

LEDline® for the Military and Marine Environments.

NVG and Visible, Corrosion Resistant, Submersible, Encapsulated Linear and other LED Lighting Systems, for Improving Safety in Marine and Military Applications.

HIL-Tech Ltd. is a Canadian manufacturer who produces linear and other styles of completely solid, fully encapsulated LED lamps for various extreme and high-hazard, difficult applications. LEDline® lamps come in any available LED colour and can have both visible or Infra-Red (IR) light for stealth applications. The lamps are always dimmable.

Approved for publication by the US Navy, LEDline® is used for outlining the helideck of the US Navy's latest DDG-1000 class of ships. HIL-Tech is supplying linear LEDline® there to increase safety and stealth of the deck helideck area.

(**Note:** Picture from Seaforces-online; here is a picture of the helideck area of the US Navy DDG-1000 Zumwalt Class of ships, where LEDline® is used to outline the deck area to improve safety).



The enclosed information is on our linear LEDline® products, which improve safety, survivability and lighting effectiveness on all types of ships from aircraft carriers to submarines.

LEDline® / LEDlineDV™ / LEDlineHB™ has NATO commercial code (NCAGE) L4132 Code and Defense Logistics Agency, Central Contractor Registration (CCR), DUNS # 243165714

Completely Sealed at Manufacture: LEDline® is a ruggedized off the shelf (ROTS) and commercial off the shelf (COTS) available lighting system and can be used in a wide variety of difficult environments. It can be surface mounted or inset depending on application and the LEDs, being low powered, can be powered by mains 90 – 220 VAC power system; VDC power system; or renewable solar / wind power. All can be battery backed up.

LEDline® LED Lighting can be used for the Navy, Marines, Army, and the Air Force: For the military, the system has a number of key advantages. Being encapsulated the LED lighting is extremely tough, corrosion resistant, highly weather resistant, submersible to depths, chemically resistant, and can be night vision glasses (NVG) compatible with embedded IR LEDs for stealth mode, where only NVG equipped people can see it.

Night Vision Goggle (NVG) Compatible: Green or cyan coloured LEDline® can be dimmed to be NVG compliant and still be visible. However, for visible and NVG / stealth use, both visible and IR (Infra Red) LEDs are used in the same unit.

As the US Navy's Sea Fighter and DDG-1000 demonstrate, LEDline® can be used to highlight helipad visual aids, outlining and improving the deck safety for the sailors and the helipad area for pilots. Here, it outlines the helideck when the ships rails are down to allow helicopters aboard. And, being linear, at night, it provides helideck area dimensions, so pilots can more easily judge nighttime closing speeds, approach height, and other key flying vectors.

LEDline® is used to outline the aiming circle and to light the "H" of hospital helipads, again for pilot closing speeds and easier landing height assessments, for softer landings for critically injured or ill patients.

Possible Military Applications: LEDline® can be used for marking, highlighting or provide guidance on or in, just about anything. Already used for outlining ships helidecks, being submersible, corrosion resistant, and long lasting, how about using it for lighting in the ship's bilge? Like the bilge area, it is easily pre-positioned in difficult areas to be available and useful when needed.

LEDline® can be used for vehicle / aircraft guidance on airfields and on roads; for people guidance at; airports; heliports; ships; and buildings; for regular or emergency lighting of steps, docks, office exits, storage facilities, warehouses; or temporary or permanent lighting for bridges and tunnels.

It can could be used to highlight emergency vehicles such as ambulances, or for marking fire drop zones for the forestry service or military. It would also be useful for highlighting exits or emergency lighting in vehicles, (troop carriers, armoured vehicles, ships, helicopters, submarines etc.).

Some LEDline® Types; Completely Solid Linear Lights; White, omni-directional and Green semi-directional are displayed.



Completely Solid Point Source 360° Lamps;



Corrosion Resistant Lighting of Any Shape: LEDline® can be made to fit just about anywhere to provide highly corrosion resistant lighting of any shape, therefore, custom lighting applications can easily and inexpensively be entertained, contact HIL-Tech Ltd. for details.

Navy Use: LEDline® is used for both visible and NVG / stealth lighting systems, (with IR LEDs). The system is;

- highly visible in either the visible or NVG / stealth mode;
- tough and concussion resistant;
- submersible and highly corrosion resistant;
- and requires minimal maintenance. (Inset sometime Fall of 2009, as aircraft visual aid guidance at Vancouver International's de-icing pads, linear LEDline® have been left on constantly for more than +10 years).

