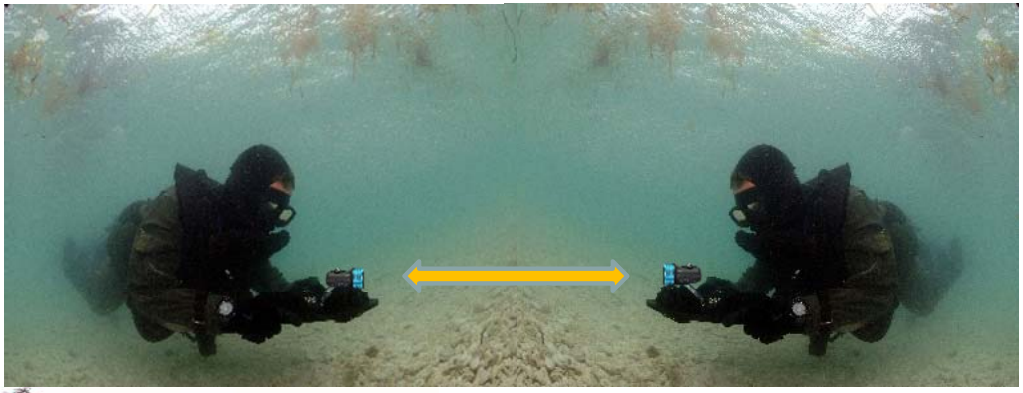
# New Diving Flashlight – Commercial Product

- Small Handheld unit
- 2-way communication system
- 2 frequencies: In Air and In Water
- 10Mbps + full duplex Voice
- 25’+  in dirty water
- 100’+  in blue water
- 2km+  in air



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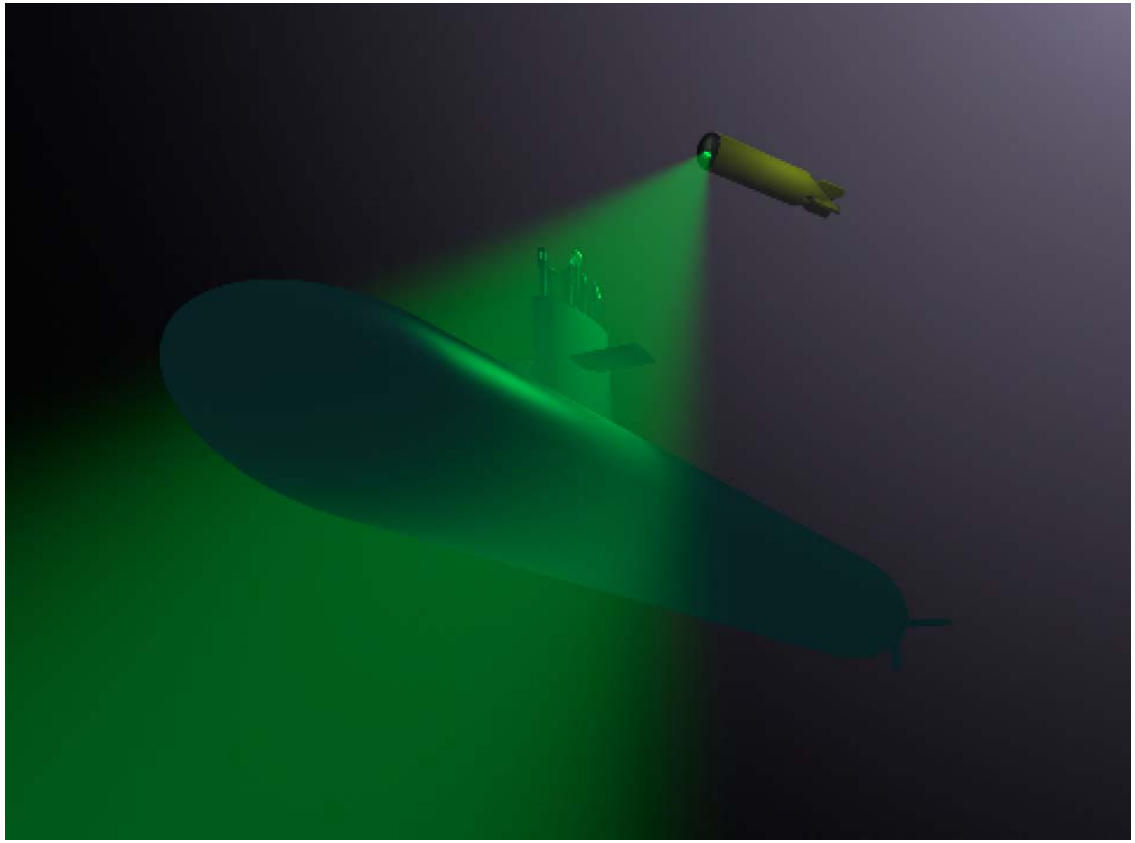
# Deep Water Applications

