

1.0 Welcome and Introductions

New Board Members

President-elect: Oh-Kyong Kwon, Korea (NAEK)

Members 2019-2020

Hugh Bradlow, Australia (Australia)

Xiaohong LI, China (CAE)

Panu Nykanen, Finland (TAF)

Sanak Mishra, India (INAE)

Board Members in their final year

Members 2018-2019

Roger McCarthy, United States (NAE)

Lucas P. J. J. Noldus, Netherlands (AcTI.nl)

Stane Pejovnik, Slovenia (IAS)

István KRÁLIK, Hungary (HAE)



CAETS Board Agenda

24 June 2019

9 a.m. – Noon

IVA Conference Center

Grev Turegatan 16

Stockholm, Sweden

Board Members

Officers

Tuula Teeri, Sweden (IVA)

Lucio Cáceres, Uruguay (ANIU)

Oh-Kyong Kwon, Korea (NAEK) – Represented by Donggun Park (NAEK EVP)

Ruth David, United States (NAE)

Members 2018-2019

Roger McCarthy, United States (NAE)

Lucas P. J. J. Noldus, Netherlands (AcTI.nl)

Stane Pejovnik, Slovenia (IAS)

István KRÁLIK, Hungary (HAE)

Members 2019-2020

Hugh Bradlow, Australia (Australia)

Xiaohong LI, China (CAE)

Panu Nykanen, Finland (TAF)

Sanak Mishra, India (INAE)

- | | | |
|-------|---|---------------|
| 9:00 | 1. Welcome and Introductions | Tuula Teeri |
| | 2. <u>Action</u> : Approval of Agenda | Tuula Teeri |
| | 3. <u>Action</u> : Approval of Board Minutes of 10 September 2018 | Tuula Teeri |
| 9:10 | 4. Report of the Secretary/Treasurer | Ruth David |
| | a. <u>Information</u> : Audit Report: 2018 Financial Audit | |
| | b. <u>Information</u> : 2019 Financial Status | |
| | c. <u>Action</u> : 2020 Operating Budget | |
| | d. <u>Information</u> : Rotation Schedule | |
| 9:30 | 5. Discussion: CAETS 2019 “Reflections” | Tuula Teeri |
| 9:45 | 6. Discussion: CAETS Website | Ruth David |
| 10:15 | 7. Discussion: CAETS Strategy | Tuula Teeri |
| | a. Member Development | |
| | b. Achieving CAETS Objectives | |
| 11:00 | 8. Discussion: Discussion Groups/Working Groups | Ruth David |
| | a. Proposed: Cyber threat to nuclear weapons | Magnus Bredne |
| 11:30 | 9. New Business | Tuula Teeri |
| 12:00 | 10. Adjourn | |

Board Meeting Minutes

Monday, September 10, 2018 – 0900 - 1200
 Sheraton Montevideo Hotel
 Victor Solino 349, Punta Carretas, Montevideo, Uruguay

Board Member Attendees

Acad. Eng. Lucio Cáceres (President)
 Dr. Elías Fereres (Past-President)
 Dr. Tuula Teeri (President-Elect)
 Dr. Ruth David (Secretary/Treasurer)
 Roger McCarthy (United States)
 Lucas Noldus (Netherlands)

Frank Behrendt (Germany)
 Trueman Goba (South Africa)
 Ulrich Suter (Switzerland)
 Prof. Stane Pejovnik (Slovenia)
 István Králik (Hungary)

Additional Attendees

Matt Wenham (Australia)
 Magnus Breidne (Sweden)
 Jaime Dominguez (Spain)

Jose Albarran (Mexico)
 Adriana Gamboggi (Uruguay)

1. Welcome and approval of agenda

President Cáceres welcomed the attendees and provided a brief description of Uruguay's economy, government, and educational systems. The agenda was approved as proposed.

2. Approval of Board Minutes of November 13, 2017

The Board Minutes from November 13, 2017 were approved as presented.

