

Liberty Defense Holdings Ltd.

Internet of Things

25 March 2022

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Overview

Liberty Defense (SCAN-TSXV) is a provider of threat detection security solutions designed for sensitive, high foot traffic areas, including airports, sports venues, and other public spaces. The company's flagship HEXWAVE™ product combines millimeter wave sensors and machine learning technology to detect metallic and non-metallic threats, without the need to divest articles of clothing, phones, wallets, etc. Pieces of the foundational technology are licensed from the MIT Lincoln Laboratory. Over the last several years, the company has overhauled its management team, now populated with industry veterans with significant experience (including several with connections to L3/Leidos' ProVision scanner product team). Liberty Defense is headquartered in the greater Boston, MA area, with additional engineering space in the Atlanta, GA area.

Advancing next-gen threat detection

Our experience following this space and the companies participating in it has given us a healthy respect for the challenges in commercializing this type of product. With that said, Liberty Defense's management believes it has made significant progress advancing its threat detection technology. We recently had the opportunity to meet the new management team and observe a live demonstration of the HEXWAVE product in action:

- **Detection of both metallic and non-metallic threats.** The product detected handguns (including 3D printed) and IEDs (e.g., pipe bombs, plastic explosives).
- **Ability to see through layers of clothing.** Millimeter wave technology allows the sensors to see through clothing and detect objects that are hidden closer to the body. This reduces or eliminates completely the need to remove jackets or other clothes. Importantly, the system abstracts and anonymizes physical characteristics. Liberty believes HEXWAVE's unique use of low-rate radio frequency delivers a competitive advantage over existing systems installed at airports.
- **Can learn to ignore permissible objects.** Liberty claims its algorithms can be taught to recognize phones, wallets, and keys that trigger a response from existing metal detectors.
- **A form factor management considers close to commercialization.** While there are multiple applications of the fundamental technology, the HEXWAVE product is presented as a walk-through, gate-style set-up that allows a relatively rapid throughput, particularly in relation to what people currently experience in places like airports.

A clear end-market use case

The weapons detection security solutions market opportunity remains robust, with MarketsandMarkets forecasting the physical security market to be worth US\$48.2B in 2026, a CAGR of 5.2% from 2021. Rising instances of terrorist activity globally, mass shootings, and other physical attacks could increase the demand for threat detection products, particularly as the world returns to pre-COVID activity levels.

What to look for next from Liberty Defense

The company has outlined the following expected near-term milestones:

- **Beta 1.0** - Currently in progress, this phase includes data collections and algorithm tuning of HEXWAVE.
- **Beta 2.0** - Trials are expected by August 2022, whereby the product will be hardened for field use.
- **Initial production of HEXWAVE** - Targeted for December 2022. Discussions are in process with a contract manufacturing partner.

Key Metrics

Price	C\$0.40	CEO	Bill Frain
Market Cap (M)	C\$36.1	CTO	Mike Lanzaro
Shares Out (M)	90.1	CFO	Omar Garcia
LTM Revenue (M)	C\$0.0	VP,Eng.	Jeffrey Gordon

Management

Headquarters

Liberty Defense Holdings Ltd.
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Wilmington, MA, 01887
888.617.7226

