

Rakon Limited

Stars Align

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Rakon (RAK) is a New Zealand headquartered technology company specialising in high-frequency control systems and timing solutions. At the core of the product suite is the requirement for stable and highly accurate timing and frequency references to successfully transfer data and provide positioning information. Growing momentum in several potentially long-dated growth markets builds confidence in RAK's future.

NZX Code	RAK	Financials: Sep/	21A	22E	23E	24E	Valuation (x)	21A	22E	23E	24E
Share price	NZ\$1.79	NPAT* (NZ\$m)	9.6	31.2	19.5	23.2	PE	42.5	13.2	21.0	17.7
Spot Valuation	NZ\$2.26	EPS* (NZc)	4.2	13.6	8.5	10.1	EV/EBIT	36.9	11.5	17.8	14.8
Risk rating	Medium	EPS growth* (%)	n/a	n/a	-37.4	18.9	EV/EBITDA	17.8	8.2	10.6	9.0
Issued shares	229.1m	DPS (NZc)	0.0	0.0	0.0	5.1	Price / NTA	4.3	3.2	2.8	2.6
Market cap	NZ\$410m	Imputation (%)	0	0	0	100	Cash div yld (%)	0.0	0.0	0.0	2.8
Avg daily turnover	289.6k (NZ\$302k)	*Based on normalised profits					Gross div yld (%)	0.0	0.0	0.0	3.9

Key structural growth drivers – Technology play in 5G, low-earth-orbit satellites and autonomous vehicles

The three critical drivers for RAK's growth are the long-tail growth segments of 5G & data centre infrastructure, low-earth-orbit satellite (LEO) networks, and autonomous vehicles. First, the global rollout of 5G network infrastructure and data centres is the key driver of growth. Second, from FY24 the new breed of low-earth-orbit (LEO) satellites, with highly demanding performance specifications, provide RAK with a second growth platform. Third, as autonomy in the automotive, agriculture, mining and aircraft segments progresses demand for RAK's highest precision and accurate solutions should grow. RAK sits at the leading edge of these segments as it tilts away from the highly competitive, and lower margin, consumer products.

Stars align during FY22

The stars have aligned for RAK during FY22 as a beneficiary of the disruptions in global supply chains. These disruptions have opened the door to several new customers, providing management the opportunity to create enduring relationships, similar to that with its existing customers all while pushing higher specification products. Additional one-off business has come on at much better margins, driving operational leverage and lifting earnings in FY22 materially. However, RAK is not immune to potential supply issues with significant 4Q22 risks looming in sourcing key inputs. Core underlying market growth should fill most of the gap in FY23 from the one-off deals in FY22.

Valuation

A Discounted Cash Flow (DCF) approach, supported by a comparables analysis, drives our NZ\$2.26 per share spot valuation for RAK. Post the temporary COVID-19 related earnings uplift in FY22, this equates to 13.8x EV/EBITDA on our underlying FY23 earnings estimate. Key to forecasting earnings over the next year is RAK's ability to:

- Secure key components (especially in the 4Q22) to satisfy client orders
- Drive 5G revenue growth
- Add manufacturing capacity in India
- Gain market acceptance of its new LEO satellite applications

Rakon Limited (RAK)

Market Data (NZ\$)

Priced as at 17 Dec 2021	1.79
52 week high / low	1.88 / 0.54
Market capitalisation (NZ\$m)	410.0

Key WACC assumptions

Risk free rate	2.30%
Equity beta	1.15
WACC	8.9%
Terminal growth	2.5%

Profit and Loss Account (NZ\$m)	2020A	2021A	2022E	2023E	2024E
Sales revenue	119.0	130.9	173.3	171.1	188.2
Normalised EBITDA	14.5	23.5	49.4	37.5	44.2
Depreciation and amortisation	(13.7)	(13.4)	(13.4)	(8.6)	(9.2)
Normalised EBIT	3.5	11.3	35.0	22.4	26.9
Net interest	(1.1)	(1.6)	(1.6)	(0.4)	(0.0)
Associate income	0.8	1.4	3.3	3.4	3.4
Tax	0.7	(1.5)	(5.5)	(5.8)	(7.1)
Minority interests	0	0	0	0	0
Normalised NPAT	4.0	9.6	31.2	19.5	23.2
Abnormals/other	0	0	0	0	0
Reported NPAT	4.0	9.6	31.2	19.5	23.2
Normalised EPS (cps)	1.7	4.2	13.6	8.5	10.1
DPS (cps)	0	0	0	0	5.1

Growth Rates	2020A	2021A	2022E	2023E	2024E
Revenue (%)	4.3	10.0	32.4	-1.3	10.0
EBITDA (%)	9.2	62.1	>100	-24.1	17.9
EBIT (%)	-31.5	>100	>100	-36.1	20.3
Normalised NPAT (%)	18.3	>100	>100	-37.4	18.9
Normalised EPS (%)	18.3	>100	>100	-37.4	18.9
Ordinary DPS (%)	n/a	n/a	n/a	n/a	n/a

Cash Flow (NZ\$m)	2020A	2021A	2022E	2023E	2024E
EBITDA	14.5	23.5	49.4	37.5	44.2
Working capital change	(6.6)	7.2	(19.4)	1.5	(3.4)
Interest & tax paid	(1.4)	(1.8)	(7.1)	(6.2)	(7.1)
Other	2.9	(8.8)	(2.5)	(2.6)	(2.7)
Operating cash flow	9.4	20.1	20.5	30.2	31.0
Capital expenditure	(4.5)	(5.1)	(8.5)	(15.2)	(6.4)
(Acquisitions)/divestments	0.0	0	0	0	0
Other	(4.9)	(2.0)	(3.1)	(3.2)	(2.8)
Funding available/(required)	0	12.9	8.9	11.8	21.8
Dividends paid	0	0	0	0	(4.6)
Equity raised/(returned)	0	0	0	0	0
(Increase)/decrease in net debt	0	12.9	8.9	11.8	17.2

Balance Sheet (NZ\$m)	2020A	2021A	2022E	2023E	2024E
Working capital	57.8	50.6	70.0	68.5	71.9
Fixed assets	18.9	18.3	21.2	30.3	28.5
Intangibles	9.0	7.6	7.1	6.7	6.6
Right of use asset	9.7	7.2	4.5	1.8	13.2
Other assets	27.5	29.6	29.6	29.6	29.6
Total funds employed	122.9	113.3	132.4	137.0	149.7
Net debt/(cash)	7.9	(5.0)	(14.0)	(25.8)	(43.0)
Lease liability	6.7	5.4	2.3	(0.8)	10.5
Other liabilities	16.4	9.0	9.0	9.0	15.9
Shareholder's funds	91.9	103.9	135.1	154.6	166.2
Minority interests	0	0	0	0	0
Total funding sources	122.9	113.3	132.4	137.0	149.7

* Forsyth Barr target prices reflect valuation rolled forward at cost of equity less the next 12-months dividend

Spot valuation (NZ\$)

1. DCF	2.26
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DCF valuation summary (NZ\$m)

Total firm value	513
(Net debt)/cash	(5)
Less: Capitalised operating leases	
Value of equity	518

Valuation Ratios	2020A	2021A	2022E	2023E	2024E
EV/EBITDA (x)	29.1	17.8	8.2	10.6	9.0
EV/EBIT (x)	>100x	36.9	11.5	17.8	14.8
PE (x)	>100x	42.5	13.2	21.0	17.7
Price/NTA (x)	4.9	4.3	3.2	2.8	2.6
Free cash flow yield (%)	3.4	6.1	7.1	11.1	9.1
Net dividend yield (%)	0.0	0.0	0.0	0.0	2.8
Gross dividend yield (%)	0.0	0.0	0.0	0.0	3.9
Capital Structure	2020A	2021A	2022E	2023E	2024E
Interest cover EBIT (x)	3.4	7.1	22.0	59.4	>100x
Interest cover EBITDA (x)	13.7	14.7	31.1	99.5	>100x
Net debt/ND+E (%)	7.9	-5.1	-11.5	-20.0	-34.9
Net debt/EBITDA (x)	0.5	n/a	n/a	n/a	n/a

Key Ratios	2020A	2021A	2022E	2023E	2024E
Return on assets (%)	2.4	7.3	18.0	11.2	11.6
Return on equity (%)	4.3	9.3	23.1	12.6	14.0
Return on funds employed (%)	0.0	0.0	0.0	0.0	0.0
EBITDA margin (%)	12.2	17.9	28.5	21.9	23.5
EBIT margin (%)	3.0	8.6	20.2	13.1	14.3
Capex to sales (%)	-3.8	-3.9	-4.9	-8.9	-3.4
Capex to depreciation (%)	-39	-45	-74	-229	-86
Imputation (%)	0	0	0	0	100
Pay-out ratio (%)	0	0	0	0	50

Segment Revenue (NZ\$m)	2020A	2021A	2022E	2023E	2024E
Telecommunications	65.2	77.1	79.8	102.1	117.5
Positioning	18.9	14.0	27.1	29.0	26.5
Space and Defence	28.2	30.2	30.5	32.3	36.4
IoT, Emerging and Other	6.7	7.0	35.2	7.4	7.6
Other revenues	0.0	2.6	0.7	0.2	0.2
Total Revenue	119.0	130.9	173.3	171.1	188.2

Segment Gross Margin (%)	2020A	2021A	2022E	2023E	2024E
Telecommunications	40	40	41	40	41
Positioning	36	48	53	51	49
Space and Defence	69	68	67	67	65
IoT, Emerging and Other	-5	15	56	15	15

Underlying EBITDA	2020A	2021A	2022E	2023E	2024E
Profit before income tax	3.3	11.2	36.7	25.3	30.3
Depreciation and amortisation	(8.8)	(8.7)	(8.7)	(9.2)	11.2
Finance costs - net	(1.1)	(1.6)	(1.6)	(0.4)	(0.0)
Adjustments	(1.4)	(1.8)	(2.4)	(2.4)	(2.5)
Other non-cash items	(0.2)	(0.2)	0.1	(0.1)	(0.2)
Underlying EBITDA	14.8	23.5	49.4	37.5	44.2

Investment thesis

RAK's products are used across various applications and industries, including mobile network infrastructure, high precision positioning, NewSpace satellite applications and cloud computing. Its history dates back more than five decades and RAK now operates across several continents, with manufacturing operations on three continents and six R&D centres globally. RAK's focus on the high end of industrial applications has bolstered revenue growth and uplifted overall margins. A purposeful tilt away from highly competitive applications like consumer products has helped stabilise the business and margin trajectory. Built on a culture of innovation in designing leading-edge technology, RAK aims to keep ahead of the competition through market-leading specifications and quality while remaining competitive in terms of price.

Attractive valuation

RAK is currently priced at a ~20% discount to our DCF valuation of NZ\$2.26 per share. Normalising for the temporary COVID-19 related earnings uplift in FY22, this equates to 13.8x our underlying FY23 EV/EBITDA estimate.

The market is undervaluing the opportunities for growth in 5G, data centres, and NewSpace (LEO satellite deployments), in our view. RAK's refresh of its strategy a few years ago to tilt towards less volatile segments has seen margins stabilise and grow, and enable a lessening of risks and revenue volatility. We believe the refocussed strategy will enable RAK to outswim some of the inevitable return, either in FY23 or FY24, of competitive pricing pressures. RAK has an experienced and highly capable management team, focussing on technology leadership and shareholder value in a competitive industry.

Invest for growth

Finally, we would not anticipate or recommend the company progress with any dividends paid over FY22 or FY23. While RAK has the opportunities ahead of it in growth markets, like 5G, data centres and low-earth-orbit satellites, or in accretive acquisitions, we see it as significantly more prudent for management and the Board to retain funds to invest in the business and maintain a solid balance sheet.

Figure 1. Inside the clean room in RAK's Auckland facilities



Source: Company supplied

Company overview

Rakon Limited (RAK.NZ, market capitalisation NZ\$412m) is a globally recognised leader in the frequency control product industry, providing timing and synchronisation solutions for equipment in the Telecommunications, Positioning, Space and Defence sectors. RAK sells to 60 countries, with three manufacturing sites, six R&D centres, a sixteen-country support network and a strong partner manufacturing network. Its products are in many applications, from 5G networks, to satellites, to emergency beacons, and autonomous vehicles.

Products in its target industry segments require time to exceptionally high accuracy and RAK's products measure down to one millionth of a second. This accuracy is required in often harsh environments, including vibration, shock, electromagnetic radiation, and while travelling at speed. RAK sees itself as the preferred supplier to many top-tier players within its targeted market segments.

The RAK team has expanded to in excess of 1,000 personnel worldwide, with the majority in India and NZ.

Core markets

RAK is organised into four market segments: 1) Telecommunications, 2) Space and Defence, 3) Positioning, and 4) IoT, Emerging and Other.

Figure 2. Core markets

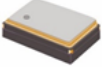
Segment	Description	Key Products
Telecommunications (~60% of Revenue)	The telecommunications infrastructure market encompasses the equipment that enables communications networks to operate. This includes 4G/5G small cells, mobile base stations, microwave, backhaul networks as well as data centres (e.g. cloud computing), transport switches, routers and optical transmission equipment.	■ Oven Controlled Crystal Oscillators (OCXOs) ■ Temperature Compensated Crystal Oscillators (TCXOs) ■ Crystal Oscillator (XO) ■ Voltage Controlled Crystal Oscillator (VCXO)
Space & Defence (~24% of Revenue)	From traditional satellites, NewSpace, deep space exploration, avionics to radar, RAK's products go into applications where high-reliability, precision and performance is critical.	■ GNSS Receivers ■ S-Band Transceivers ■ Frequency Generation Units (FGUs) ■ Oscillators ■ Clock Drivers
Positioning (~11% of Revenue)	RAK's products provide the accuracy required for applications including Global Navigation Satellite System (GNSS) equipment, Personal Navigation Devices (PNDs), high precision positioning (surveying, mining, and agriculture), emergency locator beacons, aviation, drones, automotive, asset tracking, sport and recreation products.	■ Oven Controlled Crystal Oscillators (OCXOs) ■ Temperature Compensated Crystal Oscillators (TCXOs) ■ Crystal Oscillator (XO) ■ Voltage Controlled Crystal Oscillator (VCXO)
IoT, emerging and other (~5% of Revenue)	RAK also supplies into other applications such as wireless control, test and measurement, the Internet of Things (IoT) including Machine-to-Machine (M2M), smart grids and metering, as well as other emerging markets.	■ Oven Controlled Crystal Oscillators (OCXOs) ■ Temperature Compensated Crystal Oscillators (TCXOs) ■ Crystal Oscillator (XO) ■ Voltage Controlled Crystal Oscillator (VCXO) ■ Oven Controlled SAW Oscillator (OCSO)

Source: Forsyth Barr analysis, based on FY21 results

Products

All modern communication and location systems require highly accurate time and a stable frequency to operate. At its core, RAK creates high-tech products that generate this reference frequency. RAK is focussed on seven critical products across these market segments, as summarised below:

Figure 3. RAK's frequency control products

Crystals	XO	VCXO/VCSO	TCXO	ASIC based OCXO	Discrete OCXO	System solutions
						
Passive single frequency resonator used in mass market positioning and telecommunications devices	Active crystal oscillator used in network applications (e.g. optical networks and data centres)	Active crystal oscillator that uses voltage control to bring oscillator back to frequency	Temperature compensated crystal oscillator to achieve better frequency stability	Miniature ovenised crystal oscillator using full integrated ASIC	Ovenised crystal oscillator to achieve best frequency stability	Ideal retrofit solutions for upgrading radar, electronic defence and other systems

Source: Company supplied

Operations

Five key RAK statistics:

1. Three company and three partner manufacturing sites across four continents
2. Six R&D and quality assurance centres
3. 16 customer support locations
4. 1000+ employees
5. RAK customers in over 60 countries

Manufacturing strategy

"RAK's stated manufacturing strategy is to "[focus on] building manufacturing scale at three sites, lengthening product lifecycles through low-cost [partner] manufacturing options, and mitigating supply chain risk through multiple sourcing"

Source: RAK shareholder update 1H22 (September 21)

Multiple plants and partners provide RAK with significant redundancy in its manufacturing supply chain, which is also highly valued by its customers. It also allows RAK to pass a product to a partner to produce (at a lower manufacturing cost) when it becomes uneconomic for RAK to produce. The Company can then take a margin on sales, or the partner operates as a contract manufacturer. This also provides the benefit of extending the product life cycle and ROI on R&D, and extends the connection with clients.

Manufacturing sites (company owned)

Over time, we see the new Indian facility taking on more complex and high-tech manufacturing roles for the company, providing:

- Opportunities for margin improvements through lower costs
- A second manufacturing facility for risk control and the ability to offer higher confidence of delivery to customers
- Ability to better manage capacity in NZ and efficiently sequence production between the two countries

Figure 4. Company owned manufacturing sites

Location	Details	Key Products	Key Markets
Auckland (HQ), NZ 	Floor Area: 6,600 m ² Employees: ~195 First Production: 1967	■ IC-OCXOs, TCXOs, VCXOs, XO & Crystals	Telecommunications Positioning Defence IOT/Emerging/Other
Bengaluru, India 	Floor Area: 4,000 m ² Employees: ~474 First Production: 2018	■ Discrete OCXOs ■ High Reliability: TCXOs, VCXOs, XO and VCOs	Telecommunications Space NewSpace Defence IOT/Emerging/Other
Point-St-Marie, France 	Floor Area: 1,800 m ² Employees: ~40 First Production: 2007	■ High Reliability: Subsystems, USO, MRO, ■ OCXOs, OCSOs, TCXOs, VCXOs, VCSOs, ■ XO & SC cut crystals	Space NewSpace Defence IOT/Emerging/Other

Source: Company, Forsyth Barr analysis

Manufacturing (Partnerships)

In addition to RAK's manufacturing facilities, the company has manufacturing relationships with three key partners. These partnerships provide RAK with a highly diversified manufacturing base, economies of scale, low-cost manufacturing options and significantly, given current events, assistance to reduce supply chain risks. According to the company at the 1H21 results announcement, "*customer partnerships have also been instrumental in the successful development and adoption of new products, as well as overcoming significant supply chain challenges during the period*".