Sea Fighter: LEDline® has been used as visual aids on the US Sea Fighter since 2005. It is still being used for;

- helicopter and personnel safety for deck edge lighting;
- for helicopter line up lines on the sides of the ship;
- outlining helipad obstacles, like the conning tower;
- and as visual nighttime clearance for accessing the two helipads.

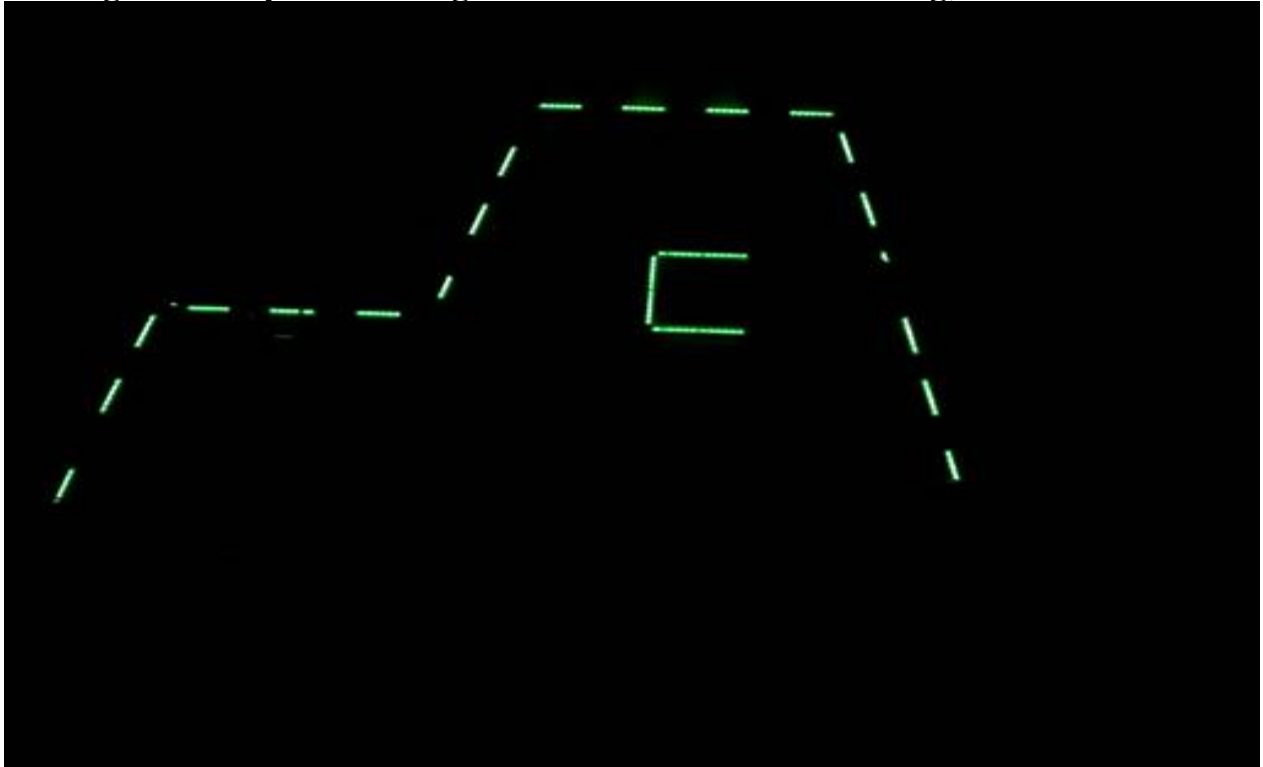


January 2021; for the Sea Fighter to date, HIL-Tech has not had supplied any replacement parts for the various uses there.

Sea Fighter Conning Tower Obstruction Outline Lighting and Nighttime Helipad Visual Aid Status / Clearance;