Global locations

HQ in Wilmington, MA and a
Center of Excellence for
Engineering in Atlanta, GA

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Liberty Defense

Company description

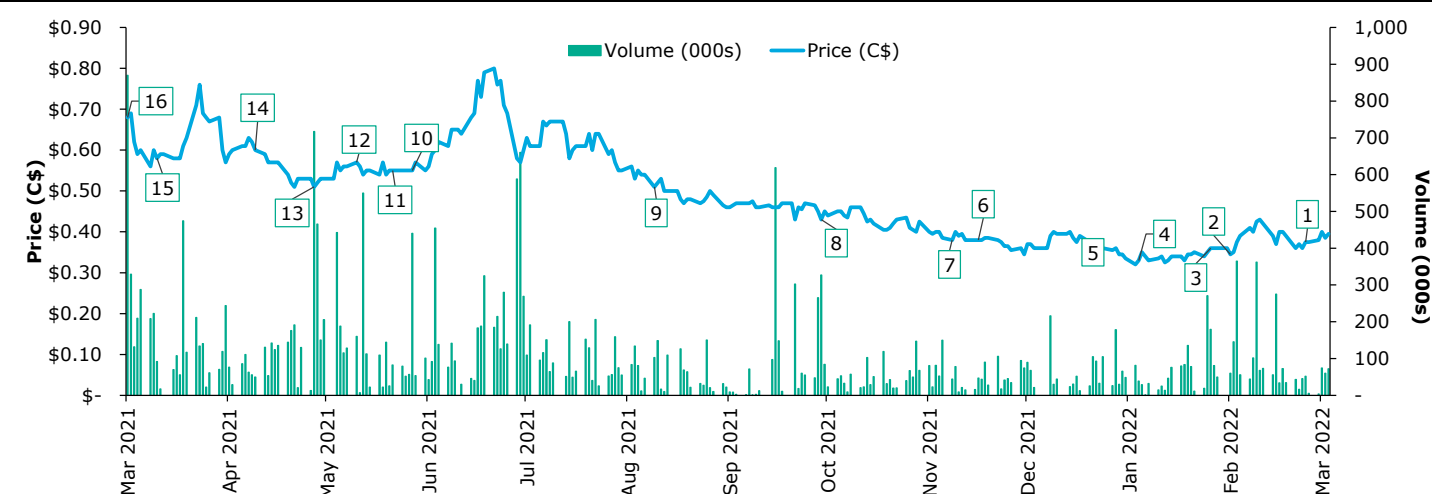
Figure 1: Liberty Defense logo



Founded in 2018, Liberty Defense is a provider of multi-technology security solutions for concealed weapons detection in enhanced security, high-volume foot traffic locations, including airports and sports stadiums among others. The company's HEXWAVE product leverages an exclusive license from the Massachusetts Institute of Technology (MIT) and uses 3D imaging and AI to detect metallic and non-metallic concealed threats to warn security staff before a threat is carried out. The company also provides aviation security screening solutions. In 2021, Liberty announced contracts with the TSA and Maryland Stadium Authority to deploy HEXWAVE and looks to commercially release HEXWAVE to the market in 2022.

Source: Company Reports

Figure 2: Annotated stock chart

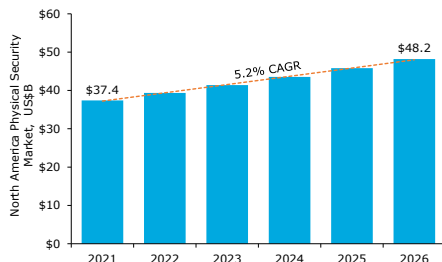


ID	Date	Time	Event	Reaction
1	Mar 17, 2022	Intra-day	Announced closing of \$8.6M private placement.	4.2%
2	Feb 22, 2022	BMO	Announced a HEXWAVE trial to be conducted at Toronto Pearson International Airport in Q3 2022.	-4.2%
3	Feb 16, 2022	BMO	Announced receipt of an FCC order for HEXWAVE permitting its certification and marketing.	2.9%
4	Jan 25, 2022	BMO	Announced HEXWAVE test at Atlanta Temple of Major Global Hindu Organization.	3.1%
5	Jan 11, 2022	BMO	Announced signing of University of Wisconsin to test HEXWAVE walkthrough screening.	-6.7%
6	Dec 07, 2021	BMO	Announced signing of Maryland Stadium Authority, Camden Yards Sports Complex as Beta client.	0.0%
7	Nov 29, 2021	AMC	Q3 2021 results.	5.3%
8	Oct 20, 2021	BMO	Announced \$500,000 contract award from TSA for HEXWAVE system.	-4.4%
9	Aug 30, 2021	BMO	Q2 2021 results.	-5.6%
10	Jun 17, 2021	Intra-day	Announced closing of \$7.13M oversubscribed brokered private placement.	0.0%
11	Jun 11, 2021	Intra-day	Announced upgrade to OTCQB Venture market in US.	0.0%
12	May 31, 2021	AMC	Q1 2021 results.	-1.8%
13	May 18, 2021	BMO	Announced \$5M private placement.	-3.8%
14	Apr 30, 2021	AMC	FY2020 results.	-1.7%
15	Mar 31, 2021	BMO	Announced US\$1M grant from BIRD Foundation and Department of Homeland Security.	-3.3%
16	Mar 22, 2021	BMO	Resumption of trading on TSXV; announced reverse split of 1 for 6.2 shares.	46.2%

Source: FactSet, Company Reports

Market overview

Figure 3: North America Physical Security Market (2021 – 2026)



Source: MarketsandMarkets

Figure 4: Worst US mass shootings (since 1991)

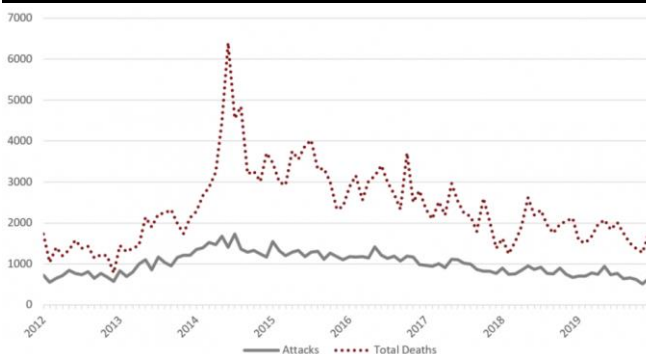


Source: FBI, Las Vegas Police, BBC

The use case for weapons detection systems continues to be underscored by a rise in global terror attacks and active shootings. Eleven of the worst mass shootings in the United States have occurred since 2015, with the deadliest, the Las Vegas Strip Massacre, occurring in 2017 (Figure 4). We highlight key data points below:

- The North American Physical Security market is expected to grow to US\$48.2B by 2026 from US\$37.4B in 2021, a CAGR of 5.2% according to MarketsandMarkets. Growth is expected to be attributed to the digital transformation enabled by video security systems, integration of AI and machine learning (ML) technology, analytics, and the convergence of integrated security systems.
- Future Market Insights projects the global concealed weapon detection systems market to grow at a 6% CAGR between 2020 and 2030, with millimeter wave body scanners projected as the most attractive opportunity worth US\$760M over the period.
- Global military spending increased to US\$1,981B in 2020, an increase of 2.6% from 2019, with 62% of expenditures coming from the US, China, India, Russia, and the United Kingdom. The growing threat of terrorist attacks and concerns over safety is likely to increase the demand for concealed weapon detection systems, particularly as the global economy continues its recovery from COVID-19 shutdowns.
- The Washington Post has found 292,000 students across 310 schools have been affected by school shootings in the United States since the Columbine High Massacre in 1999. 2021 saw 34 school shootings, the most since at least 1999, despite rolling lockdowns that closed in-person classes across various states and school districts.
- The Global Terrorism database notes there were ~8,500 terror attacks worldwide in 2019, killing more than 20,300 people amidst increasing violence in Afghanistan, the Islamic State's expanding global impact, and increases in racially and ethnically motivated terrorism.
- MarketsandMarkets notes the global threat detection systems market was valued at US\$43.38B in 2015 and is estimated to reach US\$119.17B by 2022, a CAGR of 13.11%. MarketsandMarkets points to increasing acts of terrorism that have led to some terror-affected governments mandating advanced security systems at airports, commercial centers, and tourist destinations.

Figure 3: Terror attacks and casualties (2012 – 2019)



Source: Global Terrorism Database

Figure 4: Gun-related killings as % of all homicides



Source: FBI, Home Office, Australian Bureau of Statistics, Statistics Canada, BBC

Products and services overview

Figure 5: HEXWAVE portal



Source: Company Reports

Liberty Defense's core offerings are being developed to serve customers screening patrons at high-volume foot traffic venues such as airports and transit hubs, sports stadiums, schools, and places of worship. The company is positioning its products as superior to incumbent walkthrough portal systems in its use of artificial intelligence (AI) and deep learning to detect threats while enabling uninterrupted traffic flow and maintaining patron privacy. The company's products are built atop technologies secured via licenses with labs at MIT and the Pacific Northwest National Laboratory.

Liberty Defense develops its products through a Center of Excellence location in Atlanta, GA, and recently established a 6,000 sq. ft. office and engineering space in Wilmington, MA, to serve as the company's new headquarters effective September 2021. The company currently has 21 employees, including 13 engineers across its two locations.

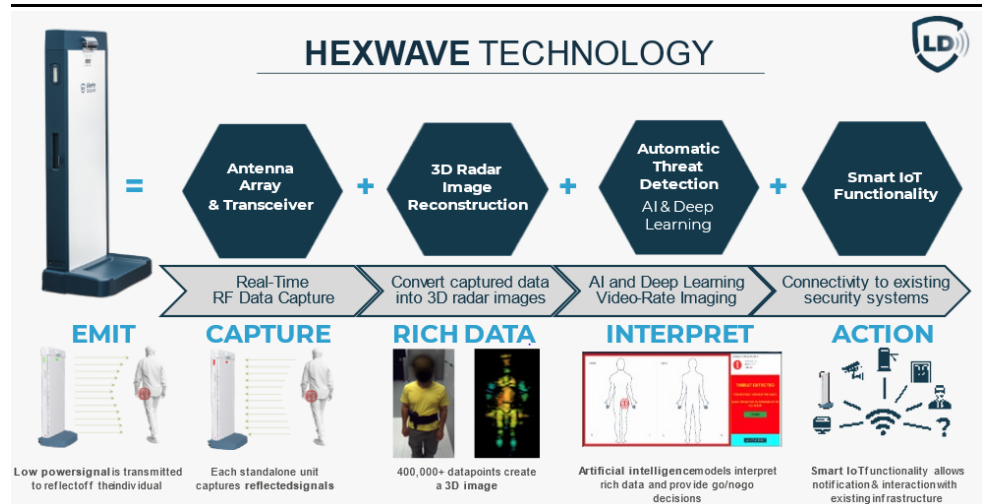
HEXWAVE

Active Real-Time 3D Imaging Technology

HEXWAVE is being developed as an active 3D imaging technology system to detect concealed threats in high-volume foot traffic areas. The system is being built atop intellectual property from the Massachusetts Institute of Technology Lincoln Labs (MIT LL), which had been developing the core technology since 2014. MIT LL successfully tested a pre-prototype of the active imaging technology in 2017. In 2018, MIT LL began transferring the IP to Liberty Defense for ongoing development. Liberty Defense now holds the exclusive license for the use of this technology underpinning HEXWAVE until December 2035.