The three partnerships can be seen in Figure 5 below.

Figure 5. Manufacturing partnerships

Entity	Nature of relationship	Description
Timemaker Group China 	RAK has had a 40% shareholding in Timemaker since 31 January 2009 and RAK's Brent Robinson sits on its board. Two key shareholders of Timemaker together have a combined 2.3% stake in RAK via Etimes Group International Limited (1.61%) and HLR Holdings Limited (0.69%). Associate Income (6 months): NZ\$2.6m Investment on balance sheet: NZ\$14.1m (Both as at 1H22 – equity accounted) Timemaker provides RAK with crystal blanks (a key raw material). The depth of the relationship minimises supply risks.	Timemaker is the world's largest quartz blank manufacturer and its products are used in communication, household electrical appliances, and other industrial and costumer electronics Floor Area: 30,000 m2+ (two sites in China) Employees: ~1100+ http://www.timemaker.com
Siward Crystals Technology Co Taichung, Taiwan  	Siward became a substantial shareholder (16.6%) in RAK in 2017 and recently reduced its holding, in July 2021, to 12.23% while noting it has "no plan for another sell down and remains a long-term investor and technology partner of Rakon". Yin Tang Tseng, the Chair of Siward, is a Board member of RAK. Roger Yao attends Board meetings as his observer. Siward is a sub-contractor to RAK and also produces items that are no longer profitable for RAK to produce. Items are either sold directly by Siward with RAK taking a cut, or provided back to RAK for sale.	Siward is one of the world's leading providers of crystal and oscillator solutions. Floor Area: 21,010 m2+ Employees: ~700 http://www.siward.com
HANA Microelectronics Group Lamphun, Thailand 	Hana is an assembler of some of RAK's key products. Rakon has been involving them in its ASIC based products (Pluto first) from FY08 and onward. Hana receives components from RAK (and others), compiles them and then sends them back to RAK to finish, test and add any required software and then ultimately to sell to the end user. The partnership with Hana commenced in 2003 and there is no common shareholding.	The Group manufactures products in six production facilities located in Thailand, China, USA and Cambodia. The Company manufactures electronic components on behalf of its customers for shipment to them or its customers. Floor Area: 20,000 m2+ Employees: ~1,165 These floor areas relate to the facility relevant to RAK only, i.e. at the Lamphun 2 site in Thailand. https://www.hanagroup.com

Source: Company websites, Forsyth Barr analysis

R&D, quality assurance capability and capex

Critical to the success of RAK is an internal culture of constant innovation that delivers unique high-tech products with long lifecycles. This requires significant R&D capability.

R&D progress continued during HY22 with RAK spending NZ\$6.5m in R&D and an additional NZ\$4.8m in CAPEX. This included NZ\$1m for purchasing land for its new Indian production facility. We forecast an additional NZ\$1.5m will be spent on developing plans for the Indian plant in 2H22. This represents a substantial investment in both CAPEX and R&D, representing a combined 13.2% of sales in HY22 that will aid future results. In an industry that has relentlessly driven down the price of products as they are commoditised, R&D and new lower-cost production facilities will provide RAK with some protection.

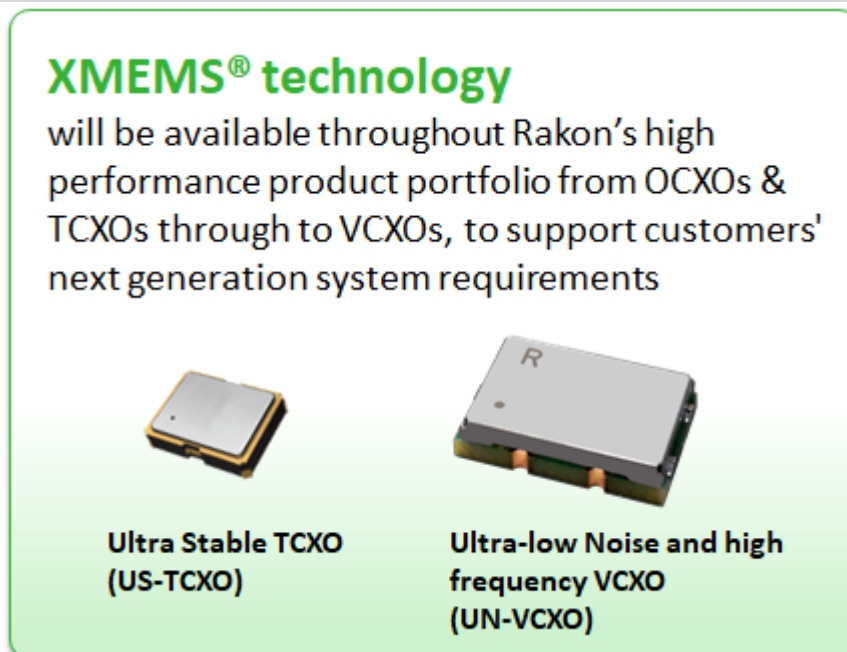
Over 1H22 there was good uptake of RAK's new 5G millimetre wave radio heads and small cells using a semiconductor reference redesign. Furthermore, a new smaller Mercury OCXO was adopted by several Tier 1 customers. RAK's R&D team rapidly re-developed and introduced a range of new TCXO ASIC-based products, targeting customers who needed new designs due to the global chip shortage. Three new product developments offer genuine near-term opportunities, including:

1. Launch of multiple XMEMS® based families of products.
2. Release of latest proprietary chip 'Niku' for next-generation of TCXO ASIC products.
3. Development of numerous NewSpace for platforms and telecommunications payloads. These will be used in smallsat platforms, data communications and transmissions.

XMEMS® – A Key Catalyst for Continued Relevance?

- A particularly important development was RAK's launch of XMEMS®™ during FY20, its key quartz-based technology for future products.
- XMEMS®™ is an advanced resonator technology made with RAK's Nano Quartz™ photolithography microfabrication process on quartz wafers, which delivers significantly enhanced resonator and oscillator performance.
- XMEMS®™ enables the creation of new products, not possible using conventional mechanical processing methods, which are smaller, higher performing and more cost-effective.

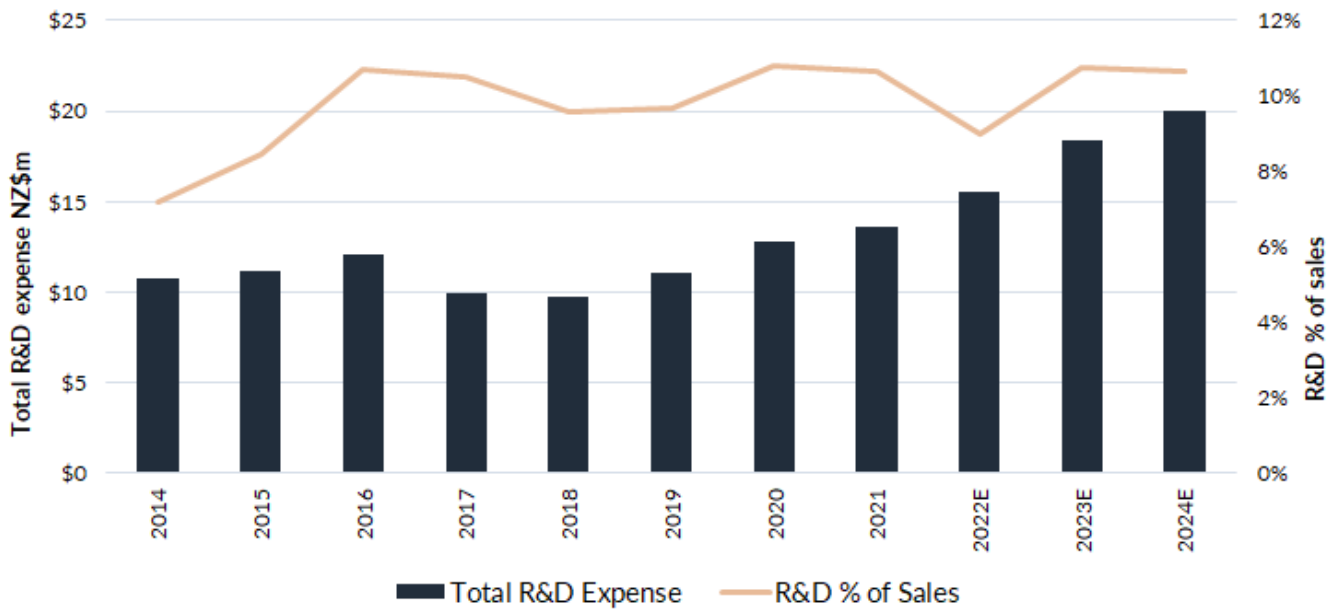
Figure 6. XMEMS technology



Source: Company supplied

Over the last five years RAK invested a total of circa NZ\$60m in R&D (circa 10% of sales), and we forecast that this level of investment will be required for RAK to maintain its market position in these high-tech market segments. This figure excludes further R&D investment that is capitalised. See Figure 5 below.

Figure 7. Total R&D expense & R&D % of sales



Source: Forsyth Barr analysis

RAK has R&D and Quality Assurance capability in four countries. The following three pictorials, which RAK presented at its 1H22 results, summarises this capability.

Figure 8. RAK technology

Technology leadership over the decades

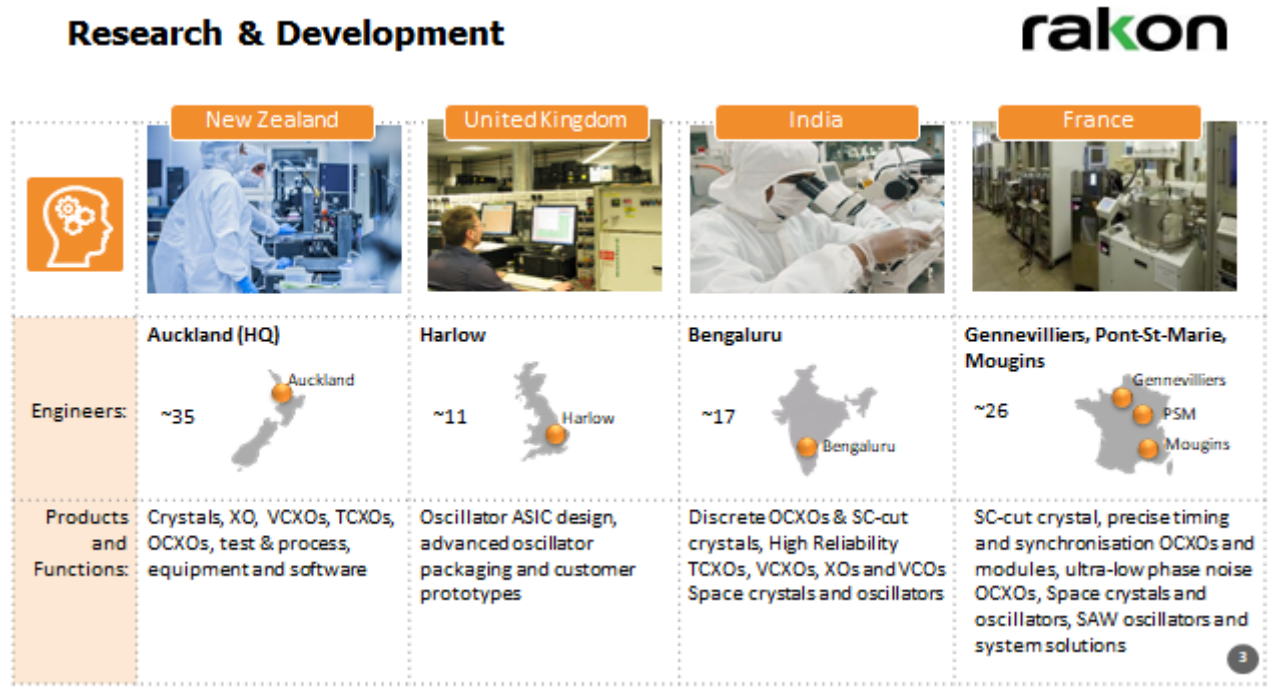
Since 1967, Rakon has continually developed product solutions, helping to enable the next wave of technology

rakon



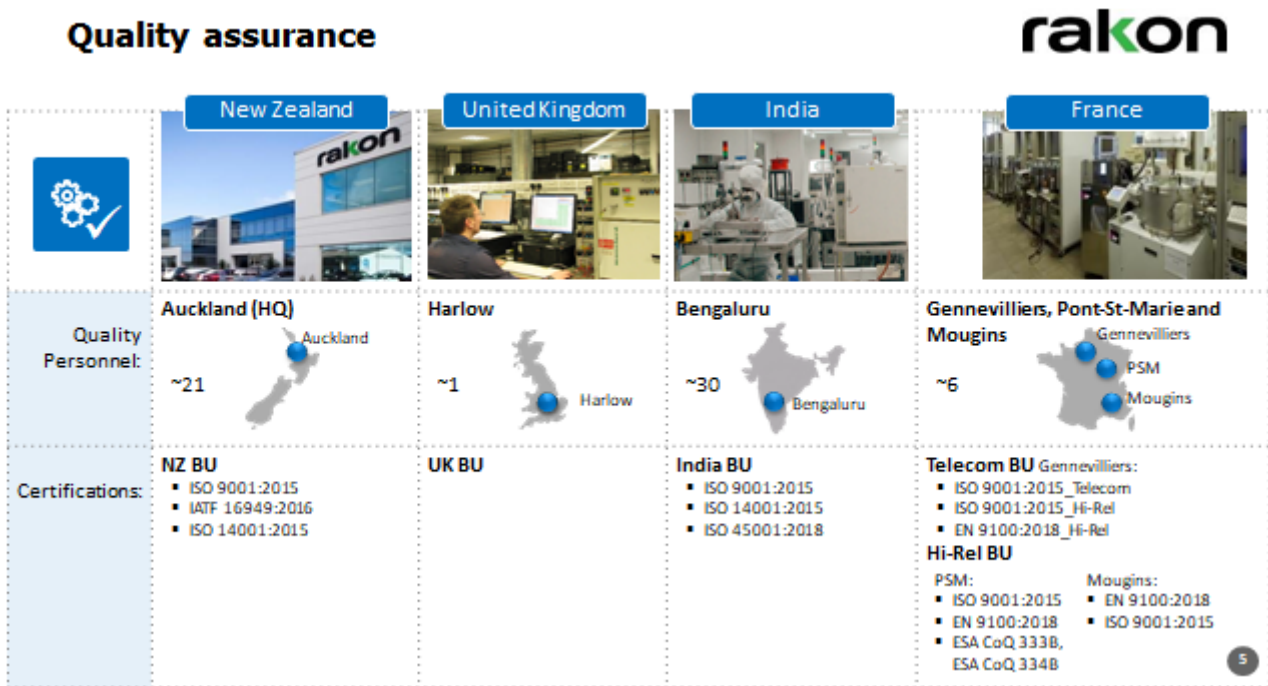
Source: Company documents

Figure 9. Research & Development



Source: Company documents

Figure 10. Quality Assurance



Source: Company documents

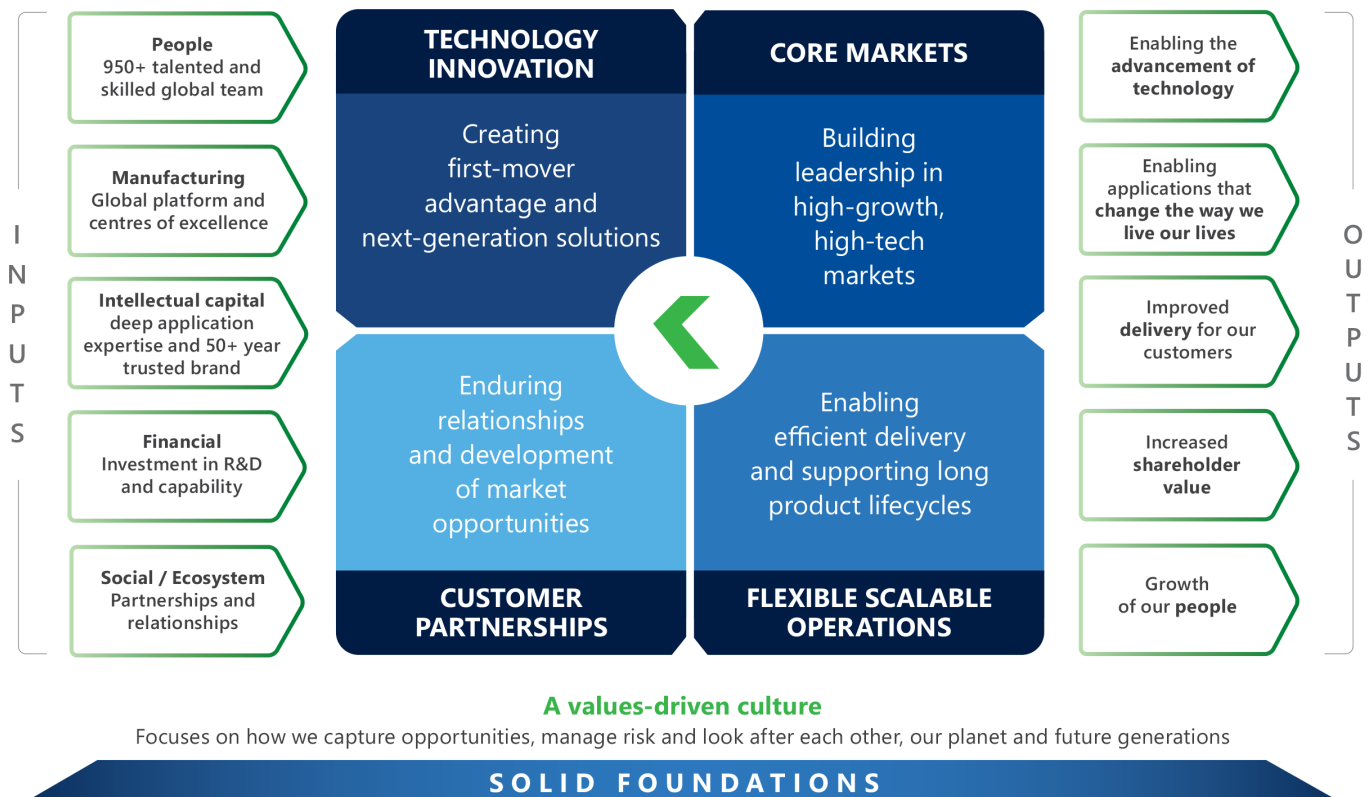
Company strategy

RAK's stated company strategy is to *"drive the advancement of precision timing and frequency control solutions in our core markets and ensure long product lifecycles through operational excellence and enduring customer relationships"*

Source: Rakon shareholder update 1H2022 (September 21)

At the 1H22 results announcement RAK presented the chart below, summarising its four new strategic pillars.