3. Report of the Secretary/Treasurer, Ruth David

a. Audit Committee: 2017 Financial Audit

The Treasurer reported that the 2017 Financial Audit was complete and that no issues were identified.

b. 2018 Financial Status and Banking Relationships

The Treasurer reported that 2018 expenses were within budget and that the USAA account had been closed with all remaining funds transferred to the Bank of America Account. Two actions were proposed for the coming year: 1) Establish a second-signer for the Bank of America account at the NAE who will have account access in event of an emergency; 2) Establish an interest-bearing account at Bank of America with the transfer of approximately \$225,000 from the checking account.

c. 2019 Operating Budget

The 2019 Operating Budget was presented by the Treasurer. After discussion, the Board agreed to recommend to the Council an increase in the Management Fee from \$44,000 to \$50,000 for



2019. The CAETS President-Elect, Tuula Teeri, agreed to undertake benchmarking analysis to determine an appropriate amount going forward. The budget was approved with this modification.

d. Rotation Schedule

The updated Rotation Schedule was provided for information.

e. IAP-R (InterAcademy Partnership for Research)

The Secretary/Treasurer reported that she had represented CAETS at the InterAcademy Partnership for Research Board Meeting in London on 8 February 2019. CAETS is an Observer but has a vote on IAP-R matters. Minutes from the meeting were provided for information. An item of note was the attendees' discussion of the fact that although engineering is included in the IAP mission, there is no secretariat representing engineering. It was agreed during the IAP-R meeting that for the foreseeable future, CAETS participation in IAP-R is the best avenue for engagement with CAETS member academies. The Secretary/Treasurer also noted that the IAP-R is still getting organized but it will be important for CAETS to stay engaged to strengthen the voice of the engineering community in IAP-R projects. The 2019 Board Meeting of IAP-R is being held in South Korea; NAEK has agreed to represent CAETS during that meeting.

4. Discussion: CAETS Statements

The Board had a robust discussion of the purpose, target audience, and structure of CAETS Statements, which typically derive from content presented during the Technical Meetings associated with CAETS Annual Meetings. It was agreed, for recommendation to the Council, that the host academy should identify topics and work throughout the year prior to the meeting to prepare and circulate a draft statement for consideration by the Council. Comments would be solicited well in advance of the meeting with a fixed deadline for feedback; the edited statement would be presented during the Council meeting for a final vote.

The Board discussed other types of CAETS Statements that might be issued on an ad hoc or continuing topical basis; such statements might derive from ongoing discussion threads supported on the future CAETS website.

The discussion also addressed issues relating to consensus and the possibility that individual academies could opt not to endorse a CAETS statement. Board members agreed that no CAETS Statement should be issued absent endorsement by at least two-thirds of the member academies.

5. CAETS Website Requirements

Board Members provided a number of recommendations for a restructured CAETS website, including both public and members-only accessible content. It was agreed that the home page should be structured to communicate with the public, featuring upcoming events, highlighting CAETS statements, and potentially highlighting individual member activities around selected themes. The members-only section should provide not only access to meeting information but also should facilitate committee and group collaboration, statement development, and access to

Board Meeting Minutes

relevant reports provided by member academies. Out-dated information should be retained in archives. Further, the website should be structured to be mobile-friendly.

6. CAETS Discussion Groups

Board Members expressed interest in all of the topics to be addressed by Discussion Groups later in the day. It was agreed that the topics would be carried forward into 2019, with the recommendation that groups be organized in advance of the meetings via telecons.

7. New Business

The Board discussed the need for proactive recruitment of new member academies. The Secretary agreed to compile a list of engineering academies, using Euro-CASE and other related organizations as a basis; the list is to be circulated to CAETS members for their feedback and also will be used by the host academy to issue observer invitations to the 2019 meetings in Stockholm. It was agreed that the Board would further discuss a strategy for recruitment of new members during the 2019 meeting.