- U10 - Small Deep Water unit
- 2-way communication system
- 10Mbps + full duplex Voice/control
- 25’+  in dirty water
- 100’+  in blue water
- Seaconn 13pin w/ Audio & Ethernet



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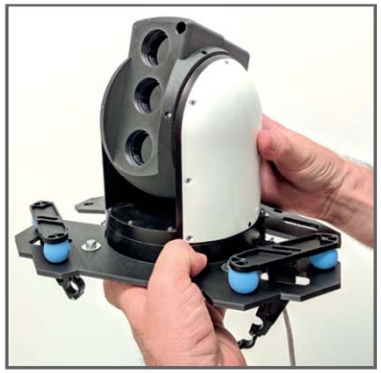
# *Light**Speed*** F10

**Optical Comms**

**Video and Control Link**

- Operates in RF denied / congested environments
- No spectrum license needed
- Low probability of detection
- High speed data Ethernet link
- Low power consumption



Lightweight, man portable design

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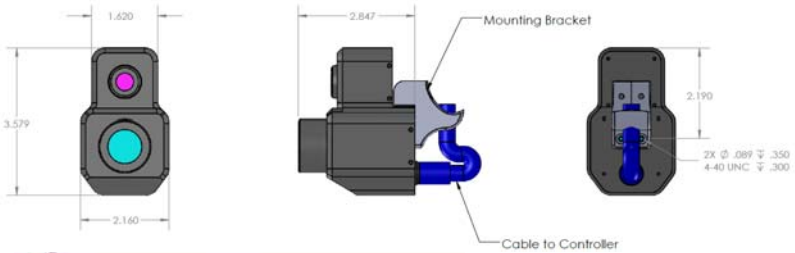
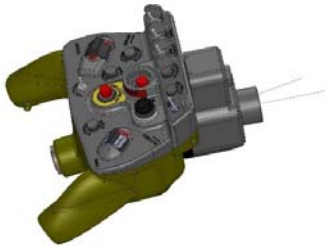
# *Light**Speed*** on X47

Deck Handling System:

- Bi-directional optical comms to control vehicle on deck
- Refueling comms and position measurements
- UAV control (Gremlins)



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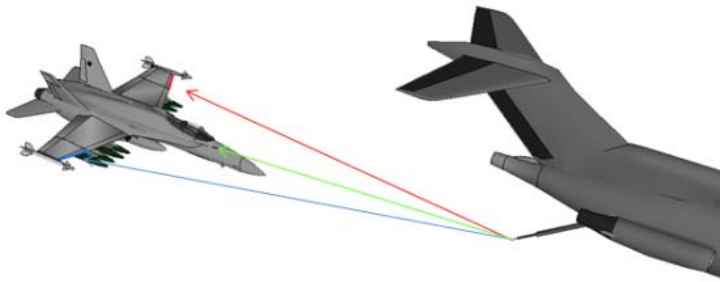
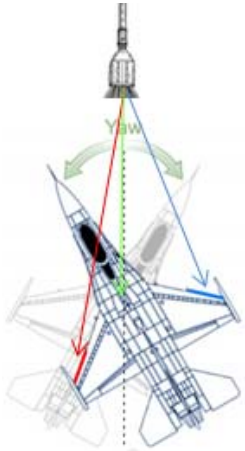
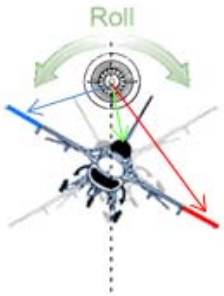
# *Light**Speed*** for refueling

