



Board Members

Officers

President: Manuel Solanet, Argentina (ANI)
 President-Elect: Pascal Viginier, France (NATF)
 Past-President: Oh-Kyong Kwon, Korea (NAEK)
 Secretary/Treasurer: Ruth David, US (NAE)

Directors (2020-2021)

Hideaki Koizumi, Japan (EAJ) Jose Albarran, Mexico (AIM)
 David Thomlinson, UK (RAEng) Peter Mascher, Canada (CAE)

Directors (2021 - 2022)

Rita Hofmann-Sievert, Switzerland (SATW) Nasim Khan, Pakistan (PAE)
 Elisabeth Monard, Belgium (BACAS) Ulrich Wagner, Germany (acatech)

Meeting Agenda

0830	Welcome and Introductions	Manuel Solanet
	1. Action: Approval of Agenda	Ruth David
	2. Action: Approval of Board Minutes of 12 October 2020	Ruth David
	3. Report of the Secretary/Treasurer	Ruth David
	a. Information: 2020 Financial Audit Report	
	b. Information: 2021 Financial Status	
	c. Action: Approval of 2022 Operating Budget	Inadvertently skipped Item 4.
	d. Information: Options for international funds transfers	
	e. Information: 2022 Rotation Schedule	
0900	5. Discussion: Communications Committee	Hugh Bradlow
0915	6. Discussion: Energy	Yves Bamberger
0930	7. Discussion: Engineering Education	Jesse Zhu
0945	8. Discussion: Sustainable Development Goals	David Thomlinson
1000	9. Discussion: Diversity and Inclusion	David Thomlinson
1015	10. Discussion: CAETS Strategy and Operating Guidelines	Tuula Teeri/Ruth David
	Action: Recommendation to Council	
1045	11. Discussion: CAETS Dues Structure	Ruth David
	Action: Initiate ad hoc review	
1100	12. Information: IVA Working Group on Cyber Threats	Gosta Lemne
1120	13. New Business	Manuel Solanet
1130	14. Adjourn	Manuel Solanet



Board Members in Attendance

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)
 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)

Other Attendees

Elin Elliot, Sweden (IVA)	Shinhye Kim, Korea (NAEK)
Wolf Gehrisch, France (NATF)	Kaori Yoneno, Japan (EAJ)
Gosta Lemne, Sweden (IVA)	Doggun Park, Korea (NAEK)
Shane McHugh, UK (RAEng)	Kylie Walker, Australia (ATSE)
ADM Ijioma, Nigeria (NAE)	

Meeting Agenda

Welcome and Introductions

Oh-Kyong Kwon

President Kwon opened the meeting by welcoming all participants and noting that Secretary/Treasurer Ruth David would manage the meeting agenda. He also noted that discussions on the Strategic Plan would be led by Tuula Teeri, and that a proposal from the Communications Committee would be presented by Hugh Bradlow. He then introduced the first agenda item.

1. **Action:** Approval of Agenda Ruth David

The meeting agenda was approved as presented.

2. **Action:** Approval of Board Minutes of 24 June 2019 Ruth David

The minutes from 24 June 2019 were approved as presented.

3. Report of the Secretary/Treasurer Ruth David

a. Information: 2019 Financial Audit Report

The Secretary/Treasurer noted that a copy of the Audited 2019 Financial Statements was provided in the meeting materials. She observed that 2019 Operating Expenses were well below budget but that considerable Reserve Expenses were incurred from the three Visiting Committees that performed due diligence site visits for the membership



applications from New Zealand, Nigeria and Serbia. She also noted that a question had arisen during a pre-audit review of the CAETS financials by the NAE Director of Finance regarding the variation between dues payable and dues received from some member academies.

b. **Action:** Dues Collection Variations

The Treasurer noted that CAETS Revenue Budgets are established annually equal to the total dues payable, but that dues received typically fall short of this amount. Shortages may be attributed to banking fees at the origin and/or intermediary banks, or to currency fluctuations. [No fees are incurred on incoming wire transfers by the CAETS account with Bank of America.] It was also noted that a smaller number of payments received actually exceed the payable amount, likely due to currency fluctuations. Two options were presented: 1) Status quo: Continue to “write-off” shortfalls and absorb excess payments; or 2) Establish a business process to note both shortfalls and excess payments on Dues Paid Receipts, and to adjust the payment due the following year either upward or downward by the amount of the variation. The Board voted to implement option 2; the new process will be documented as an update to CAETS Operating Procedures and implemented beginning with the 2021 dues cycle.

c. Information: 2020 Financial Status

A spreadsheet was provided showing the year-to-date financial status as well as the estimate at completion. The Treasurer noted that Operating Expenses will be well below budget for the year due to the lack of travel, and also that no Reserve Expenses had been incurred since the Visiting Committee meeting for the Irish Academy of Engineering membership application was hosted by IAE via ZOOM.

d. **Action:** Approval of 2021 Operating Budget

The Treasurer noted that 2021 Operating Expenses budgeted fell short of the budgeted Receipts from dues and that excess funds would add to CAETS Reserves. The 2021 Operating Budget was approved as presented.

e. Information: 2021 Rotation Schedule

The 2021 Rotation Schedule was provided for information. It was noted that Denmark opted to defer their Board nominee for the 2021-2022 term and that Switzerland had provided a nomination for that slot. It also was noted that annual meeting hosts had been confirmed for 2023 (Croatia) and 2024 (Finland).

