

MISSION:

A WORLD OF INNOVATION



TURI Industry Incentive Grant Project

Janitorial Cleaning Chemical Reduction- Andover Facility

Donna Laviolette

04/03/2014

Raytheon Government and Defense Business

Raytheon Company
William H. Swanson

Integrated Defense Systems

Daniel J. Crowley



Intelligence, Information and Services

Lynn A. Dugle



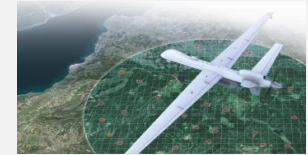
Missile Systems

Taylor W. Lawrence



Space and Airborne Systems

Richard R. Yuse



Core markets: Sensing, C3I, effects, mission support and cyber

Integrated Defense Systems



Daniel J. Crowley
President



2013 Net Sales: **\$6.5B**

Headquarters: **Tewksbury, Mass.**



Serving customers worldwide with air & missile defense; radars; C4I; air traffic management; and naval systems



- Integrated air & missile defense
- Battlefield, land and sea-based radars
- C4I for defense & civil markets
- Air traffic management
- Sonar, navigation, integrated bridge & shipboard combat systems
- Systems integration



Integrated Defense Systems

Our Vision

To be the most admired defense and aerospace systems company through our world-class people, innovation and technology

- 2013 revenue of \$6.5 billion
- 2,500 contracts
- Over 15,000 global employees
- 25 locations
- Global customer base
- Headquarters: Tewksbury, Mass.



Integrated Defense Systems Locations



UNITED STATES



INTERNATIONAL



IDS Headquarters
Tewksbury, Mass.



Huntsville, Ala.



Portsmouth, R.I.



Raytheon Australia
Canberra, Australia



Billerica, Mass.



San Diego, Calif.



McKinney, Texas



Raytheon Anschutz
Kiel, Germany



Andover, Mass./
Pelham, N.H.



Fullerton, Calif.



Salt Lake City, Utah



Jeddah, Saudi Arabia



Woburn, Mass.



St. Petersburg, Fla.



Arlington, Va.



Abu Dhabi, UAE



Sudbury, Mass.



Raytheon Solipsys
Fulton, Md.



Keyport, Wash.



Raytheon Canada
Waterloo, Canada



Marlborough, Mass.



White Sands, N.M.

