



“...investment in and exploitation of knowledge remain key drivers of innovation, economic performance and social well-being.”

OECD Science, Technology and Industry Outlook, 2002.

CAE IS:

+

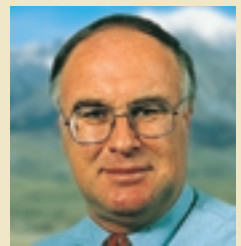
- + building networks of knowledge, collaboration and capability
- + helping transform New Zealand's knowledge infrastructure
- + structured as a not-for-profit trust
- + governed by a board of directors drawn from leaders in business, government, research and academia.

## our mission

To advance social progress and economic growth for New Zealand through broadening national understanding of emerging technologies and facilitating early adoption of advanced technology solutions.

“CAE was founded on ‘for the public good’ principles in 1987, to mark the centenary of the School of Engineering at the University of Canterbury.

Since then, CAE’s role within New Zealand’s technology landscape has expanded nationally. Moving beyond the advancement of engineering, we have become a key player in the development of New Zealand’s knowledge infrastructure, offering individuals and organisations access to knowledge and technical capability through which ideas can be transformed into fresh solutions and new opportunities.”



Francis Small

Francis Small CHAIRMAN, CENTRE FOR ADVANCED ENGINEERING

# In a world of change, New Zealand needs...



How can New Zealand enterprises capitalise on our country's distinct advantages to create the wealth needed to achieve our social and economic aspirations?

To survive and thrive in international markets, New Zealand enterprises must compete at global pace — and we are in danger of falling behind. For example, New Zealand produces only 19 technical graduates / 1000 graduates, compared to up to 160 technical graduates in countries such as Australia and Britain.

As a small trading nation New Zealand can only compete selectively. In order to develop genuine, niche expertise within our competitive sectors, the knowledge generators within industry, academia and government must specialise. Yet, with limited resources, we must also make the knowledge and capabilities that we *do* have work very effectively for us. And here is what seems a paradox: we need to develop both deep, specialised knowledge 'silos', *and* the systems and networks for collaboration and co-operation.

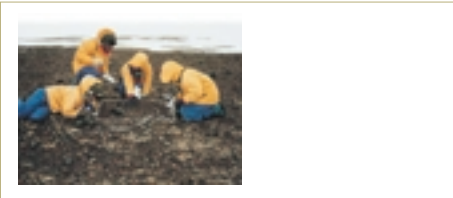
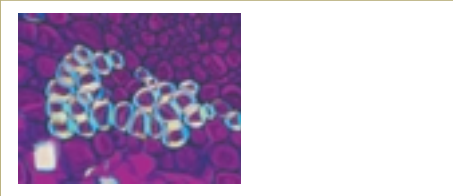
The increasing complexity of systems and problems means that traditional approaches to resolving that paradox are inadequate. For our national industries to compete strongly, they must not only continue working effectively, but also keep developing their own knowledge and capabilities through high-quality connections that support and sustain competitive advantage.

In our own professional base of engineering, the role of the engineer is being re-invented. Engineering is increasingly boundary-spanning in transforming ideas into reality. As a profession it impacts on almost every facet of our day-to-day life: from the food we eat, to the electronics in the appliances we use and the infrastructure our towns and cities are built on. This new dimension demands broad participation, cross-discipline approaches, and the capacity to solve complex problems.

The corollary is that an additional component has now become critical to the achievement of New Zealand's social and economic objectives: that component is *a knowledge infrastructure that brings about real change in New Zealand's technology capability*.

“Effective networking and collaboration between individuals, enterprises, and institutions will be critical to achieving our economic transformation goal. Given our problems of size and distance, collaboration is particularly important to enable New Zealand innovators and entrepreneurs to compete internationally and build effective global partnerships”

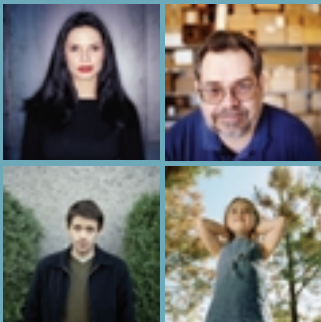
*Science and Innovation Advisory Council, 2002.*



how does CAE  
benefit me?



