



CAETS Board Agenda

12 October 2020

1300 – 1500 (KRT)

Virtual Meeting

Board Members

Officers

President: Oh-Kyong Kwon, Korea (NAEK)

President-Elect: Manuel Solanet, Argentina (ANI)

Past-President: Tuula Teeri, Sweden (IVA)

Secretary/Treasurer: Ruth David, US (NAE)

Members (2019-2020)

Hugh Bradlow, Australia (ATSE)

Panu Nykanen, Finland (CoFA)

Xiaohong LI, China (CAE)

Sanak Mishra, India (INAE)

Members (2020-2021)

Hideaki Koizumi, Japan (EAJ)

Jose Albarran, Mexico (AIM)

David Thomlinson, UK (RAEng)

Peter Mascher, Canada (CAE)

Meeting Agenda

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|------|---|---------------|
| 1300 | Welcome and Introductions | Oh-Kyong Kwon |
| | 1. Action: Approval of Agenda | Ruth David |
| | 2. Action: Approval of Board Minutes of 24 June 2019 | Ruth David |
| | 3. Report of the Secretary/Treasurer | Ruth David |
| | a. Information: 2019 Financial Audit Report | |
| | b. Action: Dues Collection Variations | |
| | c. Information: 2020 Financial Status | |
| | d. Action: Approval of 2021 Operating Budget | |
| | e. Information: 2021 Rotation Schedule | |
| 1320 | 4. Discussion: CAETS Strategic Plan | Tuula Teeri |
| | Action: Recommendation to Council | |
| 1350 | 5. Discussion: Communications Committee Proposal | Hugh Bradlow |
| | Action: Recommendation to Council | |
| 1420 | 6. Discussion: Conduct of Committees/Working Groups | Ruth David |
| | Action: Recommendation to Council | |
| 1440 | 7. New Business | Ruth David |
| | a. Cyber Threat to Nuclear Weapons Systems | Gosta Lemne |
| 1500 | 8. Adjourn | Oh-Kyong Kwon |



CAETS Board Minutes

24 June 2019

IVA Conference Center

Stockholm, Sweden

1. Welcome and Introductions

CAETS President Tuula Teeri opened the meeting, welcoming all participants. She acknowledged new board members (Hugh Bradlow, Xiaohong LI, Panu Nykanen, and Sanak Mishra) and thanked members who were completing their two-year terms (Roger McCarthy, Lucas Noldus, Stane Pejovnik, Istvan Kralik).

2. Action: Approval of Agenda

The agenda was approved as presented.

3. Action: Approval of Board Minutes of 10 September 2018

The minutes were approved as presented.

4. Report of the Secretary/Treasurer

- a) Secretary/Treasurer Ruth David reported that the 2018 Financial Audit was complete; a copy of the final report was provided with Board Materials and also posted on the CAETS website. She noted that the year ended with an operating surplus of over \$12,000 and that reserves had increased by the \$2,000 contribution from the Pakistan Academy of Engineering upon election into CAETS.
- b) The Secretary/Treasurer provided an update on the FY19 Financial Status, noting that all but two countries had paid their 2019 dues, and projecting another operating surplus on the order of \$12,000 for the current year. Also noted were reserve fund expenses to support visiting committees performing due diligence on the applications for membership of New Zealand, Nigeria, and Serbia. Not all expenses had been reimbursed to date; total expenditures in excess of \$40,000 were projected.
- c) The 2020 Operating Budget was approved as presented.
- d) An updated Rotation Schedule was provided in the Board Materials and made available on the website. It was noted that two countries, Czech Republic and Norway, opted to defer nomination of a Board Member for the 2020 cycle, but Japan and Mexico agreed to nominate individuals to fill those slots.

5. Discussion: CAETS 2019 'Reflections'

President Teeri proposed that in lieu of a formal CAETS statement following the annual meetings, she would prepare a document summarizing and synthesizing the key topics and themes that emerged during the technical symposium. This document would be posted on



CAETS Board Minutes

the IVA website as well as the CAETS website shortly after the event and would be attributed to IVA as host of the meeting.

After discussion, Board Members agreed with this approach but generally felt that a formal statement was also important. It was agreed that all member academies would be invited to identify one point they felt should be included in the statement and that IVA would prepare a draft within a few months of the meeting for circulation to Council Members for comment. Hugh Bradlow, Chair of the Communications Committee, agreed to assist with dissemination of the statement. It was noted that the new CAETS website could be used for both gathering of comments and dissemination of the statement.

6. Discussion: CAETS Website

The Secretary/Treasurer demonstrated the structure and content of the new CAETS website, noting that significant work remained to re-host historical content from the old site. Members generally endorsed the overall structure and agreed to serve as a sounding body with regard to site refinements over the coming year.

After discussion, it was agreed that a new 'Resources' category should be added to the public home page Menu; this would provide links to publications (reports, journals, statements) by individual member academies (with their permission). The objective is to increase the visibility of individual academy endeavors.

Further discussion considered additional information that might be posted on the public site, including brief descriptions of the CAETS discussion groups and updates on their activities.

The final major topic of discussion was how the website might be used to foster and enable collaboration among CAETS members—particularly the discussion groups/committees, but also for development of CAETS statements and other communications. It was agreed that software to enable such collaboration would be investigated and prototyped within the following few months.

7. Discussion: CAETS Strategy

President Teeri opened a discussion of the need for a CAETS Strategic Plan to focus actions such that the Objectives, as delineated in the CAETS Bylaws, are attained. It was noted that plans had been prepared in the past but that follow-through was often lacking.