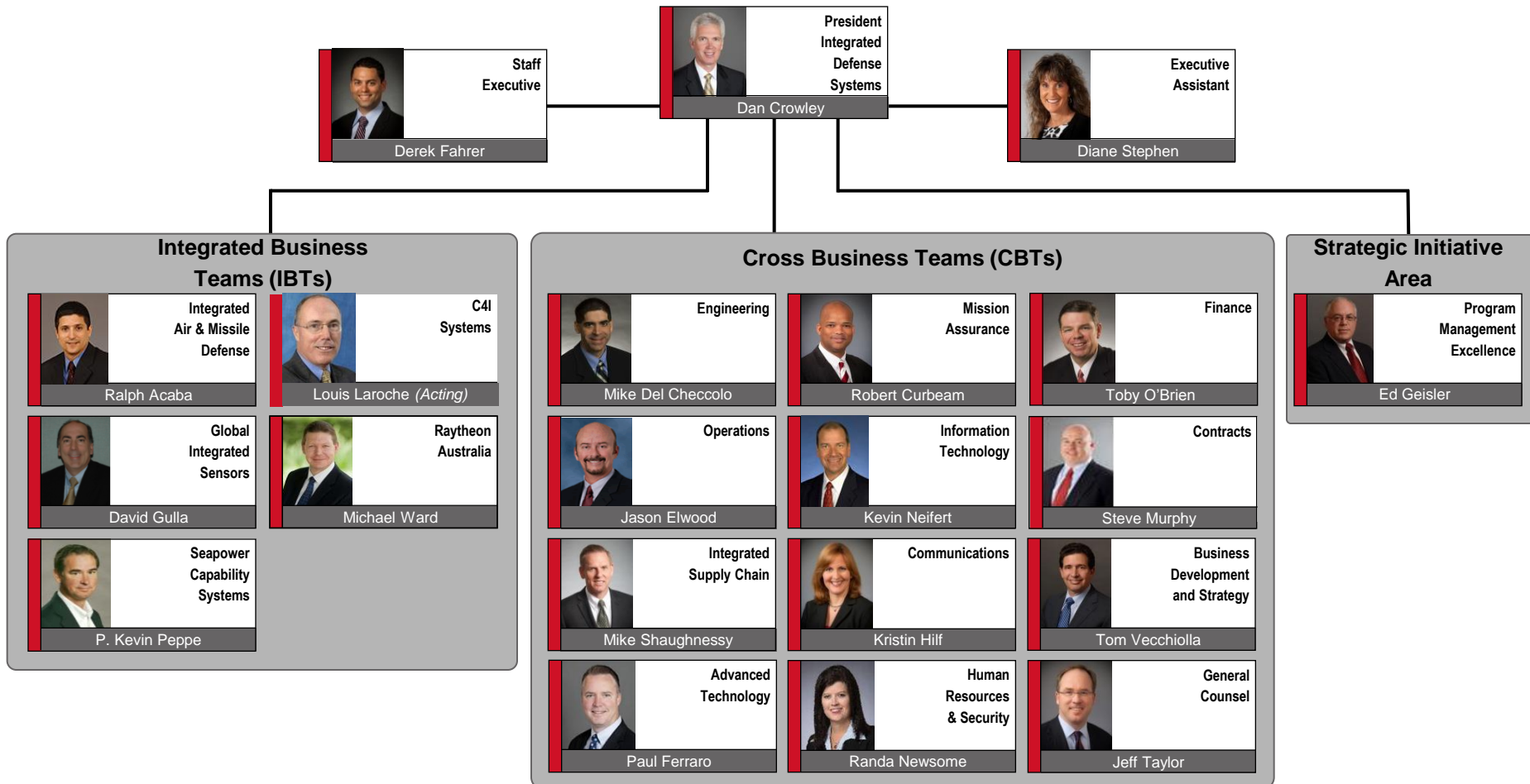


Raleigh, N.C.



Taipei, Taiwan

IDS Business Leadership Team



Leading through accountability, collaboration and respect

IDS' Four Core Capabilities

Integrated Air and Missile Defense



- IDS delivers combat-proven performance against the complete spectrum of airborne and ballistic missile threats.
- Patriot, Hawk XXI, JLENS, NASAMS, THAAD

Naval Combat Systems and Electronics



- IDS is established in the design, development, production, integration and support of innovative and affordable ship systems.
- DDG 1000 technologies, naval radars, sonar, torpedoes, ship combat systems, navigation and bridge systems

Large Ground and Naval Radars



- IDS is a world leader in large scale radar development, technology and production.
- AN/TPY-2, AMDR, Upgraded Early Warning Radar, SBX

C4I Systems



- IDS has more than 45 years experience in developing command and control systems for defense and civil requirements.
- FAA and global air traffic systems, U.S. Air Force battle control system, multiple national sovereignty systems

IDS is a leader and innovator across four core capability areas

Integrated Air and Missile Defense

Ralph Acaba
Vice President



Headquarters: **Andover, Mass.**



Integrated Air and Missile Defense systems are the world's most sophisticated short-, medium- and long-range, low- to high-altitude, all-weather air and missile defense systems.

- Patriot is the premier, combat-proven air and missile defense system protecting the U.S. and allied forces around the world, providing the foundation for a global, regional and theater integrated air and missile defense architecture.
- National Advanced Surface-to-Air Missile System (NASAMS) is a tailorable, state-of-the-art air defense system that can defeat current and emerging cruise missile threats and a wide range of air breathing threats.
- Hawk XXI provides the warfighter with a high-lethality, high-firepower air and missile defense system with full interoperability with Patriot and NASAMS.

Proven air and missile defense

Global Integrated Sensors

Dave Gulla
Vice President



Headquarters: **Woburn, Mass.**



Leading developer of advanced multi-purpose systems and situational awareness systems.

- Proven capabilities over decades, around the world and in combat.
- Global leader in radar solutions.
- Developing and fielding advanced solutions in all domains – air, land, sea, space.

**Solutions for integrated sensing
and situational awareness**

Seapower Capability Systems

Kevin Peppe
Vice President



Headquarters: **Portsmouth, R.I.**



Leveraging our extensive experience and proven technologies, Seapower Capability Systems delivers affordable and effective solutions that advance the performance and capabilities of surface and undersea warfare missions for navies worldwide.