# Here’s how CAE is helping New Zealanders build a more secure and prosperous future



## FRESH PERSPECTIVES

Technology and technical capabilities are increasing in importance for us all. ☐ At home, in the classroom, at work, we’re using technology more. Technology is everywhere: it impacts virtually every area of our lives, from the appliances we use, to the infrastructure our cities are built on, to the ability of our companies to compete in global markets. ☐ As New Zealand makes the transition to a knowledge economy, and technology becomes more complex, individuals, companies and institutions increasingly need to specialise. For New Zealand, as a small country, the need is to maximise the resources of knowledge and capability that we do have. ☐ And that’s where CAE contributes: through linking New Zealand’s businesses, government agencies, academic and research institutions, we enable effective networking and collaboration, for the creation of new knowledge and opportunity.

•	ENGINEERING AND RELATED PROFESSIONS
•	ACADEMIC AND RESEARCH ORGANISATIONS
•	BUSINESS, INDUSTRY SECTORS AND INDIVIDUAL ENTERPRISES
•	CENTRAL AND LOCAL GOVERNMENT
•	COMMUNITIES AND INTERESTED INDIVIDUALS

# ...fresh perspectives

Formal and informal co-operation among institutions has become crucial to increasing the value of knowledge creation and fostering technological advance.

In facilitating this process, CAE occupies a special position. We are uniquely able to bridge institutional divides, for example, between academia, where new ideas originate, and business, which uses the new ideas and products in the market.

We seek to make a difference, particularly in those areas where the application of the unique problem-solving skill-set offered by engineering and its related disciplines will produce dividends within a wide social context.

As an independent, knowledge-based body with our roots in both the engineering profession and academia, CAE fosters fresh perspectives and encourages collaborative effort. In so doing, we make a unique and powerful contribution to New Zealand's economic growth and social progress.

“Alliances, joint ventures, and other interorganisational arrangements enable firms to access critical complementary assets, and scarce talent. In rapidly changing environments, the presence of networks turns out to be very important”

David Teece, *‘Profiting From Innovation’, Research Policy, Dec 1986.*



## CAE'S VALUES

- + **Collaboration** – Coalition-building approaches
- + **Non-partisan** – Operating in the public good
- + **Purposeful** – Technology solutions for the good of our community
- + **Perspective** – Visionary, insightful and forward-thinking.

# CAE’s objectives, roles...



CAE’s mission is focused on contributing to New Zealand. However, as recognised in the objectives we pursue and our roles within the national technology landscape, involvement with CAE also offers our supporters and stakeholders new channels to further their own objectives—principally through accessing knowledge and collaborating in creating new opportunities.

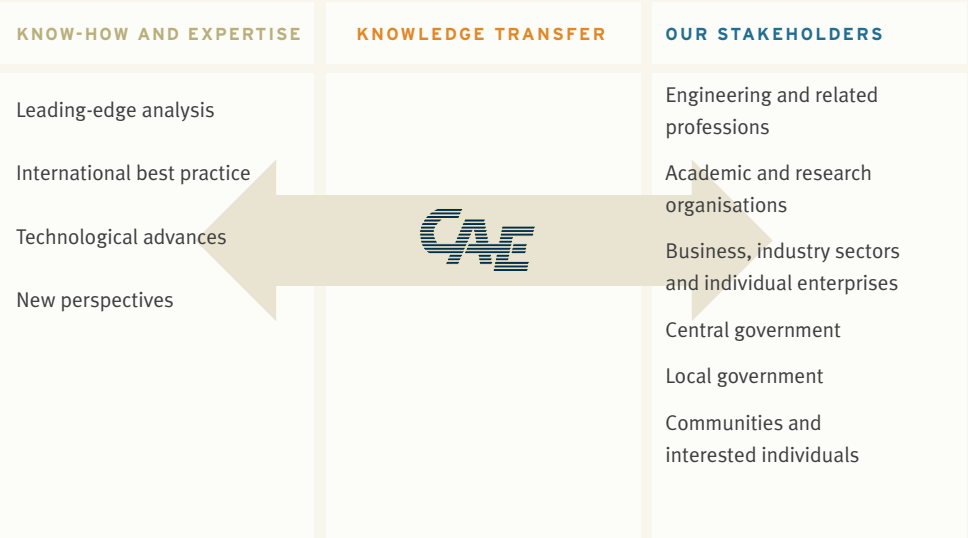
CAE’S OBJECTIVES		
<div><div></div><div>+ Establish collaborative frameworks to address New Zealand’s emerging technology issues</div><div>+ Advance engineering and technology-related knowledge</div><div>+ Stimulate the uptake of advanced technology</div><div>+ Raise awareness of the benefits of technological advance.</div></div>		
CAE’S ROLES		
INTEGRATOR	Connecting ideas and resources to create opportunity	Successfully applying new and emerging technologies requires business strategy to span an ever greater technological range. CAE can help New Zealand organisations to access and apply new technologies, through bringing together the required knowledge and capabilities from disparate sources. Through improving integration in strategic technology areas, resources are better utilised, knowledge is shared, and further innovation encouraged.
AWARENESS RAISER	Increasing engineering and technology awareness	CAE is helping inform and educate New Zealand communities about technology matters to enable more informed community participation in decision-making.
KNOWLEDGE BROKER	Crossing institutional boundaries to stimulate new thinking	New Zealand has a well-developed – but often fragmented – capability in science and engineering. As a knowledge broker, CAE helps to transfer ideas and technology between New Zealand organisations, and to involve international collaborators.
PIONEER	Developing new insights and actionable outcomes	CAE is helping develop new solutions for technology -related economic and social issues by applying engineering knowledge and insight.