4. Discussion: CAETS Strategic Plan

A discussion draft of the CAETS Strategic Plan was distributed to Board Members in advance of the meeting, with feedback compiled for consideration. During the meeting Tuula Teeri provided a summary of the work to date, which had focused on structuring



CAETS to more effectively execute its plan and achieve CAETS objectives, with lesser emphasis on strategies for membership development. The Board largely endorsed the proposed changes to CAETS Objectives, while recognizing that acceptance would require a change to CAETS Bylaws and full Council approval. Several options for structuring CAETS to more effectively achieve its objectives were discussed, focusing largely on ensuring that committees/working groups are based on strong mutual interests to improve ownership, commitment, engagement and leverage. The need for committed leadership with a multi-year tenure as well as options for Board engagement in driving execution of CAETS strategy were also discussed. A final point of discussion included the need for clear assignment of responsibility for communicating outcomes from working groups/committees. The Board agreed that the presentation to the Council should summarize the key issues and focus on next steps over the coming months which would lay the groundwork for any proposed changes to CAETS Bylaws in 2021.

5. Discussion: Communications Committee Proposal

Hugh Bradlow presented a proposal to establish a CAETS Technology Communications Prize with the dual aim of 1) inspiring students to follow careers in engineering and technological sciences, and 2) to educate the general public on the impact that engineering and technological sciences have in their lives and future. Two prize categories would be established: Engineering Success Stories and High Potential Innovations. An annual process for nominations and judging criteria was defined, culminating in announcement of the winning videos during the CAETS annual meetings. After discussion, the Board endorsed the proposal for presentation to the Council.

6. Discussion: Conduct of Committees/Working Groups

A draft operating procedure for CAETS working groups/committees was provided to the Board in advance of the meeting. The discussion of this topic was brief as the issues raised will be subsumed into further work on the CAETS strategic plan.

7. New Business

a. Cyber Threat to Nuclear Weapons Systems Gosta Lemne

Gosta Lemne, IVA described a proposed working group on Cyber Threats to Nuclear Weapons Systems, to be led by IVA. After discussion, it was agreed that the activity would not be sanctioned by CAETS but that the IVA team could seek the participation of individuals identified via the CAETS member network. The group's work will not be attributed to CAETS.

There was no additional new business.

8. The meeting was adjourned by President Kwon at 1500 (KRT).



CAETS

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

2021 President
Manuel Solanet, ANI, Argentina

2021 President Elect
Pascal Viginier, NATF, France

2021 Past President
Oh-Kyong Kwon, NAEK, Korea

Secretary/Treasurer
Ruth David, NAE, US
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CAETS Records
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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
 - Council of Finnish Academies
 - National Academy of Technologies of France
 - German Academy of Science and Engineering
 - Hungarian Academy of Engineering
 - Indian National Academy of Engineering
 - Irish 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 Manuel Solanet
Academia Nacional de Ingeniería (ANI)
Buenos Aires, Argentina

Dear President Solanet:

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 FY2020, dated 7 March 2021. 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 2020.

Submitted by,

DC Thomlinson 7/12/2021

David Thomlinson Date
RAEng International Secretary

AI Romig 4/25/2021
Date

NAE Executive Director

Mary Kuttruff 4/21/2021
Date
Mary Kuttruff
NAE Financial Officer

CAETS

2020 FINANCIAL SUMMARY

AUDITED

	Fiscal year 2020		1/1/2020 -12/31/2020		
	OPERATIONS				
	FY2018	FY2019	FY2020	FY2020	FY2021
Receipts	actual	actual	actual ¹	budget	budget ³
Dues	80,811.00	81,175.00	90,535.50	84,460.00	87,550.00
Expenses					
Communications	510.79	84.99	74.99	2,500.00	500.00
Equipment	-	-	-	-	
Legal-Prof. Fees	162.00	80.00	13.64	300.00	300.00
Management Fee ²	44,000.00	50,000.00	50,000.00	50,000.00	50,000.00
Meetings	50.71	-	-	300.00	200.00
Postage, Delivery	183.12	-	12.05	200.00	100.00
Printing	-	-	-	360.00	200.00
Supplies	88.73	122.36	139.66	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	50,240.34	84,460.00	82,000.00

¹Budget approved in 2019 did not include dues from 3 new members totaling \$3090; adjusted budget \$87,550. 2020 Dues Receipts were \$87,461.25. Total Receipts included dues in arrears of \$3,074.25. Board approved (12 October 2020) new operating procedure beginning with 2021 invoices to adjust annual payment due for surplus or shortfall in prior year dues payment received.

²Increase recommended by Board and approved by Council September 2018; reviewed annually during budget approval process.

³2021 Budget approved by Board 12 October 2020.

⁴Activities endorsed by Board that are supportive of strategy implementation.