Figure 11. RAK's strategic pillars



Source: Company documents

The company states these four strategic pillars are critical to creating long-term value. Below we highlight recent actions taken by the company to strengthen each pillar and the medium-term strategic focus. This has been adapted from the materials presented by RAK at 1H22.

RAK intends to report against each of the strategic pillars to assist stakeholders in understanding the progress made in each area and how it will contribute to RAK's overall success.

Figure 12. Strategic pillars — action and focus

Strategic Pillar	Recent Company Actions	Medium Term Focus
Technology Innovation	■ Reference design partnership with leading semiconductor players ■ Substantial uptake of new 5G millimetre wave radio heads and small cells using major semiconductor reference designs ■ Design-in and adoption of new miniature Mercury OCXO by multiple Tier-1 customers ■ Rapid development and launch of new TCXO ASIC 1 based products (in response to the global chip shortage)	■ Launch of multiple XMEMS® based products ■ Release of latest proprietary chip 'Niku' for next generation TCXO ASIC products ■ Development of multiple NewSpace subsystem modules (ESA partnership)
Customer Partnerships	■ RAK released XMEMS®™ during FY20, its key quartz-based technology for future products ■ Strong support from Tier-1 customers through supply chain shortages ■ Reference design partnership with leading semiconductor player enabled the release of new ultra-low phase noise TCXO and VCXO products	■ Reduced customer supply risk through dual sourcing/dual manufacturing strategy ■ Management of pricing expectations as costs increase ■ Continued work with customers to identify next generation technology needs and capture new design in opportunities
Core Markets	Telco ■ 1H22 Telco revenue +9% driven higher by Tier-1 customers and 5G rollout growth ■ Major design wins with two new Tier-1 data centre equipment suppliers Space and Defence ■ Revenue for 1H22 +4% higher driven by growth in low earth orbit (LEO) satellites Positioning ■ 1H22 Revenue +108% higher driven by industrial applications and global TCXO chip shortages IoT, Emerging and other ■ Revenue +416% higher resulting from orders due to one-off global TCXO chip shortages	Telco ■ Meet 5G market demand as network deployments continue to gather momentum ■ Intensified data centre design-in opportunities for new OCXO and TCXO products ■ Data centres tool up to become communication service providers for mobile operators Space and Defence ■ Medium term growth opportunities in emerging NewSpace segment ■ Maintaining current defence revenue levels through US budget cutbacks Positioning ■ Retention of strategic new business in automotive, safety, tracking and industrial applications ■ Increasing new business opportunities in Advanced Driver Assistance Systems (ADAS) and V2X infrastructure to support future autonomous vehicles ■ Further develop low-cost manufacturing partnerships to extend higher volume product lifecycles IoT, Emerging and other ■ 2H22 delivery of remaining TCXO orders ■ Pursue ongoing multi source customer requirements
Flexible Scalable Operations	■ Successful navigation of numerous supply chain issues through multiple initiatives ■ NZ operation output +60% higher, delivering record gross margins and capacity milestones ■ India and France operations meeting targets, demonstrating resilience through COVID-19	■ Continued focus on supply chain risk mitigation, with a constrained raw material supply environment expected to continue through FY22, easing during FY23 ■ Continue to increase capacity in India and NZ to meet increasing demand ■ Commencement of construction of new high tech manufacturing facility in India ■ Minimise COVID-19 related risks at all manufacturing sites

Source: Forsyth Barr analysis

Competitors and localisation

RAK has no singular competitor across all its four core market segments. It does, however, have strong competitors in each of its market segments. Assessing market share by segment is challenging due to low visibility into customers' sales and many competitors are a small division of a much larger organisation. In general, competition is regionally or product based.

RAK's French operations provide it with a sense of being in the 'local' market for its European customers. RAK's New Zealand base is seen as neither a positive or negative by global customers. However, it remains possible that by not having a beachhead in the US it may make it more difficult to sign large US contracts without a significant US presence. RAK's technology leadership has allowed it to break down these geographic barriers to some degree, but we would not be surprised if management sought an acquisition in the US. Acquiring a beachhead with complementary technology or targeted technical expertise appears a logical step with the added benefit of appearing to be more 'local' to US customers.

NewSpace is proving to be an exception to this rule – the players in this segment are singularly focussed on garnering a market position as soon as possible. The existing large regional competitors appear to be less able to react fast enough to meet the NewSpace customers' requirements. This has provided opportunities for RAK.

In the Valuation section we summarise and comment on the trading metrics and multiples of the above entities relative to RAK.

Figure 13. Competitors

Key listed competitors	Description	Compete with RAK?
KDS Daishinku (listed in Japan)	■ Daishinku Corp. is a Japan-based company principally engaged in the manufacture and sale of crystal applied electronic components. ■ The Company operates in Japan, the United States, Europe, China, Taiwan and Asia. ■ Revenue circa US\$313m p.a.	Telecommunications Positioning Defence Emerging/Other
TXC (listed in Taiwan)	■ TXC Corp is a Taiwan-based company principally engaged in the research, development, design, manufacture and sale of frequency control components and sensing components. The Company mainly operates the quartz component business. ■ The Company operates within the domestic market and to overseas markets, including China mainland, the Americas and Europe. ■ Revenue circa US\$375m p.a.	Telecommunications Positioning Defence Emerging/Other
NDK (listed in Japan)	■ Nihon Dempa Kogyo Co. is a Japan-based company mainly engaged in the manufacture and sale of crystal devices, such as crystal oscillators (XOs) and crystal equipment, as well as crystal-related products, such as application equipment, artificial crystals and crystal blanks. ■ The Company operates in North America, Southeast Asia, Europe, China and other markets. ■ Revenue circa US\$370m p.a.	Telecommunications Positioning Space NewSpace Defence Emerging /Other
SiTime (listed in the US)	■ SiTime Corp provides silicon timing systems solutions. The Company's silicon timing solutions are comprised of microelectromechanical systems (MEMS) resonators and Clock integrated circuits (ICs). ■ It serves various industries, such as infrastructure, automotive, industrial and Internet of things. ■ Revenue circa US\$116m pa.	Telecommunications Positioning Defence Emerging/Other

Source: Forsyth Barr analysis, Refinitiv, Company websites

Figure 14. Competitors cont.

Key listed competitors	Description	Compete with RAK?
Siward (listed in Taiwan)	- Siward Crystal Technology Co Ltd is a Taiwan-based company principally engaged in the research, development, design, manufacture and distribution of quartz crystal products. - The Company mainly distributes its products in Asian, European and the American markets. - Siward is Rakons second largest shareholder. - Supplier/ contract manufacturer. - Revenue circa US\$88m p.a.	Telecommunications Positioning Defence Emerging/Other
Seiko Epson (Listed in Japan)	- Seiko Epson Corporation is a Japanese electronics company and one of the world's largest manufacturers of computer printers, information and imaging related equipment. The company has numerous subsidiaries and operations worldwide. - Epson's Microdevices business (a unit within its Manufacturing Related and Wearables division) competes with RAK in the Telco sector. - Divisional revenue circa US\$200m p.a.	Telecommunications Positioning Defence Emerging/Other

Source: Forsyth Barr analysis

Thinextra investment

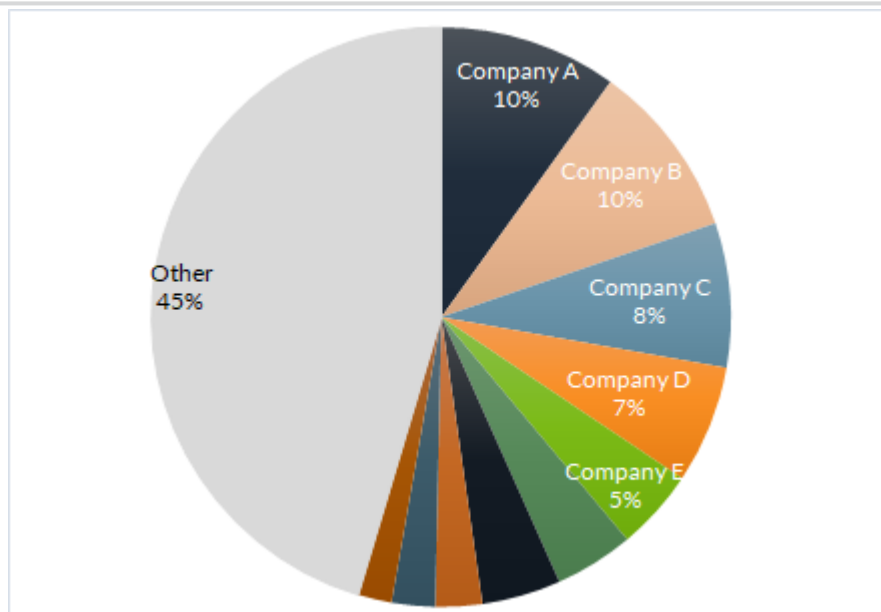
Alongside its partnership deals, RAK also has an investment in Thinextra, an IoT solutions business, which it invested NZ\$5.8m in back in 2015. RAK partially sold down its stake in 2017 (netting AUD\$2.8 million after costs) and now holds ~785k shares or 6.9% of the company. Thinextra is attempting to commercialise a low-power wide-area network (LPWAN) that enables small device internet connectivity with very low bandwidth. Existing customers of Thinextra include Coles, Qantas, Origin, AGL, Konvoy and Loscam. Thinextra has publicly signalled an IPO for early to mid-2022. It has some 194,000 live connections and, as of September 2021, was generating Annual Recurring Revenues (ARR) of A\$1.5m. The IPO may provide an uplift in value from RAK's net NZ\$2.9m remaining investment and/or an avenue for liquidity.

Customer concentration

RAK's customer base is relatively concentrated but not overly so given the industry. The top-5 customers are circa 40% of revenue based on information supplied by the company for FY21. This risk would appear to be elevated given the lack of long-term contracts, however, RAK has an exceptional track record of keeping customers. RAK seldom loses customer relationships and in past years if RAK has been uncompetitive in terms of price its market share/volume within that customer's products falls rather than lose them as a customer entirely or designed out of a product.

The yearly renegotiation on pricing further illustrates the requirement for continuous success in R&D and relentlessly driving costs lower to ensure they are meeting or exceeding client requirements and garnering an appropriate volume versus margin outcome.

Figure 15. Customer Concentration of RAK's top ten customers (March 2021)



Source: Company data, Forsyth Barr analysis

SWOT

In the following SWOT table we have summarised our view of the company's key strengths, weaknesses, opportunities, and threats.

Figure 16. RAK's key strengths & weaknesses

Strengths	Weaknesses
■ Exposure to high growth 5G market ■ Option value into other high market growth segments of LEO satellites, data centres, autonomous vehicles & IoTs ■ Conservative balance sheet with a secured long term debt facility ■ A global footprint ■ Strong eco-system partnerships and relationships ■ NZ production capability now 60% greater in FY22 ■ Proposed Indian plant almost doubles local capacity, provides some manufacturing redundancy for NZ and lowers production costs ■ COVID-19 resilience ■ Proven commercialisation of technology ■ Strong order book ■ Excellent longevity of customers ■ Good operating leverage ■ Market leading products in terms of frequency, stability, phase noise, size and cost. These difficult to replicate product characteristics protect the company somewhat from price erosion ■ Depth of management and a reinvigoration of a focus on technology and innovation	■ Yearly price renegotiation on some products exposes the company to annual price declines ■ Annual R&D investment at a net 10% of sales needs to be successful to maintain volume growth and margins ■ Military exposure may limit investor appetite and liquidity ■ NZ headquartered – potentially limiting opportunities with some established customers in US/Europe ■ Limited growth observed outside of 5G which is ~45% of revenue ■ Client concentration, albeit not overly so, with RAK's top ten clients representing 55% of revenue
Opportunities	Threats
■ Chip shortage globally assisting pricing and sales and giving entry points to new customers ■ Biden's announcement of US\$1 trillion infrastructure investment includes broadband (5G) and EV sectors ■ New segments emerging with cloud computing, autonomous vehicles and space ■ Growth into Data Centres segment ■ NewSpace – a different type of customer that breaks existing market dynamics and provides opportunities to RAK ■ RAK a potential takeover target for the larger offshore players ■ Acquisition opportunities in Europe or potentially a US beachhead ■ Indian facility capacity uplift along with potential to reset its cost base lower	■ Potential overbuild of sector capacity leading to a reinvigoration of pricing pressures ■ Supply chain risks for its own operations especially in Q422 and into FY23 ■ Cost inflation pressures from raw material prices ■ Tech obsolescence ■ Exposure to US/China trade or geopolitical wars ■ Strategic product development risk if they get their R&D focus wrong (given long product life cycles) ■ New COVID-19 strains and restrictions potentially limiting production capability ■ Labour cost pressures

Source: Forsyth Barr analysis

Management changes (CEO to CTO and COO to CEO from 1 April 2022)

On 16 December 2021, RAK announced that its Chief Operating Officer (COO) Dr Sinan Altug will succeed Brent Robinson as Rakon's Chief Executive Officer (CEO) from 1 April 2022. Brent Robinson, who has led RAK's executive team for more than 35 years, will transition to Chief Technology Officer (CTO) but remain on the board as an Executive Director.

Focusing Brent Robinson's time and unparalleled industry knowledge, after 42 years at RAK already, on driving RAK's technological roadmap, will aid in continuing the development of cutting-edge timing and frequency control solutions. This focus will ensure the business is positioning itself to take advantage of the world's demand for faster, more accurate and more reliable data connectivity.

Sinan has proven himself over nineteen years within the Company as Managing Director of RAK's European businesses and as Global Business Development Director. As COO, he led the recent expansion of NZ's manufacturing capacity and implemented the company's new global strategy. Therefore, Sinan's commitment to continue the transition from a component manufacturer to a leader in high-performance solutions will continue.

Summary and the supply chain

The technology sector is highly competitive. Market positions can quickly be won (and lost) and the critical strategic threat appears to be price compression from competition. Historically, price declines of an estimated 5–8% per annum were seen annually on older products in Telecommunications and Positioning. Price has always been a significant factor for top tier customers, hence, the typical yearly price renegotiation.

During the global disruptions of 2021, RAK had pricing power that saw unit prices rise for the first time in likely twenty or thirty years. The disruptions emerged not long after the COVID-19 pandemic impacted the world's economy.

How long these disruptions continue for and what long-term implications there are is difficult to assess but will depend on:

- Semiconductor capacity normalising and in what timeframe
- Inventories within the system returning to levels where delays are not common and companies don't exacerbate the problem by over-ordering
- Delays at shipping and logistics companies lessening
- No further plant closures from new strains of COVID-19 globally
- How the global economy recovers
- Delays in processing goods across borders lessening

Continued successful with R&D while maintaining a competitive and flexible manufacturing capability are, therefore, the critical drivers for RAK to remain relevant and achieve the new incremental volume and margins required to be value accretive. RAK's strategy of diversifying its manufacturing and partnership relationships has also allowed it so far to navigate COVID-19 related supply issues. However, pressures are building as the year progresses. Continued focus on lowering its cost of manufacturing, through the development of manufacturing capability and scale in India, will provide a buffer in response to any renewed price compression.

Industries associated with RAK's timing and frequency control equipment, like the semiconductor industry, are poised for significant growth in volumes over the next few years, post-recovery from the cyclical downturn and COVID-19 disruptions. Technology inflection points coming in 5G, AI, IoT, cloud computing and machine learning are driving up the long-term demand for the component suppliers to these industries. RAK has an impressive track record of creating bespoke, market leading products for its clients. This provides a degree of pricing leverage – with margin pressure appearing as competitors catch up. Management's strategy refresh a number of years back and recent reorganisation appears well-timed to reinvigorate the drive for innovation.