# ...and contributions

## PROGRESSING KNOWLEDGE

Involvement with CAE offers our stakeholders significant opportunities for gaining access to knowledge. CAE facilitates the cross-pollination of knowledge across disciplines and institutional boundaries, as well as providing access to, and contributing to the development of, international best practice.



## TRANSFERRING KNOWLEDGE

Access to knowledge and technical capability is one major benefit of involvement with CAE. As shown below, our activities are typically organised within a project framework that delivers outcomes such as leading-edge analysis and best practice.

CAE'S PROCESS FRAMEWORK			KEY OUTCOMES
INITIATE	EXECUTE	SUSTAIN	
<div>+ Programme advisory groups</div> <div>+ Visiting experts</div> <div>+ Conferences, workshops and seminars</div>	<div>+ Project management framework</div> <div>+ Experienced practitioners</div> <div>+ Sector-led teams and champions</div> <div>+ Analysis, investigation and dissemination</div>	<div>+ Technology and information transfer</div> <div>+ Ongoing workshops</div> <div>+ Publications</div> <div>+ Centres of excellence</div>	

# CAE's programmes...



Looking ahead over the next decade, New Zealand has great opportunities, but also significant challenges, in a number of key areas. Accordingly, we have developed a strategic view of what are the nation's critical technology platforms. Also vital to securing New Zealand's future are the challenges of sustainability and resource stewardship. We therefore underpin our work with a commitment to improving environmental performance and enabling a sustainable future for New Zealand.

The following five areas are the key programme areas on which we are focusing our effort, and within which we initiate specific projects.

TECHNOLOGIES FOR SUSTAINABILITY	
<p><b>PROGRAMME OVERVIEW</b></p> <p>CAE seeks to advance environmental sustainability in New Zealand by improving best practice and levels of resource stewardship and technology application. Our focus is on stimulating collaborative action on the identified knowledge gaps in sustainable management practice, and raising awareness of the underlying technology and science opportunities.</p>	<p><b>CAE CONTRIBUTIONS</b></p> <ul style="list-style-type: none"><li>+ Initiated waste minimisation project, including specialist studies on landfill practices, cleaner production and hazardous waste. Published:<ul style="list-style-type: none"><li>– <i>Our Waste: Our Responsibility</i>, a major work on sustainable waste management in New Zealand.</li><li>– <i>Assessment of Environmental Effects: Information, Evaluation and Outcomes</i>.</li></ul></li><li>+ Initiated energy efficiency project, assessing current and emerging energy efficient technologies and changes in management practice. Currently undertaking a major study on distributed generation opportunities.</li><li>+ Published a range of specialist publications addressing renewable energy, energy supply/ demand and energy efficiency topics.</li></ul>
INFRASTRUCTURE SYSTEMS	
<p><b>PROGRAMME OVERVIEW</b></p> <p>Critical to New Zealand's economic growth and our communities' vitality is the renewal and extension of our built infrastructure. CAE is a leader in developing a more thorough understanding of the vulnerability of local infrastructure to natural hazards. The use of systems approaches to improve understanding of the connections and inter-dependencies that govern infrastructure investment forms the basis for ongoing activity within this area.</p>	<p><b>CAE CONTRIBUTIONS</b></p> <ul style="list-style-type: none"><li>+ Initiated the Lifelines project, bringing together local government, engineering expertise, infrastructure groups and utilities to upgrade our communities' disaster readiness.</li><li>+ Published <i>Lifelines in Earthquakes: Wellington Case Study, the Edgecumbe Earthquake Case Study</i> and <i>Risk &amp; Realities</i>.</li><li>+ Published guidelines for fire engineering and the use of structural precast concrete in buildings.</li><li>+ Now advancing other hazard management initiatives and programmes for improvement in the construction industry.</li></ul>