HEXWAVE's threat detection platform consists of four major subsystems (as shown in Figure 6 below). The platform first emits a low-power energy signal to capture reflected energy which it then uses to create real-time 3D images to detect weapons through clothing and hand-held baggage. The 3D images are then processed through the system's automated threat detection system that leverages AI trained on over 400k datapoints to determine whether there is a threat item in the images. The decision is then communicated through existing security infrastructure and personnel. The company notes that no personally identifiable information is gathered or used as the AI engine only processes the images and 3D data collected.

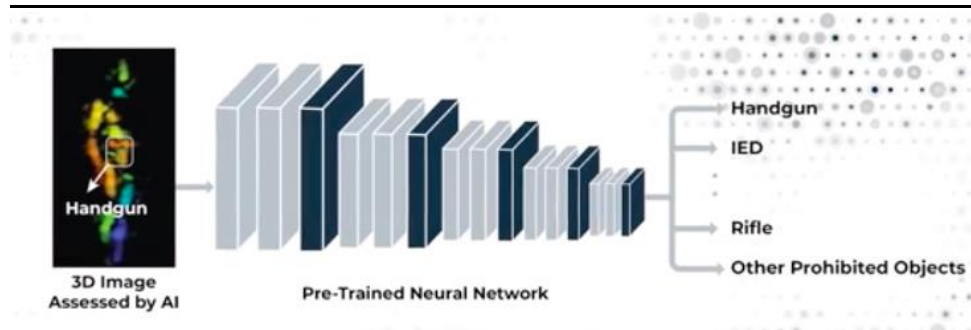
Figure 6: HEXWAVE overview



Source: Company Reports

AI and Deep Learning – Automatic Threat Recognition (ATR). The company is leveraging the 3D data and images collected by HEXWAVE to train its in-house artificial intelligence (AI) engine to recognize concealed metal and non-metal threats in the third step noted in Figure 6. The algorithms can work at a frame capture rate of 10 images per second to determine and detect, based on changes in a person's positioning, whether security personnel need to take immediate action, such as additional questioning or detainment for further analysis. Below is an illustration of this ATR system at work (Figure 7). The company expects to improve ATR and HEXWAVE generally through over-the-air (OTA) algorithm and software updates as the AI improves and gains sophistication in catching emerging types of threats and weaponry.

Figure 7: HEXWAVE AI overview



Source: Company Reports

Since the HEXWAVE system emits radio-frequency (RF) energy, it therefore needs a Federal Communications Commission (FCC) certification to approve its testing, marketing, and sale in the US market. In April 2019, the company was granted an experimental license by the FCC to test HEXWAVE at its Atlanta operations and has subsequently received additional experimental licenses for certain Beta test sites in the US. The company was initially anticipating an FCC certification in Q2/20; however, the timeline was pushed back after the company decided to reallocate some resourcing into further Beta prototyping development. In February 2022, the company received an FCC waiver on its rules governing ultra-wideband (UWB) devices, which permits HEXWAVE to continue towards final certification and commercialization. Prior to official launch, the company also intends to secure an Underwriters Laboratories certification. For sales into the EU market, the company expects to pursue Conformité Européenne certification. The company has outlined its HEXWAVE roadmap to the end of 2022 as follows:

Figure 8: HEXWAVE roadmap

Targeted Completion	Milestone	Status
	Beta 1.0 • Develop portals to enable data collection and algorithm tuning	In Progress
End of June 2022	Beta 2.0 • Harden the portals for field use • Beta trials	-
December 2022	Beta 3.0 • Secure contract manufacturing partner	Discussions in Process

Source: Company Reports

Figure 9: Maintenance fee payment schedule to MIT LL

Year	Amount (US\$000s)	Status
2019	\$20	Paid
2020	\$50	Paid
2021	\$60	-
2022	\$100	-
2023	\$200	-
2024 and thereafter	\$350/year	-

Source: Company Reports

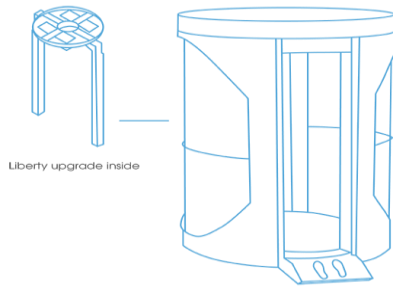
License agreement and partnership with MIT Lincoln Labs. The company maintains an R&D agreement with MIT LL in the development of certain elements of the HEXWAVE system. Under the license agreement, the company is required to meet ongoing commitments to MIT LL to maintain its right to the IP: 1) annual maintenance fees under the schedule described in Figure 9; 2) royalty of 5.7% of all future net sales; and 3) the achievement of certain milestones as outlined in Figure 10 below. MIT LL can provide notice of default if Liberty Defense fails to meet any of these obligations, and if not rectified within 60 days, it can terminate the exclusive license.