Figure 17. RAK's products on board the Mars Perseverance Rover



Source: NASA, Company supplied

Core markets deep dive

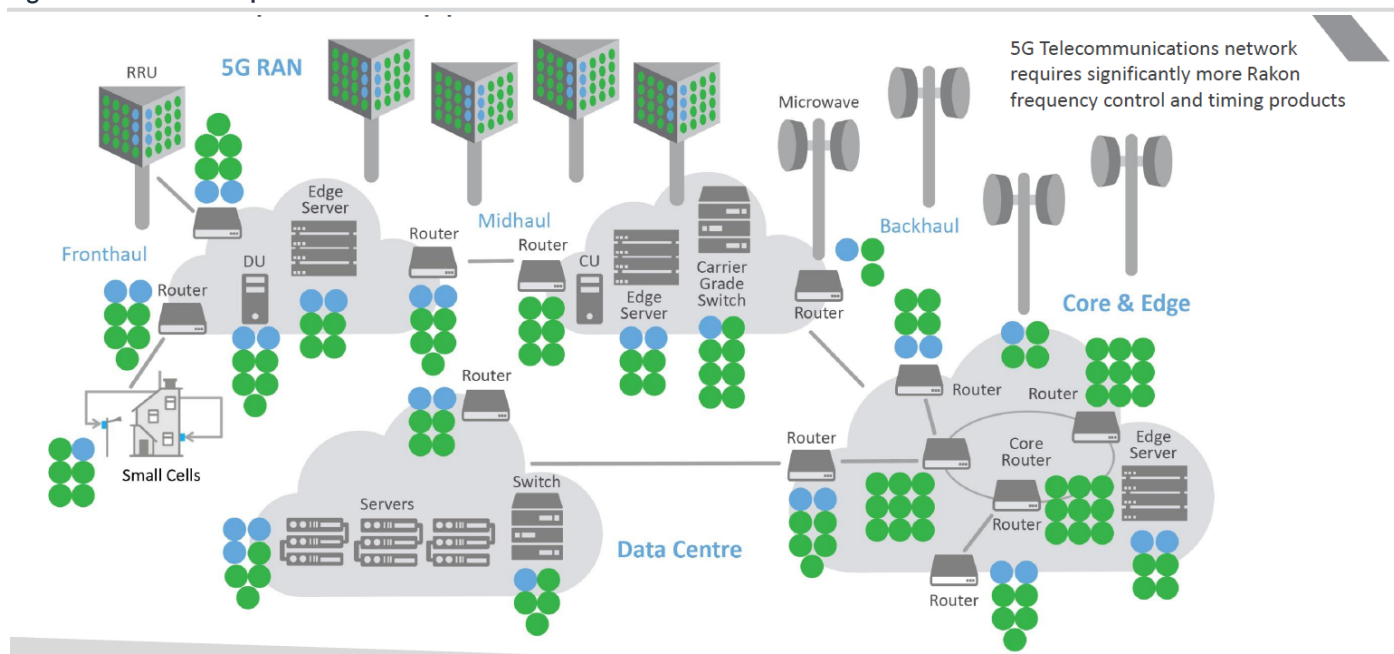
Telecommunications (60% of FY21 Group revenues)

The core of RAK's current operations and growth outlook is supplying network infrastructure businesses in the telecommunications market. Representing some 60% of normalised Group revenues, RAK produced **Telecommunications revenue of NZ\$77m in FY21, +18% on the year earlier**. RAK's products assist in enabling fast and reliable communications across networks and within cloud computing infrastructure. RAK's products in infrastructure help provide:

- Timing references
- Improve reliability and stability
- Aid in garnering speed improvements for high-performance telecommunications networks and cloud computing infrastructure equipment

Across telecommunications, RAK's products are utilised as a component in routers, nodes, servers, microwave towers, data centres, central units, base stations, radio towers, small cell bases, microwave backhaul, radio-area-networks and switches across the network. Collectively, these products amalgamate telecom, computer and data centres storage functions into a cohesive system. Products include RAK's Mercury, Mercury+ and the Pluto branded products. Indicative of its excellence in developing innovative timing solutions, RAK holds long term relationships with several tier-one clients. The comprehensive Telecommunications product set is complex, with thousands of product codes across a client list of many thousands. Most clients have differentiating requirements so products are often adapted to fit specific client requests.

Figure 18. 5G network product use



Source: Company, Forsyth Barr analysis

5G

Leading telecommunications providers worldwide are aggressively investing in 5G network infrastructure, required to cater to the ever-growing demand for faster data transfers and the need for greater network reliability. The significance of 5G infrastructure is driven by the heightened importance of continuously reducing latency on data networks and delivering seamless connectivity. Emerging technologies require fast and efficient communication infrastructure, demanding more data and greater bandwidth. These infrastructure customers often operate in demanding conditions or require high specifications suiting RAK's product suite. 5G infrastructure data-intensive applications are seen to drive overall productivity and operational efficiency, and form an essential part of the roadmap in other technologies. Applications apply to precision agriculture, mining, education, connected healthcare, smart manufacturing and retailing. During FY21, the 5G market represented an estimated 40%–50% of RAK's current telecommunications revenues and is the principal growth segment the company will pursue over the next two to four years.

For the telecommunications companies themselves, 5G networks offer vastly lower costs for data, along with falling deployment costs, driving significant benefits to network operators to roll out 5G rapidly. Offering 10 to 100 times faster data rates, at latencies up to 10× shorter, and permitting 100–1000 times more traffic capacity than 4G networks, the differential is significant and essential in a modern world.

To date, 5G network deployments have mostly been the larger cell towers/macro cell deployments. However, small cell/micro cell in cities and built-up areas will be the driver to RAK's future as the number of smaller cells (costing the network operator under US\$10,000) will vastly outnumber the larger macro cells (costing hundreds of thousands) in dense urban areas by potentially 10 to 100+ times. mmWave spectrum and services are now becoming more widely available by country and this will again push demands for new small cell developments. Beneficially for future 5G networks, small cells offer higher speeds and lower latency than macro cells, however, can cope with fewer than 200 users at one time. While macro cells cover much higher range, kilometres as compared with metres for smaller cells, and are able to cope with hundreds of users, the performance deteriorates rapidly at the edge of the network or when usage is high. Small cell radio waves cover a smaller area, maybe a few hundred metres of range, but provide much more consistent and reliable device connections within that range, especially in built up areas or within offices or buildings. Built up area small cells, down to 10–100m metres, such as to cover a home, small business or floor of an office significantly improve connectivity in that specific area but user numbers are limited (<15). This could be required in the thousands and tens of thousands in many major centres.

Data Centres (DCs)

Globally, data is being created at an exponential rate. This will likely continue in the next three to five years, with demand for DCs driven by the ever-increasing demands to store and localise data, rollout 5G, of smartphone penetration, IoT deployment and the general adoption of technology. In 2020, Grand View Research projected that the global market for DCs was around US\$44.4 billion and was projected to grow at a CAGR of 13% between 2021 and 2027.

In an information and low latency world, DCs will be located closer to these small cells to take advantage of the low latency capabilities of 5G at the edge of the network. While large or mega DCs will remain essential, the development of many smaller, more local DCs also appears likely. As such, similar to small cell development in 5G being important the deployment of smaller more localised DCs will be an ongoing driver to RAK's future growth. Small DCs will require synchronisation to a microsecond to deliver low latency, resiliency, and accessibility to consumers where massive volumes of data has been collected. This use looks to be a new and growing global trend and may get as localised as small DCs within large enterprises.

Outlook

The outlook remains solid in telecommunications with good visibility of growth over the next three to four years as spend in 5G peaks. RAK's opportunity is embedded in the infill of small cells. This will be driven by deployment into buildings, malls, stadiums, private enterprises and industrial applications. Private organisations, especially in logistics, manufacturing, transportation, healthcare and ports will require higher and more reliable bandwidth and, as such, deploy 5G small cells for its use. As demand from customers' pressures networks, RAK's low noise products and move to push higher-end products (often commanding a 100–500% relative price) will aid revenues.

In Telecommunications we forecast RAK's 2H22 will be somewhat affected by supply disruptions. Post this interrupted period we then forecast strong growth from FY23–FY26, from the rollout of 5G networks, before tailing off to moderate growth from FY27–FY30. From FY31 onwards growth could start reaccelerating with the rollout of 6G networks, which we anticipate using timing estimates from Nokia Bell Labs. Given the better product mix and additional efficiencies of the new and sizeable Indian manufacturing facilities, we expect gradual gross margin growth until they stabilise around 42% in FY26 before gradually falling for the remaining forecast period. We anticipate a return to competitive pricing, where pricing falls annually when supply markets return to normal, sometime in late calendar year 2023. The cyclical nature of industry capacity likely continues, while end-use demand remains incredibly strong. We see RAK management seeking consumer deals opportunistically when it has sufficient capacity. This strategy should provide better stability to revenues and margins.

Figure 19. Telecommunications

Telecommunications	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Revenue (NZ\$m)	77.1	41.7	38.1	79.8	102.1	117.5
Gross Profit (NZ\$m)	31.0	17.6	15.1	32.7	41.1	47.9
Gross Profit Margin %	40.2%	42.2%	39.7%	41.0%	40.3%	40.8%

Source: Forsyth Barr analysis

Space and Defence (24% of FY21 Group revenues)

RAK is at the forefront of innovation for precision timing and reliable frequency control products. RAK's space offering is found in an extensive range of applications: satellites, ground stations, deep-sea exploration, in addition to defence and instrumentation applications such as avionics and radar. Representing 24% of RAK's overall business normalised Space and Defence revenue was NZ\$30m in FY21, +7% from FY20. Continuously developing at the leading edge of technology innovation, RAK's products meet demanding performance expectations in situations requiring stringent criteria and in highly-challenging environments. The traditional base of the space business is relatively low growth – in the +3% to +5% range. Similarly, the Defence business is relatively stable. However, both the Space and Defence segments have their own future growth opportunities.

Space

Pre 2020, government organisations from the US, Japan, UK, India, Russia, China, Germany and France dominated the space industry with traditional space objectives such as large high-earth-orbit satellites, human spaceflight, earth observation, global navigation systems, and scientific missions held under its control. Budgets have been significant, with NASA's overall 2021 budget being US\$23.3 billion, +3% on the prior year and is 0.5% of total US Federal funding. In the past, private enterprises operated in the industry via launches of satellites for communications and GPS. We estimate that the Space business is around 60% of the Space and Defence segment for RAK with its production facilities in France, and less so India, leading the operations. Traditional space geostationary satellites are big and expensive, with long life expectations of ten or even twenty years. Because of this they have high-reliability requirements. Products in this segment are the most expensive that RAK produces and range from US\$5,000 to US\$100,000 per unit, being its frequency control OCXO, TCXO and clock oscillators. Revenue in frequency control for traditional space applications has been steady.

NewSpace and the deployment of Low Earth Orbit (LEO) satellites

The space market has been rapidly evolving with a new generation of private space companies. Companies like SpaceX, Virgin Galactic, Boeing, and NZ's Rocket Lab are reshaping the future of the space industry driven by cultures of innovation and competition for new service offerings. NewSpace opportunities are primarily for the mega networks for data communication purposes (OneWeb, Starlink, Amazon). This forms the 'NewSpace' opportunity for RAK. RAK's 'MRO NS' solution offers ultra-low noise and very low power consumption, features essential for LEO applications. In FY21, RAK started deliveries for a significant LEO satellite constellation, and designed and manufactured products into the NASA Mars Perseverance Rover. RAK's competitive advantage in this segment emerges from its market-leading product offering of high-resolution frequency stability and high-performance phase noise analysers.

Most of these LEO satellites have life expectancies from a few years to ten years plus, providing the expectation of replacement and a more enduring revenue stream. At the lowest end of life expectancy of these satellites, in the range of three to four years, communication companies often design inferior frequency control and timing devices ranging from US\$50–US\$500 per unit. However, most telecommunication LEO satellites will have design lives of eight or more years, thereby demanding higher-end products selling in the range of US\$500–US\$3000 per unit (which are the higher end OCXOs and TCXOs).

Figure 20. LEO satellite deployments

Satellite constellation	Number of satellites	
	Planned to launch	Approved to launch
	12,000	42,000
	1,000	2,000
	3,000	10,000
	1,400	3,000

Source: Company supplied, industry data, Forsyth Barr analysis

NewSpace is primarily driven by the launch and manufacturing innovations in rocket technology, attracting many billions of new capital and investment while also gaining additional government support to lower its own costs of payload delivery into orbit. Innovation in the sector has come from using new materials, deployment of assembly like manufacturing lines, better software, quantum technology, AI, big data, 3D printing and the reusability of rockets. Innovation has potentially cut the cost of launching satellites by three quarters. It is now cheaper and faster than ever before to get rockets into space. Competition between billionaires Musk and Besos could also aid in expediting the rollout of new satellites and space operations. Elon Musk's Starship, Super Heavy and Falcon 9 booster rockets will allow significantly larger payloads into orbit, lowering costs and with a much higher frequency of launches.

RAK has profited from this emerging trend across the NewSpace industry, seeing the uplift of high performance, commercial-off-the-shelf (COTS) practices, allowing satellite manufacturers to use commercial products in their equipment in space. This new approach has positive downstream effects on RAK with faster development cycles demanding innovation and significantly lowered production costs aiding in increasing volumes. Backed by the European Space Agency (ESA) research funding, RAK is progressively innovating subsystems and modules for LEOs. Subsystems like an S-band transceiver and a GNSS receiver (GPS) module and a Master Reference Oscillator (MRO), will sell for US\$10,000 to US\$20,000 per unit, greatly increasing the revenue opportunity per LEO Satellite. These are manufactured out of RAK's French facilities and earmarked for the new factory in India.

An example of the opportunity set is the extensive satellite rollout programmes of NewSpace companies. The SpaceX satellite constellation has launched 1,740 Starlink satellites to date. Looking forward, SpaceX has plans approved by the FCC to launch 42,000 Starlink satellites with current launch plans for 12,000. This compares with the total number of satellites currently in space of around 7,000. See Figure 20 above.

Defence

The Defence business is estimated to represent around 40% of RAK's Space and Defence segment revenues or 10% of RAK's group FY22 revenues based on information supplied by RAK. RAK's defence products have been prevalent across well-known international programmes for more than 30 years. Revenues from Defence are primarily for communication, navigation devices and radar, but RAK's customers are also likely using RAK's timing and frequency control products as a component in weapons. RAK has policies requiring Defence purchasers to ensure its products are not used in weapons of mass destruction, nuclear weapons (nuclear explosive devices, biological weapons, chemical weapons and their means of delivery) and cluster munitions. See the ESG section of this document for more information.

RAK's Defence operations operate out of its French manufacturing site for European based customers in radar (high-end OCXO, OCSO), communications and some navigation (both being higher end TCXOs) and from NZ (primarily North American deals providing navigation applications and some communications TCXOs). Typically, defence revenue is long term business for five or ten years and sometimes up to 20-year agreements. Once a tender is won and the products are contracted into a defence solution it is often sole sourced for the product's life. Therefore, new revenue streams rely on winning new business in a relatively flat market. RAK also earns non-recurring engineering revenues (NRE) when designing specific solutions. R&D goes into 'ruggedising' performance (for more extreme environments, better frequency performance, and better phase noise and stability in demanding environments). This R&D has positive flow-on implications for improving RAK's whole product line-up.

The performance of these high-end products could be 2–3x better than the performance of similar outcomes for commercial applications. Defence margins are likely higher than the overall Space and Defence segment which averaged 68% gross margin over FY21.

While the development of RAK's new XMEMS® technology (the resonating element in the crystal forming part of a high-end TCXOs) is relevant across all markets, it will provide the opportunity for defence growth given the technological advancement. XMEMS® delivers unprecedented resonator and oscillator performance in terms of stability and noise. Instead of silicon, the quartz MEMS process enables dimension accuracies in the tens of nanometre range and performance improvements 2–3x better than other high-end RAK products. The technology will also enable new products and applications to take full advantage of the high bandwidth 5G future.

Outlook

The outlook for RAK's Space and Defence segment looks solid longer term. The potential to win a large LEO contract in the US\$5m to US\$20m range appears real given RAK's technology positioning and entry into some of the key space players already. NewSpace presents an immense opportunity for RAK based on yearly industry projections through an extensive 10-year launch programme. In Defence, solutions using the new XMEMS® technology are currently out to tender for some Defence applications, and could achieve revenues from FY24 and beyond.

In Space and Defence, we forecast a relatively flat market until new product developments garner market support. As RAK's new products, targeting the fast-growing LEO sector, gain further market acceptance it is estimated to elevate growth. We factor this starting in FY24 and anticipate good growth until FY27 from LEO satellite and XMEMS® related defence products, before trailing off to moderate growth from FY28 onwards. Given the product mix toward commercial LEO applications and away from Defence, we anticipate gross margins falling from the 67% experienced in FY21 to 59% in FY31.

Figure 21. Space & Defence

Space & Defence	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Revenue (NZ\$m)	30.2	11.9	18.6	30.5	32.3	36.4
Gross Profit (NZ\$m)	20.4	8.0	12.4	20.4	21.5	23.6
Gross Profit Margin %	67.5%	67.4%	66.7%	67.0%	66.5%	65.0%

Source: Forsyth Barr analysis

Positioning (11% of FY21 Group revenues)

RAK's Positioning segment includes products going into autonomous vehicles in agriculture and mining, private cars, precision positioning for surveying, aircraft and marine navigation, aviation and emergency locator beacons. Positioning contributed NZ\$14m of revenue in FY21, down 26% on the year earlier. The segment represented around 11% of RAK's group revenues in FY21. In recent years, the unit has purposely pivoted away from consumer products such as personal navigation devices, drones, and sports products towards higher specification industrial applications. This is because higher-end products often command prices multiple times more than the lower-end consumer-facing products, a much more highly competitive market segment. However, during FY22, RAK has picked up several one-off orders due to the global TCXO chip shortage. This has boosted divisional revenues and has been achieved at good margins. The contracts became available at reasonable margins due to shortages from the global disruption of supply chains and a fire at a large Asian semiconductor facility. The global shortage of TCXO chips has allowed RAK to expand its clientele, with some relationships potentially extending into continuing business. Post this initial opening of the door it appears more likely that RAK can maintain some of this business due to customers seeking supplies from multiple sources to minimise their supply chain risks.