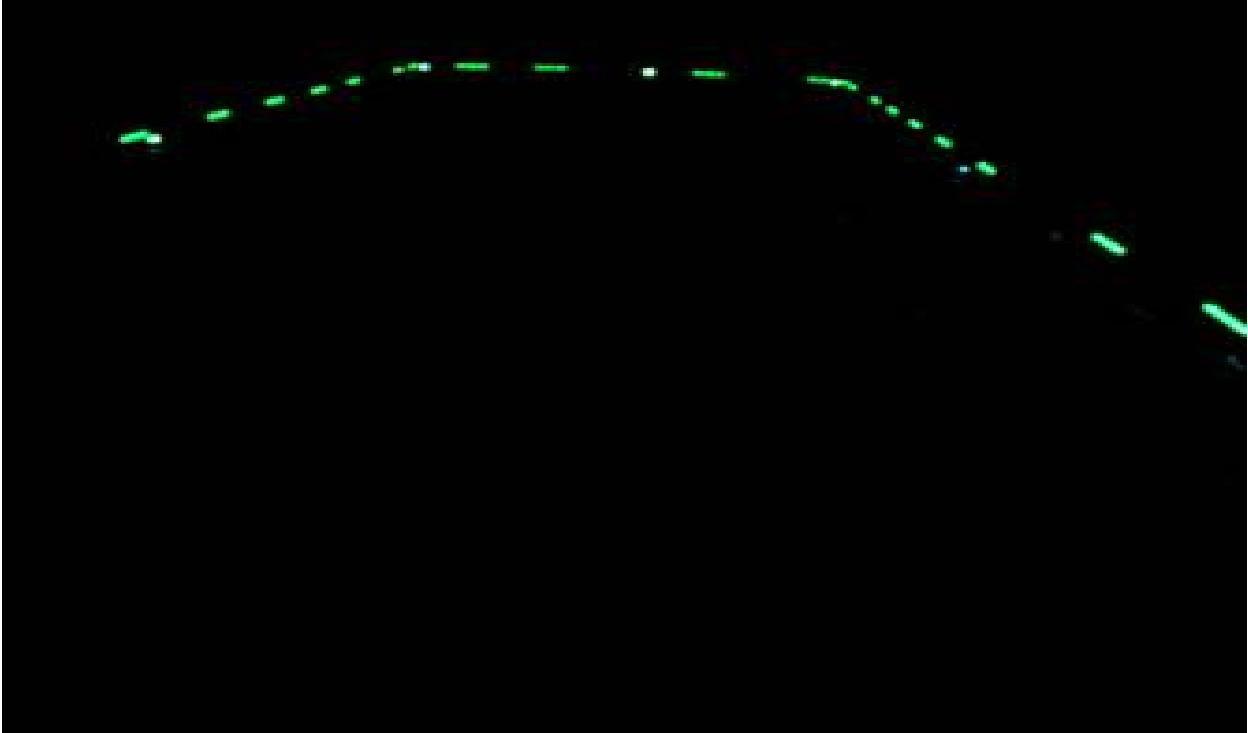
Sea Fighter Helipad Conning Tower Obstruction Outlining;



Sea Fighter Deck Edge Visual Aids:



Sea Fighter Deck Edge Visual Aids:



Multiple Use LEDline®, Is the Toughest Light Source in The World.

- Used for submarine escape chamber lighting, earlier versions of the linear lamps were tested by the Canadian Navy for thousands of pressurisation and de-pressurisation cycles, to seawater depths of 300m (1000ft.).
- FHWA tested an older LEDline® version to 89,000 lbs. direct loading and bent the light unit section, (not the light unit and its Mounting Plate), by some 75mm (3”), yet the unit continued to light and functioned normally.



Today's LEDline® lamps are similarly tough and submersible, yet have even far better electrical connections and higher resistance to weathering).

For Airfields, LEDline® is Highly Visible as Visual Aids to Pilots and Drivers:

- Anchorage International Alaska, 2017: Early linear 6 x LED yellow LEDline® lamps, (right), were directly compared to incandescent bulbed, standard green FAA taxiway lights (left) in identical heavy snow conditions. The LEDline® units were as visible as the green incandescent FAA taxiway lights, but cost a lot less, some +60% less.



In addition, like the old-style incandescent bulbed FAA lamps, LEDline® melts snow without needing any additional heating elements! (**Note:** Unless today's LED visual aids have additional heating elements built into them, adding to their cost, **they don't melt snow. The latest LEDline® units with 12 x embedded LEDs, are even better at being visible and melting snow!**) As such, LEDline® LED lamps continue to cost significantly less and being linear provides the directionality, for better guidance, than traditional point source inset lamps.

- **LEDline® is Tough:** The LEDs and optics are embedded into a solid matrix, as such, the system can take significant weight such as a Boeing 747 or A-380 (¾ million-pound aircraft).
- Installed flush with the pavement, LEDline® avoids and survives snow ploughs. (**Note:** As with most northern airfields, Vancouver keeps its runways and taxiways clear of snow and ice with snow plows and brushes. See how LEDline® survives these tough environments from Vancouver's operations <http://www.yvr.ca/en/media/snow-operations>);
- **LEDline® is Long Lasting:** Installed back in the Fall 2009, the LEDline® at Vancouver International's de-icing pad's have been left on continuously since they were installed, some +10 years ago, and they continue to function;
- Being solid and submersible, it survives highly corrosive de-icing chemicals like glycol and other corrosive chemical sprays at de-icing pads.