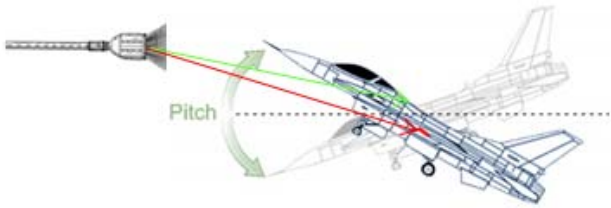
Terminal Guidance for Autonomous Aerial Refueling:

- Provides 6DOF positioning drogue - aircraft
- Can support manned or unmanned operation
- Establish bi-directional optical comms to debrief vehicles
- Same for USV craft on water



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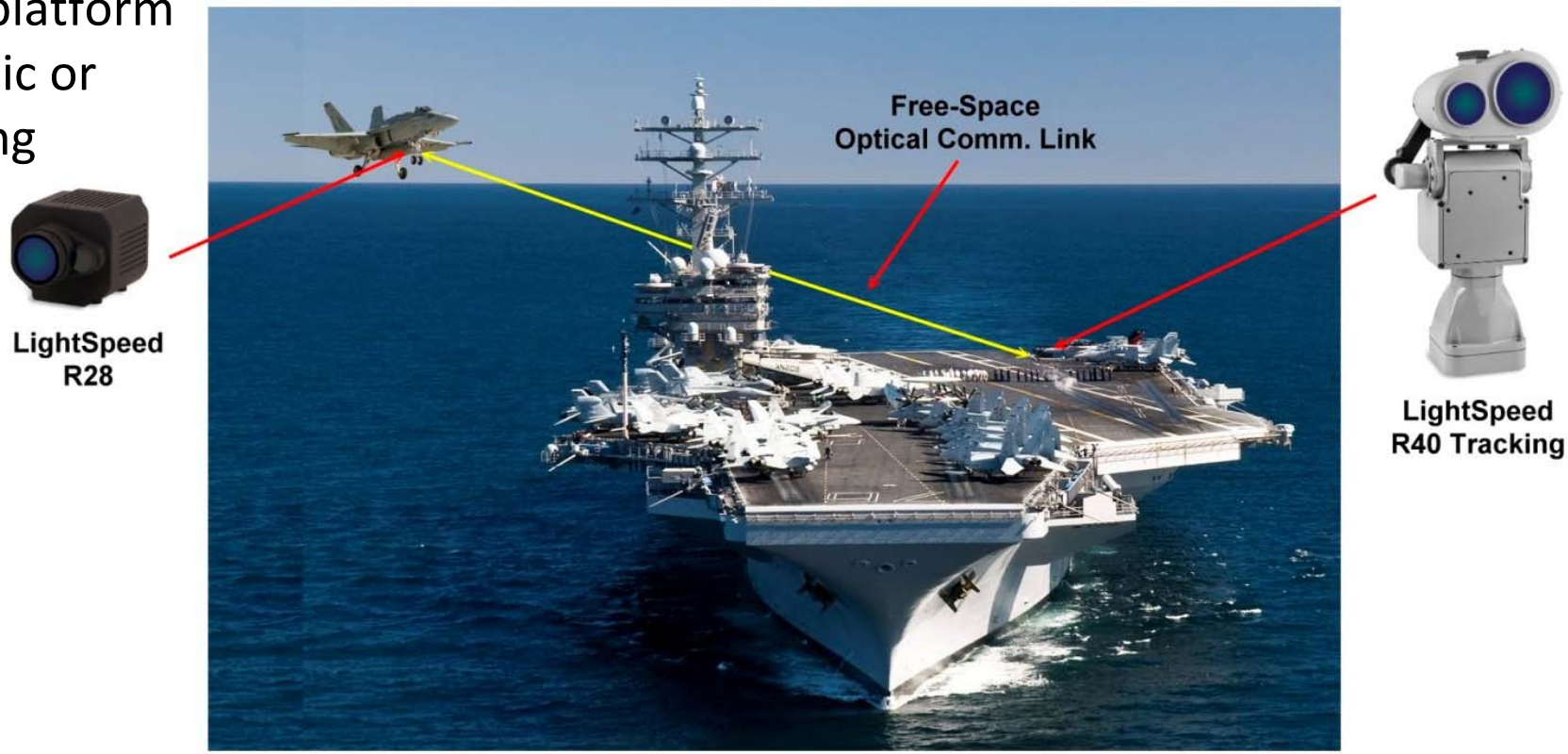
# ***PRONG*** – PRecision Optical Navigation Guidance

