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4. TITLE AND SUBTITLE Final Report: Understanding China's Efforts to Becoming a Global Defense Science, Technology, and Innovation Leader: Research Area 8.5 Social and Behavioral Sciences.	5a. CONTRACT NUMBER W911NF-15-1-0407
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER 106011

6. AUTHORS	5d. PROJECT NUMBER
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7. PERFORMING ORGANIZATION NAMES AND ADDRESSES University of California - San Diego Office of Contract & Grant Adm 9500 Gilman drive, MC 0934 La Jolla, CA 92093 -0934	8. PERFORMING ORGANIZATION REPORT NUMBER
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13. SUPPLEMENTARY NOTES The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Tai Ming Cheung
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU			19b. TELEPHONE NUMBER 858-534-6894

RPPR Final Report
as of 15-Apr-2019

Agency Code:

Proposal Number: 66748LS

Agreement Number: W911NF-15-1-0407

INVESTIGATOR(S):

Name: Tai Ming Cheung
Email: tcheung@ucsd.edu
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Principal: Y

Organization: **University of California - San Diego**

Address: Office of Contract & Grant Adm, La Jolla, CA 920930934

Country: USA

DUNS Number: 804355790

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Report Date: 26-Feb-2019

Date Received: 12-Apr-2019

Final Report for Period Beginning 27-Jul-2015 and Ending 26-Nov-2018

Title: Understanding China's Efforts to Becoming a Global Defense Science, Technology, and Innovation Leader: Research Area 8.5 Social and Behavioral Sciences.

Begin Performance Period: 27-Jul-2015

End Performance Period: 26-Nov-2018

Report Term: 0-Other

Submitted By: Marie Stewart

Email: mthiveos@ucsd.edu

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees:

STEM Participants:

Major Goals: This project builds on work conducted by the University of California Institute on Global Conflict and Cooperation through its Study of Innovation and Technology in China (SITC) project, which examines how China is making concerted progress toward becoming an advanced national and defense science, technology, and innovation power; the lessons that can be applied in the study of defense innovation in other rising and near-peer countries; and the strategic implications for the United States and the balance of power in the Asia-Pacific region and globally. The project originally consisted of three sub-projects: 1) China's Defense Research, Development, and Acquisition System; 2) Annual Review of China's Defense Industrial Base; and 3) Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers. However, as funding was cut for Year 3 of the project, we were unable to pursue the sub-project on China's defense research, development, and acquisition system.

The following are the major goals of each sub-project.

Project 1: Annual Review of China's Defense Industrial Base: This project was adjusted to focus on US-China Strategic Competition in Defense Technological and Industrial Development. It considers how both the United States and China have been actively engaged in formulating plans and promoting programs to boost their long-term defense and strategic technological and innovation capabilities, taking into consideration the drivers, dynamics, trends, and implications of these developments. Analysis focuses on topics such as how the US Third Offset Strategy is being implemented and perceived by other countries; Chinese development strategies; frameworks for examining long-term strategic competition between major powers; Sino-American competition; long-term defense budget trends; and sectors such as artificial intelligence, emerging technologies, aviation, missiles, space, and counterspace.

Project 2: Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers (Years 2?3): China has been successful at using a top-down, technonationalist model to rapidly modernize its military, but other paths to military modernization for developing countries may exist that are more efficient or better suited to local circumstances. This project seeks to apply the lessons learned from the study of China's defense technological and industrial renaissance to develop a more generalizable analytical framework to provide more nuanced and robust indicators and explanations as to why, how, and when catch-up countries decide to develop indigenous or joint defense technological and industrial capabilities.

Accomplishments: Please see attached PDF.