After discussion, it was agreed that the Board would appoint a small group to develop a 5-year strategic plan organized around three components: 1) Structuring CAETS to more effectively execute its plan; 2) Membership Development; and 3) Achievement of CAETS



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Objectives. The intent is to have a draft plan available for Council review and comment in April 2020 and the final plan presented for concurrence at CAETS 2020 in June.

Participants on the Strategic Planning task force include: Tuula Teeri, Hugh Bradlow, David Thomlinson, Sanak Mishra, Oh-Kyong Kwon, and Friedrich Wu. The Secretary/Treasurer will support the effort.

8. Discussion: Working Groups

Ruth David opened a discussion on CAETS discussion groups, including the four scheduled to meet during CAETS 2019, but also opening the door to new discussion groups in the future. Board Members discussed how such activities should be initiated and organized in order to effectively contribute both to CAETS Member Academies and also to the broader engineering communities. It was noted that CAETS Statements might arise from a particular Discussion Group rather than relying only on CAETS Annual Meetings. It was agreed that a more appropriate organizational structure might be to enlist a Chair together with a Vice Chair who could succeed the Chair as mutually agreed. It also was agreed that collaboration among members between meetings must be facilitated by the CAETS website.

Board Members were supportive of the four groups already chartered, and felt that leadership would be most effective if undertaken by an academy with a strong interest in the topic. IVA raised two topics for consideration as new working groups: Cyber Threat to Nuclear Weapons and AI & Ethics. After discussion, it was agreed that a procedure was needed to support CAETS decisions regarding when to establish new working groups. The Secretary/Treasurer agreed to develop such a procedure for Board consideration.

9. New Business

There being no new business, the Board Meeting adjourned.



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

2020 President
Oh-Kyong Kwon, NAEK, Korea

2020 President Elect
Manuel Solanet, xxx, Argentina

2020 Past President
Tuula Teeri, IVA, Sweden

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
Royal Society Te Aparangi, New Zealand
National Academy of Engineering, Nigeria
Norwegian Academy of Technological Sciences
Pakistan Academy of Engineering
Academy of Engineering Sciences of Serbia
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

CAETS President O-Kyong Kwon
National Academy of Engineering of Korea
Korea Technology Center
Republic of Korea

Dear President Kwon:

We were selected by our respective academies, the Royal Academy of Engineering of the United Kingdom 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 FY2019, dated 14 March 2020. 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 2019.

Submitted by

David Thomlinson
RAEng International Secretary

Al Romig
NAE Executive Director

Mary Kutruff
NAE Financial Officer

Enclosure: 2019 Financial Statements

Fiscal year 2019

1/1/2019- 12/31/2019

OPERATIONS

	FY2017	FY2018	FY2019	FY2019 ²	FY2020 ¹
Receipts	actual	actual	actual	budget	budget
Dues	84,494.20	80,811.00	81,175.00	83,430.00	84,460.00
Expenses					
Communications	-	510.79	84.99	2,500.00	2,500.00
Equipment	-	-	-	200.00	-
Legal-Prof. Fees	1,113.00	162.00	80.00	500.00	300.00
Management Fee	44,000.00	44,000.00	50,000.00	50,000.00	50,000.00
Meetings	127.07	50.71	-	200.00	300.00
Postage, Delivery	33.30	183.12	-	300.00	200.00
Printing	-	-	-	500.00	360.00
Supplies	243.15	88.73	122.36	230.00	300.00
Travel	15,409.09	20,791.15	18,268.79	25,000.00	25,000.00
Strategy Implementation	-	2,887.70	-	4,000.00	5,500.00
Total Expenses	60,925.61	68,674.20	68,556.14	83,430.00	84,460.00

¹Approved by Board and Council during annual meetings June 2019; dues budget reflects previously approved 3% increase and addition of Pakistan (elected in 2018).

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.

ACTIVITIES AND CHANGES IN RESERVE FUNDS

Balance From 12/31/2018	286,269.83
Revenue	
Dues Received	81,175.00
Reserve Fund Contributions	6,000.00
	<u>87,175.00</u>
Expenses	
Operating Expenses	68,556.14
Reserve Fund Expenses	41,635.17
	<u>110,191.31</u>
	(23,016.31)
Balance 12/31/2019	263,253.52

Statement of Financial Position
12/31/2019

ASSETS

Bank of America Account Balance 12/31/19	<u>273,774.87</u>
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Total Assets	273,774.87
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LIABILITIES

Deferred Revenue from Prepaid Dues	10,234.00
Checks Issued but Not Cleared	-
Due to Secretary/Treasurer	287.35
On Account for Members	<u>-</u>

Total Liabilities	10,521.35
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NET ASSETS	<u>263,253.52</u>
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Total Liabilities and Net Assets	273,774.87
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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	286,269.83

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

CAETS Dues Collection Variations

During a pre-review of the 2019 CAETS Financials, the NAE Director of Finance questioned the variation between dues payable and payments received, noting that this is a chronic issue.

In the past, these variations have been noted on the financials, but no explicit effort to collect/repay was implemented due to the costs of funds transfer by member academies. Instead, verbiage was added to the cover letter noting that total dues payable should be received by the CAETS bank (net of transfer fees); the CAETS Bank of America account does not levy a fee on incoming wire transfers. Additionally, last year, a copy of the bank's payment received notification was pasted into the receipt returned to the member academy. *Based on analysis of the payment notifications, some shortfalls appear to be banking fees either at origin or by an intermediary bank; others may be due to currency fluctuations*. It should be noted that in some cases, funds received exceed the payment due (likely due to currency fluctuations).