- Optical communication system for landing aircraft
- Can also measure crosswind and communicate this to the manned aircraft or UAV
- Guide the air platform to an automatic or assisted landing

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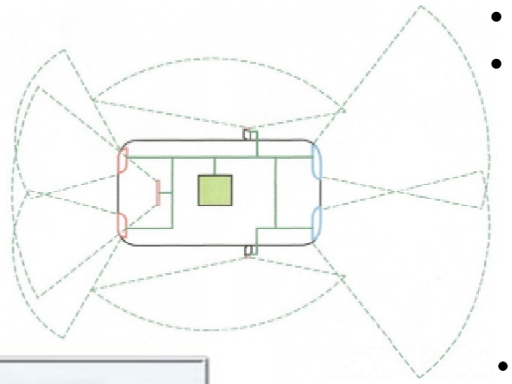
# *Light**Speed*** on MRAP or Convoy

- Connected convoy
- Uses existing IR NV illuminator on MRAP
- Intra-convoy Communication System



- Collect vehicle logistics
- **Secure, Non-RF Comms**

- Same module as LightSpeed Flashlights

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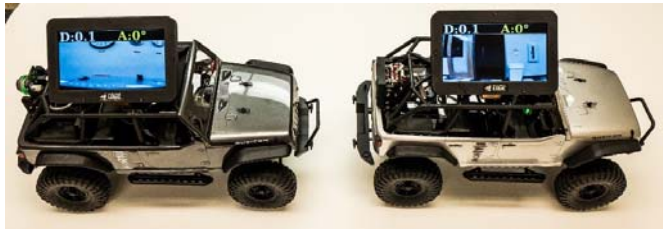
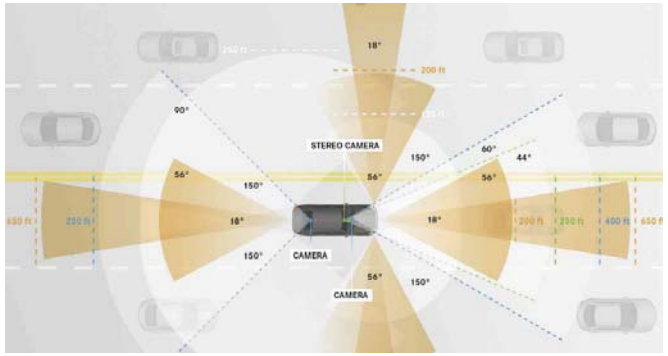
# *Light**Speed*** as Commercial Advanced Driver Assistance

- Connected cars - ADAS
- Use of car LED light
- LightSpeed for Audi, VW, Ford, GM…