- Ship defense systems
- Sensor systems:
 - Naval radars
 - Integrated undersea warfare
- Undersea weapons
- Naval and maritime bridge and navigation systems
- Reliable performance and proven technologies for naval forces worldwide

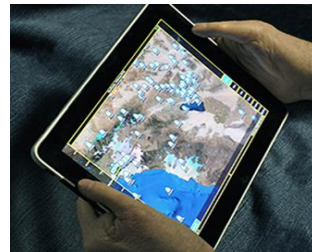
Global naval capabilities integrator

Command, Control, Communications, Computers and Intelligence (C4I) Systems

Louis Laroche
Vice President
(Acting)



Headquarters: Fullerton, Calif.



Providing command and control systems for air, land and joint operations, as well as modern battlefield radars for weapon-locating and air defense. Thales Raytheon Systems, a major component of the C4I business, focuses on air C4I and battlefield radar with more than 600 units fielded in 24 countries worldwide.



- Global air traffic management systems serve more than two-thirds of the world's airspace, providing safe transportation for more passengers than any other company in the world.
- Air, land, joint and tactical command and control systems for national sovereignty protection, battlespace awareness, mission planning and execution.
- Battlefield radars for short- and medium-range weapon location, air surveillance and weapon coordination.

Global C4I leader

TURI Industry Incentive Grant

Janitorial Cleaning Chemical Reduction Andover Facility

The Project

- IDS sites in the Northeast used a 3M dilution system for all required cleaning. It includes glass cleaner, bowl cleaner, disinfectant and neutral cleaner for floors.
- In an effort to become more environmentally friendly, safer and cost efficient, a pilot study was conducted in Woburn comparing 3M, SC Johnson Diversey and Lotus® PRO.
- An additional pilot study was conducted at Tewksbury between 3M and SC Johnson Diversey.

3M System

Pros

- Dispensers function properly
- Cleaners are effective
- Less PPE required than Diversey

Cons

- Less Green than Diversey
- Cost slightly higher than Diversey

Diversey- SC Johnson

Pros

- Cheaper than 3M
- Greener than 3M
- No Red List chemicals used
- LEED Gold status

Cons

- Dispensers malfunction
- Glass cleaner streaks
- Bowl cleaner ineffective
- Some cleaners less effective

An Alternative to Cleaning Chemicals

lotus

HOW IT WORKS

INDUSTRIES

PRODUCTS

INNOVATION

MEDIA

lotus PRO

High Capacity Wall-Mount Unit

Model #LQFC225K

The lotus® PRO High Capacity Unit transforms water into aqueous ozone on-the-spot. Produces a continuous flow of approximately 2.5 gallons of aqueous ozone per minute which is then easily transferred for use in mop buckets, floor cleaners and auto scrubbers. It provides residue-free performance for a longer lasting clean and low slip/fall hazard on even the smoothest floors.

About the Cleaning System

Aqueous ozone is nature's most effective cleaner, stain remover, deodorizer and germ killer. It eliminates pathogens, grime, grease, mold, mildew and more from any porous or non-porous surface. It's also 50% more powerful than chlorine bleach and leaves no residues, reverting back to water and oxygen after heavy-duty cleaning.

Increase productivity by eliminating rinsing and the need for stocking, fetching and guesswork in using multiple chemical cleaners. Beats out quat-based and "green" cleaners in TURI tests.

Aqueous ozone produced by this unit maintains its cleaning power for up to 24 hours.

For mounts and other add-ons, see our [Accessories](#).



Cleaning with Aqueous Ozone

About lotus® PRO

- A 1,600 gallon filter/stabilization unit allows 4 hours of product working time
- An 800 gallon filter/stabilization unit allows 24 hours of product working time

Current Regulatory Approvals

With the needs of our customers in mind, Tersano designed the **lotus PRO** system with the most advanced innovative technology, providing a natural and safe solution for all cleaning needs and applications. Our company strongly believes in using only the highest standards with all of our products and **lotus PRO** exceeds specific regulations in our industry.



How It Works - Sustainable Cleaning Solution



1. Cold tap water enters the **lotus PRO** Stabilization Module.
2. The **lotus PRO** Stabilization Module mixes with the cold tap water stream, expanding the cleaning time up to 24 hours.
3. Treated water leaves the **lotus PRO** Stabilization Module.
4. Water passes through the FloJet connector, which prevents back flow with air lock, then enters the **lotus PRO** High Capacity Unit.
5. Oxygen enters the dispenser through the replaceable filter cartridge.
6. 4,500 volts of electricity transforms O₂ to O₃.
7. Ozone gas that is not saturated in the water is separated and safely dispensed as oxygen.
8. Aqueous ozone leaves the dispenser to fill mop buckets, trigger sprayers, autoscrubbers and carpet extractors.