A 3-year history is shown below:

2020 Dues Reconciliation:

Payment Shortfall	\$218.75	Attributable to 10 Members
Excess Payment	\$130.00	Attributable to 2 Members

2019 Dues Reconciliation:

Payment Shortfall	\$271.00	Attributable to 10 Members
Excess Payment	\$76.00	Attributable to 1 Member

2018 Dues Reconciliation:

Payment Shortfall	\$209.00	Attributable to 10 Members
Excess Payment	\$20.00	Attributable to 1 Member

While there were 10 Member shortfalls during each of the 3 past years, the list of academies varies from year to year (with some common elements).

Options include:

1. Continue to "write off" shortfalls and absorb excess payments. Concern: While this is consistent with CAETS history, it does not provide equitable treatment across the member base.
2. Establish a business process to note both shortfalls and excess payments on Dues Paid Receipts; adjust the payment due in the following year either upward or downward by the variation. Implement beginning with the 2021 dues payment cycle, but account for only 2020 shortfall/excess payments. This would not introduce additional wire transfer fees but would hold all member academies accountable for full payment of dues (while also giving credit for excess payments) going forward.

Note: Per CAETS Bylaws, "The Board shall have paramount authority with respect to the funds of CAETS, and the power to adopt the annual budget of the Council." Both the Bylaws and CAETS Operating Procedures are silent on this issue. Board decision could be documented as an update to Operating Procedures, requiring Board approval, vs. a policy change (Bylaws), requiring Council approval.

2020 Financial Status

	FY2018	FY2019	FY2020 ²	FY2020	FY2020
Receipts	actual	actual	budget	YTD	EAC
Dues ³	80,811.00	81,175.00	84,460.00	80,251.25	87,461.25
Expenses					
Communications	510.79		1,500.00		
Website		84.99	1,000.00	25.99	300.00
Equipment	-		-		
Legal-Prof. Fees	162.00	80.00	300.00	13.64	13.64
Management Fee ¹	44,000.00	50,000.00	50,000.00	25,000.00	50,000.00
Meetings	50.71		300.00		
Postage, Delivery	183.12		200.00		
Printing	-		360.00		
Supplies	88.73	122.36	300.00		100.00
Travel	20,791.15	18,268.79	25,000.00		
Strategy Implementation	2,887.70		5,500.00		
Total Expenses	68,674.20	68,556.14	84,460.00	25,039.63	50,413.64

¹Management Fee increase recommended by Board and approved by Council during 2018 Annual Meetings.

²2020 Budget approved by Board during 2019 Annual Meetings.

³Dues Payable in 2020 were increased by \$3090 with the election of New Zealand, Nigeria, and Serbia (not reflected in Dues budget amount (total payable is \$87,550). Dues received shortfall (year-to-date) is largely attributable to 3 member academies who have not yet paid 2020 dues; the EAC adjustment assumes those dues will be paid.

3.d Proposed 2021 Operating Budget

2021 Proposed Operating Budget

	FY2018	FY2019	FY2020 ²	FY2021
Receipts	actual	actual	budget	budget
Dues ³	80,811.00	81,175.00	84,460.00	87,550.00
Expenses				proposed
Communications	510.79		1,500.00	
Website		84.99	1,000.00	500.00
Equipment	-		-	
Legal-Prof. Fees	162.00	80.00	300.00	300.00
Management Fee ¹	44,000.00	50,000.00	50,000.00	50,000.00
Meetings	50.71		300.00	200.00
Postage, Delivery	183.12		200.00	100.00
Printing	-		360.00	200.00
Supplies	88.73	122.36	300.00	200.00
Travel	20,791.15	18,268.79	25,000.00	25,000.00
Strategy Implementation ⁴	2,887.70		5,500.00	5,500.00
Total Expenses	68,674.20	68,556.14	84,460.00	82,000.00

¹Management Fee increase recommended by Board and approved by Council during 2018 Annual Meetings.

²2020 Budget approved by Board during 2019 Annual Meetings.

³Dues Payable in 2020 were increased by \$3090 with the election of New Zealand, Nigeria, and Serbia (not reflected in Dues budget amount (total payable is \$87,550). Dues received shortfall (year-to-date) is largely attributable to 3 member academies who have not yet paid 2020 dues; the EAC adjustment assumes those dues will be paid.

⁴Activities endorsed by Board that are in support of implementation of CAETS Strategy.

CAETS Rotation Schedule - 2021 - 2022

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

International Council of Academies of Engineering and Technological Sciences (CAETS)

‘Engineering a better world’ Strategy 2021-2026

CAETS is an independent international network organization aiming to facilitate collaboration between national academies of engineering and technological sciences worldwide. Today, CAETS has member academies from 30 countries in Europe, the North and South America, Asia, Oceania and Africa. The main objective of CAETS is to promote engineering and technology development as engines of sustainable growth and welfare throughout the world.

At the CAETS Board meeting 24 June 2019, it was agreed that the Board would appoint a small group to develop a 5- year strategic plan organized around three components: 1) Structuring CAETS to more effectively execute its plan; 2) Membership Development; and 3) Achievement of CAETS Objectives. The intent is to have this draft plan reviewed and commented by the Council July/August 2020 and the final plan presented for concurrence at CAETS annual meeting in the autumn 2020.

Because this working document proposes for consideration several modifications to the CAETS Bylaws, a full copy of the Bylaws is provided in Appendix A. Note that no changes to the CAETS Bylaws could occur prior to CAETS 2021 due to the requirement for 90-day notice to the Council.