Figure 10: Required milestones to maintain exclusive license to MIT LL patent

Required Completion Date	Milestone	Status
10/01/2018	\$6M+ in equity financing	Complete
10/01/2019	Develop an engineering prototype	Complete
12/01/2019	Develop a beta prototype	Complete
08/01/2019	Enter into 2 customer trials for development and commercialization	Complete
03/01/2022	Complete 1+ commercial sale of the HEXWAVE product	-
2022	Achieve \$2M in net sales	-
2023	Achieve \$5M in net sales	-
2024	Achieve \$8M in net sales	-
2025	Achieve \$12M in net sales	-

Source: Company Reports

Figure 11: Airport scanner mockup



Source: Company Reports

Figure 12: Royalty Schedule

Timing	Expense Type	Amount (US\$000s)	Status
04/13/2021	License Fee	\$30	Paid
10/13/2021	License Fee	\$30	-
01/22/2022	Prior Patent Expenses	\$50	-
Year 1 of Revenues	Royalty	\$50	-
2024 and thereafter	Royalty	\$200/year	-

Source: Company Reports

Aviation Security

Liberty Defense has also gained exclusive licenses to High-Definition Advanced Imaging Technology (HD-AIT) using millimeter wave technology developed by the Pacific Northwest National Laboratory to address the airport security scanner market. We provide more detail on this agreement below. Liberty Defense sees the potential for HD-AIT to improve on existing market solutions by improving the scanning penetration level to detect concealed threats beneath clothing without requiring passengers lift their arms over their heads. The technology in development also includes a footwear screener to detect threats inside shoes while being worn instead of requiring removal, which would remove a passenger inconvenience and potentially accelerate the screening process flow. Figure 11 is a mockup of how the HD-AIT and footwear screener system could be implemented in an airport setting.

License agreement with Battelle Memorial Institute. The company considers itself well positioned from a patent perspective. In April 2021, Liberty licensed the millimeter wave-based, High-Definition Advanced Imaging Technology (HD-AIT) body scanner and shoe scanner from Battelle Memorial Institute. The patents were developed by the Pacific Northwest National Laboratory (operated by Battelle) and was funded by the US Department of Homeland Security. The license provides Liberty exclusive use of certain patents for three years, after which the license will become non-exclusive for the remaining patent life. Liberty also received certain non-exclusive patents at the inception of the agreement. Under the license agreement, the company has to meet the following commitments to Battelle (as shown in Figure 12): 1) license fees of \$30k both at time of closing and after six months; 2) compensation for prior patent expenses; and 3) minimum annual royalty payments. Royalties also include payments of 5% on net sales and 25% on all sublicensing revenues (if permitted).

Figure 13: Concealed gun on hip



Source: Company Reports

Wilmington, Massachusetts site tour

We visited the company's recently established US headquarters in Wilmington, MA, to attend a demonstration of the HEXWAVE system.

The demonstration consisted of two HEXWAVE systems pointed towards each other to capture both sides of a person passing through the checkpoint. The results were compared with a traditional standing metal arch next to it to show the purported advantages of the new technology. The system was then challenged with a variety of weapons, including handguns and IEDs such as pipe bombs and C4. The company demonstrated the following:

- The system captures images with a high degree of frequency which gives the algorithm many opportunities to recognize a threat. This provided a high true positive rate for the threats observed during the demonstration.
- Both plastic and metal weapons were recognized.
- Weapons were hidden under a number of different articles of clothing including coats.
- The varying body types of people who tested the device did not noticeably alter the performance.
- Attendees had the opportunity to alter weapons in an attempt to fool the system, without success.

Figures 14 and 15 were captured from the live demonstration.

Figure 14: Snapshot of AI identifying and locking onto moving person



Source: Company Reports, Canaccord Genuity

Figure 15: Sample display of detected threat on security screen



Source: Company Reports, Canaccord Genuity

Recent announcements

- **February 22, 2022** – The company announced an agreement with The Greater Toronto Airports Authority (GTAA) to trial HEXWAVE in Q3/22 at Toronto Pearson Airport. This would represent the first airport trial for the HEXWAVE system.
- **February 16, 2022** – The company announced an order issued by the Federal Communications Commission (FCC) addressing the rules governing HEXWAVE, clearing the path for the product's final certification and commercialization. The FCC announced the waiver standard had been met for the organization's rules governing unlicensed ultra-wideband (UWB) devices.
- **February 14, 2022** – Liberty Defense announced a best-efforts broker private placement of up to 20M shares at a price of \$0.33 per share for gross proceeds of up to \$6.6M. Each unit will consist of one common share and one-half warrant at \$0.50. The financing was later upsized to \$7.5M on February 24, and closed March 17 for total gross proceeds of \$8.6M with the exercise of the over-allotment.
- **January 25, 2022** – Liberty Defense announced a collaboration agreement with a major Hindu organization to beta test its HEXWAVE technology at a temple outside Atlanta, GA. Beta testing is expected to begin in Q2/22.
- **January 11, 2022** – The company announced a collaboration agreement with the University of Wisconsin Police Department to beta test HEXWAVE at the UW-Madison campus. Beta testing is expected to begin in Q2/22 and into Q3/22.
- **December 7, 2021** – The company announced a Memorandum of Understanding with Maryland Stadium Authority to beta test HEXWAVE at the Camden Yards Sports Complex in the City of Baltimore. Testing is expected to begin in Q1/22 at the Complex.
- **October 26, 2021** – The company announced its appointments of Jeffrey Gordon as the company's VP of Engineering and Ajay Subramanian as its principal RF (Radio-Frequency) Design Engineer. Mr. Gordon brings expertise in RF, infrared (IR), and AI/machine learning techniques, with over 35 years of industry experience in developing products such as the ProVision™ body scanner at L3-Harris (now Leidos) deployed across most US and EU airport checkpoints. Mr. Subramanian joined Liberty Defense after serving at Raytheon over the past 12 years as a senior-level engineer focusing on RD design, correspondence with DARPA, and authoring papers and patents in the area of Wideband High Frequency.
- **October 20, 2021** – The company announced a \$500k contract award as part of the US TSA's On-Person Screening Capability Program. The funding is for demonstration and evaluation of HEXWAVE's ability to enhance detection and throughput performance in screening aviation workers at a TSA designated location.