For Helipads; LEDline® is Highly Visible;





- **LEDline® is Used for the Aiming Circle and lighting the hospital “H”;** Here LEDline® is especially useful since it allows pilots to more easily judge the touchdown, helping them to provide for soft landings for seriously ill or injured patients.



LEDline®, Linear, Helipad Advantages:

- **At Night, Linear Lit Markings Provide Dimension to Helipads:** At night, everyone loses their depth perception and, if distant, one cannot differentiate if point source lights are beside or in front of each other, unless one is high enough to be almost on top of them. Therefore, at night, from a distance, a helipad is not defined by its standard ICAO point source lights.

In contrast, lit linear markings effectively restores lost nighttime depth perception, by providing dimension to the helipad. This allows pilots to more easily gauge; closing speeds; height; angle of attack; and other key vectors. (Please visit our web site www.ledline.net to view helipads there, or at <http://www.youtube.com/watch?v=Y-T0uXgf5Ss>)

- **Looks Different:** Linear LEDline® systems, at night, look completely different to typical surrounding point source lighting found in cities or ships, and are thus very distinctive. From a distance, linear markings much better define the helipad area and so increase helipad safety and efficiency.
- **Softer Landings:** When used as a lit aiming circle and /or lit hospital “H”, this allows pilots to more accurately gauge height from the ground for much softer landings for critically injured or ill patients.
- **The Use of Colour:** Using colour such as green for the FATO outline further differentiates the pad by colour and shape, allowing pilots from distances, to quickly view helipads in just about any weather.
- **Increased Safety:** If used to supplement obstruction lights on nearby helicopter hazards, such as transmission wires, building towers or other type of hazards, the system provides for increased helicopter helipad safety.

For Roads, Linear LEDline® is Highly Visible:

- Here, a freeway is being gang snow ploughed. Used flush with the pavement surface, it is fully snow ploughable! A video is available at www.ledline.net

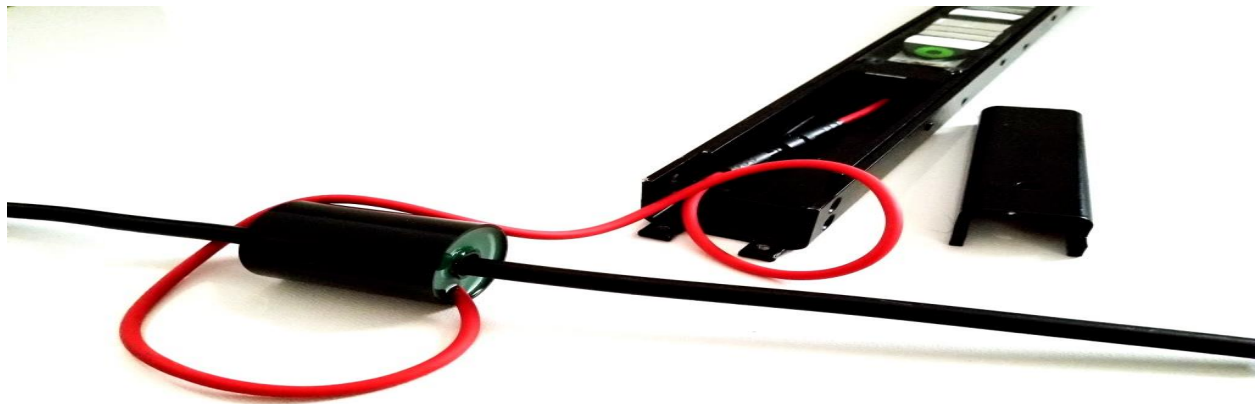


- **Weather and Corrosion Resistant:** Completely sealed at manufacture, the embedded LEDs and their induction connection systems are extremely tough and waterproof. And LEDline® being solid, so not that compressible, provided the unit could be supplied with power, should work at great depths. (**Note:** Depths beyond 300m (1000ft.) have yet to be tested).
- **Submersible:** Previous generations of LEDline®'s use for lighting the escape chambers of submarines, were successfully tested by the Canadian Navy down to seawater depths of 300m (1000ft) at 2°C, (35.6F), equivalent to 3 MPa (433 PSI). And, since the units were left in the test pressure chambers for lighting purposes, they accomplished thousands of pressurization and decompression tests (including one sudden decompression episode) at the seawater depths of 300m (1000ft.);
- resistant to all sorts of chemicals including; de-icing fluids, jet fuel, oils, salts and many other chemicals found at airports, roads, on ships, or on rigs.