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Training Opportunities: A Study of Innovation and Technology in China training workshop was held July 21 – 28, 2016. It provided training to 29 participants, including DoD affiliated specialists, other government specialists, academic and other non-government organization specialists, and PhD students. Participants from defense-related agencies based in the U.K., France, and Japan also participated. Participants receiving support were recruited in consultation with the DoD Minerva Research Initiative. The cohort of participants provided a unique blend of expertise that enriched the outcome of discussions. Sessions focused on the examination of the relationship between national security, technology, innovation, and China's rise as a world power. Of central interest was the question of how China is mobilizing and applying its economic, political, strategic, corporate, financial, intellectual, and scientific capabilities in conjunction with leveraging external resources to achieve its grand ambition of catching up technologically with the world's advanced military powers. Participants also attended the "U.S.-China Strategic Competition in Defense Technological and Industrial Development" conference July 26-28, as a part of the workshop curriculum. Topics addressed included the following:

1. Bitzinger, Richard. "Regional Responses and Perspectives to China's Defense Science and Technological Development."
2. Cheung, Tai Ming. "Making and Implementing Chinese Military Long-Term Armament Development Strategies and Plans."
3. Cheung, Tai Ming. "Reforming China's National and Defense S&T Systems to Engage in Higher-End Innovation."
4. Cheung, Tai Ming. "The Changing Innovation Dynamics of Chinese Airpower."
5. Cheung, Tai Ming. "The Development of the Defense Economy from Mao Zedong to Hu Jintao (1950's – Early 2010s)."
6. Cheung, Tai Ming. "The Funding of China's Defense Science, Technology, and Industrial System and the Transformation of its Defense Corporations."
7. Cheung, Tai Ming. "The Impact of Corruption and Structural Impediments on China's Defense Science, Technology, and Innovation System."
8. Cheung, Tai Ming. "The Importance of Absorption and Foreign Technology in China's Defense S&T Development."
9. Cheung, Tai Ming. "The Innovation Dynamics of China's High Performance Computing System."
10. Cheung, Tai Ming. "The Leadership and Organizational Structures of the Chinese Civilian and Defense S&T System."
11. Cheung, Tai Ming. "The Place of Science and Technology in Chinese Thinking on Security and Development: Techno-Nationalism and Chinese Approaches to Technological Innovation."
12. Cheung, Tai Ming. "The Structure and Process of China's Approach to Defense Research, Development, and Acquisition."
13. Cheung, Tai Ming. "The Study of Innovation and Chinese Defense Innovation."
14. Cheung, Tai Ming. "Xi Jinping and the Restructuring of the PLA High Command and the Implications for the Defense Science and Technology System."
15. Kashin, Vasily. "China-Russia Defense Technological and Industrial Cooperation."
16. Mahnken, Thomas. "Competitive Strategies: Theory, Practice, and the Case of the U.S. Versus China."
17. Pollpeter, Kevin. "Technological Innovation in the Chinese Space Industry."

A training workshop on the Study of Chinese Security and Technology was held from April 30 – May 2, 2018 at the UC Washington Center. It provided training to eleven participants, including DoD affiliated specialists, other government specialists, academics, and other non-government organization specialists. The cohort of participants provided a unique blend of expertise that enriched the outcomes of the discussions.

Sessions focused on examining the relationship between national security, defense modernization, technology, innovation, and China's rise as a world power. Of central interest was how China is mobilizing and applying its economic, political, strategic, corporate, financial, intellectual, and scientific capabilities in conjunction with leveraging external resources to achieve its grand ambition of catching up technologically with the world's advanced military powers. Participants also attended the "Comparing Defense Innovation in Advanced and Catch-up Countries" conference on May 13, 2018. Topics addressed at the training included the following:

1. "Overview of China's Defense Science, Technology, and Industrial Establishment and Analytical Frameworks for Understanding Chinese Defense Innovation."
2. "The Leadership and Organizational Structure of the Chinese Defense Science, Technology, and Innovation System."
3. "Chinese Grand Strategic Thinking on Innovation, Security and Development."
4. "How China Formulates and Implements its Long-Term Weapons Development Strategies and Plans."
5. "The Chinese Defense Research, Development, and Acquisition System."
6. "The Importance of Absorption and Foreign Technology in China's Defense Science and Technology"

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Development.”