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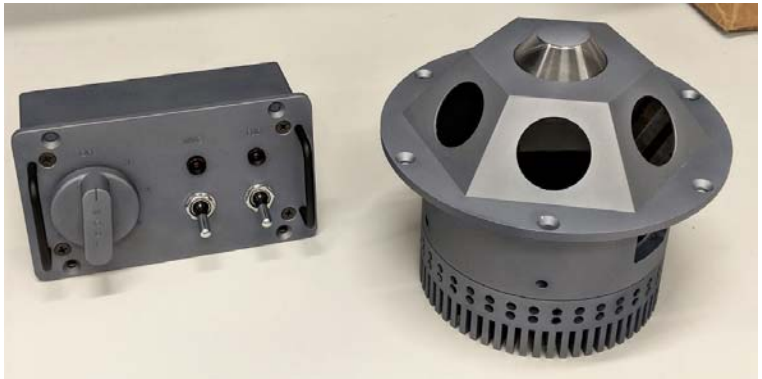
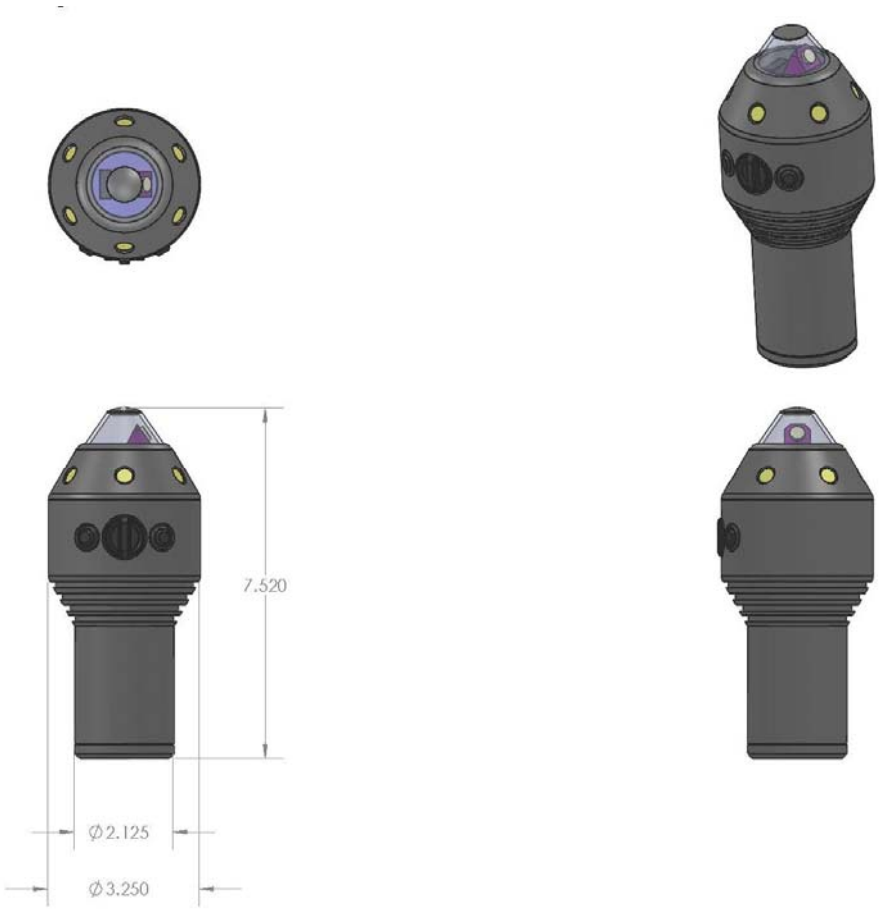
# Thermal Optical Comms and Beacons

- Handheld or stationary mounted
- Communication / ID
- Mid-wave and SWIR/NIR
- Detection distance – 10s of km