LEDline® has Multiple Power Supplies from; Induction, (VDC) Power and the Induction Connections; to Direct Current (DC); or Renewable Energy Power: For Naval ships, LEDline® is usually powered via a direct current (VDC) 28VDC – 36VDC source. However, it can also be powered via an induction, or renewable energy source, like solar or wind power with battery backed up.

Induction Powered Connector System:

The current transformer (CT), is a sealed unit with a hole running through it, for the fully cladded insulated power line to be threaded through it for the induction connection. As such, there is no need for installers to remove a power line's protective covering or to have to cut, splice, connect, or seal, (hard wire) a connection, since working via electro-magnetics, power is induced into the LEDline® products via this system.



This induction system is by far the most secure connection system and is recommended for all outdoor in-pavement applications, or for corrosive atmospheres such as the marine environment.

The induction CT system is sealed at manufacture and is attached to the quick disconnect IP69K stainless steel or nickel-plated brass screw together system.

Latest IP69K Quick Disconnect: Since, at some point, LEDline® will need to be changed and removed from the buried in-pavement CT, LEDline® has an IP69K quick disconnect connector for the lamp. Other than deep-sea high-pressure electrical connectors, this is the highest possible IP electrical connector type.



To Conclude, LEDline® is:

- **Concussive Resistant:** LEDline® units are solid so are tough and resistance to concussive shock waves.
- **Low Power Requirement:** Depending on their colour, LEDline® units with 6 x 1Watt embedded LEDs use approx. 20 -21 volts at 350 mA. The 12 x LED system uses approx. 20 -21 volts at 700mA; therefore, the system is low powered and energy efficient.
- **LEDline® Can Be Both Visible and Night Vision Goggle (NVG) Compatible, with IR Stealth Capabilities:** Since LEDs can be dimmed from daylight visible to zero, most colours other than red, can be dimmed so as not to bloom the NVG goggles. In addition, for those wishing for the units only to be seen via NVG, then IR (infra red) LEDs can be used for stealth purposes. Again, both visible and IR LEDs can be installed within the same lighting system and each controlled.
- **Functional Area Lighting:** Since the LEDs are high output, LEDline® is able to be used for tough, corrosion resistant, functional lighting in tents, armoured vehicles, ships and other vehicles. Their toughness improves the survivability of the lamps.

LEDline®'s extreme toughness; energy savings; low maintenance and cost, should make them of interest to those who want lights to survive just about anything. Being submergible and corrosion resistant, LEDline® can be used for;

- exterior lighting applications for NVG or stealth IR applications;
- temporary airfields or helipads or helicopter drop zones and being compatible with (NVG) goggles be used for extremely tough stealth IR applications;
- lighting expeditionary airfields and damaged areas on runways, so returning aircraft could avoid them. All could be powered via batteries or mains;
- the inside of armoured vehicles as an emergency light backup powered via mains and batteries in case of power failures;
- marking cleared paths through beach minefields, or lighting the edge of temporary bridges. Temporarily illuminated, creating lit paths, and then turned off for security of vehicles crossing the minefield / bridge;

For ships, LEDline® could be used for increasing the safety on;

- helipads;
- outlining the deck edge;
- navigational visual aids and obstruction lighting on nearby hazards, all of which can be in visible or NVG compatible and with Infra-Red LEDs be in a stealth mode, where only NVG personnel can see the light;
- general ship emergency lighting; lighting magazine shafts; ship identification numbers; accommodation ladders;
- artificial horizon bars;
- markings on carrier decks for better visibility and increased safety and efficiency. Automated here to act as an aircraft guidance / traffic signals, with the idea of increasing the safety as well as reducing the manpower on carrier decks;
- guidance characteristics for the well decks for landing craft;
- marking cleared lanes in the sea / beach for landing craft;
- increasing the visibility on buoys for navigation;
- helping in salvage operations by outlining cables in the sea and guiding divers in difficult to see operations for underwater wrecks;
- lighting / outlining, highlighting, gantries, corridors, steps, ship numbers
- aircraft carriers for outlining the deck elevator gaps when the aircraft elevator shaft is collecting aircraft.
- underwater ships port perimeter security light in ports, since the system is completely submersible and is not affected by seawater / salt;
- various (360°) light navigational lighting applications;

- areas where previously no lighting would have been installed, as it would not have survived, such as in the bilges of ships. Prepositioned for years, it is not used but is still available when needed;
- submarines escape chamber lighting and lighting for a variety of other areas.

The possibilities for providing extremely tough, corrosion resistant, submersible, lighting for military applications is endless. Could LEDline® be of use for you?

----- The World's Toughest
Light; linear LEDline®, day / night visible, corrosion resistant,
submersible, and other LED lighting; for improving safety and
guidance anywhere!!

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