Objectives of CAETS (a proposal for a slight revision of the current **CAETS Bylaws** - Article 1.) – See *Appendix B for mapping of current objectives to proposed objectives*

1. Provide an international forum for enlightened dialogue and communication of engineering and technological sciences,
2. Contribute to advancing engineering and technological sciences in order to promote economic growth, sustainable development and social welfare throughout the world,
3. Foster collaboration and the development of bi- and multilateral programs between the member academies,
4. Prepare science-based proposals in order to advise governments and international organizations on policy issues related to engineering and technology development,
5. Promote diversity and inclusion in the global engineering profession,
6. Contribute to continuous improvement and modernization of engineering education and practice internationally,
7. Foster a balanced public understanding of the applications of engineering and technology,
8. Foster establishment of engineering academies in countries where none exist.

CAETS priorities 2020-2025 – on-going process

The world is currently facing many grave challenges, some of them approaching crisis, concerning for example, global warming and associated issues of energy consumption and supply, and the digital transformation of world industries. CAETS has been discussing the need for engineering leadership to solve these global grand challenges that we know will be shaping the fate of mankind long into the future.

CAETS is operating through working committees that gather expertise within member academies within selected focus areas, and Annual Conferences addressing specific themes relevant for engineering futures. The current working committees focus on:

- energy,
- engineering education,
- sustainable development goals,
- diversity and inclusion,
- communicating with public, and
- COVID-19 (*recently chartered*).

Proposals and observations from the current strategy working for CAETS working practices

Being an informal network organization, CAETS has often experienced difficulties in leveraging the results of the various discussion groups/committees and agreeing on the CAETS statements following the annual convocations. The strategy working group is therefore proposing that CAETS develop a **Roadmap for “Engineering a Better World”** – as summarized below:

1. Constitute **Committees/Working Groups** that are based on strong mutual interest to improve ownership, commitment, engagement and leverage. These themes/activities may be of global significance or region-specific (like Asia, Europe, Africa etc.).
 - Assign a committed **leadership** for each working group for a duration of 3-5 years at a time.
 - Establish a mechanism for an **annual board review** of the work done by the Committees/Working Groups, including a plan how to **communicate** the results. The recommendations emanating from such activities should be offered to concerned national/international bodies for facilitating engineering solutions and implementation.
2. Implement means to **share results and recommendations of individual academies e.g.:**
 - Implement various exchange programs of issues concerning socio-economic development of specific regions,
 - create a **repository of information** pertaining to the activities conducted by various academies such as reports, Awards, Publications etc. for sharing with all the members of CAETS,
 - include a session (as part of the CAETS convocations) where the members share highlights of their accomplishments during the past year. The highlights by individual academies could also be disseminated in the form of presentations and/or reports shared prior to the meetings to stimulate discussions on shared interests and to seed of new working groups.
 - Include links to the main results of the national academies in a **CAETS on-line internal newsletter** with regular reminders sent to the member academies about 2-3 weeks in advance of publication of the News.
3. To broaden the influence of CAETS, **establish collaborations with international bodies** (WFEO, ICSU, IAP, IPCC etc.) and UN organizations (UNESCO, UNEP, UNDP etc.). Identify the key areas in which the CAETS activities can be undertaken in order to suggest recommendations for implementation. Establish an organization and routines for coordination and leadership, for example in the form of an **executive vice president for each priority area**.
4. Create a **Corporate Communication** resource to foster engineering and technology worldwide through data and information originating from the Roadmap activities.

Reorganizing CAETS to develop and implement strategic plan

The discussions during the June 2019 Board Meeting focused on better positioning the CAETS Board to oversee implementation of the 5-year strategic plans; the discussion included a proposal to extend Board Member terms to provide more continuity. *It was noted that the CAETS President as well as the President-Elect are consumed by planning and implementation of the CAETS Annual Meetings.*

- **Relevant Bylaws – Article 3 – Board of Directors.**

- **Section 1. Functions:** Subject to the provisions of the Articles of Incorporation and these bylaws, the Board of Directors shall be responsible for executing the **strategy** [current Bylaws language: **policies and actions**] approved by the Council. The Board shall have paramount authority with respect to the funds of CAETS, and the power to adopt the annual budget of the Council. The Board of Directors shall meet at least annually, in conjunction with meetings of the Council; and, with 90 days notice, at the call of the President or two other members of the Board through the Secretary/Treasurer.
- **Section 2. Composition:** The Board of Directors shall consist of four officers and eight additional members.
- **Section 3. Officers:** The President shall be the chief elected officer of the corporation and preside the meetings of the Council and of the Board of Directors. The President-elect, in the absence of the President, shall preside at meetings of the Council and of the Board. The Secretary/Treasurer shall provide the administration and other support necessary for assuring the continuity and effectiveness of Council and Board policies and programs. The Past-President shall be that person who has immediately preceded the current incumbent as President.
- **Section 4. Terms:** The terms of office for the officers of the Board, with the exception of the Secretary/Treasurer, shall be one year beginning January 1. *[Clarification: Because the President-elect becomes the President and subsequently the Past-President, the individual serves 3 1-year terms.]* The terms of office for the additional members of the Board shall be two years beginning January 1. The Council shall set the term of the Secretary/Treasurer.
 - **Proposal to consider: Establish a Standing Committee for CAETS Strategy** among the Board members other than the Officers (President, President-Elect, Past-President, Secretary/Treasurer). These Board members could serve 3-4-year terms (**Bylaws change**) and **adopt responsibilities as 'Executive Vice Presidents' to lead the Council approved focus areas of CAETS.**
 - **Proposal to consider: The terms of the 'Executive Vice Presidents' forming the Standing Committee will be for the duration of the respective Working groups addressing the current CAETS priorities (3-4 years). The terms of office for the remaining Board positions shall be two years beginning January 1.**
- **Section 5. Selection:** a) The presidents are selected based on the Council-approved Rotation Schedule of all member academies based on date of membership in CAETS. b) The positions on this rotation schedule of the member academies nominating additional members of the Board, relative to the position of the member academy nominating the president, shall be determined by the Council.