8. The meeting was adjourned.



*International Council of Academies of
Engineering and Technological Sciences, Inc.*

2019 President
Tuula Teeri, IVA, Sweden

2019 President Elect
Oh-Kyong Kwon

2019 Past President
Lucio Cáceres, ANIU, Uruguay

Secretary/Treasurer
Ruth David, NAE, US
355 Toscana Circle
Gordonville, TX 76245
ruth.a.david@outlook.com
Tel+1-571-216-7773

CAETS Records
National Academy of Engineering
Room 302A
2101 Constitution Ave. N. W.
Washington, D.C. 20418 USA
www.caets.org

CAETS Member Academies
National Academy of Engineering, Argentina
Australian Academy of technology and Engineering
Royal Belgian Academy Council of Applied Sciences
Canadian Academy of Engineering
Chinese Academy of Engineering
Croatian Academy of Engineering
Engineering Academy of Czech Republic
Danish Academy of Technical Sciences
Technology Academy Finland
National Academy of Technologies of France
German Academy of Science and Engineering
Hungarian Academy of Engineering
Indian National Academy of Engineering
The Engineering Academy of Japan
The National Academy of Engineering of Korea
Academy of Engineering, Mexico
Netherlands Academy of Technology and Innovation
Norwegian Academy of Technological Sciences
Pakistan Academy of Engineering
Slovenian Academy of Engineering
South African Academy of Engineering
Royal Academy of Engineering, Spain
Royal Swedish Academy of Engineering Sciences;
Swiss Academy of Engineering Sciences
Royal Academy of Engineering, United Kingdom
National Academy of Engineering, USA
National Academy of Engineering, Uruguay

President Tuula Teeri
Royal Swedish Academy of Engineering Sciences
Grev Turegatan 14
WE-102 42 Stockholm, Sweden

Dear President Teeri:

We were nominated to the CAETS Audit Committee by our respective academies, the South African Academy of Engineering (SAAE) and the National Academy of Engineering (NAE) of the United States to serve 2-year terms on the Audit Committee, in accordance with CAETS Operating Procedures.

The CAETS Secretary/Treasurer prepared and submitted the enclosed two-page statement, CAETS Financial Summary FY2018, dated 25 February 2019. We have reviewed the relevant supporting account statements and vouchers and believe this enclosed statement accurately reflects the state of CAETS financial affairs as of 31 December 2018.

Submitted by,

Trueman Goba
President, SAAE

Al Romig
NAE Executive Director

Mary Kutruff
NAE Financial Officer

Enclosure: 2018 Financial Statements

Fiscal year 2018

1/1/2018 - 12/31/2018

OPERATIONS

	FY2016	FY2017	FY2018	FY2018 ¹	FY2019 ²
Receipts	actual	actual	actual	budget	budget
Dues	79,975.20	84,494.20	80,811.00	81,000.00	83,430.00
Expenses					
Communications	531.36	-	510.79	7,000.00	2,500.00
Equipment	1,230.78	-	-	500.00	200.00
Legal-Prof. Fees		1,113.00	162.00	100.00	500.00
Management Fee	44,000.00	44,000.00	44,000.00	44,000.00	50,000.00
Meetings		127.07	50.71	300.00	200.00
Postage, Delivery	21.24	33.30	183.12	300.00	300.00
Printing	600.00	-	-	500.00	500.00
Supplies	147.40	243.15	88.73	300.00	230.00
Travel	17,382.37	15,409.09	20,791.15	25,000.00	25,000.00
Strategy Implementation ³		-	2,887.70	3,000.00	4,000.00
Total Expenses	63,913.15	60,925.61	68,674.20	81,000.00	83,430.00

¹Approved By Board on 13 November 2017; dues based on 6 at \$1K; 3 at \$2K; 11 at \$3K; 6 at \$6K.

Note: \$7000 expense for CAETS website upgrade deferred pending further analysis and review.

²Approved by Board & Council September 2018; dues budget reflects previously approved 3% increase to tiers; Management Fee increase recommended by Board and approved by Council.

³2018 expense incurred for Visiting Committee trip to Pakistan (PAE Membership Application).