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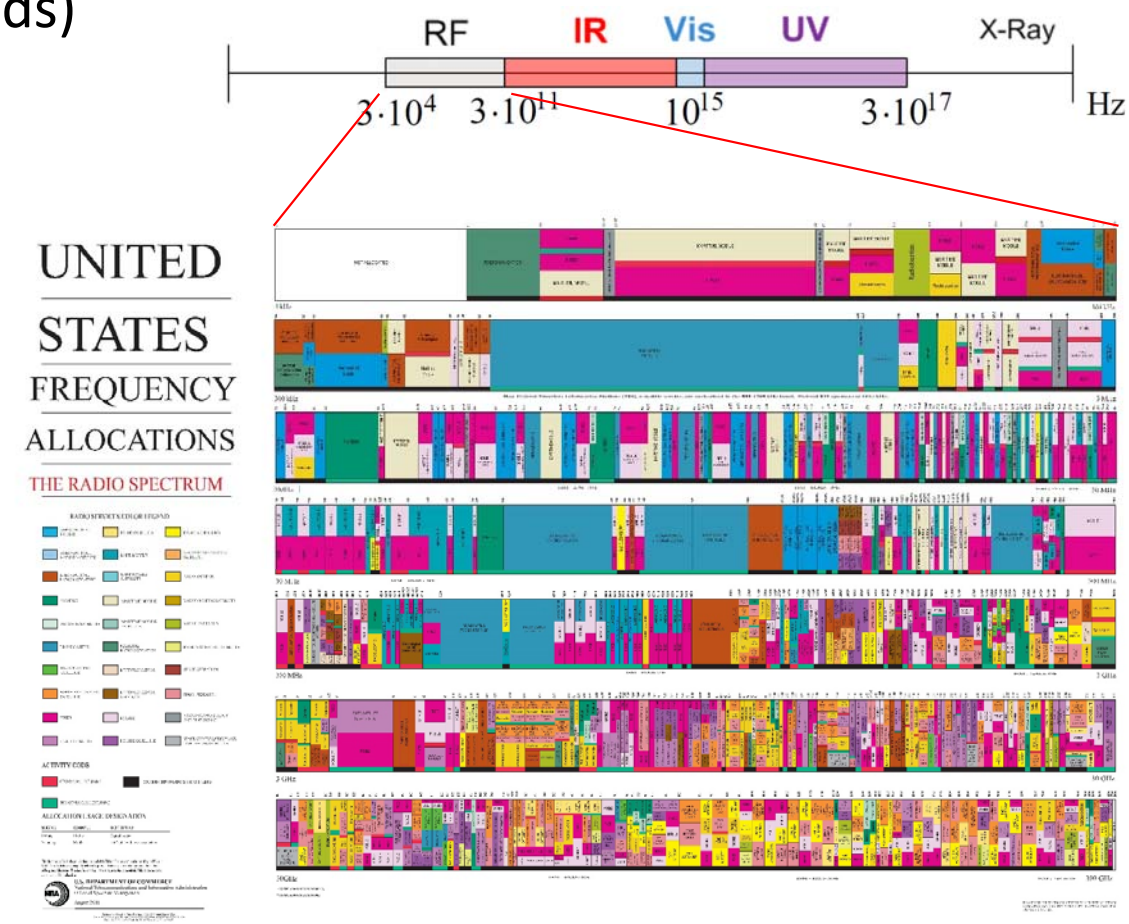
# *Today's Communication Challenges*

- RF Allocation (Commercial Demands)
- RF Access Denied (Jammers)
- RF Detection (Scanners)
- Bandwidth Demand (Sensors)
- Optical Comms:
  - High reuse factor
  - Inherent security
  - Lower power requirements
  - Robustness to EMI
  - Unregulated spectrum
  - Ease of use