- **Proposal to consider: The Standing Committee members are selected by a separate Council approved nomination process for the duration of the Working groups.**

Strategy to expand CAETS Membership

Election of the Royal Society Te Aparangi in 2019 established a precedent that a candidate organization need not be an independent Academy of Engineering or Engineering Sciences. The discussion at the Board meeting in 2019 was that this affords additional opportunities to recruit other multi-disciplinary academies. It was decided that the criteria for Membership should be scrutinized to ensure clarity to both prospective members and Visiting Committee members performing due diligence. However, it seems that the general opinion is that the criterias as stated are clear.

- **Relevant Bylaws: Article 2 – Council Membership**
 - **Section 3. Criteria for Membership.** A member of CAETS shall:
 1. Be representative of the engineering and technological community of that country;
 2. Subscribe to the nonpolitical, non-governmental international character of the Council;
 3. Have a peer elected membership with criteria for election based on significant personal contributions to engineering, technological sciences, or related activities;
 4. Be governed by its elected membership;
 5. Be engaged in significant activities demonstrating that its objectives are compatible with the objectives of the CAETS; and
 6. Have sufficient financial support to pay the costs of CAETS membership and the costs of participation in CAETS activities.
 - **Proposal to consider:** No amendments in the current revision. Being representative of the engineering and technological community of that country remains a criteria, multi-disciplinary academies will not be targeted. Nor will multi-national academies. Instead focus will be to communicate the value of being a CAETS member.
- **Reserve Fund Contribution and Dues Schedule**
 - Per CAETS Bylaws, the Council is responsible for establishing the initial contribution and the annual dues. The tiered structure was initially established with 3 levels (1K, 3K, 6K), with the expectation that academies would eventually move from 1K to 3K as the norm, but this has not happened. An intermediate level (2K) was added to encourage movement, but that has had limited impact. Additionally, dues payments by individual countries appear uncorrelated with relevant national statistics (e.g. GDP, High Tech Exports)
 - **Proposal to consider: Establishment of a transparent policy and process for both setting dues initially and periodically revisiting dues payments. The formula is suggested to be proportional to GDP per capita with consideration of high-tech exports.**

APPENDIX A. CAETS Bylaws

Changes to Bylaws

Approved October 13, 2000

Effective January 1, 2001

Amended July 14, 2005 (Art. 5, Sec. 1, b)

Amended October 26, 2007 (Art. 3, Sec. 2, Sec.4)

Amended June 30, 2010 (Art. 2, Sec.2; Art. 6)

Amended November 30, 2017 (Art. 2, Sec. 2)

ARTICLE 1 - Objectives

Consistent with its Articles of Incorporation and in support of its mission, CAETS will:

- 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.

ARTICLE 2 - Council Membership

Section 1. Composition

The members of CAETS shall be academies of engineering and technological sciences. Each academy shall appoint a representative to speak and vote on its behalf. The body of the academy representatives shall be known as the Council. The CAETS officers shall be members of the Council without the right of vote, unless also the representative of an academy.

Section 2. Functions

Subject to the provisions of the Articles of Incorporation of CAETS and other provisions of these bylaws, the Council shall:

- a) Establish the policies of CAETS;
- b) Approve procedures for and the election of academies to membership in CAETS;
- c) Establish the initial contribution of new academy members and the annual dues of members;
- d) Accept the representative of each member academy to the Council and elect the members of the Board of Directors; and
- e) Approve the general concept and outline of CAETS convocations, symposia, projects, and endorsed activities.

Section 3. Criteria for Membership

A member of CAETS shall:

- a) Be representative of the engineering and technological community of that country;
- b) Subscribe to the nonpolitical, non-governmental international character of the Council;
- c) Have a peer elected membership with criteria for election based on significant personal contributions to engineering, technological sciences, or related activities;
- d) Be governed by its elected membership;
- e) Be engaged in significant activities demonstrating that its objectives are compatible with the objectives of the CAETS; and
- f) Have sufficient financial support to pay the costs of CAETS membership and the costs of participation in CAETS activities.

Section 4. Procedures for Admission of New Members

- a) Applications for admission will normally be accepted for consideration no earlier than three years after the official date of establishment of the applicant, with council flexibility for up to five years at its discretion.
- b) The election of a new member academy shall take place only during a regularly scheduled meeting of the Council when the Secretary/Treasurer receives completed application documents 90 days in advance of such meeting.
- c) Admission of a new member academy shall require the affirmative votes of at least all but one of the members' representatives present and voting.
- d) Applicants elected by the Council, on complying with Council-approved entry requirements, shall be admitted to CAETS effective at the conclusion of the Council meeting at which elected.

Section 5. Meetings

Annual meetings of the Council shall be held at a place and date approved by the Council. With 90 days notice, special meetings of the Council may be called by the President or at the request of four or more members. Each member is entitled to one vote on each matter submitted to a vote at any meeting, but no member with dues in arrears for a period of six months shall be entitled to vote. Fifty percent of the current CAETS membership, with accepted representation present, shall constitute a quorum.

Section 6. Resignation and Removal of Members

- a) A member may resign effective at the end of a fiscal year, provided it gives written notice to the Secretary/Treasurer prior to the beginning of that fiscal year.
- b) The removal of a member, for cause including extended non-payment of dues, shall take place only during a regularly scheduled meeting of the Council and shall require the affirmative votes of at least all but one of the members' representatives present and voting.