ACTIVITIES AND CHANGES IN RESERVE FUNDS

Balance From 12/31/2017	272,129.54
Revenue	
Dues Received	80,811.00
USAA Interest Income	3.49
Reserve Fund Contribution (PAE)	2,000.00
	<u>82,814.49</u>
Expenses	
Operating Expenses	68,674.20
Reserve Fund Expenses	-
	<u>68,674.20</u>
	14,140.29
Balance 12/31/2018	<u>286,269.83</u>

Statement of Financial Position
12/31/2018

ASSETS		
USAA Account Balance 12/31/18 (closed)	-	
Bank of America Account Balance 12/31/18	312,008.41	
Total Assets		312,008.41
 LIABILITIES		
Deferred Revenue from Prepaid Dues	25,667.00	
Checks Issued but Not Cleared	-	
Due to Secretary/Treasurer ¹	71.58	
On Account for Members	-	
Total Liabilities		25,738.58
 NET ASSETS		 286,269.83
Total Liabilities and Net Assets		312,008.41

¹ 2017 Expense not reimbursed in 2018 (See 2017 Financial Statements)

Fiscal year 2017

1/1/2017 - 12/31/2017

OPERATIONS

	FY 2015	FY2016	FY2017	FY2017 ¹	FY2018 ²
Receipts	actual	actual	actual	budget	budget
Dues	77,286.97	79,975.20	84,494.20	81,000.00	81,000.00
Expenses					
Communications	1,538.20	531.36	-	2,000.00	7,000.00
Equipment	342.13	1,230.78	-	2,000.00	500.00
Legal-Prof. Fees			1,113.00	100.00	100.00
Management Fee	44,000.00	44,000.00	44,000.00	44,000.00	44,000.00
Meetings	101.21		127.07	600.00	300.00
Postage, Delivery	635.78	21.24	33.30	2,000.00	300.00
Printing		600.00	-	2,000.00	500.00
Supplies	170.63	147.40	243.15	300.00	300.00
Travel	8,587.68	17,382.37	15,409.09	25,000.00	25,000.00
Strategy Implementation			-	3,000.00	3,000.00
Total Expenses	55,375.63	63,913.15	60,925.61	81,000.00	81,000.00

¹Approved by Board on 16 September 2016; dues based on 6 at \$1K; 3 at \$2K; 11 at \$3K; 6 at \$6K

²Approved By Board on 13 November 2017; dues based on 6 at \$1K; 3 at \$2K; 11 at \$3K; 6 at \$6K.

Note: \$7000 expense for CAETS website upgrade deferred pending further analysis and review.

ACTIVITIES AND CHANGES IN RESERVE FUNDS

Balance From 12/31/2016	248,476.49
Revenue	
Dues Received	84,494.20
USAA Interest Income	84.46
Reserve Fund Contribution	-
	<u>84,578.66</u>
Expenses	
Operating Expenses	60,925.61
Reserve Fund Expenses	-
	<u>60,925.61</u>
	23,653.05
Balance 12/31/2017	<u>272,129.54</u>

Statement of Financial Position
12/31/2017

ASSETS		
USAA ¹ Account Balance 12/31/17	6,103.95	
Bank of America Account Balance 12/31/17	297,017.63	
	<u> </u>	
Total Assets		303,121.58
LIABILITIES		
Deferred Revenue from Prepaid Dues	11,000.00	
Checks Issued but Not Cleared	19,359.99	
Due to Secretary/Treasurer	71.58	
On Account for Members	560.47	
	<u> </u>	
Total Liabilities		30,992.04
NET ASSETS		<u>272,129.54</u>
Total Liabilities and Net Assets		303,121.58

¹USAA Account to be closed during 2018; process is underway; remaining funds will be transferred to Bank of America Account.

4.b 2019 Financial Status

Pending – Will be provided when costs incurred for Visiting Committees are known.

4.c. 2020 Operating Budget

2020 Operating Budget

	FY2016	FY2017	FY2018	FY2019 ¹	PROPOSED FY2020
Receipts	actual	actual	actual	budget	budget
Dues	79,975.20	84,494.20	80,811.00	83,430.00	83,430.00
Expenses					
Communications	531.36	-	510.79	2,500.00	2,400.00
Equipment	1,230.78	-	-	200.00	-
Legal-Prof. Fees		1,113.00	162.00	500.00	230.00
Management Fee	44,000.00	44,000.00	44,000.00	50,000.00	50,000.00
Meetings		127.07	50.71	200.00	200.00
Postage, Delivery	21.24	33.30	183.12	300.00	200.00
Printing	600.00	-	-	500.00	200.00
Supplies	147.40	243.15	88.73	230.00	200.00
Travel	17,382.37	15,409.09	20,791.15	25,000.00	25,000.00
Strategy Implementation ²		-	2,887.70	4,000.00	5,000.00
Total Expenses	63,913.15	60,925.61	68,674.20	83,430.00	83,430.00

¹Approved by Board & Council September 2018; dues budget reflects previously approved 3% increase to tiers; Management Fee increase recommended by Board and approved by Council (budget shifted from Strategy Implementation to Management Fee to cover within fixed bottom line).