Competitive landscape

The establishment:

Leidos Holdings, Inc. (LDOS-NYSE | Not Rated)

Leidos was founded as Science Applications International Corporation (SAIC) in 1969 and is a US-based developer of products and technologies spanning defense and intelligence, civil, healthcare, and other data and intelligence applications. In May 2020, the company acquired L3Harris Technologies' Security Detection and Automation business for \$1B in cash. The acquisition included L3H's portfolio of checkpoint CT scanners, people scanners, explosive trace detectors, and checked baggage screeners (among other equipment). The people screening portfolio includes its ProVision 2 and SafeView systems, with the former being the most widely deployed personal scanner in the world. Overall, Leidos has deployed over 2,400 of its millimeter wave body scanners across an install base of airports, courthouses, prisons, power plants, border crossings, and business facilities.

ProVision 2 features Automatic Target Detection, a software-based feature that can scan for metallic and non-metallic items (e.g., weapons, explosives, liquids, gels, plastics, etc.) and highlight areas of concern on a display for security personnel to further examine. ProVision 2 also claims a sub-six second total processing time per person that can result in up to 200-300 people processed per hour, depending on the application. SafeView features the ability to generate 3D black-and-white images can be equipped with algorithm driven auto-assist and auto-detect options. The company claims a sub-1.5 second multidirectional scan time per person.

Rapiscan Systems, Inc. (subsidiary of OSI Systems, Inc. (OSIS-NASDAQ | Not Rated))

Founded in 1993, Rapiscan is a US-based developer of X-ray inspection and radiation detection systems in over 170 countries. The company's Meteor family of people scanners include its 6E for aviation, 6WP (weatherproof), 6S (high sensitivity), and 6M (versatile). The 6E, 6S, and 6M can be outfitted with radiation detection to scan simultaneously for both metallic and radioactive threats at locations such as prisons, critical infrastructure, transportation hubs, and government facilities. Other pedestrian portals include its extra-wide PM-SPLIT-GN, which is designed for multiple users with baggage in high-traffic locations; PM700 for pedestrian and carry-on baggage; and TPM905, which is compact, water resistant, and transportable for use in outdoor events.

Smiths Group Plc (SMIN-GB | Not Rated)

Founded in 1851, Smiths Group is a UK-based developer of control systems and instruments through five segments: John Crane, Smiths Medical, Smiths Detection, Smiths Interconnect, and Flex-Tek. Smiths Detection serves end-markets in aviation, ports and borders, urban security, and defense, with products including sensors, inspection, and scanning equipment. The division's people screening solutions include its eqo system for aviation, which features automated detection using millimeter wave technology to uncover concealed objects and display corresponding markers on the person's screen representation. eqo can scan 3D images and uncover items including ceramics, metals, liquids, explosives, leaders, plastics, and narcotics, among others. The company's B-SCAN X-ray screening series is designed to help uncover on or in-body drugs, weapons, mobile phones, and other contraband in restricted environments such as prisons, mines, refineries, and customs checkpoints. The company claims a sub-seven second scan time.

Tek84, Inc.

Tek84 is a US-based developer of body scanning systems, dating back to its introduction of the world's first body scanner in 1991. The company's products are deployed with agencies including the US Transportation and Safety Administration (TSA), Department of Defense, and the State of Israel, among others. The company's three primary offerings are its Intercept, Defender, and Traveler portals.

The Intercept is used in law enforcement applications such as contraband screening at prisons; Defender for aviation, court houses, embassies, and other public sector applications; and Traveler as a portable version of Defender for military and dignitary protection applications. Defender and Traveler feature Automated Threat Detection software, which can examine computerized data from the scanner, detect hidden objects, and display them as yellow boxes on the body outline. The company believes its system, which uses background-level X-rays, is superior to millimeter-wave based ATD competitors in catching threats.

The newcomers:

Patriot One Technologies, Inc. (PAT-TSXV | Not Rated)

Patriot One is a Canadian developer of threat detection and counter-terrorism solutions, founded in 2010. The company's Multi-Sensor Gateway detects threats on individuals carrying concealed guns and knives into secured private or public spaces using a passive sensor array and can be installed in schools and stadiums among other locations. Patriot One's Video Recognition System combines digital camera feeds and AI to detect visible weapon threats, fights, and other health and safety issues. Incidents are displayed to authorized security personnel in real-time through the PATSCAN platform, ensuring timely response to issues. PATSCAN augments users' abilities in monitoring incidents, using real-time analytics and heads-up display solutions.