ARTICLE 3 - Board of Directors

Section 1. Functions

Subject to the provisions of the Articles of Incorporation and these bylaws, the Board of Directors shall be responsible for executing the policies and actions approved by the Council. The Board shall have paramount authority with respect to the funds of CAETS, and the power to adopt the annual budget of the Council. The Board of Directors shall meet at least annually, in conjunction with meetings of the Council; and, with 90 days notice, at the call of the President or two other members of the Board through the Secretary/Treasurer.

Section 2. Composition

The Board of Directors shall consist of the four officers and eight additional members.

Section 3. Officers

Officers may be, but are not required to be, representatives of the member academies. Election of officers shall be by majority vote by the Council of member representatives.

- a) The President shall be nominated by the member academy in position to make such nomination, based on date of membership in CAETS and as further described below in Article 3 Section 5. The President shall be the chief elected officer of the corporation and preside at meetings of the Council and of the Board of Directors.
- b) The President-elect shall be nominated by the member academy next in line to appoint the president. The President-elect, in the absence of the President, shall preside at meetings of the Council and of the Board.
- c) The Secretary/Treasurer shall be nominated by the member academy selected by the Council to host the CAETS Office. The Secretary/Treasurer shall provide the administration and other support necessary for assuring the continuity and effectiveness of Council and Board policies and programs.
- d) The Past-President shall be that person who has immediately preceded the current incumbent as president. If that person is unable for any reason to participate fully as a member of the Board of Directors, the position shall be vacant until the end of that term.

Section 4. Terms

The terms of office for the officers of the Board, with the exception of the Secretary/Treasurer, shall be one year beginning January 1. The terms of office for the additional members of the Board shall be two years beginning January 1. The Council shall set the term of the Secretary/Treasurer.

Section 5. Selection

- a) The selection of the member academy that nominates the President shall be based on a Council-approved rotation schedule of all member academies based on date of membership in CAETS. The Board of Directors may approve temporary exchanges of position on that schedule, for a specific purpose only, between two member academies based on their joint agreement and request for Board approval.
- b) The positions on this rotation schedule of the member academies nominating additional members of the Board, relative to the position of the member academy nominating the president, shall be determined by the Council.
- c) Except for the position of Past-President, if the incumbent is unable to complete the term for whatever reason, the incumbent's academy will propose a successor nominee for approval by the Council to complete the term.

Section 6. Meetings

The Board of Directors may conduct business in any way permitted by the laws of the District of Columbia, including but not limited to telephone conference or similar communications equipment, provided all persons participating in such a meeting can hear each other. Participation in a meeting by such means shall constitute presence in person at the meeting. The Board of Directors may conduct any of its affairs by mail vote, provided that all members of the Board give signed, written consent to action without a meeting and that any question so decided shall have been transmitted in writing prior to the vote to every member of the Board in the same wording. Unless otherwise required by these Bylaws, the Articles of Incorporation, or by law, an affirmative vote of a majority of all of the members of the Board of Directors shall be necessary for action by mail vote. A quorum for the conduct of business of the Board of Directors shall consist of a majority of the number of its members.

Section 7. Removal/Vacancies

- a) Directors may be removed, with or without cause, by a two-thirds vote of the entire Council at a regular meeting of the Council.
- b) An officer may be removed, for cause, by a two-thirds vote of the entire Council at a regular meeting of the Council. Any vacancies created shall be filled by the member academy that nominated the removed officer.

ARTICLE 4 - Executive Committee

The Executive Committee shall consist of the President, President-elect, and the Secretary/Treasurer. The Executive Committee shall conduct routine business between meetings of the Board and act in emergencies. All actions of the Executive Committee shall be taken consistent with resolutions and policies of the Board.

The Executive Committee shall not have authority as to the following matters:

- a) The submission to the Council any action requiring Council approval;
- b) The filling of vacancies in the Board of Directors or in any committee;
- c) The amendment or repeal of the bylaws or the adoption of new bylaws; and
- d) The amendment or repeal of any resolution of the Board of Directors which by its terms shall not be so amenable or repealable.

In addition to the Executive Committee, there shall be such standing committees as shall be authorized from time to time by the Board of Directors.

ARTICLE 5 - Expenses

Section 1. Member Expenses

- a) Each member academy shall be responsible for the expenses of its delegation to a CAETS meeting, for the expenses of its member serving as an officer or member of the Board (with the exception of the position of Secretary/Treasurer, which shall be the responsibility of CAETS), and for bearing the costs of CAETS meetings it hosts.
- b) However, in exceptional circumstances when no other source of funding is readily available, and when requested in advance, within specifically budgeted funds, and with prior approval of the Executive Committee, travel expenses may be paid from CAETS funds for individuals pursuing objectives of the current CAETS Strategy.

Section 2. CAETS Expenses

Other expenses of the Council shall be included in the annual budget of CAETS prepared by the Secretary/Treasurer and approved by the Board of Directors.

ARTICLE 6 - Language

The language of CAETS Convocations, Symposia, Council, Board of Directors, and all other meetings and activities shall be English.

ARTICLE 7 - Fiscal Year

The fiscal year of CAETS shall be from January 1 of each year through December 31.

ARTICLE 8 - Indemnification

Every person who was or is a party or is threatened to be made a party to or is involved in any action, suit, or proceeding, whether civil, criminal, administrative, or investigative, by reason of the fact that the person, or another of whom the person is or was the legal representative, is or was an officer, director, employee, or agent of the corporation shall be indemnified and held harmless to the fullest extent permissible under the law against all expenses, liability, and loss (including attorneys' fees, judgments, fines, and amounts paid or to be paid in settlement reasonable incurred or suffered by the person in connection therewith), so long as such person acted in good faith and in a manner he or she reasonably believed to be within the scope of his or her authority and for a purpose that that person reasonably believed to be in the best interests of the corporation and, with respect to any criminal action or proceeding, had no reasonable cause to believe his or her conduct was unlawful. Such right of indemnification shall not be exclusive of any other right which such officers, directors, employees, or agents may have or thereafter acquire and, without limiting the generality of such statement, they shall be entitled to their respective rights of indemnification under any bylaw, agreement, provision of law, or otherwise, as well as their rights under this section.