The Positioning market can be split into three distinct parts:

- 1. Industrial.** A strategic priority for RAK is the lucrative industrial positioning market. We estimate, during FY21, this represented around 80% of RAK's Positioning segment revenues. Applications into precision agriculture, mining, education, connected healthcare, smart manufacturing and retailing where high levels of precision are required. High margin growth is expected to continue going forward, driven by RAK's vigilant approach to creating new industrial applications, partnerships and developing products at the forefront of innovation, leveraging its market-leading experience.
- 2. Consumer.** End-use applications for RAK's consumer facing products include watches, personal navigation devices, and games. Consumer goods represented an estimated 5% of revenues in FY21 for RAK's Positioning segment. The lower revenues reflect the tilt away from consumer products over the previous few years in spite of the short-term benefits brought on by the global shortages of TCXO chips. We estimate this share of revenues will be elevated in FY22, FY23 and FY24, to between 35% in FY22 to 15% in FY24 due to our assessment of the more recent consumer contract wins. We assume these shorter term consumer deals tail off by FY27 but the company may seek to extend these deal by involving its low-cost manufacturing partners.
- 3. Automotive.** The automotive section represents in car navigation, communications, driver assistance and the development of autonomous vehicles. A modern car currently has two potential points of use for RAK related products, in communications and navigation. Current demand from within this industry is predominantly GPS navigation applications, representing 90% of the supply in automotive. In the future, the network of sensors within autonomous vehicles will require precision timing and be highly synchronised down to the microsecond. This offers RAK the third entry point into autonomous cars, with a master timing device likely needed.

In FY21, we estimate that automotive revenues represented around 15% of total Positioning revenues. The automotive Positioning market is segmented into three markets:

- **Communication.** On the communication front, crystal-based technology provides Bluetooth, Wi-Fi and mobile connectivity for a car. This market is highly commoditised, with products often selling for less than a dollar per crystal unit. RAK does not attempt to compete in this segment. However, in the future RAK may benefit from upcoming car-to-car mesh/grid-like technology, which would enable vehicles within a localised area to communicate with each other, helping to navigate and avoid traffic issues, congestion and obstacles. While this will require higher specification products, it is more likely these crystal-based communication technologies will be similarly commoditised, like other consumer-related products and, as such, not likely a focus for management.
- **Navigation.** Autonomous vehicles require precise frequency controls and highly reliable products to aid navigation. As such, the automotive industry represents a significant growth opportunity for RAK with its high-end precision technology. The anticipated uptick in high specification in-car driver assistance and then autonomous vehicles will result in upside for RAK through the increased implementation of its frequency control and timing products across a broader range of functions within cars. There will be an increased dependency on semi-conductors in an autonomous world to provide vehicles with the utmost precision and accuracy when accommodating driver assistance solutions. The accuracy of navigation systems within autonomous vehicles is expected to significantly increase, with an end goal of precision down to 10cm, implying the need for notably more reliable semi-conductors than currently being supplied. This requirement for ever-increasing accuracy will likely result in RAK seeing demand for its higher-end offerings into the market. Margins should stabilise at higher levels through the transition from present high stability TCXOs to the necessary ultra-stable TCXOs, with prices sometimes ten times entry-level equivalents.
- **Master timing device.** The network of sensors within autonomous vehicles will require precision timing and be synchronised down to a microsecond. This could present an opportunity and see RAK's products integrated as a master timing device on a large scale. A typical internal combustion engine (ICE) car uses between 50 and 150 semiconductors. By comparison, an autonomous vehicle could easily have more than 3,000 semiconductors per car, each requiring accurate timing stamps relative to each other. This offers a significant opportunity as these products will require higher specification products, suiting RAK's positioning in the market.

Outlook

With a 50-year track record in innovation, these emerging opportunities will allow RAK to play a pivotal role in the timing and systems required within industrial applications and inevitably in autonomy through the use of its advanced and higher-margin TCXO, IC-OCXO and discrete OCXO product offerings. RAK sees good growth into precise positioning for autonomous agriculture and mining equipment, which forms the majority of revenues from the segment.

The rise in autonomous vehicles will be an important driver for growth in the positioning segment in the long term. The transition towards higher-end industrial applications and away from the competitive market in consumer is complete, except for some one off revenues. From a lower base, we see the Positioning segment presenting a solid runway for steady growth on elevated and more stable margins. RAK's market share is increasing in applications requiring the highest precision and accuracy. This trend is expected to continue with management prioritising margin growth within the Positioning business. In the high-volume consumer sub-segment, competitive pressures from global positioning module makers in Asia are expected to revert to putting pressure on pricing; however, RAK will likely opportunistically accept deals when they have the capacity, and it makes sense to do so, thereby building partnerships and relationships.

In Positioning, we forecast 2H22 to be somewhat affected by supply disruptions with moderate growth throughout the remainder of the forecast period driven by industrial demand and automotive growth. Given our expectations of a return to competitive pricing we see longer term gross margins falling gradually toward 45% over ten years, down from the 55% seen in 1H22 but above the FY17-FY21 average of 42%.

Figure 22. Positioning forecasts

Positioning	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Revenue (NZ\$m)	14.0	12.5	14.6	27.1	29.0	26.5
Gross Profit (NZ\$m)	6.7	6.9	7.4	14.2	14.8	13.0
Gross Profit Margin %	47.9%	54.9%	50.4%	52.5%	51.0%	49.0%

Source: Forsyth Barr analysis

IoT, Emerging & Other (5% of FY21 Group revenues)

The IoT, Emerging & Other segment of RAK's Core markets make up the remainder of RAK's revenues, **contributing NZ\$7m in revenues over FY21**. In this segment, the company places its emerging applications such as the Internet of Things (IoT), wireless control, testing and measurements, machine-to-machine applications, and products for use in smart grids and metering.

One-off consumer contract due to global chip shortages

In 1H22, RAK took on a sizeable one-off order and therefore experienced a notable uplift in revenues to NZ\$19m as compared with NZ\$3.5m in 1H20. This was driven principally by the global TCXO chip shortages, where RAK profited from a significant order from a tier-one consumer goods manufacturer. RAK won this opportunistic one-off order due mainly to the worldwide supply disruptions in other companies. At the same time, RAK was able to exploit its flexible and scalable operations to scale profitably to meet the market demands. We estimate this individual order will contribute NZ\$28m in revenues and NZ\$18m in EBITDA in FY22. It remains possible RAK is awarded ongoing revenues from this customer, although, this is not in our estimates.

IoT

The Internet-of-Things (IoT) revolution has already started. IoT products and applications already connect tens of millions of smart sensors and devices via communication infrastructure. IoT connects devices to the internet, fostering data exchange through embedded software and sensors, allowing communication. Smart devices powered by IoT are increasing in prevalence. This trend is expected to continue as the need for device-enabled insights to drive efficiency becomes stronger across every industry. The opportunity for RAK exists in the sensors which capture data and the edge gateways which process it, with both these systems requiring precision timing and synchronisation – the heart of RAK's product set. It also connects with RAK's progress in 5G. 5G is necessary to enable new IoT capabilities for these new, advanced technologies that will be internet and sensor-enabled, giving enriched information to consumers and companies alike.

Long-term enduring relationships with tier-one customers allow RAK to implement its products into the sensors connecting devices. The uptake of IoT is expected to increase in significance with the advent of 5G, bringing innovations across all industries and resulting in the integration of several billion devices into a hyper-connected society. As IoT platforms and networks evolve, RAK could benefit from opening new revenue streams, leveraging its history of innovative timing solutions. We consider this as longer term optionality for RAK and do not specifically factor in any revenues from IoT.

Outlook

Despite the potential of some of the markets within RAK's IoT, Emerging, and Other business segment, it is not a strategic focus for management. RAK's current approach is to target areas in which it can leverage its market-leading innovative capabilities to provide high-performance frequency solutions and achieve margin growth. Aside from the one-off large consumer order during FY22, we estimate mild-to-moderate growth of 3% per annum over the forecast period, holding a constant 15% margin – as was achieved in FY21. We do not anticipate RAK to pursue development in this area actively. However, over time the opportunity for one of these emerging technologies to expand and become a new core market segment in itself, especially in IoT, remains possible.

Figure 23. IoT, Emerging & Other

IoT, Emerging & Other	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Revenue (NZ\$m)	7.0	19.3	15.8	35.2	7.4	7.6
Gross Profit (NZ\$m)	1.1	11.4	8.3	19.7	1.1	1.1
Gross Profit Margin %	15.0%	58.9%	52.4%	56.0%	15.0%	15.0%

Source: Forsyth Barr analysis

Result highlights

1H22 result

On 25 November 2021, RAK announced its 1H22 financial results. It was a strong result and well guided after management updates in September and early November. Revenue in 1H22 was NZ\$85.4m, up +NZ\$25.9m or +43% on 1H21. Underlying EBITDA was NZ\$26.4m, up +NZ\$15.0m on 1H21 or +132%. NPAT was NZ\$18.9m, up +308% or +NZ\$14.3m on 1H21. In summary, the 1H showed:

- Core markets performing well, aided by the continued 5G network infrastructure rollout and growth in new market segments.
- RAK was able to work through the uncertainties of procurement of raw materials and parts, manufacturing capacity, and by adaptation of design specifications and other resources in the first half to deliver greater than expected volumes of higher-margin products in September and October.
- Margins increased in the key Telecommunications, and the IoT, Emerging & Other segments due to economies of scale from new customer wins.
- Aggressive growth in the 1H saw working capital grow substantially, with trade debtors & other receivables rising +NZ\$12.2m and inventories +NZ\$5.8m. Despite the working capital increases, cash and cash equivalents at 1HY22 was NZ\$19.9m.

Benefits of semiconductor market constraints

RAK gained significant revenues in 1H22 due to the global TCXO supply constraints. Shortages driven by the fire at Asahi Kasei Microdevices Corporation (AKM), of Japan, in November 2020 and the ongoing constraints throughout the semiconductor market helped provide RAK the opportunities to utilise its capability to increase capacity and output. Production from NZ hit an all-time high and increased +60% over 1H21 with significant increases in TCXO and OCXO production.

Figure 24. RAK HY21 & HY22 Results and Forsyth Barr 2H22 expectations

30 September half year end	1H21	1H22	Deviation	2H21	2H22 Forecast	Deviation
Revenue	59.5	85.4	+43%	68.7	87.1	+27%
Cost of sales	(32.4)	(41.9)	+29%	(36.9)	(43.6)	+18%
Gross Profit	27.1	43.5	+60%	31.8	43.6	+37%
Other operating income	0.1	0.6	+548%	0.2	0.1	-31%
Operating expenses						
Selling and marketing costs	(4.4)	(3.9)	-12%	(5.0)	(5.9)	+19%
Research and development	(6.6)	(6.5)	-3%	(7.0)	(9.1)	+30%
General and administration	(13.4)	(14.3)	+7%	(12.6)	(12.8)	+2%
Total operating expenses	(24.5)	(24.6)	+1%	(24.6)	(27.8)	+13%
Other gains/(losses) - net	2.3	(0.4)	-116%	(1.1)	(0.0)	-100%
Operating profit	5.0	19.1	+280%	6.3	15.9	+153%
Finance income	0.0	0.0	+45%	0.0	0.0	+130%
Finance costs	(0.4)	(1.3)	+204%	(1.2)	(0.4)	-69%
Share of net profits of associates	1.0	1.6	+63%	0.5	1.6	+262%
Profit before income tax	5.6	19.5	+247%	5.6	17.2	+210%
Income tax expense	(1.0)	(0.5)	-46%	(0.6)	(5.0)	+792%
Net profit after tax for the period	4.6	18.9	+308%	5.0	12.2	+145%
Profit before income tax	5.6	19.5	+247%	5.6	17.2	+210%
Depreciation and amortisation	(4.3)	(4.6)	+6%	(4.3)	(4.1)	-6%
Finance costs - net	(0.4)	(1.3)	+208%	(1.2)	(0.3)	-72%
Adjustments (associates, tax, depreciation)	(0.9)	(1.0)	+15%	(1.0)	(1.4)	+41%
Other non-cash items	(0.1)	(0.1)	-34%	(0.1)	0.2	-417%
Underlying EBITDA	11.4	26.4	+132%	12.1	23.0	+90%

Source: Forsyth Barr analysis

FY22 forecasts

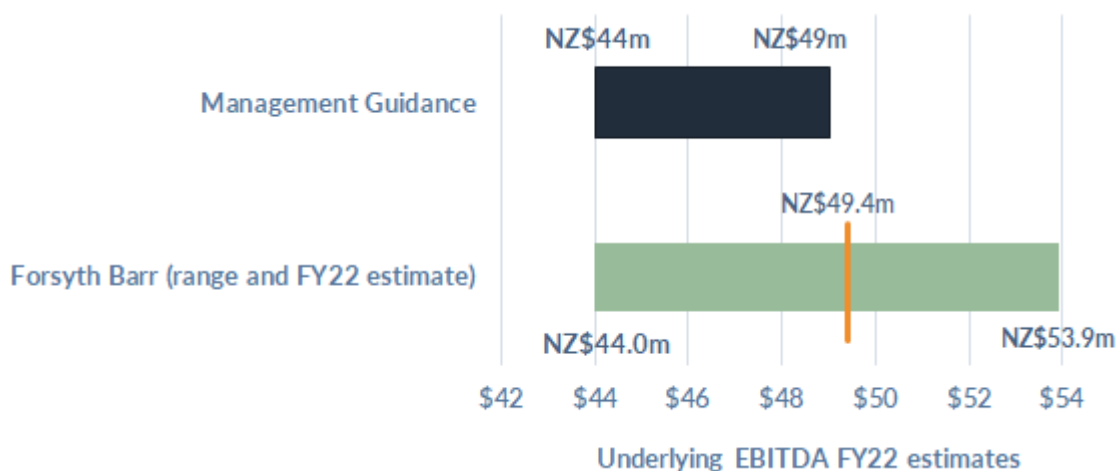
Concern about sourcing sufficient supplies of componentry inputs has been highlighted by management. 4Q22 will be exceptionally tight regarding raw material and parts supplies and offers a real risk of disrupting 2H22 sales. We believe customer orders are there, if adequate raw material supplies can be sourced in time. Delivery timeframes for component suppliers has extended out from a normal one to three months, out to five to ten months or more, compounding the issue. Our estimates for FY22 are:

Base case — We have factored in partial disruption of 4Q22 sales into our BASE CASE. We forecast FY22 revenues of NZ\$172.5m and underlying EBITDA of NZ\$49.4m. Our underlying EBITDA forecast is marginally above management's range and 6% ahead of the middle of management's forecasts, we assume, on a mildly less negative view of the impact on 4Q22 trading from component shortages. We believe that 5G and DC demand is there but can they source components in time?

Upside case — Our no supply constraint revenue forecast is NZ\$187.1m, producing underlying EBITDA of NZ\$53.9m. This estimate of underlying EBITDA is +16% ahead of the middle of management's current guidance range.

Downside case — If 4Q22 supplies are more severely impacted and insufficient quantities of materials are sourced, this offers significant downside risk. If supply constraints make it impossible to fulfil half of our non-disrupted 4Q revenue forecast, our significant Q4 impact revenue forecast is NZ\$165.6m, producing underlying EBITDA of NZ\$44.0m. This lower underlying EBITDA forecast aligns with the lower end of management's forecast expectations of underlying EBITDA of NZ\$44.0m to NZ\$49.0m.

Figure 25. Company and our forecast of Underlying EBITDA



Source: Forsyth Barr analysis

RAK definition of Underlying EBITDA - RAK has used Underlying EBITDA as a non-gap financial measure. Underlying EBITDA is defined as Earnings before interest, tax, depreciation, amortisation, impairment, employee share schemes, non-controlling interests, adjustments for associate's share of interest, tax and depreciation, loss on disposal of assets and other cash and non-cash items.

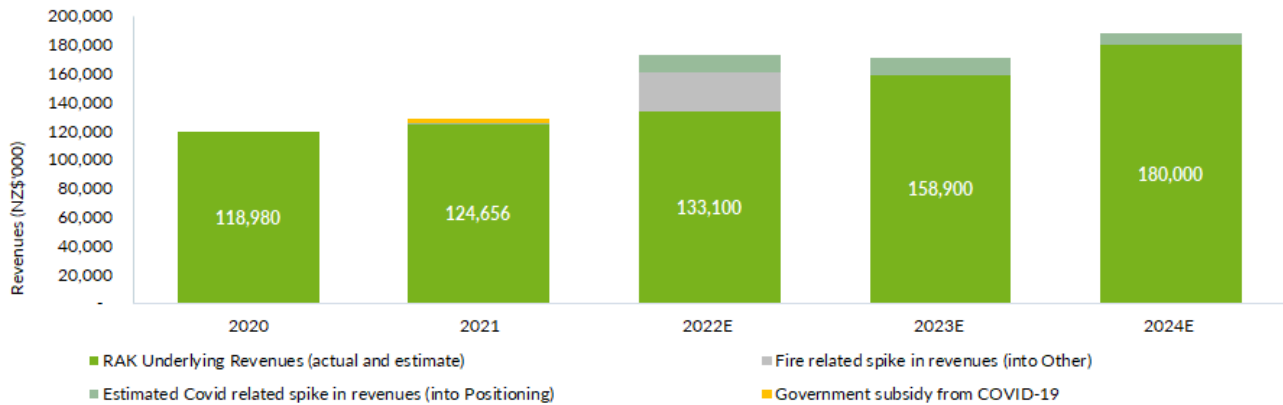
Outlook

RAK's management reiterated guidance for underlying EBITDA of NZ\$44 million to NZ\$49m for FY22. We anticipate the business will perform well throughout the remainder of FY22, provided the company can secure raw materials and component inputs, manage the supply chain, and maintain the high output level at its manufacturing sites by avoiding COVID-19 related disruptions. Sourcing of adequate supplies is extremely difficult to forecast and will be the major swing factor in the FY22 result.