Evolv Technologies Holdings, Inc. (EVLV-NASDAQ | Not Rated)

Founded in 2013, Evolv manufactures and develops security screening products, providing AI-based solutions to casinos, industrial workplaces, and schools, among others. Evolv Express is the company's physical security screening product that reduces congestion through physical access points by screening individuals in a touchless manner, while maintaining a high degree of weapons detection accuracy. The company's Cortex AI software enables Express to integrate and process data from multiple sensors to better detect and learn from threats, while Insights Analytics provide security teams with the ability to access and visualize security system performance, visitor flow and sort through threats in real-time.

Thruvision Group Plc (THRU-GB | Not Rated)

Founded in 2009, Thruvision is a UK-based developer of passive people screening technologies. Its offerings include its HTC16 high-traffic camera for events; CPC16 checkpoint camera for airport screenings; and TAC8 and TAC16 for greater detection sensitivity on semi-stationary and moving people such as at customs and border crossings. The company's DynamicDetection AI provides colourized overlays in real time to help agents detect metallic and non-metallic contraband items.

Key competitive differentiators

Liberty Defense summarizes the purported key benefits of its HEXWAVE system over existing industry solutions as follows:

- Ability to detect both metal and non-metal objects.
- Indoor and outdoor versatility including for overt and concealed application.
- ATR enables quicker triaging of threats for further investigation using 3D data and AI/machine learning, saving time for security personnel.
- Accelerates traffic flow as it does not require people to first remove their keys, wallets, cell phones, shoes, and other items that could fall outside of coverage range of incumbent scanning solutions or produce false alarms. The company claims a sub-0.2 second process time per person (~1,000 people per hour).
- Privacy protection as it does not gather or analyze any personally identifiable information.
- Smart functionality enables connectivity/interoperability with existing security systems (e.g., video monitoring services, door locks/access control, networks).
- Ability to update its software and AI via OTA updates.
- Portability: HEXWAVE is easily transportable from one location to another.

Financial overview

Proposed revenue model

At this point, the company is still in the pre-revenue stage. Based on the pricing of available solutions, which range from standing metal arches to ProVision millimetre wave scanning booths, the company believes that it can price the product at US\$75K per unit. Once to scale, Liberty expects this to produce ~50% gross margins.

In addition to the upfront capital cost of the product to the buyer, there is also a services revenue stream that the user pays for support and maintenance of the product. This can be in the range of 15–25% of the upfront cost on an annual basis. The company believes this is particularly valuable as the product can be further improved after deployment through upgrades to the accompanying algorithms.

Current balance sheet and cash burn picture

The company ended Q3/21 with \$3.5M in cash but has recently completed an equity offering, bringing in gross proceeds of \$8.6M. We summarize the recent equity financings in Figure 16.

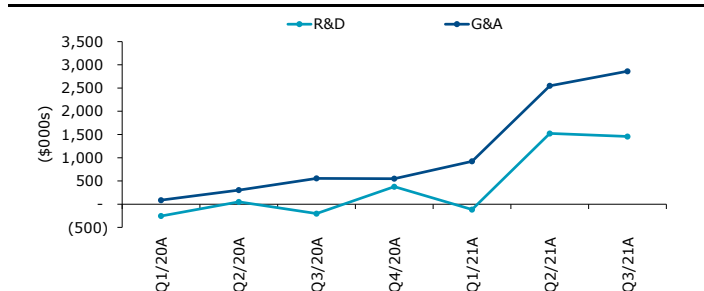
Figure 16: Recent financings

Date Closed	Transaction Type	Gross Proceeds (USD\$M)	Issuance Price (CAD\$/share)	Shares Issued (000s)	Hold Period	Warrants Issued (000s)	Warrant Exercise Terms
03/17/2022	Private Placement	CAD\$8.6	\$0.33	26,136	4 months	13,068 warrants 8% compensation warrants (2% for subscribers on SCAN's president's list)	- Warrants: CAD\$0.50 for 24 month term - Compensation warrants: CAD\$0.33 for 24 month term
06/17/2021	Private Placement	\$5.8	\$0.50	14,260	4 months	7,130 warrants 1,107 compensation warrants	- Warrants: CAD\$0.75 for 24 month term - Compensation warrants: CAD\$0.50 for 24 month term
03/12/2021	RTO with DrawDown Detection Inc.	\$5.5	\$0.40	17,250	-	8,625 warrants 1,098 compensation warrants	- Warrants: CAD\$0.60 for 24 month term - Compensation warrants: CAD\$0.40 for 24 month term
03/20/2019	RTO/Go-Public QT with Private Placement with Gulfstream Acquisition 1 Corp.	\$7.1	\$0.80	8,827	-	8,827 warrants	Warrants: CAD\$1.10 for 24 month term