²2018 expense incurred for Visiting Committee trip to Pakistan (PAE Membership Application). Although non-recurring (unbudgeted) cost, given the relative small cost it was covered within operating expenses.

CAETS Rotation Schedule - 2019

Member Academy	Date Elected	Annual Meeting Host	Officer			Board			
			President Elect	President	Past President	Board	2019	2020	2021
Sweden (IVA)	1978 (F)	2019	2018	2019	2020	2018	Tuula Teeri	Tuula Teeri	
Korea (NAEK)	2000	2020	2019	2020	2021	2019	Prof. Kwon Oh-Kyong	Prof. Kwon Oh-Kyong	Prof. Kwon Oh-Kyong
Argentina (ANI)	1999	2021	2020	2021	2022	2020		Manuel A. Solanet	Manuel A. Solanet
France (NATF)	1989	2022	2021	2022	2023	2021			NOM (Pres-Elect)
Croatia (HATZ)	2000	2023	2022	2023	2024	2017			
Finland (TAF)	1989	2024	2023	2024	2025	2019	Dr. Panu Nykanen	Dr. Panu Nykanen	
Czech Republic (EA CR)	1999	2025	2024	2025	2026	2015		DEFERRED	DEFERRED
USA (NAE)	1978 (F)	2026	2025	2026	2027	2018	Roger McCarthy		
Norway (NTVA)	1990	2004				2015		DEFERRED	DEFERRED
Germany (acatech)	2005					2017			NOM (2021-2022)
Australia (ATSE)	1978 (F)	2005				2019	Prof. Hugh Bradlow	Prof. Hugh Bradlow	
Belgium (BACAS)	1990	2006				2016			NOM(2021-2022)
Japan (EAJ)	1990	2007				2016		*HideakiKoizumi	HideakiKoizumi
Netherlands (AcTI.nl)	1993	2008				2018	Lucas P. J. J. Noldus		
Slovenia (IAS)	2000					2018	Prof. Stane Pejovnik		
South Africa (SAAE)	2009					2017			
Canada (CAE)	1991	2009				2015		Peter Mascher	Peter Mascher
Denmark (ATV)	1987	2010				2016			NOM (2021-2022)
Mexico (AI)	1978 (F)	2011				2016		*Jose Albarran	Jose Albarran
Switzerland (SATW)	1988	2012				2017			
Hungary (HAE)	1995	2013				2018	István Králik		
China (CAE)	1997	2014				2019	Prof. LI Xiaohong	Prof. LI Xiaohong	
India (INAE)	1999	2015				2019	Dr. Sanak Mishra	Dr. Sanak Mishra	
United Kingdom (RAEng)	1978 (F)	2016			2017	2015		David Thomlinson	David Thomlinson
Spain (RAI)	1999	2017	2016	2017	2018	2018			
Pakistan (PAE)	2018								NOM (2021-2022)
Uruguay (ANIU)	2000	2018	2017	2018	2019	2019	Lucio Cáceres		
Secretary/Treasurer	2017						Ruth David	Ruth David	Ruth David

F = Founding Member

*Changes to Rotation Schedule due to deferrals by EA CR and NTVA

6. BOARD: CAETS Website Discussion

Purpose

To elicit comments and suggestions regarding the structure, content, and needed functionality of the new CAETS website.

Website Overview

The site is structured to be mobile-friendly and leverages security provided by HTTPS access protocols. In an effort to reduce spam/junk emails, no email addresses are exposed on the public portion of the website; the automated 'Contact CAETS' form can be used by anyone accessing the site. CAETS policies for Terms of Use, Privacy, and Digital Millennium Copyright Act (DMCA) are posted; *NAE permitted adaptation of their statements in these areas.*

The current site uses a free hosting service (available for small nonprofit corporations) as well as a free (open source) content management system and plugins. Looking forward, it may be beneficial to purchase some plugins and consider a low-cost managed hosting service. Projected expenditures would remain below \$1000/year.