Customer orders remain strong, particularly in 5G, and would likely be stronger if the business could secure sufficient inputs or had additional capacity. 2H22 will see the final tranche of orders due to the worldwide TCXO chip shortage. Management has commented that there was an extreme focus on supply chain risk mitigation. Capacity is increasing in NZ and India, allowing the business to continue developing existing products and exploring new markets. The new Indian manufacturing facility, to be delivered in the middle of calendar year 2023, will allow RAK to shift product production to the best location and give customers another layer of security of supply. This has been of growing importance in the sector. A better product mix, and the move towards 5G infrastructure and away from the highly competitive consumer products, will see margins remain elevated (see chart below) and not out of scale relative to peers.

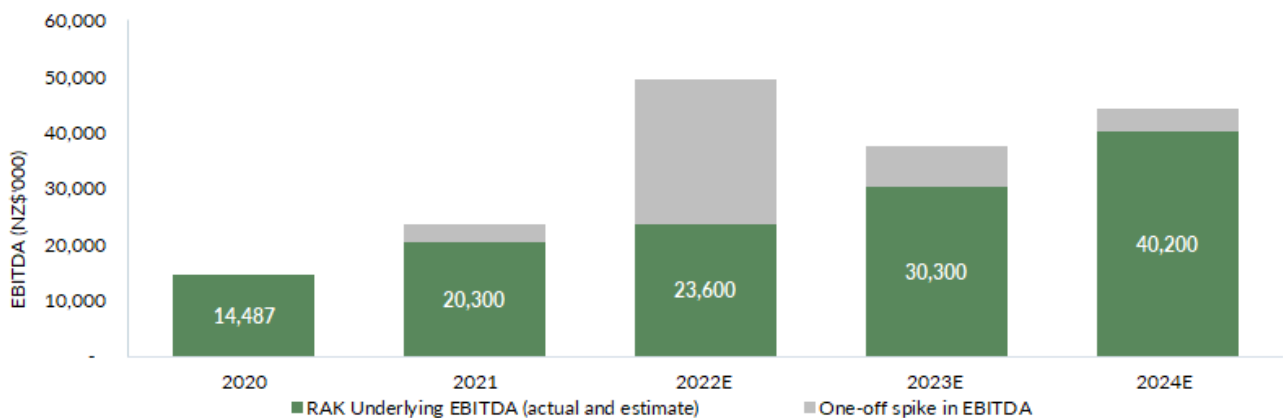
Key charts

Figure 26. Rakon actual and estimated revenues (with and without Covid spike)



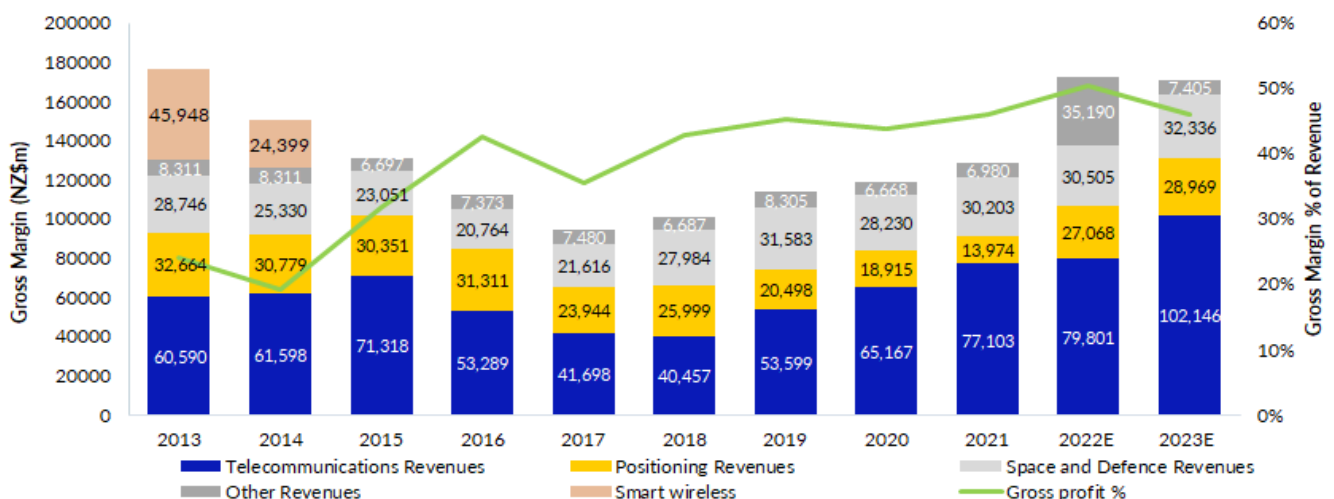
Source: Company data, Forsyth Barr analysis

Figure 27. Rakon actual and estimated EBITDA (with and without Covid spike)



Source: Company data, Forsyth Barr analysis

Figure 28. RAK Revenue Stack by Division and Gross Margin %



Source: Company data, Forsyth Barr analysis

Valuation

Our NZ\$2.26 per share spot valuation of RAK is based upon a Discounted Cashflow (DCF) approach, supported by comparable analysis.

Key Assumptions

The key assumptions underlying our forecast growth in RAK's free cash flow over the next few years are listed below. We believe that, on balance, these assumptions are a fair assessment within a range of potential outcomes.

Figure 29. Key assumptions

		FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Group Revenue and Gross Margin	Revenue (NZ\$m)	128.3	85.4	87.1	172.6	170.9	188.0
	Gross Profit (NZ\$m)	59.2	43.9	43.2	87.1	78.5	85.6
	Gross Profit Margin %	46.1%	51.3%	49.6%	50.5%	45.9%	45.6%

We are forecasting total revenue growth in FY22 of +34.6% and Gross Margin growth of 47% due to a solid performance by RAK in its core markets and some abnormal wins related to disruptions at competitors. In FY23, Group revenue is forecast to decline slightly, -1%, due to the partial reversal of these COVID-19 abnormals and the impact of supply chain pressures, with a larger -10% decline in Gross Margin. In FY24, revenue and gross profit are both forecast to increase by circa 10% due to continued strong performance in Telecommunications and Space.

Opex forecasts In FY22 we assume supply constraints and cost pressures result in cost inflation of circa 4.2%, progressively declining to 2.5% by FY24. This results in the following profile in Opex:

	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
Opex	49.0	24.6	27.8	52.4	56.3	58.9
as % of sales	38.2%	28.8%	31.9%	30.4%	33.0%	31.4%

Opex as a percentage of sales declines from 38% in FY21 to 31% by FY24, reflecting the operating leverage implicit in RAK's operations. We anticipate Opex increasing in low single digits percentages pa in absolute terms, delivering rising operating margins over time.

Capex We have assumed a total investment of NZ\$10m for the new Indian plant over FY22 (NZ\$2.5m) and FY23 (NZ\$7.5m). Excluding India, RAK forecasts to spend circa 4–5% of sales pa on capital expenditure.

The large uptick in FY24 reflects the renewal of the right of use lease on the Auckland Headquarters building (non-cash, IFRS 16 basis)

	FY21A	1H22A	2H22E	FY22E	FY23E	FY24E
PPE Capex	4.2	4.0	2.9	6.9	13.7	4.7
Right of Use Capex	0.0	0.0	0.0	0.0	0.0	14.1
Intangibles Spend	0.9	0.8	0.8	1.6	1.5	1.7
Total Capax	5.1	4.8	3.7	8.5	15.2	20.5
as % of sales	4.0%	5.6%	4.2%	4.9%	8.9%	10.9%

FX We do not assume any major change in FX rates. A stronger NZD against the Asian currencies would lead to earnings downgrades due to the translation impact into NZ earnings. The fundamental currency for the company's sales is USD and as such the key cross rate is NZD/USD. RAK has a hedging program in place. RAK has hedging policy targets to have hedging covering 75% of net exposures in a 0–12 month period and 50% in 13–24 month period.

Source: Forsyth Barr analysis

These assumptions result in the following profile of Free Cash Flow to FY24 – with Underlying EBITDA (the key metric reported by RAK) forecast to decrease from NZ\$49.4m in FY22 to NZ\$44.2m by FY24.

Figure 30. Underlying EBITDA to Free Cash Flow

	2022	2023E	2024E
Underlying EBITDA (RAK Measure)	49.4	36.8	44.2
Cash EBITDA	43.7	30.9	38.1
Less Valn Tax	(9.8)	(6.1)	(7.6)
Plus/Minus Change in Working Capital	(10.0)	2.1	(4.1)
Less Capex and Investments	(8.5)	(15.2)	(6.4)
Free Cash Flow	5.5	11.8	20.1

Source: Forsyth Barr analysis

Note: the key difference between Operating Leverage and Underlying EBITDA is that the latter includes Income from Associates (which is non-cash). We account for the value of these Investments as an explicit adjustment to our valuation.

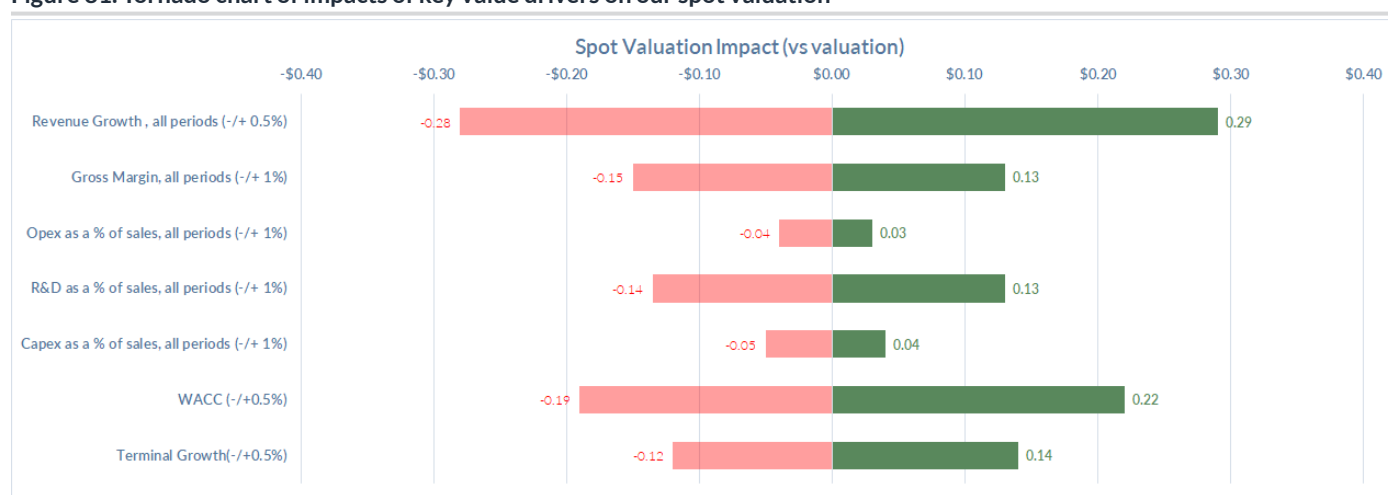
Top six Key Risks

We have identified the following top six key risks (in no particular order) to our valuation of RAK. A further breakdown of key risks (and opportunities) is outlined in the SWOT analysis in the Strategy section of this report.

- Pricing pressure:** Potential overbuilds in the semi-conductor sector as seen in previous cycles leading to a reinvigoration of pricing pressures
- New COVID strains and restrictions:** Increased supply chain pressure and potential for a significant global economic downturn
- Inflation pressures:** Opex, capex and wage cost overruns impact margins
- R&D 'success' risk:** The annual R&D burden (of net 10%) of sales and requirement for this to be successful to maintain volume growth and margins
- Geo-political:** Exposure to US/China trade or geopolitical wars
- ESG:** Military exposure results in increased social and political pressures, limits investor appetite and liquidity

The below tornado chart summarises the impact of key value drivers on our spot valuation of NZ\$2.26 per share.

Figure 31. Tornado chart of impacts of key value drivers on our spot valuation



Source: Forsyth Barr analysis

Figure 32. Valuation – Detailed DCF input and outputs

General assumptions	
Stock Code	RAK
Share Price	NZ\$1.80
Valuation Date	16-Dec-21
Last Balance Date	31-Mar-21
Next Balance Date	31-Mar-22
Days till Year End	105
Shares on Issue (m)	229.1
Mkt Cap (NZ\$m)	412.3
WACC and terminal value inputs	
Asset Beta (x)	1.15
Risk Free Rate (%)	2.3%
Corporate Tax Rate (%)	28.0%
Target Debt Equity Ratio (%)	0.00%
Market Risk Premium (%)	5.50%
Equity Beta (x)	1.10
Cost of Equity (%)	8.9%
Debt Premium (%)	6.3%
Cost of Debt (%)	6.30%
WACC	8.9%
LR Pay-out Ratio (%)	50.00%
LR Growth Rate (%)	2.50%
Valuation outputs	
PV of cash flows	496
Add investments	17
Total Firm Value (NZ\$m)	513
Add net cash on balance sheet (NZ\$m)	5
Total Enterprise Value (NZ\$m)	518
Diluted number of Shares on Issue (m)	229
Forsyth Barr Spot Valuation (NZ\$/Share)	\$2.26

Source: Forsyth Barr analysis

Our inputs into WACC calculations include assessing asset beta at 1.15x, using a Risk-free rate (Rfr) of 2.3%, cost of debt at 6.3%, market-risk-premia (MRP) of 5.5% and long-run growth rate of 2.5%. These inputs create our assessment of RAK's **WACC at 8.94%**. We conservatively ascribe no value to the tax losses in NZ or France.

In revenue and earnings forecasts we have endeavoured to reflect a balance between potential growth in markets and the likelihood of a return to more competitive pricing environments post the easing of supply chain impacts and new industry capacity comes online.

FY22 guidance has already been upgraded twice and depending on how input procurement proceeds we would expect at least one more upgrade before the full year result in late May 2022. **We note 4Q22 risks associated with sourcing of adequate inputs is significant and the most difficult to determine swing factor.**

Comparable company analysis

We have cross referenced our valuation with the key metrics of comparable companies. The comparable set of companies used for the analysis is further detailed in the Strategy section of this report.

RAK has few direct comparable companies and generally competes with subdivisions of larger corporations, e.g. Epson, a large Japanese electronics company which has a “Microdevices” business.

Given FY22 has several COVID-19 related abnormals we believe FY23 is a more relevant reference point for a comparables analysis.

The full set of comparable companies reflected in the below table trade at a FY23 EV/EBITDA multiple ranging between 6x to 72x. SiTime sits as an outlier compared to the comparable set. After removing SiTime as an outlier, and those companies where only a small part of the business competes with RAK, we consider three relevant comparable companies; TXC Corp, Mircochip Technology and Epson.

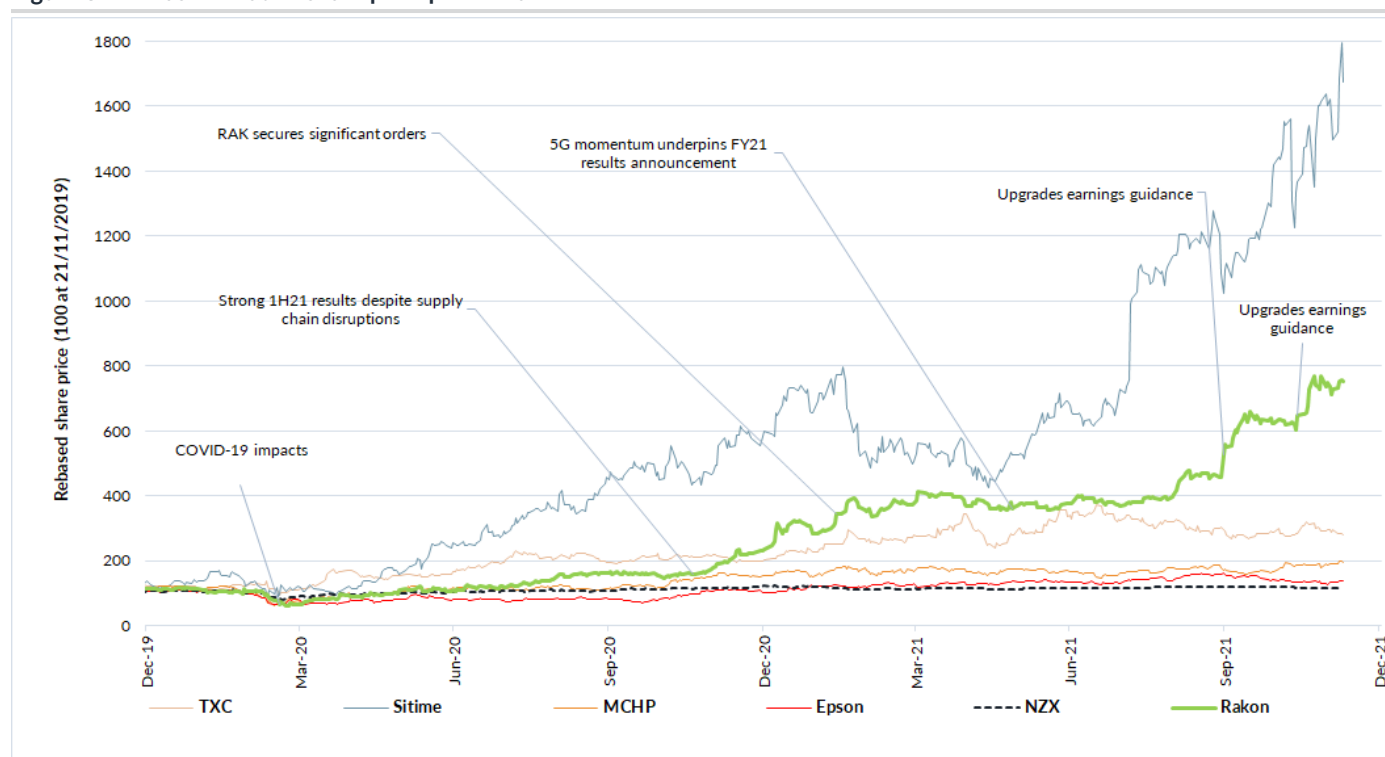
The EV/EBITDA multiple derived from these three comparables provides a range of between 5.5x and 16.0x FY23 EBITDA. We believe, after weighing up the factors described below, RAK should trade at the upper end of the peer range and this is consistent with Rakon’s current trading multiple of 11x FY23 and that implied by our spot valuation of NZ\$2.26 (which is a FY23 multiple of 13.8x).