ACTIVITIES AND CHANGES IN RESERVE FUNDS

Balance From 12/31/2019		263,253.52
Revenue		
Dues Received	90,535.50	
Reserve Fund Contributions	-	
	<u>90,535.50</u>	
Expenses		
Operating Expenses	50,240.34	
Reserve Fund Expenses		
	<u>50,240.34</u>	
Balance 12/31/2020		<u>40,295.16</u> 303,548.68

Statement of Financial Position
12/31/2020

ASSETS

Bank of America Account Balance 12/31/20 314,439.37

Total Assets **314,439.37**

LIABILITIES

Deferred Revenue from Prepaid Dues 10,363.00

Checks Issued but Not Cleared -

Due to Secretary/Treasurer (2019) 287.35

Due to Secretary/Treasurer (2020) 240.34

Total Liabilities **10,890.69**

NET ASSETS **303,548.68**

Total Liabilities and Net Assets **314,439.37**

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		<u>263,253.52</u>

Statement of Financial Position
12/31/2019

ASSETS

Bank of America Account Balance 12/31/19 273,774.87**Total Assets** **273,774.87**

LIABILITIES

Deferred Revenue from Prepaid Dues 10,234.00

Checks Issued but Not Cleared -

Due to Secretary/Treasurer 287.35

On Account for Members -**Total Liabilities** **10,521.35****NET ASSETS** **263,253.52****Total Liabilities and Net Assets** **273,774.87**

2021 Financial Status

	FY2019	FY2020	FY2021 ¹	FY2021	FY2021
	actual	actual	budget	YTD ³	EAC
Receipts					
Dues ³	81,175.00	90,535.50	87,550.00	80,326.25	88,566.25
Expenses					
Communications		-			
Website	84.99	74.99	500.00		200.00
Equipment		-			
Legal-Prof. Fees	80.00	13.64	300.00	293.64	300.00
Management Fee	50,000.00	50,000.00	50,000.00	25,000.00	50,000.00
Meetings		-	200.00		
Postage, Delivery		12.05	100.00		40.00
Printing		-	200.00		
Supplies	122.36	139.66	200.00		100.00
Travel	18,268.79	-	25,000.00		
Strategy Implementation ²		-	5,500.00		
Total Expenses	68,556.14	50,240.34	82,000.00	25,293.64	50,640.00

¹2021 Budget approved by Board during 2020 Annual Meetings.

²Activities endorsed by Board that are in support of implementation of CAETS Strategy.

³YTD receipts are below budget as 3 academies have not yet paid 2021 dues; EAC assumes payment in full as well as additional dues from new member academy not included in budget.

2022 Operating Budget

	FY2019	FY2020	FY2021	PROPOSED FY2022
Receipts	actual	actual	budget	budget
Dues	81,175.00	90,535.50	87,550.00	88,580.00
Expenses				
Communications		-		500.00
Website	84.99	74.99	500.00	1,000.00
Equipment		-		
Legal-Prof. Fees	80.00	13.64	300.00	300.00
Management Fee	50,000.00	50,000.00	50,000.00	50,000.00
Meetings		-	200.00	100.00
Postage, Delivery		12.05	100.00	100.00
Printing		-	200.00	200.00
Supplies	122.36	139.66	200.00	150.00
Travel	18,268.79	-	25,000.00	25,000.00
Strategy Implementation		-	5,500.00	5,000.00
Total Expenses	68,556.14	50,240.34	82,000.00	82,350.00

3.d Options for International Funds Transfers

Options (investigated) for International Funds Transfers

1. Bank of America – Credit Card Processing
 - Bank of America Merchant Services: monthly fees, payment gateway fees, plus transaction fees (at least 3.5% plus \$0.15 on “card-not-present” transactions). Customer reviews are negative due to high fees and lack of transparency.
2. PayPal Business Account – Payments via PayPal/Credit Card
 - Domestic fee is 3.5%; international fee is additional 1.5% plus fixed fee based on currency used. Coverage includes 200 countries and 25 currencies; does include all CAETS member countries.
3. GooglePay
 - Provides a window to either Western Union or Wise for sending money internationally.
4. Western Union
 - Variable transfer fees plus variable markups on exchange rates (up to 6%); all member countries supported but service options vary.
5. Wise (Formerly TransferWise)
 - Fees are relatively low and transparent; does not make money by marking up exchange rate. Available to roughly half of CAETS member countries for sending payments.
6. Global Reach
 - UK-based. Not available in the US, but you can transfer money to the US from other countries. Doesn't process transfers below 1,000 British Pounds; eliminates all academies at \$1,030 level.
7. PaySend
 - Scotland-based. Supports only 48 sending countries; does not include all member academies.
8. XE Money Transfer
 - Does not support credit card payments. No transfer fees; makes its margin from exchange rates; processed via SWIFT network so banks at either end charge a fee when you fund with a bank transfer. (Likely the same as current wire transfer process which uses the SWIFT network.)