Source: Company Reports

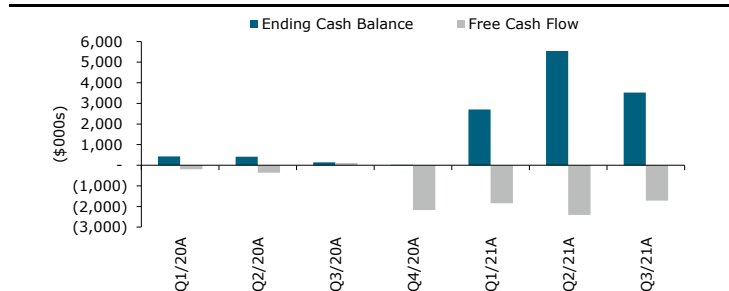
The company is currently averaging a ~\$2.0M quarterly free cash burn over the past year as it continues to develop its HEXWAVE technology, which includes beta testing and preparations for manufacturing. We summarize the recent R&D and G&A spend below, along with its cash position and free cash profile.

Figure 17: Quarterly opex



Source: Company Reports

Figure 18: Cash position and quarterly FCF



Source: Company Reports

Capital structure

Figure 19: Pro Forma Capitalization

<i>in 000s</i>	<i># of Shares</i>
<i>As of November 30, 2021:</i>	
Shares Outstanding (Basic)	63,993
Warrants	21,346
Options	3,668
Shares Outstanding (FD)	89,007
<i>Subsequent Activities:</i>	
- Options issued as per employee LTIP	100
March 2022 Financing:	
- Shares Issued	26,136
- Warrants Issued	13,068
- Compensation Warrants Issued	2,091
Shares Outstanding (Basic - Pro Forma)	90,130
Shares Outstanding (FD - Pro Forma)	130,402

*Figures adjusted for share consolidation

Source: Company Reports

Leadership team

Liberty Defense is led by CEO Bill Frain and President/CTO Mike Lanzaro who collectively control ~1.2% of the company's pro forma outstanding shares. In total, management and the board control ~3.4% of the company's fully diluted shares.

Figure 20: Management & board ownership

In 000s	Basic Shares	Options and Warrants	Fully Diluted Shares	% of Total Pro Forma FD
Leadership Team				
Daryl Rebeck	2,025	819	2,844	2.2%
Bill Frain	448	581	1,029	0.8%
Michael Lanzaro	-	500	500	0.4%
Total	2,473	1,900	4,373	3.4%

Source: SEDI, FactSet

Management team and board of directors

Bill Frain – Chief Executive Officer and Director

Mr. Frain has 25+ years of experience and was previously Senior Vice President for L-3 Security & Detection systems, leading global sales, business development and key account management.

Mike Lanzaro – President, Chief Technology Officer

Mr. Lanzaro has over 30 years of experience, most recently as the former Vice President of Engineering and Technology at L-3 Security & Detection Systems.

Omar Garcia – Chief Financial Officer

Mr. Garcia has over 20 years of experience in international accounting and previously held the role of CFO for a Canadian-listed public company.

Jeffrey Gordon – Vice President of Engineering

Mr. Gordon has 35+ years of experience developing imaging/sensing products for the military, medical, industrial, and commercial markets, and he previously spent five years at GE Global Research.

Jay Adelaar – SVP of Capital Markets

Mr. Adelaar has 10+ years of capital markets experience taking companies through the start-up to acquisition lifecycle.

Daryl Rebeck – Chairman of the Board

Mr. Rebeck has 20+ years of capital markets and senior leadership experience. Mr. Rebeck was formerly co-founder and president of publicly listed LexaGene and SVP of Corporate Finance at Auryn Resources.

Linda Jacksta – Director

Ms. Jacksta has 35 years of experience with US Customers & Border Protection, managing threats to border security and operational challenges. Ms. Jacksta is currently President of J2 Consulting Group.

Arjun Grewal – Director

Mr. Grewal is currently a Program Lead for IBM Cloud and is a 19-year veteran of the Canadian Armed Forces.

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Investment Recommendation

Date and time of first dissemination: March 25, 2022, 04:31 ET

Date and time of production: March 24, 2022, 20:22 ET

Distribution of Ratings:

Global Stock Ratings (as of 03/25/22)

Rating	Coverage Universe		IB Clients
	#	%	%
Buy	654	69.65%	41.13%
Hold	123	13.10%	21.95%
Sell	10	1.06%	20.00%
Speculative Buy	147	15.65%	53.74%
	939*	100.0%	

*Total includes stocks that are Under Review

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HOLD: The stock is expected to generate risk-adjusted returns of 0-10% during the next 12 months.

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An analyst has visited the material operations of Liberty Defense Holdings Ltd.. Full payment was received for the related travel costs.

Liberty Defense Holdings Ltd. Rating History as of 03/23/2022



Buy (B); Speculative Buy (SB); Sell (S); Hold (H); Suspended (SU); Under Review (UR); Restricted (RE); Not Rated (NR)

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