Figure 33. RAK weighing up the factors

Factors driving Higher Multiple	Factors driving Lower Multiple
High margin	Based in New Zealand
Strong revenue growth	Scale
Recent market wins	Historical issues
Track record of R&D	

Source: Forsyth Barr analysis

Below is a summary of RAK’s share price performance relative to a Price Index formed from its comparable set of companies. Presenting stock price histories of the companies within this index, rather than showing the absolute changes, allows us to better compare share price performance across different price levels for each company. Since 31 December 2019, RAK’s share price has increased from NZ\$0.28 to NZ\$1.80 on 16 December 2021, representing an increase of +642% over the period. In contrast, the mean appreciation in share price of RAK’s peer group has been +74% (excluding SiTime), while the NZX50 has risen 66% over the same period. RAK’s strong financial performance over the past two years is representative of the firm’s adaptability and scalability to take on additional COVID-19 related business coupled with management’s strategy change, over the past few years, and adaptability in difficult operating conditions.

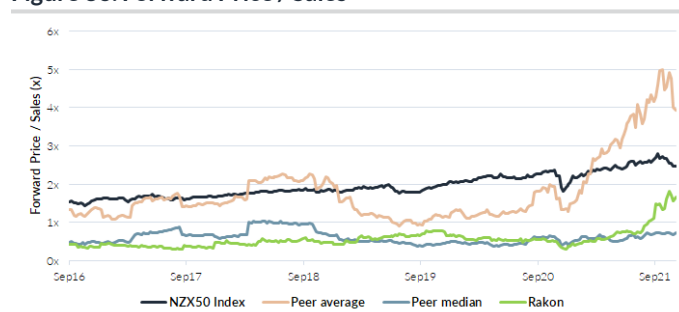
Figure 34. Rebased relative share price performance


Source: Forsyth Barr analysis

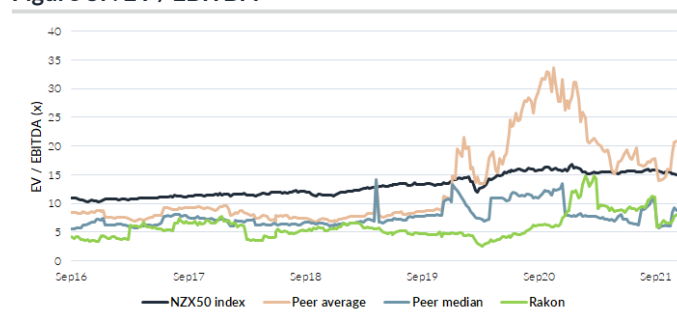
Figure 35. Comparable valuations (as at 16 December 2021)

	Market Cap (US\$m)	Current Price / Sales (x)	Forward Price / Sales (x)	Current EV / EBITDA (x)	FY23 EV / EBITDA (x)	Current PE (x)	Forward PE (x)	Current EV / EBIT (x)	LTM Sales Growth (%)
TXC	1,114.8	2.1	1.9	6.2	5.8	11.1	9.8	8.6	31.0
SiTime	5,508.7	31.7	23.5	70.3	72.3	479.6	93.2	83.5	38.2
Microchip Technology	47,252.8	9.1	6.8	17.0	16.0	61.2	18.2	18.0	3.1
Siward Crystal Technology	225.5	2.0	1.8	-	-	20.5	12.6	10.4	12.7
Daishinku Corp	472.2	1.3	1.3	8.1	-	17.7	16.9	13.5	11.1
Nihon Dempa Kogyo Co., Ltd	320.3	0.8	0.8	7.4	-	5.5	9.0	12.0	-0.7
Seiko Epson Corporation	6,947.9	0.6	0.7	5.1	5.5	10.8	12.5	9.2	-4.6
Total peer group median		2.0	1.8	7.8	10.9	17.7	12.6	12.0	11.1
Total peer group average		6.8	5.3	19.0	24.9	86.6	24.6	22.2	13.0
Considered peer group average		3.9	3.1	9.4	9.1	27.7	13.5	11.9	9.9
NZX50	-	2.5	2.4	15.0	-	19.3	29.5	-	-
RAK	278.5	2.5	2.4	8.3	11.0	18.4	20.7	20.8	35.1

Source: Forsyth Barr analysis

Figure 36. Forward Price / Sales


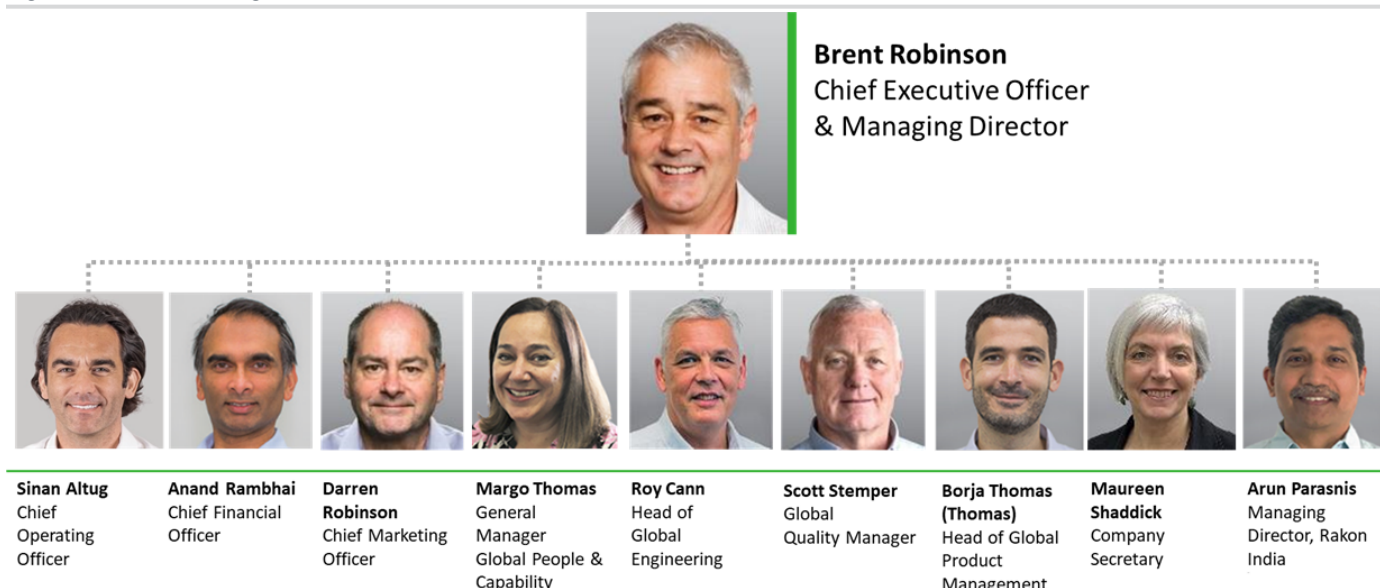
Source: Bloomberg data, Forsyth Barr analysis

Figure 37. EV / EBITDA


Source: Bloomberg data, Forsyth Barr analysis

Governance

Figure 38. Senior management



Source: Company supplied

Figure 39. Management

Management	Position	Description
Brent Robinson	CEO until 1 April 2022	Brent has been Managing Director and Chief Executive Officer from 1986 and will step down from this role on 1 April 2022 to focus on RAK's technology. In his capacity as Chief Technology Officer (CTO), Brent will oversee the business's technology and innovation of the group. He has 42 years' experience at RAK in the design and manufacture of crystals and oscillators. Brent owns a direct 15.2% shareholder in RAK.
	CTO (from 1 April 2022)	
Sinan Altug	COO until 1 April 2022	Sinan joined RAK in 2002 and was appointed COO in January 2020 and will become CEO from 1 April 2022. Other senior positions held by Sinan include Managing Director of RAK's European businesses and Global Business Development Director. Sinan has held various management positions in the frequency control product industry before joining RAK, including Director of European Operations for Champion Technologies. He has a PhD in Electrical Engineering and an MBA.
	CEO (from 1 April 2022)	
Anand Rambhai	CFO	Anand joined RAK in January 2012 and was appointed CFO in November 2018. Anand brings strong leadership, commercial skills and in-depth RAK business knowledge to the company. In his current role he is responsible for RAK's finance, information systems and investor relations functions. Anand has gained broad commercial and financial experience in previous roles with organisations including Sony, British Telecom and Deloitte. Anand is a member of Chartered Accountants Australia and New Zealand (CAANZ).
Darren Robinson	CMO	Darren has led sales and marketing since 1990, having earlier held various roles with the company in New Zealand and overseas. He has been instrumental in the company's expansion into new markets, its commercialisation of new applications and its development of business relationships with many Fortune 500 companies. Through Darren's in-depth understanding of the markets RAK competes in he also plays an integral part in steering its R&D efforts. He guides product development teams to meet new requirements in emerging applications and solve problems for customers. Darren owns an equivalent 15.2% shareholding in RAK.
Margo Thomas	Global Head of HR	Margo joined RAK in January 2016. In her current role she is responsible for all global Human Resources (HR) strategy, policies and processes including organisational alignment, talent acquisition, leadership development, change management, employment relations and health and safety. Prior to this she held the position of General Manager of People and Capability New Zealand. Margo has more than 20 years' experience working in HR including senior HR positions in a range of industries with Crowe Horwath, Spark, Westpac and New Zealand Post.

Source: Forsyth Barr analysis

Figure 40. Management (continued)

Roy Cann	Head of Global Engineering	Roy joined RAK in May 2018 as Head of Global Engineering. He is responsible for driving new product developments and leveraging the benefits of a collaborative global R&D team. Prior to joining RAK Roy held the position of Electronic Controls Design Manager at Fisher and Paykel Technologies, where he was responsible for the design and supply chain management of high-volume microprocessor-based motor controllers across New Zealand and China. Prior to this, Roy was an Engineering Director at Trimble for five years. He has held a number of other senior roles with multi-site responsibilities, including positions with Avery Weightronix (UK), Rolls-Royce Aerospace (UK), Meissner Power Systems (South Africa), and Connetics (NZ). Roy holds a PhD in Electrical Engineering.
Scott Stemper	Global Quality Manager	Scott joined RAK in January 2015. He leads the development and improvement of quality processes and systems to enhance RAK's drive to be the leading provider of world-class frequency control products. Scott's background includes ten years as Global Quality Manager with Raltron Electronics Corporation and 20 years with CTS Frequency Controls in oscillator product engineering and quality management roles. He has also held senior quality management positions with L3 Technologies and D&S Consultants Incorporated.
Borja Thomas Schuhmacher	Global Product Manager	Thomas joined RAK in April 2015. In his current role he is responsible for generating and growing profit for the business through its existing and future product offering. His previous senior positions at RAK include Head of Product Management New Zealand and Senior Product Line Manager. Prior to joining RAK, Thomas was a Product Line Manager for Nexans (formerly Alcatel) in France and led the launch of two new product lines addressing the smart grid and electric vehicle markets. Thomas has also spent time in Europe in product consultancy roles in France and began his career as an R&D Engineer in the UK.
Maureen Shaddick	Company Secretary and Legal Council	Maureen joined RAK in November 2018. She provides legal, company secretarial and regulatory advice and support. She has more than 25 years' experience as a commercial lawyer and governance adviser in private practice, corporates and not-for-profit organisations in New Zealand, London and Dubai. Maureen was the General Counsel and Company Secretary of Genesis Energy from 2003 to 2016. She is the Chair of Cancer Research Trust New Zealand and has been a Trustee since 2003. She has also held a number of other not-for-profit governance roles.
Arun Parasnis	Managing Director, Rakon India	Arun joined RAK in October 2018 and is responsible for overseeing all business functions at RAK India. Arun has more than 30 years of experience in the electronics industry, overseeing functions including engineering, operations, business development and profit and loss management. His experience across the electronics industry includes electronic components, consumer electronics and Electronics Manufacturing Services (EMS). Prior to joining RAK, Arun was the Vice President of Cyient Limited. He has also held senior positions at Radiall India Private Limited, Jabil Circuit India Private Limited and Vishay Components India Private Limited (formerly the Philips Electronics Passive Components division).

Source: Forsyth Barr analysis

Board

Following approval of an increase to directors fees approved at the 2021 Annual Meeting, Board remuneration is set at NZ\$140,000 per annum for the Chair and NZ\$70,000 per annum for non-executive Directors with an additional allowance of NZ\$12,000 per annum for the Chair of the Audit and Risk Committee and NZ\$8,000 per annum for the Chair of the People Committee effective from 1 October 2021. Total expenses for the Board amounted to NZ\$1,085,213 over FY21.

Figure 41. Board remuneration

Name	Category	Remuneration (NZ\$)	Shareholding	Shareholding %
Bruce Irvine *	Independent (Chair)	\$105,000	744,102	0.32%
Brent Robinson	Executive	\$766,857	34,846,237	15.21%
Keith Oliver *	Independent	\$52,500	*	
Yin Tseng	Non-Executive	\$55,856		
Roger Yao	Non-Executive Observer			
Lorraine Witten	Independent	\$52,500	176,820	0.08%
Robert Keith Watson	Independent	\$52,500	100,000	0.04%
	Total	\$1,085,213		

Source: Company data, Forsyth Barr analysis

Effective from 1 October 2021 Steven Tucker was appointed to the Board.

Figure 42. RAK Board

Board member	Appointment	Description
Bruce Irvine	18 Nov 2005	Chair and Non-Executive Director. Bruce was Managing Partner of Deloitte Christchurch from 1995 until his retirement in 2007 to focus on his director roles. Bruce is a professional director with extensive experience across a wide range of industries. He is a Chartered Fellow of the Institute of Directors, as well as an Accredited Fellow of Chartered Accountants Australia and New Zealand (CAANZ). He is currently Chair of Heartland Bank, Market Gardeners and Skope Industries. He is also a director of Scenic Hotel Group, House of Travel Holdings and a number of other private companies. Bruce is involved in a voluntary capacity as a Trustee of Christchurch Symphony Trust. Bruce is paid a remuneration of NZ\$140,000 annually and owns 744,102 shares (0.32% shareholding). *
Keith Oliver	10 Mar 2017	Non-Executive Director. Keith is a professional director and a business advisor with Alto Capital, where he is also a director. He is a past director of a range of NZ technology companies operating in international markets in Asia, Europe and the Americas, several of which he has been a founder and investor in. Keith is currently Executive Chair of Blackhawk Tracking Systems Limited, and a director of Wellington Drive Technologies Limited. Keith holds a Bachelor of Engineering (Electrical) with First Class Honours from the University of Auckland. Keith is Chair of the People Committee and is paid a remuneration of NZ\$78,000 annually, however, does not own any shares individually. *
Brent Robinson	5 Nov 1991	Executive Director. Brent has worked at RAK for 42 years and has been CEO/Managing Director since 1986, during which time RAK has established global operations and markets. In his capacity as Chief Technology Officer, Brent drives the business' technology and innovation. Under Brent's leadership RAK has grown into a global business and a recognised leader in the frequency control product industry. Brent is an Honorary Fellow of the Institution of Professional Engineers New Zealand. Total remuneration in FY21 was NZ\$766,857 achieving 45% of STI. He was awarded the New Zealand Hi-Tech Trust Flying Kiwi Award in 2011. Brent was paid a remuneration of NZ\$766,857 in FY21 and owns 34,846,237 shares (15.21% shareholding).
Lorraine Witten	10 Mar 2017	Non-Executive Director. Lorraine is a professional director with extensive experience in technology and Information Communications Technology (ICT) sectors, as well as competence in strategy and entrepreneurship. She is a Chartered Fellow of the Institute of Directors and has more than 25 years' experience in senior management and finance roles, including as past General Manager of Telecom Mobile from 1997 to 2001. Lorraine is Chair of Move Logistics Group, Horizon Energy Group and PushPay Holdings. She is also Chair of Simply Security Limited, a company she founded in 2007, and Chair of vWork. Lorraine is a past Chair of Kordia Group and a past board member of New Zealand Trade & Enterprise, among others. She is a member of Chartered Accountants Australia and New Zealand (CAANZ). Lorraine holds a Bachelor of Management Studies with First Class Honours from the University of Waikato. Lorraine is Chair of the Audit and Risk Committee and is paid a remuneration of NZ\$82,000 annually and owns 176,820 shares (0.077% shareholding).
Yin Tang Tseng	10 Mar 2017	Non-Executive Director. Yin Tang (Tony) is the current Chair of Siward Crystal Technology Co. , a substantial shareholder (16.6%) in RAK. Tony has more than 30 years of experience in the frequency control product industry, having founded Siward in 1988 and grown the company to become one of the leaders in the industry globally, with revenue of US\$100+ million. Tony is a director of Securitag Assembly Group. Tony is paid a remuneration of NZ\$70,000 annually, however, does not own any shares.
Roger Yao	2 Jun 2017	Observer for Yin Tang Tseng since 2 July 2020.
Keith Watson	21 Sep 2018	Non-Executive Director. Keith is a professional director with substantial experience in the technology and engineering sectors. He is a Chartered Member of the Institute of Directors and has over 30 years' experience in senior VP and executive roles, including positions with Hewlett Packard in North America, Asia and NZ. He was Managing Director of Hewlett Packard, New Zealand from 2004 to 2016. Keith has governance, management and leadership experience in companies across the Asia Pacific region, the Americas, Central Europe, the UK, Australia and New Zealand. He has previously chaired Opus International Consultants Limited and is a past board member of the New Zealand Technology Industry Association (NZTech) and the University of Auckland Business School. Keith is currently Chair of the New Zealand Institute of Economic Research (NZIER), and a director of Acumen Trust, Acumen Republic, Counties Power, ECL Group and Complete 3D. Keith is paid a remuneration of NZ\$70,000 annually and owns 100,000 shares (0.04% shareholding).
Steven Tucker	1 Oct 2021	Non-Executive Director. Steve is a professional director with extensive governance and senior executive experience in the technology sector. Steve is Chair of Gallagher Holdings and Goodnature, and a director of HJ Asmuss and Co Ltd, Taska Prosthetics, 5th Element and Purpose Capital Impact Fund. He is also Chair of Primary Growth Partnership Caprine Innovations NZ Programme. He was previously a director of publicly listed Methven, a councillor of Waikato Institute of Technology and trustee of St Peter's School, Cambridge. Steve has over 20 years' senior management experience including as Deputy Chief Executive at Gallagher. Steve is a Chartered Member of the Institute of Directors and a Fellow of the Institute of Chartered Accountants. He has a Bachelor of Management Studies from University of Waikato and has attended the Executive Management Program at Darden University in the USA. Steve is paid a remuneration of \$70,000 annually.