CAETS Rotation Schedule - 2022

Member Academy	Date Elected	Annual Meeting Host	Officer			Board			
			President Elect	President	Past President	Board	2021	2022	2023
Argentina (ANI)	1999	2021	2020	2021	2022	<i>2020</i>	Manuel A. Solanet	Manuel A. Solanet	
France (NATF)	1989	2022	2021	2022	2023	<i>2021</i>	Pascal Viginier	Pascal Viginier	Pascal Viginier
Croatia (HATZ)	2000	2023	2022	2023	2024	2017		Neven Duic	Neven Duic
Finland (TAF)	1989	2024	2023	2024	2025	2020			<i>President-Elect</i>
Czech Republic (EA CR)	1999	2025	2024	2025	2026	<i>2015</i>			
USA (NAE)	1978 (F)	2026	2025	2026	2027	2019			
Norway (NTVA)	1990	2027	2026	2027	2028	<i>2015</i>		Torbjorn Digernes	Torbjorn Digernes
Germany (acatech)	2005					2022	Ulrich Wagner	Ulrich Wagner	
Australia (ATSE)	1978 (F)	<i>2005</i>				2020			
Belgium (BACAS)	1990	<i>2006</i>				2022	Elisabeth Monard	Elisabeth Monard	
Japan (EAJ)	1990	<i>2007</i>				2021	Hideaki Koizumi		
Netherlands (AcTI.nl)	1993	<i>2008</i>				2019			<i>Board</i>
Slovenia (IAS)	2000					2019			
South Africa (SAAE)	2009					2017		Bob Pullen	Bob Pullen
Canada (CAE)	1991	2009				2021	Peter Mascher		
Denmark (ATV)	1987	2010				2016		Nils O. Andersen	Nils O. Andersen
Mexico (AI)	1978 (F)	2011				2021	Jose Albarran		
Switzerland (SATW)	1988	2012				2022	Rita Hofmann	Rita Hofmann	
Hungary (HAE)	1995	2013				2019			<i>Board</i>
China (CAE)	1997	2014				2020			
India (INAE)	1999	2015				2020			
United Kingdom (RAEng)	1978 (F)	2016			2017	2021	David Thomlinson		
Spain (RAI)	1999	2017	<i>2016</i>	2017	2018	2018			<i>Board</i>
Pakistan (PAE)	2018					2022	Nasim A. Khan	Nasim A. Khan	
Uruguay (ANIU)	2000	2018	2017	2018	2019	2019			
New Zealand	2019							Geoff Chase	Geoff Chase
Serbia (AESS)	2019								<i>Board</i>
Nigeria (NAE)	2019								
Sweden (IVA)	1978 (F)	2019	2018	2019	2020	2020			
Ireland (IAE)	2020								
Korea (NAEK)	2000	2020	2019	2020	2021	2021	Prof. Kwon Oh-Kyong		