Unrestricted Access Content

Audiences - Prospective Members; Related Professional Organizations; Academic Institutions; Policy-Makers; Public

The home page is intended to feature CAETS Events. Each January, the top featured content would be dedicated to the upcoming annual meetings, with an emphasis on the symposium theme. Additional information/links would be provided as soon as available. Shortly after the event, a synopsis or 'Reflections' developed by the host academy would be posted. This could include photos and/or a brief video, and/or links to the host academy website. The "Events" tab would contain both history and upcoming Event information.

The Sidebar is envisioned to feature 2 types of information—member-sponsored activities and more general engineering-related information/activities. It would be good to have new content at least monthly but member assistance will be needed to identify and provide relevant information.

The top menu contains much of the traditional information (but could benefit from some rewriting as time permits). The 'About' section could feature a more compelling description of CAETS strategy rather than a simple statement of objectives taken directly from the Bylaws. The Statements and Reports section contains the materials previously posted (with a little bit of clean-up). New content is needed here. An option would be to add a 'Resources' tab to this menu and link to PDFs of Member Academy reports of general interest (as distinct from CAETS reports/Statements).

Member Only Content

This portion of the site is intended to increase transparency of CAETS operations, enable more efficient and effective communications among academies, and support collaborative efforts (committees, discussion groups, task forces etc.). Ultimately, it will track the history of CAETS leadership, events, and activities. Approximately 5 years will be retained as "active"; older information will be posted in the Archives (still accessible online).

What additional information should be added?

Is the downloadable Member Directory (which was developed to avoid putting that information on an open website) necessary, or would it be better to simply list the content on the site (or both)?

6. BOARD: CAETS Website Discussion

Would it be beneficial to separate 'Member Activities and Issues' — associating Activities with each academy and moving Issues to a collaboration section to enable identification and synthesis of common issues, using this to stimulate subsequent discussions? [An annual call could be used to gather the information well in advance of the CAETS Annual Meetings, affording time for pre-work and agenda-setting.]

A key open question is what type of collaboration support is needed. Free plugins are available that support forums, but further research is needed. Member input regarding desired functionality would be helpful; member experience with specific tools would also provide useful insights.

7. CAETS Strategy

Background

The EXCOM agreed during its meeting on 14 March 2019 to recommend to the Board initiation of a CAETS Strategic Plan to address both Member Development and achievement of CAETS Objectives as delineated in the CAETS Bylaws (Bylaws, Article 1 – Objectives):

- a) *Provide an independent nonpolitical and non-governmental international organization of engineering and technological sciences academies, prepared to advise governments and international organizations on technical and policy issues related to its areas of expertise;*
- b) *Contribute to the strengthening of engineering and technological activities in order to promote sustainable economic growth and social welfare throughout the world;*
- c) *Foster a balanced understanding of the applications of engineering and technology by the public;*
- d) *Provide an international forum for discussion and communication of engineering and technological issues of common concern;*
- e) *Foster cooperative international engineering and technological efforts through meaningful contacts for development of programs of bilateral and multilateral interest;*
- f) *Encourage improvement of engineering education and practice internationally;*
- g) *Foster establishment of additional engineering academies in countries where none exist; and*
- h) *Undertake other projects, programs, and activities not inconsistent with section 501 (c)(3) of the Internal Revenue Code and any applicable law of the District of Columbia.*

Suggested approach for Board consideration:

- Identify and task a small group to draft a 5-year strategic plan (2020-2025) with annual milestones and targets – July - December 2019
- Review and iterate by the full Board: January – March 2020
- Post for Council review and comment: April 2020
- Refine and finalize: May 2020
- Post final plan with 2020 Council Meeting Materials by 31 May 2020 for adoption by Council during June meeting in Seoul

Potential Considerations for Member Development Strategy

Targets:

- Specific regions, countries (should we include a strategy for “fostering establishment of engineering academies where none exist per CAETS objectives)?
- Should we recruit multidisciplinary academies (e.g. those in which engineering is a distinct component residing within a broader academy structure)?
- Should we consider a type of membership for multi-country/regional academies?