Source: Forsyth Barr analysis

ESG and Defence

RAK's defence business constitutes approximately 10% of forecast FY22 revenue. Products sold to the defence sector customers are for a range of applications including communications, radar, navigation and positioning.

RAK is committed to operating in accordance with all applicable laws and regulations in the countries in which it operates and observing sound business and ethical conduct.

Export Controls and Trade Law Compliance

In 2020, New Zealand introduced new broader export catch-all controls. Previously, export permits from MFAT were required if a product was listed on the Strategic Goods List, could be for use in weapons of mass destruction or was for a military end use in a country subject to the United Nations Arms Embargo. RAK's products currently do not fall within the specifications listed on the Strategic Goods List. While we cannot say explicitly that this is always the case, it is unlikely that a RAK product would be captured within the definitions of 'Strategic Goods'.

The new catch-all controls build on the previous requirements but have listed a narrow number of countries as exempt from permit requirements for exports of products for a military end use. The countries on the exempt list all have export controls that are sufficiently robust and aligned with New Zealand's standards. They include: the United States of America, Canada, Iceland, Australia, Japan, Norway, Switzerland, South Korea, United Kingdom and all member states of the European Union.

Control of product end use by RAK

- **RAK mandated ban.** It is RAK policy that it will not sell or export any product for use in weapons of mass destruction or cluster munitions. RAK includes end use statements requiring confirmation that its products will be used in compliance with all trade laws, treaties and sanctions and will not be used in weapons of mass destruction (nuclear explosive devices, biological weapons, chemical weapons and their means of delivery) when it undertakes business with customers. This provides the first layer of protection.
- **Obligation to report and know your customer due diligence.** RAK is subject to the NZ Customs and Excise Act which contains an obligation that if a company is aware of, or reasonably aware, that there may be a military end-use or prohibited end use of the product, they must report it to the Secretary of Foreign Affairs. In addition, the catch-all control requirements implemented in 2020 have led the company to thoroughly review its customer base and strengthen due diligence processes for customers in exempt and non-exempt countries. This is the second layer of protection.
- **Dual-use components.** RAK's product is just one component part of something much more significant. However, as with most products RAK sells, there is usually some specialisation needed to ensure the product is robust enough in extreme environmental or operating conditions, which means it is a specialised part of the end product. This allows further insight into the application and the third layer of protection.
- **Operations outside of NZ.** RAK has manufacturing operations in both France and India and requires compliance with the export control legislation and regulation in each country in which it operates. Like New Zealand, France and India have laws and regulations which restrict the export of goods and technology that may be used in applications in weapons of mass destruction, in conventional weapons and in products that may support the activities of paramilitary or security forces to suppress populations and or terrorism. We note that France is on the list of countries exempt from the permit requirements, but India is not. Products manufactured in India are principally telecommunications related. The small output produced for the defence sector is sold for use in India only.

Will RAK's Defence exposure affect investor interest?

Investor decisions around whether companies with defence-related revenues can form parts of portfolios are often not straightforward. Considerations include:

- On the one hand, there is an acknowledgement of the right of nations to have a military for legitimate reasons such as for national self-defence or national security purposes as outlined in the Charter of the United Nations and controlled by UN arms treaties and embargos. In addition, various types of weapons are necessary for internationally accepted goals such as peacekeeping missions (communications and positioning as examples).
- On the other hand, there is the awareness that the industry entails risks related to various types of weapons and their potential use where international humanitarian law is violated or used for other purposes than national security and self-defence. Across the industry, awareness of these risks is currently heightened due to several live crises, such as the situation in Myanmar.

Mandated SRI/Ethical investors usually do not invest in companies if verified information exists that the company directly or through its supplies of bespoke components, systems or services is involved in the production of illegal weapons, such as anti-personnel mines, cluster munitions, and biological and chemical weapons. For some investors, and most often New Zealand investors, the exclusion may also include nuclear weapons.

Exclusions related to the defence sector generally do not apply revenue thresholds. They tend to have zero tolerance levels without exception.

In summary

We recognise that RAK has its own policies, is protected by NZ, French and Indian Government restrictions, its products are dual purpose with a general commercial application and there is a form of specialisation that is required giving opportunities to limit harmful exposure. While NZ and France have strong export rules for strategic goods, we identify that India is not on the exempt countries list. We would recommend that RAK more formally discloses its policies and develops a formal public ESG policy. We acknowledge that the company is working on this. We expect that RAK may not be suitable for investment for some ethically minded investors.

Appendix 1: Company history

Figure 43. Company History

1967	RAK was founded on 4 April 1967 by Warren Robinson. Robinson had previously operated a business manufacturing marine radios, Marlin Electronics.
1971	RAK moves into its own premises and employees over 30 staff. It begins exporting crystals to Australia and Southeast Asia.
1972	Warren Robinson sets up a second manufacturing plant in Singapore to supply the growing markets of Thailand, Malaysia, Philippines and Taiwan.
1980	Warren Robinson's eldest son, Brent Robinson, joined RAK as Managing Director. Brent was made responsible for the crystal manufacturing business, while Warren focussed on his other expanding business, RAK Computers.
1985	RAK comes across a product type known as temperature-compensated crystal oscillators (TCXO).
1988	TCXOs becomes the main focus of RAK's operations, and the entire manufacturing process for quartz crystals was revamped in order to support this new technology. Started supplying to NEC Australia's Melbourne factory.
1990	RAK releases a product of unprecedented frequency stability of 1 part per million (1ppm). Darren Robinson joined the company as head of marketing.
1991	RAK made entry into the emerging GPS market. IT targeted a high stability frequency reference, in a small package available in volume and takes on GPS Makers Magellan and Rockwell as customers.
1994	New Auckland facility opened.
2006	RAK announces IPO on the NZ stock exchange. The IPO price was NZ\$1.60 and shares commenced trading on the 16th of May.
2007	RAK acquires the frequency-control products division of C-MAC Microtechnology giving RAK a European operation, including two factories located in the UK and France. The business unit specialised in wireless communications and expanded RAK's into OCXO, VCXO, the Pluto ASIC and a range of low performance commodity products.
2008	Forms a joint venture with Centum Electronics to manufacture high value telecommunications infrastructure products and to commercialise RAK France's R&D programme. RAK forms a joint venture with Timemaker to vertically integrate quartz crystal supply.
2011	RAK opened a joint venture facility, RAK Crystal Chengdu, in China. RAK owns 80%.
2012	Restructured French Telecom Infrastructure operation to shut down manufacturing in France and transfer to India via the Bangalore based Joint Venture.
2013	Revenue growth globally from new products in wireless base stations for 4G. The French-designed microprocessor based OCXOs acted as door openers to large global players. Chengdu factory sold as investment ultimately proved unsuccessful with RAK exiting its stake. RAK leaves smart wireless device market.
2014	Global restructuring. Deconstructed, restructured, and redesigned two separate loss-generating business units in France coming from the two acquisitions, to form a consolidated Aerospace and Defence business
2015	Transferred UK manufacturing industrial electronics & positioning business to NZ then shut down U.K. manufacturing operation, restructured U.K. business down to an R&D core and reconciled in a single location, selling the property. RAK invests in NZ\$5.8m in Australian IoT startup Thinxtra.
2016	Crucial wins and contracts in 5G with deployments at five of top five global telecom infrastructure companies, capitalising on the next wave of global network spending in the transition from 4G to 5G. Restructuring of Space business, building relationships with local and international funding government entities and global customer base, while also reducing operational cost base.
2017	Renewal of European Space Agency certification of the French PSM operation, and moving the space business from Argenteuil to PSM, establishing RAK the primary source on several mission-critical components in European satellite applications. RAK reduces stake in Thinxtra to 18.3%.
2018	Completed takeover of Indian JV, gaining full control of the Bangalore manufacturing facility. Initiation of the NewSpace portfolio and move into subsystems, allocating resources & investment into first NewSpace products from European Space Agency. Successfully completed a second wave of France restructuring, focussing on the Hirel business. Sale of French property outside of Paris for NZ\$5M.
2019	Launched a third wave of RAK France reconfiguration and restructuring efforts that improved operational efficiency while also achieving significant operating cost reduction.
2020	Global Strategy refresh and launch of a three year plan, execution being closely tracked since.
2021	Drove capacity expansion in NZ while garnering operational efficiencies to ramp volumes +60% over six months. Business navigating through global supply chain constraints. Margin and revenue uplift.

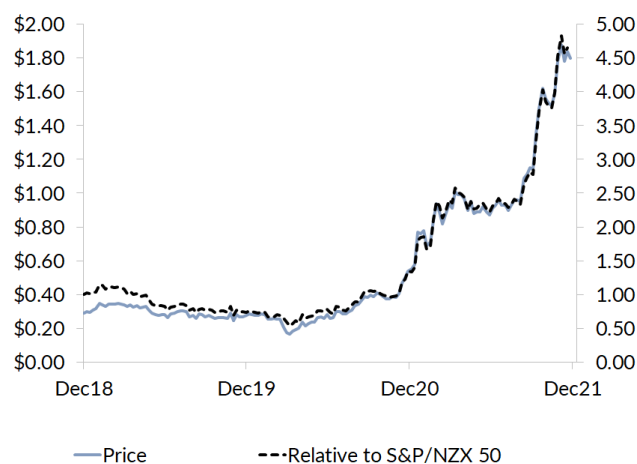
Source: Company data, Forsyth Barr analysis

Appendix 2: Key terms/definitions

Figure 44. Key terms/definitions

5G	5th generation of the telecommunications standard, providing 10 to 1000 times better performance in many different applications.
5G millimetre wave technology	The equipment that enables higher frequency data transmission in 5G.
Cloud computing	Allows users to have on-demand availability of a remote computer system's resources for improved computing power or data storage (usually located quite far from the user, such as in another country).
Crystal filters	A filter that allows only the desired frequency to pass through to the output. Crystal filters are used in space and defence applications.
Crystal resonators	Crystal resonators are high quality resonators for positioning, telecommunication, Space and Defence applications ranging from high quality SMDs to high reliability space crystals.
Datacentres	Usually a building that is used to hold a computer system and other components to backup data
Design-in	An opportunity that allows Rakon's product to be used as the reference component for certain customer reference designs (a technical blueprint of a system intended to be used by customers).
Edge computing	Allows users to have on-demand availability of a remote computer system's resources for improved computing power or data storage (usually located close to the user, such as within the same city).
Mercury™/Mercury+™	Rakon's proprietary integrated circuit used in OCXOs to achieve clock variations to less than 1 billionth of a second, these enable precision timing in 5G applications.
New space/New space LEOs	Refers to space sector commercialisation that are mainly low earth orbit (LEO) satellites.
OCXO/OCXO	A crystal oscillator that uses a miniaturised oven to keep its internal temperature constant. OCXO/OCXO high performing standard and customised for space, defence, automotive, telecommunications and other demanding applications. RAK "Mercury" & "Mercury+" brands. Oven Controlled SAW Oscillator (OCXO) An oven-controlled oscillator using Surface Acoustic Wave (SAW) technology.
O-RAN	Mobile networks that are more intelligent, open, virtualised and fully interoperable.
Oscillator	A circuit or device that generates a fixed frequency signal and consists of a resonator and electronic components.
Pluto®	Rakon's proprietary integrated circuit used in TCXOs to achieve clock variations to less than 100 millionth of a second; these enable higher data rates in 5G applications.
SAW Resonator	Surface Acoustic Wave (SAW) Resonator. At the heart of SAW oscillators are SAW resonators that use the piezoelectric effect to generate electrically stimulated acoustic waves at a resonant frequency.
System Solutions	Refers to RAK's solutions that include high performance products, equipment and consulting services for Space & Defence.
TCXO	TCXO or Temperature Compensated Crystal Oscillator wide range of high quality stable CXOs for space, defence, automotive, GNSS and 5G telecommunications and consumer products. RAK "Pluto" brand. A crystal oscillator with additional circuitry to remove frequency variations due to temperature change.
Tier 1 customers	Recognised key players within their respective industries that make up a significant market share.
Ultra-Stable TCXO	Using unique technology these TCXOs can achieve stabilities of 50 parts per billion (ppb) over temperature.
VCO	Voltage Controlled Oscillator (VCO). A purely electronic oscillator circuit with an adjustable output frequency, without the use of a crystal or SAW resonator. VCO a series designed for Space and Defence applications where phase noise performance is paramount.
VCXO & VCXO	VCXO & VCXO are Voltage Controlled Crystal Oscillator and Voltage Controlled SAW Oscillator are high reliability high performance VCXO and high frequency/Low phase noise performance VCXO for defence, space and GNSS applications. Voltage Controlled Crystal Oscillator (VCXO) is a crystal oscillator with an adjustable output frequency or Voltage Controlled SAW Oscillator (VCXO) SAW oscillator with an adjustable output frequency.
XMEMS®	RAK's advanced quartz-based resonator technology. XMEMS® or Crystal Micro-Electro-Mechanical System are ultra-high performance in terms of stability and noise for resonator and oscillator applications in 5G. It is made using RAK's NanoQuartz microfabrication process, delivering unprecedented resonator and oscillator performance. RAK believes that combined with its own ASIC oscillator that it forms the foundation of the market leading 5G product offering.
XO	XO or Crystal Oscillator a range of standard and high performance and high reliability products for telecommunications, Space Defence, Automotive and GNSS applications. An Oscillator is a circuit or device that generates a fixed frequency signal and consists of a resonator and electronic components. A quartz crystal combined with oscillation circuitry to generate a repeating electric signal.
Xtal	Crystal Resonator At the heart of XOs. VCXOs, TCXOs and OCXOs are quartz crystals which are designed to resonate with electrical stimulation using the piezoelectric effect.

Source: Company data, Forsyth Barr analysis

Figure 45. Price performance


Source: Forsyth Barr analysis

Figure 46. Substantial shareholders

Shareholder	Latest Holding
Siward Crystal Technology	12.2%
Ahuareka Trust	10.9%
Wairahi Investments and Wairahi Holdings Limited	5.1%

Source: NZX, Forsyth Barr analysis, NOTE: based on SPH notices only

Figure 47. International valuation comparisons

Company	Code	Price	Mkt Cap	PE		EV/EBITDA		EV/EBIT		Cash Yld
(metrics re-weighted to reflect RAK's balance date - September)										
			(m)	2022E	2023E	2022E	2023E	2022E	2023E	2023E
Rakon	RAK NZ	NZ\$1.79	NZ\$410	13.2x	21.0x	8.2x	10.8x	11.6x	18.1x	0.0%
Txc Corp	3042 TT	TWD103.50	TWD32,060	10.3x	11.0x	7.6x	7.3x	9.7x	9.6x	6.6%
Sitime Corp	SITM US	US\$254.54	US\$5,232	>75x	60.7x	59.8x	45.1x	70.2x	53.8x	n/a
Microchip Technology Inc	MCHP US	US\$85.23	US\$47,289	18.2x	16.9x	17.0x	15.8x	18.2x	16.9x	1.3%
Siward Crystal Technology Co	2484 TT	TWD40.35	TWD6,433	13.4x	n/a	n/a	n/a	11.2x	n/a	n/a
Daishinku Corp	6962 T	¥1564.00	¥56,612	17.6x	14.4x	7.7x	6.5x	12.7x	11.0x	1.2%
Nihon Dempa Kogyo Co	6779 T	¥1735.00	¥36,015	8.5x	7.8x	6.6x	6.3x	10.7x	9.8x	1.4%
Seiko Epson Corp	6724 JP	¥2041.00	¥815,655	12.8x	12.6x	5.3x	5.3x	9.4x	9.4x	3.1%
Compco Average:				13.5x	20.6x	17.3x	14.4x	20.3x	18.4x	2.7%
EV = Current Market Cap + Actual Net Debt				RAK Relative:	-2%	2%	-53%	-25%	-43%	-2%
										-100%

Source: *Forsyth Barr analysis, Bloomberg Consensus, Compco metrics re-weighted to reflect headline (RAK) companies fiscal year end

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