Board Discussion with Chairs of Committees/Working Groups

5. Committee – Hugh Bradlow, ATSE

6. Engineering Education WG – Jesse Zhu, CAE

7. Sustainable Development Goals WG – David Thomlinson, RAEng

8. Diversity and Inclusion WG – David Thomlinson, RAEng

9. Energy WG – Yves Bamberger, NATF (materials provided)

Maximizing CAETS output to serve its objectives

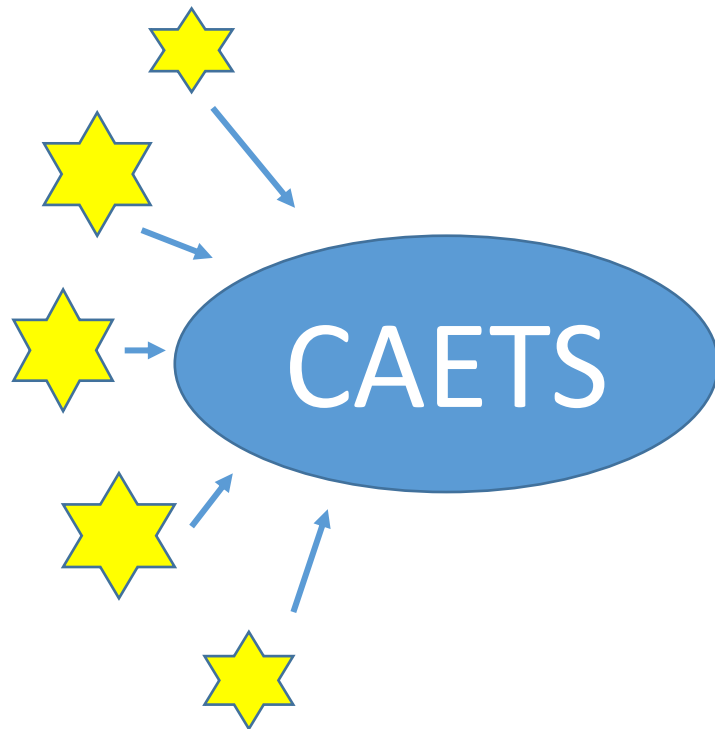
Yves BAMBERGER

CAETS Energy committee chairman

Former chairman of NATAF's Works committee

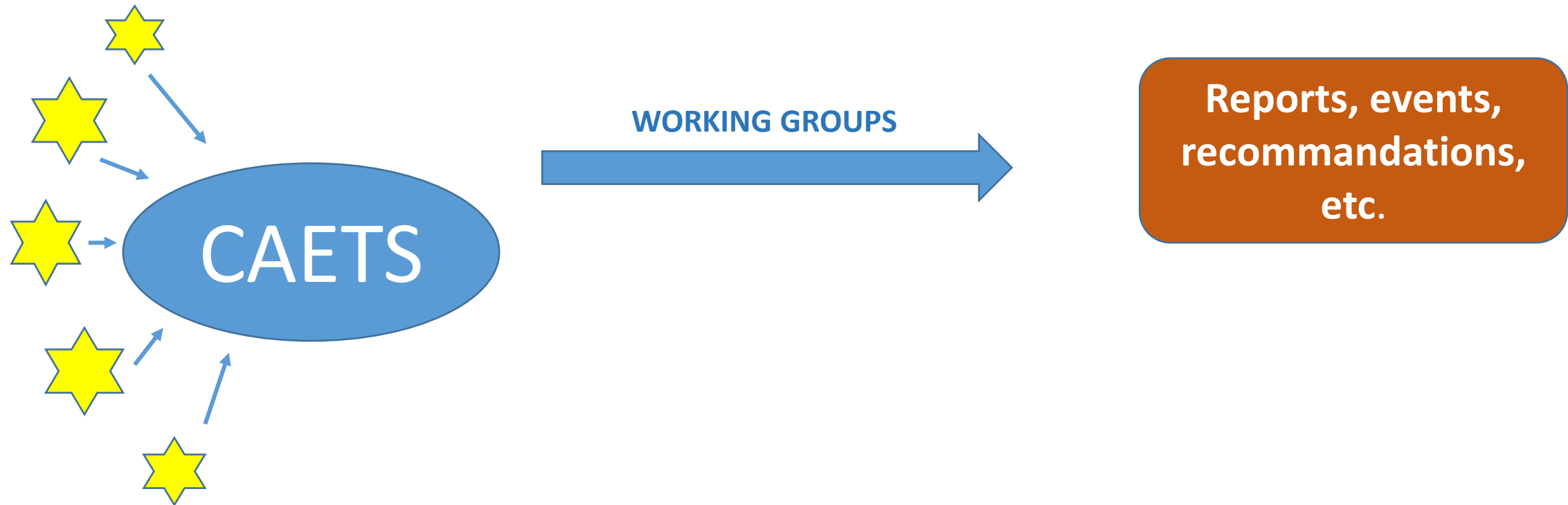


HOW to MAXIMIZE CAETS OUTPUT?