ARTICLE 9 - Amendments

Section 1. Proposed Amendments

Amendments to these Articles may be proposed by a member academy at any time and will be considered at the next regularly scheduled meeting of the Council. Proposed amendments shall be provided to all member academies through the Secretary/Treasurer at least 90 calendar days before the Council meeting at which they are to be considered.

Section 2. Approval of Amendment

Approval of an amendment at a meeting of the Council shall require the affirmative votes of at least two-thirds of the member representatives present and voting.

ARTICLE 10 - Parliamentary Procedures

The provisions of Robert's Rules of Order shall govern the transactions of business at meetings in all cases to which they apply and to the extent they are not inconsistent with these bylaws or procedures established by the Council.

Appendix B. Current CAETS Objectives vs Proposed Objectives

Article 1 - Objectives

Consistent with its Articles of Incorporation and in support of its mission, CAETS will:

Current	Proposed
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;	4. Prepare science-based proposals in order to advise governments and international organizations on policy issues related to engineering and technology development,
b) Contribute to the strengthening of engineering and technological activities in order to promote sustainable economic growth and social welfare throughout the world;	2. Contribute to advancing engineering and technological sciences in order to promote economic growth, sustainable development and social welfare throughout the world,
c) Foster a balanced understanding of the applications of engineering and technology by the public;	7. Foster a balanced public understanding of the applications of engineering and technology,
d) Provide an international forum for discussion and communication of engineering and technological issues of common concern,	1. Provide an international forum for enlightened dialogue and communication of engineering and technological sciences,
e) Foster cooperative international engineering and technological efforts through meaningful contacts for development of programs of bilateral and multilateral interest;	3. Foster collaboration and the development of bi- and multilateral programs between the member academies,
f) Encourage improvement of engineering education and practice internationally;	6. Contribute to continuous improvement and modernization of engineering education and practice internationally,
g) Foster establishment of additional engineering academies in countries where none exist; and	8. Foster establishment of engineering academies in countries where none exist.
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.	5. Promote diversity and inclusion in the global engineering profession.

CAETS Working Groups/Committees

Draft Operating Procedure

Background

During the 2019 Board Meeting, discussion time was devoted to the topic of CAETS discussion groups (also referred to as Working Groups or Committees). It was recognized that the CAETS Energy Committee has been self-perpetuating and remains active; the Board was supportive of the four working groups already established (Communicating with the Public, Sustainable Development Goals, Diversity & Inclusion, Engineering Education). Two new topics were raised for consideration (Cyber Threat to Nuclear Weapons and AI & Ethics). After discussion, the Board agreed that a procedure was needed to support decisions regarding when/how to establish new working groups/committees. The Secretary/Treasurer agreed to develop such a procedure for Board consideration.

Existing Policy/Procedure

Bylaws:

Article 2 – Council Membership, Section 2. Functions “... the Council shall: e) Approve the **general concept and outline** of CAETS convocations, symposia, projects and **endorsed activities.**”

Article 4 – Executive Committee d) In addition to the Executive Committee, there shall be such standing committees as shall be **authorized** from time to time by the Board of Directors.

CAETS Operating Procedures:

4) Financial Issues ...f) Projects and activities carried out by CAETS, or a team of experts appointed by CAETS, at the request of governments, international organizations, etc., shall be financially self-supporting and **shall not be dependent on CAETS for financial support.**

Considerations

- 1) The COVID-19 pandemic has caused member academies (as well as many other organizations) to embrace web-based conferencing tools as a means to support virtual meetings of all sizes. Platforms like Zoom are widely used and relatively inexpensive; CAETS 2020 is conducting its annual meetings via this platform. Such tools provide opportunities for CAETS working groups to ‘meet’ more frequently throughout the year (e.g. monthly, bi-monthly, or quarterly) as well as to engage member academy Fellows (subject matter experts) who might not otherwise be available due to travel costs and time limitations.
- 2) The draft CAETS Strategy document proposes ways to better organize CAETS to achieve its objectives and strategy, including the use of working groups/committees. This proposed process should, therefore, be viewed as an intermediate step, to be implemented immediately and fine-tuned to align with the CAETS Strategic Plan when the plan is finalized and approved by the Council.

Proposed Lexicon

Working Group: Collaborative effort initiated by one or more member academies focused primarily on information sharing and dialog around a topic of mutual interest; other member academies are invited to join. Work papers are not shared beyond CAETS member academies and do not imply CAETS

endorsement. Group ‘meets’ periodically throughout the year – synchronously (e.g. Zoom) and asynchronously (e.g. online discussion forum) – and provides a written summary of its activities to the Board/Council in advance of the Annual Meeting. *Note: A collaborative effort initiated as a Working Group may transition to a Committee if it meets the established criteria.*

[Standing] Committee: Chartered by the Board for indefinite period to address a topic of enduring/global (or regional) importance and concern that is explicitly aligned with CAETS Objectives and Strategies. Develops and implements an external communications plan with all communiques subject to Council approval. Meets periodically throughout the year and provides both a written report and an oral summary annually to the Board, which identifies the oral presentations to be included in the Annual Meeting of the Council (all written materials are provided to the Council).