how does  
CAE benefit  
New Zealand?



CAE’s work programme is focused on the following five key areas – areas that we judge as being vital for New Zealand’s economic growth and sustainable development:



CAE’S PROGRAMMES	
OCEANS	An area of huge economic and environmental value, with vast national assets in fisheries, minerals and hydrocarbons, and potential in biotechnology and ocean tourism.
INFRASTRUCTURE SYSTEMS	An area critical to New Zealand’s economic growth and our communities’ vitality.
RISK MANAGEMENT	An area in which the systems thinking and risk assessment techniques developed from engineering practice can facilitate integrated approaches to address very complex problems.
TECHNOLOGIES FOR SUSTAINABILITY	An area in which CAE seeks to advance environmental sustainability in New Zealand by improving best practice and levels of resource stewardship and technology application.
EMERGING TECHNOLOGIES	An area in which CAE is acting as a catalyst for enabling New Zealand organisations to achieve world-class delivery or best practice.

# ...powerful contributions



RISK MANAGEMENT	
<p><b>PROGRAMME OVERVIEW</b></p> <p>Risk management is now widely used as a decision-making tool. Through bringing together systems thinking and risk assessment techniques developed from engineering practice, CAE projects offer integrated approaches to solving complex issues. We are also helping to communicate risk management outcomes in ways that are meaningful to the practitioner and non-specialist alike.</p>	<p><b>CAE CONTRIBUTIONS</b></p> <ul style="list-style-type: none"><li>+ Organised a number of risk management conferences and workshops.</li><li>+ Published:<ul style="list-style-type: none"><li>– <i>Owning the Future</i>, offering an integrated risk management framework for practitioners.</li><li>– <i>Management of Engineering Risk</i> jointly with the Institution of Professional Engineers New Zealand (IPENZ).</li><li>– <i>The Contract in Successful Project Management</i>, which explores new forms of engineering contract and innovations in dispute avoidance.</li></ul></li></ul>
OCEANS	
<p><b>PROGRAMME OVERVIEW</b></p> <p>New Zealand is claiming exclusive rights to the fourth largest area of ocean in the world. Enormous national assets are at stake, including minerals and hydrocarbons, fish and other biological assets, along with potential in areas such as biotechnology and ocean tourism. Our vision is to see New Zealand recognised as a world leader in oceans management.</p>	<p><b>CAE CONTRIBUTIONS</b></p> <ul style="list-style-type: none"><li>+ Organised <i>Our Oceans Conference</i>, helping to focus attention on our ocean zone's economic potential and environmental importance.</li><li>+ Contributed to national policy development related to oceans and sustainable development.</li><li>+ Published <i>Our Oceans</i> commentary on New Zealand's ocean policy issues.</li></ul>
EMERGING TECHNOLOGIES	
<p><b>PROGRAMME OVERVIEW</b></p> <p>CAE is acting as a catalyst for enabling New Zealand organisations to achieve world-class delivery or best practice. We do this through providing insight into specific areas of expertise, and research relevant to current industry capability. Our aim is to bring together ideas and new opportunities for collaboration, and to lift industry/university linkages to new levels of research excellence and investment.</p>	<p><b>CAE CONTRIBUTIONS</b></p> <ul style="list-style-type: none"><li>+ Published <i>Quality Assurance Systems for Smaller Manufacturers</i>.</li><li>+ Organised a manufacturing innovations seminar in association with IPENZ congress.</li><li>+ Organised systems engineering workshop.</li></ul>