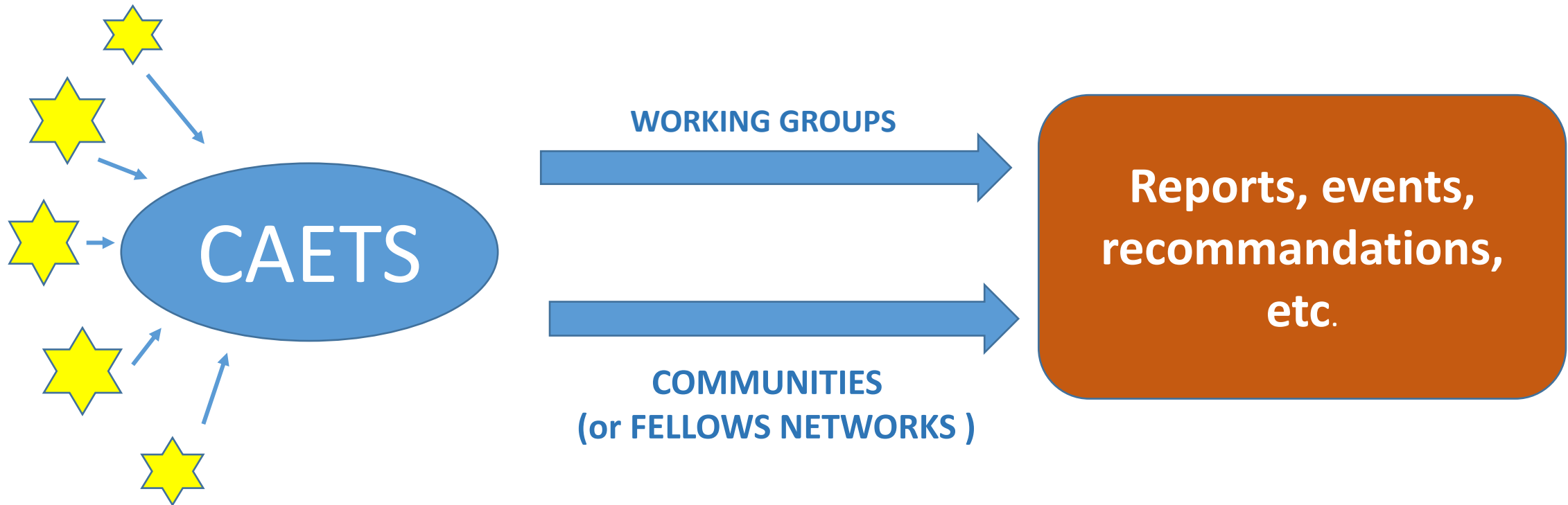


**Reports, events,
recommandations,
etc.**

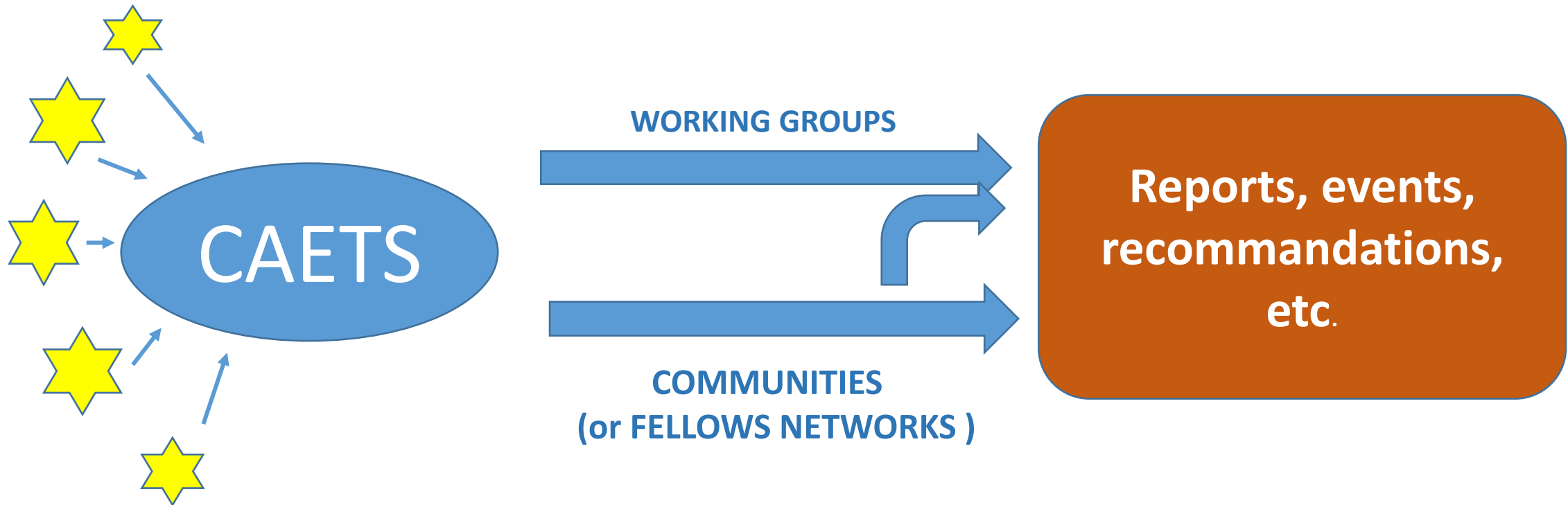
HOW to MAXIMIZE CAETS OUTPUT?



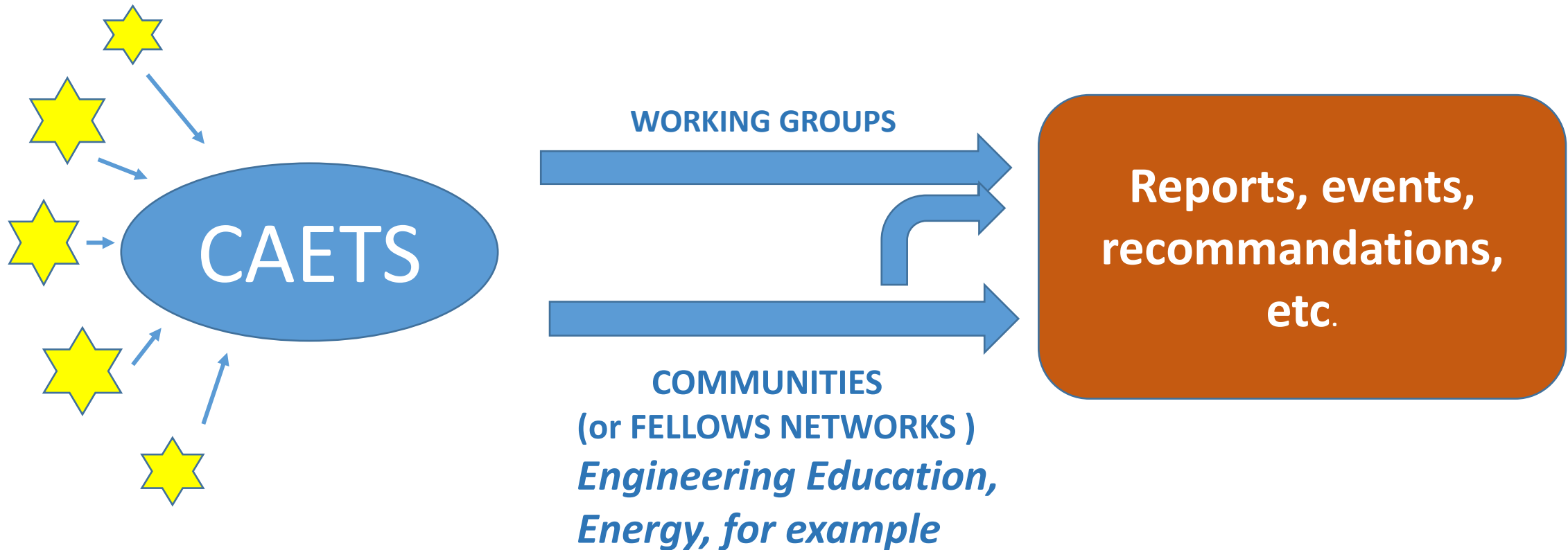
HOW to MAXIMIZE CAETS OUTPUT?



HOW to MAXIMIZE CAETS OUTPUT?



HOW to MAXIMIZE CAETS OUTPUT?





CAETS BM 20 sept 2021

Discussion: CAETS Strategy and Operating Guidelines Tuula Teeri/Ruth David

Action: Recommendation to Council

Background

During the CAETS Board meeting on 24 June **2019**, a small group of individuals was appointed 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 (Strategy 2026)**.