Process Phases

	Working Group (WG)	Standing Committee (SC)
Initiation	May be initiated at any time by a member academy which is responsible for initial leadership of the effort as well as for developing a statement of purpose, proposing meeting frequency, and inviting the participation of other member academies (<i>or the Secy/Treas could invite academies to opt in</i>). Upon initiation, the first action of the WG is to refine the statement of purpose and document membership. The initiating member academy notifies the Secretary/ Treasurer, who <i>notifies the Board</i> and establishes a member-accessible website for the group’s use and archival of activities.	May be established only with Board authorization . A member academy is responsible for development of a draft charter to include purpose, initial leadership (chair & vice chair), suggested composition (skills), proposed meeting frequency, requirements for minutes, an initial communications plan (internal to CAETS and external to public), and preliminary endorsements by at least 25% of the CAETS member academies. The draft charter is submitted to the Secretary/ Treasurer, who seeks Board approval. Upon approval the Secretary/Treasurer invites member academies to participate and establishes a membership-accessible website for the SC’s use and archival of activities.
Ongoing Operations	WG leadership provides (<i>initial and ongoing updates</i>) statement of purpose, membership, meeting notices, working papers, and annual summary of activities to Secy/Treas who posts them on the WG website. Annual summary is due 30 days prior to the scheduled Annual Meetings and is included in CAETS Board/Council materials. Additional academies may join at any time by notifying WG leadership.	SC leadership provides charter (including all updates), membership, meeting notices and meeting minutes to Secy/Treas who posts them on the SC website. Annual summary is due 30 days prior to the scheduled Annual Meetings and is included in CAETS meeting materials. All proposed external communiques agreed upon by SC members are sent to the Secy/Treas who posts them on the CAETS Members Only website and notifies Council Members, providing a 2-week comment period. The SC considers Council comments when finalizing the communique, which is posted for 1 week ; member academies who do not object are noted as having endorsed the communique.

Leadership Transition	WG leadership may recruit new leadership at any time; documentation of the transition is provided to the Secy/Treas.	Initial appointments of chair and vice chair are for 2 years, with the vice chair succeeding the chair. At each transition, the chair is responsible for recruiting a new vice chair (and notifying the Secy/Treas).
Termination	Board discusses productivity of each WG during the Annual Meeting and provides feedback/guidance. If the WG is unable to identify willing leadership and/or fewer than 20% of CAETS member academies are active participants, the WG is dissolved (notification to the Secy/Treas).	The current chair and vice chair may at any time recommend to the Board termination of the SC for stated reasons. Additionally, the Board discusses the productivity of each SC annually and provides feedback/guidance for the coming year. If SC participation drops below 25% of CAETS member academies, the Board may, at its discretion, recommend termination.

Transition of Existing Activities

If approved, the Secretary/Treasurer will work with the leadership of existing committees and working groups to implement these procedures. Additionally, the CAETS Operating Procedures will be updated to reflect this guidance.

Stockholm
08/09/2020

Cyber Threat to Nuclear Weapons Systems

Draft outline of IVA proposal to CAETS on the establishment of a working group on Cyber Threats to Nuclear Weapon Systems between member academies.

The sole purpose of this proposal is to initiate a dialog to raise awareness of the Cyber Threat and potential ways to mitigate it. A dialog based solely on open sources and no nation is expected or asked to reveal any information about their respective weapon systems through this work. Consequently, any level of dialog is valuable, including a chance to present this suggestion to CAETS at its October meeting.

A large-scale nuclear war is an existential threat to humanity. Even 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 total number of warheads is estimated at about 13.500 with 1800 at high alert. The United States and Russia have, 90 % of these warheads and also by far the largest number of nuclear weapons systems. Recent developments are alarming. The overall pace of reduction of nuclear weapons globally is slowing and countries in Asia are increasing their warhead inventories. All the nuclear weapon states are modernizing their nuclear forces and adding new types weapons. States are also abandoning nuclear arms control and disarmament treaties and no multilateral negotiations on new ones are in sight. Nuclear weapon states appear committed to retaining nuclear weapons for the foreseeable future.

The nuclear weapons on high alert present an ever-present threat, leaving only minutes to identify false information. A human error, a deliberate cyberattack 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

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

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 cyberattacks.^{2, 3, 4} This is presumably being acted upon, but it is likely that the situation is similar in other nuclear weapon states, in some the vulnerability might be still greater.

A cyberattack 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 cyberattack 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 also a single accidental nuclear weapon explosion will have global dimensions, it is essential to increase understanding among states and other global communities of these risks and of possible measures to mitigate them.

CAETS, as an independent, non-governmental international organization, has as one of its objectives to advise governments and international organizations on technical issues within 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.

IVA therefore proposes that CAETS initiates a process with member academies to explore if and how it may contribute to an increased knowledge on cyber threats to nuclear weapons system. IVA further suggests that CAETS and its member academies explore possible measures that might be taken to reduce the risk that internet and other international networks are used for cyberattacks on nuclear weapon systems. To this end IVA proposes that CAETS establishes a working group to initiate a process addressing these issues by outlining a tentative work plan based entirely on open source information, using CAETS member competence and personal networks. The work is expected to be done digitally rather than through face-to-face meetings. The tentative plan might also suggest how the results of the

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 2018. https://www.nti.org/media/documents/Cyber_report_finalsmall.pdf

process may be presented within the CAETS community and to states and other global communities. IVA finally suggests that a progress report on the process be presented at the CAETS meeting in 2021.

Tuula Teeri, President of IVA

Gösta Lemne, IVA Fellow

Ola Dahlman, Fellow of the Royal Swedish Academy of War Sciences