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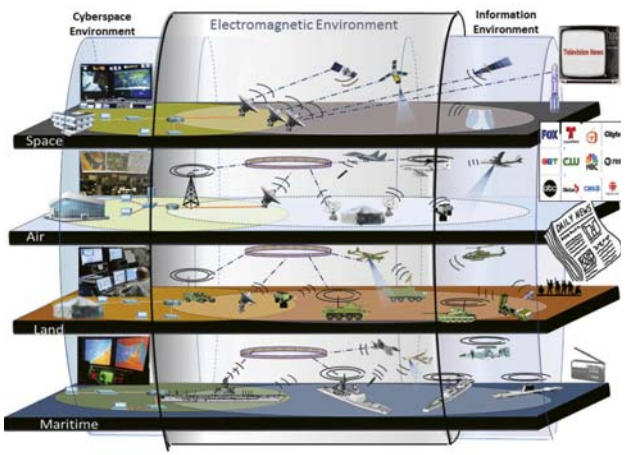
# *RF Issues*

- EW
- Countermeasures



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# *History of Light**Speed***

- ✓ 1999 – *Light**Speed***™ concepts and prototypes initially developed
- ✓ Over 100 different *Light**Speed***™ products – both COTS and DoD
  - ✓ More than 75% of products are commercial
- ✓ Over 200 different communication protocols in *Light**Speed***™ products
  - ✓ More than 95% of protocols are commercial
- ✓ Over 100 engineering man years
- ✓ Over 1 million lines of code
- ✓ Over 7 generations of hardware
- ✓ Over $50M invested into *Light**Speed***™
- ✓ Separate controls - COTS and DoD
- ✓ Next Stop - LIGHTNING

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# *History of LightSpeed Government Applications*

- ✓ 2001-2003 – TPL develops *Light**Speed***™ V2 concept and prototypes
- ✓ 2003-2005 – Fleet Requirement into ONR TechSolutions & Funded Prototype
- ✓ 2006 – NAVSPECWAR funds *Light**Speed***™ flashlight for covert comms
- ✓ 2007 – Navy OPLOG selects *Light**Speed***™ for PDL(R)
- ✓ 2008 – ONR SwampWorks funds *Light**Speed***™ underwater – OCEANLINK
- ✓ 2009 – CTTSO/TSWG funds *Light**Speed***™ G10 & other concepts
- ✓ 2010 – Air Force (AFRL) selects *Light**Speed***™ for BATMAN – Wireless Lan (OWL)
- ✓ 2011 – NSW customizes *Light**Speed***™ for special purpose LPI/LPD
- ✓ 2012 – Army selects *Light**Speed***™ based SBIR for untethered video transmission
- ✓ 2014 – Navy & MSC selects *Light**Speed***™ for Rapid Innovation Fund (RIF)
- ✓ 2015 – Navy selects *Light**Speed***™ based SBIR for carrier deck landing
- ✓ 2016 – SOCOM selects *Light**Speed***™ for urban comms Technical Experiment
- ✓ 2017 – SOCOM selects *Light**Speed***™ for combat diver Technical Experimentation
- ✓ 2018 – Navy NRDE selects *Light**Speed***™ for Urban 5th Gen ANTX

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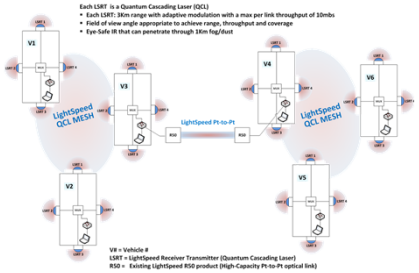
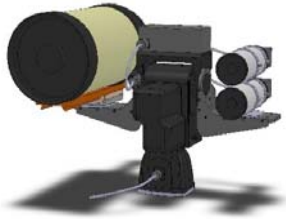
# *History of Light**Speed** Commercial Applications*

- ✓ 1999-2001 – Initial optical communication principles to become *Light**Speed***™
- ✓ 2001-2005 – First two generations of *Light**Speed***™ systems and prototypes
- ✓ 2007 – Third generation development and analog *Light**Speed***™
- ✓ 2008 – Autonomous car systems development with Audi, GM, VW
- ✓ 2012 – Underwater *Light**Speed***™ for oil and gas exploration
- ✓ 2015 – Various *Light**Speed***™ based projects for IRAD of Primes
- ✓ 2017 – LIGHTNING Development





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