*The intent was to have a draft plan reviewed by the Council July/August 2020 and a final plan presented for concurrence at the CAETS annual meeting in October 2020, BUT, with Covic-19, we are delayed and wish to decide on the plans this week with the **CAETS Board (20 sept)** and **Council (24 sept)**.*

Actions taken:

- 1. Amendment/updating CAETS bylaws** – presented for the CAETS BM today
- 2. Membership Development** – presented for the CAETS BM today
- 3. CAETS Strategy/ GOALS 2026 – proposed for the CAETS BM today for discussion/endorsement as aspirational goals (*desired end-states*) for the period of 2021-2016**
 - leaning on the CAETS' Mission and Objectives/Bylaws, incorporated to CAETS Operating guidelines
 - suggested as a way to **focus CAETS strategies and sharpen its communications both internally and externally.**

Goal 1. Engineering and technology development are recognized as engines of economic growth, sustainable development, and societal well-being throughout the world.

Goal 2. CAETS' strong international network of engineering academies gives collective voice to its mission,

- **Annual meeting agenda**
 - Focusing on issues of global/regional interest on economic, growth, sustainable development, societal implications ...
 - Engage international speakers broadly, both from CAETS member academies and other relevant organisations including industry
- **CAETS statement**, post Technical Symposium/Annual Meeting/Convocation
 - Summarize the outcomes of the Annual convocation/Technical Symposium into a collective CAETS statement that is communicated broadly
- **Reports/statements from the Working groups** – as in CAETS statements
- **Standing Communications Committee**
 - Derive, synthesize and distribute key messages from working groups and Annual Convocations (in different formats, to relevant national and international organizations)

Goal 3. CAETS' initiatives strengthen the global engineering profession and its pipeline

CAETS Strategy and Operating Guidelines – Recommendations to Council

Bylaws Amendments: ARTICLE 2, 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. Both annual meetings and special meetings of the Council may be held via teleconference or video conference provided all persons can hear *[and see]* each other and the means exist to attribute member votes. Council votes may also be conducted via email provided that all members give 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 Council 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 Council shall be necessary for action by mail vote. 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.

Question: Shall we exclude participation by telephone?

Additional Feedback Received:

Operating Guidelines Section 1 – Annual Meeting Host

“The member academy providing the CAETS President for the year normally hosts the Convocation/Symposium¹ together with the annual meetings of the Board and Council. Preliminary operating guidelines for the Annual Meeting Host are provided below.”

A member academy recommends making it clear that the designated host academy is expected to select a theme that addresses global/regional challenges/opportunities and to recruit a broad spectrum of speakers from relevant countries and member academies in order to leverage the unique strengths of CAETS.

Suggested language: The member academy providing the CAETS President for the year normally hosts the Convocation/Symposium together with the annual meetings of the Board and Council. **In order to leverage the international character of CAETS, the host academy should select a theme for the technical session that addresses global or regional challenges and opportunities and recruit a broad spectrum of speakers from relevant countries and member academies.** Preliminary operating guidelines for the Annual Meeting Host are provided below.

¹ Convocation/Symposium: CAETS lexicon specifies Symposium for a 1-day event and Convocation for a longer event.

Operating Guidelines Section 5 – Working Groups

“f) Meetings – Meeting frequency will be established annually by Working Group leadership. Quarterly virtual meetings, at a minimum, are encouraged as a means to maintain engagement and momentum. Additional meetings may be scheduled throughout the year as needed to respond to time-sensitive matters or additional workload.”

One academy suggested reduction of minimum meeting frequency to 3 meetings/year due to concern regarding ability to prepare high-quality meetings.

Suggested language: f) Meetings – Meeting frequency will be established annually by Working Group leadership. Virtual meetings every 3-4 months are encouraged as a means to maintain engagement and momentum. Additional meetings may be scheduled throughout the year as needed to respond to time-sensitive matters or additional workload.

Operating Guidelines Section 5 – Working Groups

“i) Termination – A CAETS Working Group may be terminated upon the recommendation of its leadership, in the event that new leadership cannot be recruited, if active participation falls below 25% [*Member suggests 5-academy minimum*] of CAETS member academies, or by decision of a majority of the Board based on a review of activities.”

25% would round to 8 of 31 member academies as active participants;

5 member academies would be 16%.

What % is reasonable for an activity to be considered CAETS-sponsored?

Operating Guidelines Section 6 – Other Activities

a) The proposing academy shall submit to the Secretariat, at least six months in advance, a description of the activity including purpose, format, anticipated participation, and projected impact relating to CAETS Objectives. The proposal must include endorsements by at least 25% *[or 5]* of CAETS member academies and must not be dependent upon CAETS funding.

25% would round to 8 of 31 member academies as active participants; 5 member academies would be 16%.

What % is reasonable for an activity to be considered CAETS-sponsored?

As this is envisioned as a one-time event/project vs. an ongoing Working Group, would a lower percentage of participation be beneficial?

Operating Guidelines Section 9 – Secretariat

f) Website

v)The Secretariat will routinely solicit CAETS members for featured content stemming from their individual (or collaborative) activities.

A member academy recommended that the Secretariat take additional measures to host and/or link to reports and other publications developed by member academies.

Suggested change:

v) The Secretariat will routinely solicit CAETS members for featured content stemming from their individual (or collaborative) activities. Additionally, a semi-annual call for reports and publications will be initiated.