# To meet the challenge of the future...



“In regards to our ocean heritage and the New Zealand economy – who will provide the forward-thinking leadership to bring together those with vision, enterprise and knowledge of the complex interactions involved into some sort of co-ordinated strategy for sustainable development, working with and through competitive markets? CAE, as a knowledge broker, can provide the platform required to allow the transfer of knowledge across disciplines and institutional boundaries.”

*Sir Frank Holmes, President of The New Zealand Institute of International Affairs and an Emeritus Professor of Economics, Victoria University of Wellington.*

“CAE is very effective at organising and facilitating workshops, seminars and meetings that bring together diverse groups of people to tackle specific subjects. Some examples include Opportunities of Our Oceans, Disaster Management, Infrastructure Research and Risk Management. CAE’s technical expertise and networks lead to these meetings being very successful.”

*Robin Falconer, Group Manager, Institute of Geological and Nuclear Sciences.*

“One key element for New Zealand businesses competing and prospering in world markets is the understanding of technology opportunities. CAE can help create opportunity by linking businesses with emerging technologies.”

*Sir Angus Tait, Founder and Chairman of Tait Electronics.*

“The Centre for Advanced Engineering has made a very useful contribution over recent years to improvements in environmental practice and management. The recent revision of the landfill guidelines, for instance, provides an industry standard for landfills. CAE is able to bring together experts in relevant fields and develop practical materials to a high professional quality.”

*Paddy Gresham, Senior Advisor, Ministry for the Environment.*

“In today’s networked and interlinked world, risk management has become a key decision-making tool in many sectors of industry and throughout the public sector. CAE is recognised for bringing to New Zealand the latest international research required for significant advances in this field.”

*Emeritus Professor David Elms, University of Canterbury.*

“The opportunity as a US academic to come to New Zealand and to share my experience with fellow professionals was exciting. International collaboration is essential if, as academics and professionals, we want to explore and learn from the latest advances in the field.”

*Dr Caron Chess, Associate Professor, Department of Human Ecology, Rutgers University and Director, Centre for Environmental Communication, Rutgers University.*

“Four years as a Director on the CAE Board have made a powerful impression on me in observing creative thinking in action. The Centre works hard to increase a broader understanding of technology and anticipate environmental issues in these times of challenge, not just for New Zealand but also worldwide. It can only grow in its influence and I support it wholeheartedly.”

*Dame Phyllis Guthardt, Chancellor, University of Canterbury.*

## ...valuable partnerships are imperative

“CAE is not just about expertise in engineering and technology disciplines. As important from Transpower’s perspective is CAE’s strong focus on using its expertise to contribute to the development of public policy across a range of areas. Transpower has supported the work of CAE for a number of years and values its association with the people that make up this important organisation.”

Wayne Eagleson **COMMUNICATIONS MANAGER, TRANSPOWER.**

“Involvement with CAE should be about learning, extending networks, collaborating, finding new synergies and solutions, innovating and advancing. If you and your organisation wish to be part of New Zealand’s transformation to a knowledge-based economy, I urge you to consider involvement with CAE.”

A handwritten signature in black ink, appearing to read 'G Hooper'. The signature is fluid and cursive, with a large initial 'G' and a stylized 'H'.

George Hooper **EXECUTIVE DIRECTOR, CENTRE FOR ADVANCED ENGINEERING, NOVEMBER 2002.**

*CENTRE FOR ADVANCED ENGINEERING*

► CAE ► UNIVERSITY OF CANTERBURY CAMPUS ► 39 CREYKE ROAD ► PRIVATE BAG 4800 ► CHRISTCHURCH ► NEW ZEALAND  
► PH: +64 3 364 2478 ► FAX: +64 3 364 2069 ► EMAIL: [CAE@CAE.CANTERBURY.AC.NZ](mailto:CAE@CAE.CANTERBURY.AC.NZ) ► [WWW.CAENZ.COM](http://WWW.CAENZ.COM)