Pros

- Greenest solution
- Good deodorizer
- No chemical odor complaints
- Great window cleaner
- One product does all
- Cleans sinks, counters and bowls with no problem
- No sticky residue left behind on floors after washing
- Can be used for cleaning carpet

Cons

- Will not remove heavy soap scum
- Requires training and diligence in changing water when effective time elapses

Preferred Choice of Raytheon

Cost Analysis



| Site | Chemical Expenditure 2012 |
|----------------------------|---------------------------|
| Andover | \$19,547.95 |
| Andover - Dukes & Plymouth | \$1,788.66 |
| Andover - Middlesex | \$1,019.09 |
| Billerica | \$5,328.09 |
| Marlboro | \$5,913.71 |
| Pelham | \$460.63 |
| Portsmouth | \$7,317.84 |
| Sudbury | \$2,651.40 |
| Tewksbury | \$13,753.35 |
| Waltham – Winter Street | \$6,208.91 |
| Waltham – Wyman Street | \$1,862.58 |
| Wobun | \$7,433.72 |
| Total | \$73,285.93 |

- Eliminates annual chemical cost of \$73K
- Lotus Pro High Capacity Unit \$1,981
 - One time cost per unit installed
 - Estimated 89 units = \$176.3K
- Lotus Pro Filters \$91 (Estimate two filter changes annually)
 - Estimated 180 filters = \$16.2K
- **Total first year investment = \$192.5K**

Eliminates Daily Use Chemicals

E.Coli Test Results Between Re-Juv-Nal and Lotus® PRO Aqueous System

Sample date 9 July 2012 Incubated for 20 hrs @ 37°C CFU = Colony Forming Unit

| Column1 | Column2 | Column3 | Column4 | Column5 | Column6 | Column7 | Column8 | Column9 | Column10 |
|-----------|-----------|--------------------------|---------|-----------|--------------------|-----------|-----------------------|---------------------|----------|
| R2A media | sample ID | No treatment (NT) | | sample ID | (R)ejuvnal® | sample ID | Lotus Pro (LP) | | |
| | | CFU | | | CFU | | CFU | | |
| E.Coli | M5-1A NT | 5 | | M5-1A R | 2 | M5-1A LP | 1 | Break room | |
| E.Coli | M5-1B NT | 4 | | M5-1B R | 0 | M5-1B LP | 0 | microwave counter | |
| E.Coli | M5-2A NT | 334 | | M5-2A R | 22 | M5-2A LP | 4 | Break room | |
| E.Coli | M5-2B NT | 130 | | M5-2B R | 18 | M5-2B LP | 12 | sink faucet area | |
| E.Coli | Control 1 | no growth | | | | | | | |
| E.Coli | M5-3A NT | 14 | | M5-3A R | 0 | M5-3A LP | 0 | Break room | |
| E.Coli | M5-3B NT | 4 | | M5-3B R | 0 | M5-3B LP | 0 | table | |
| E.Coli | M5-4A NT | 10 | | M5-4A R | 0 | M5-4A LP | 0 | Break room | |
| E.Coli | M5-4B NT | 7 | | M5-4B R | 0 | M5-4B LP | 1 | outdoor exit handle | |
| E.Coli | Control 2 | no growth | | | | | | | |
| E.Coli | M5-5A NT | 30 | | M5-5A R | 21 | M5-5A LP | 0 | Sink #1 | |
| E.Coli | M5-5B NT | 112 | | M5-5B R | 0 | M5-5B LP | 1 | Men's room | |
| E.Coli | M5-6A NT | 0 | | M5-6A R | 5 | M5-6A LP | 0 | Men's room | |
| E.Coli | M5-6B NT | 0 | | M5-6A R | 6 | M5-6B LP | 1 | Door handle | |
| E.Coli | Control 3 | no growth | | | | | | | |

Better Results Without the Complications of Chemicals

Recommend Lotus® PRO

- Reduced cost
- Elimination of many chemicals
- Safest system - no chemicals!
- Reduction in material handling
- Reduction in material ordering
- Reduced storage requirements
- Outperformed 3M and Diversey

Raytheon