Implementation (who will execute):

- Expectations of Host Country
- Expectations of Member Academies
- Expectations of Secretariat

7. CAETS Strategy

Potential Considerations for Achievement of Objectives

The intent is to operationalize CAETS objectives, using them to motivate and focus activities and communications. Among other elements, we might consider:

- Alignment/Contributions of Discussion Groups/Committees
- More robust communications stemming from Annual Symposium (before and after)
- Using the CAETS website as an enabler for communications and outreach
- *Should the objectives stated in the Bylaws be revisited?*

Cyber threat to nuclear weapons.

Draft outline of a decision by CAETS to establish a working group

A large-scale nuclear war is an existential threat to humanity. Also single nuclear explosions are catastrophic events, with the risk of escalating to an exterminating nuclear war. It should therefore be in everyone's interest to prevent a nuclear explosion from ever again taking place, regardless of where and why.

Nine countries today possess nuclear weapons; China, France, India, Israel, North Korea, Pakistan, Russia, UK and USA. The United States and Russia have, by far, the largest number of nuclear warheads and nuclear weapons systems.

A number of nuclear weapons are on high alert and present an ever-present threat. A human error, a deliberate cyber attack or a technical malfunction may cause a human disaster. A number of incidents, when nuclear weapons were close to be launched due to technical or human errors, have been reported from both the US and the Soviet Union.¹

C3I systems (command, control, communication and intelligence) are critical components of nuclear weapons systems. Several US studies have found that US military systems, including nuclear weapons system, are vulnerable to outside interference and that they may not resist cyber attacks.^{2, 3, 4}

A cyber attack can affect nuclear weapons systems by manipulating the warning systems to give a false indication of an incoming nuclear attack, which may provoke a retaliatory launching of nuclear weapons. A cyber attack may also cause uncertainty and confusion in a crisis situation, by breaking or disrupting communication between decision makers, operators and nuclear weapons systems. A malicious code introduced into a nuclear weapon system may be a further threat, by damaging confidence in the system.

The responsibility to ensure the integrity and safety of the nuclear weapons systems rests solely with the states possessing them. However, as the consequences of even a single accidental nuclear weapon explosion will have global dimensions, it is essential to increase the understanding among states and other global communities of these risks, and of possible measures to mitigate them.

CAETS, as an independent, non-governmental international organisation, has as one of its objectives to advise governments and international organisations on technical issues with-

¹Too Close for Comfort. Cases of Near Nuclear Use and Options for Policy, Patricia Lewis, H. Williams, N Pelopidas and S Aghlani Chatham House Report April 2014. https://www.chathamhouse.org/sites/default/files/field/field_document/20140428TooCloseforComfortNuclearUseLewisWilliamsPelopidasAghlani.pdf

²Resilient Military Systems and Advanced Cyber Threat. Task Force Report. US Department of Defense. <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB424/docs/Cyber-081.pdf>

³Weapon systems cybersecurity. DOD Just Beginning to Grapple with Scale of Vulnerabilities. Report to the Committee on Armed Services US Senate, October 2018 US States Government Accountability Office. <https://www.gao.gov/assets/700/694913.pdf>,

⁴ Nuclear Weapons in the new Cyber Age. Report of the Cyber-Nuclear Weapons Study Group. NTI September 20128. https://www.nti.org/media/documents/Cyber_report_finalsmall.pdf

in its areas of expertise. The CAETS member Academies possess scientific and technological knowledge in a number of areas relevant to address the issue of cyber threats to nuclear weapons systems.

CAETS has thus agreed to explore if and how it may contribute to an increased knowledge on cyber threats to nuclear weapons system and on how to mitigate those threats. To this end CAETS establishes a working group to identify the goals of a possible future CAETS study of these issues and to outline a tentative work plan, including resource requirements. The group will also present tentative plans on how the results of a possible study may be presented within the CAETS community and to states and other global communities. The group should present its findings at the CAETS meeting in 2020.