Review of CAETS Dues Structure

Background: The 3-tiered structure (\$1,000, \$3,000, \$6,000) was adopted in 2005. An ad hoc process was established to encourage academies at the \$1,000 level to transition to \$2,000 and then \$3,000; success was limited. In 2018 a 3% increase for each tier was approved by the Council. At present there are effectively 4 tiers: \$1,030; \$2,060; \$3,090; \$6,180.

Per CAETS Strategy, the Board is charged with: “Review Dues Structure every 5 years to ensure equity across members and facilitate member development. Recommend changes to Council if needed.”

The summary timeline States as a 2021 action item: “Initiate review of Dues Structure (Board).”

Suggested membership:

Founding Member Academy to Chair

United States (NAE)

Australia (ATSE)

Mexico (AIM)

United Kingdom (RAEng)

Sweden (IVA)

1 Member Academy from each tier:

\$6,180 (6)	\$3,090 (11)	\$2,060 (3)	\$1,030 (11)
Australia	Canada	Belgium	Argentina
China	Denmark	Netherlands	Croatia
India	Finland	Uruguay	Czech Republic
Japan	France		Hungary
United Kingdom	Germany		Ireland
United States	Korea		New Zealand
	Mexico		Nigeria
	Norway		Pakistan
	Spain		Serbia
	Sweden		Slovenia
	Switzerland		South Africa

Proposed Action: Approve initiation of review; select membership of ad hoc committee to evaluate (Secretariat to support) and report to Board 2 months prior to 2022 Annual Meeting. Suggest identification of primary and backup in case primary declines to participate.



Royal Swedish Academy of
Engineering Sciences

Introduction: Gosta Lemne

Presentation: Pontus Johnson, IVA Fellow

Prof. of Network and Systems Engineering

KTH Royal Institute of Technology

25 August 2021

Addressing Cyber Threats to Nuclear Weapons Systems

The Royal Swedish Academy of Engineering Sciences (IVA) has made a technical assessment, based on openly available information of cyber threats to nuclear weapon systems. IVA sees an important role for academies to inform and educate decision makers and the science and technology communities on cyber threats to nuclear weapons system. IVA therefore invites fellow academies to join this activity to explore possible measures that might be taken to reduce the risk that internet and other international networks are used for cyber attacks on nuclear weapon systems.

A nuclear war is an existential threat to humanity. Even single nuclear explosions would be 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, some of them on high alert, presenting an immediate and ever-present threat. Several 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.^{1,2}

A working group within the IVA has made a technical assessment, based on openly available information of cyber threats to nuclear weapon systems, and has arrived at the following conclusions.

By their very size and complexity, any large-scale information and control systems, including military systems, are inherently unsafe.³

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

² Eric Schlosser, *Command and Control*, Penguin Books, ISBN978-0-141-03791-2

³ Jeffrey Larsen, *Nuclear Command, Control, and Communications*; US Country Profile, Nautilus Institute August 22, 2019, <https://nautilus.org/napsnet/napsnet-special-reports/nuclear-command-control-and-communications-us-country-profile/>



Cyber attacks on such systems in our societies are increasing. Several US studies have found that US military systems, including nuclear weapons systems, are vulnerable to outside interference, including cyber attacks.^{4,5,6,7,8,9}

It is likely that the situation is similar in other nuclear weapon states. The ongoing modernisation of the nuclear weapon systems globally is a particularly threatening development. The modernised nuclear weapon systems will use commercially available information technology and be closely integrated, and share some components, with non-nuclear weapon systems. These developments will increase the vulnerability of the nuclear weapon systems from actors inside and outside the system.¹⁰

A cyber attack may 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. Malicious code introduced into a nuclear weapon system may be a further threat, by damaging different stakeholders' 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, since even a single accidental nuclear weapon explosion will have disastrous consequences of global dimensions, it is essential to increase understanding among states, and in the global community, of these risks and of possible measures to mitigate them.

IVA sees an important role for academies to inform and educate decision makers and the science and technology communities on cyber threats to nuclear weapons system. IVA has thus decided to broaden its activity and reach out internationally to academies and experts. IVA therefore invites fellow academies to join this activity to explore possible measures that might

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

⁵ Futter, Andrew (2016), *Cyber Threats and Nuclear Weapons. New Questions for Command and Control, Security and Strategy*. Royal United Services Institute for Defence and Security Studies.

⁶ Futter, Andrew (2018) *Hacking the Bomb: Cyber Threats and Nuclear Weapons*. Georgetown University Press, ISBN 9781626165656

⁷ *Weapon 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>

⁸ *Resilient Military Systems and Advanced Cyber Threat*. Task Force Report. US Department of Defense.

<https://nsarchive2.gwu.edu/NSAEBB/NSAEBB424/docs/Cyber-081.pdf>

⁹ Rolf Mowatt-Larssen.(2009) *Nuclear Security in Pakistan: Reducing the Risks of Nuclear Terrorism*. *Arms Control Today*. Volume 39: July/August 2009. <https://www.armscontrol.org/act/2009-07/features/nuclear-security-pakistan-reducing-risks-nuclear-terrorism#bio>

¹⁰ ODASD(NM), (2020) *The Nuclear Matters Handbook 2020, The Office of the Deputy Assistant Secretary of Defense for Nuclear Matters* (ODASD(NM)) <https://fas.org/man/eprint/nmhb2020.pdf>



Royal Swedish Academy of
Engineering Sciences

be taken to reduce the risk that internet and other international networks are used for cyber attacks on nuclear weapon systems.