7. “Money, Markets, and Monopolies: The Corporate and Financial Dimensions of China’s Defense Science, Technology, and Innovation System.”
8. “Changing Innovation Dynamics of Chinese Airpower and the Chinese Aviation Industry.”
9. “The China-Russia Defense Technology Relationship.”
10. “Obstacles and Weaknesses in China’s Defense Science, Technology, and Industrial System.”
11. “Chinese Civilian and Defense Approaches to Artificial Intelligence.”
12. “Intensifying U.S.-China Military Technological Competition.”

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Results Dissemination: Outreach was conducted throughout the project through multiple IGCC events, including:

1. “Change and Continuity in Chinese Defense Science, Technology, and Innovation and the Chinese High Command and Defense Policy-Making System: Research Insights from the Project on the Study of Innovation and Technology,” March 16, 2016.
2. “Summer 2016 Training Workshop on the Study of Chinese Security and Technology,” July 21 – 28, 2016.
3. Conference on, “U.S.-China Strategic Competition in Defense Technological and Industrial Development,” July 27 – 28, 2016.
4. “U.S.- China Strategic Competition in Defense Technological and Industrial Development,” February 22, 2017.
5. “Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers,” December 12 – 13, 2017.
6. “Training Workshop on the Study of Chinese Security and Technology,” April 30 – May 2, 2018.
7. Workshop on, “Comparing Defense Innovation in Advanced and Catch-up Countries,” May 3, 2018.
8. Workshop on, “The Current State and Long-Term Prospects for China’s Defense and Strategic Technological Development,” September 3, 2018.

In addition, a number of presentations were made as follows:

1. Tai Ming Cheung, “Innovation in China’s Defense Technology Base: Foreign Technology and Military Capabilities,” paper presented at the conference on “Reshaping the People’s Liberation Army Since the 18th Party Congress,” October 12, 2015, RSIS, Nanyang Technological University, Singapore.
2. Tai Ming Cheung: “Making and Implementing Chinese Military Armament Development Strategies and Plans,” Pentagon briefing, Washington, D.C., January 19, 2016.
3. Tai Ming Cheung, “The Restructuring of China’s Military High Command and Implications for Armaments Research, Development, and Acquisition,” Pentagon briefing, Washington D.C., January 19, 2016.
4. Tai Ming Cheung, “How Innovative is the China’s Defense Science and Technology System,” Pacific Operational Science & Technology Conference, PACOM, March 3, 2016.
5. Tai Ming Cheung: “The Restructuring of China’s High Command and the Implications for its Defense Science and Technology System,” PACOM, March 4, 2016.
6. Tai Ming Cheung, “Remaking the Chinese Defense Science, Technology, and Innovation System Under Xi Jinping,” briefing to the U.K. Ministry of Defense, London, April 11, 2016.
7. Tai Ming Cheung, “21st Century Great Power Arms Competition: Towards a New Type of Cold War?” presentation to the Second Gulf Strategic Conference, Bahrain, May 22-23, 2016.
8. Tai Ming Cheung, “How Innovative is China’s Defense Science and Technology System,” Presentation at Lawrence Livermore National Laboratory, Livermore, CA, June 8, 2016.
9. Tai Ming Cheung, “Making and Implementing Chinese Military Long-Term Armament Development Strategies and Plans,” presentation to the U.S. Navy 3rd Fleet Commander, San Diego, June 16, 2016.
10. Tai Ming Cheung: “The Changing Innovation Dynamics of Chinese Airpower,” presentation at the Republic of Korea Air Force/Yonsei University 19th Air and Space Power Conference, Seoul, South Korea, June 28, 2016.
11. Tai Ming Cheung: “Chinese Airpower and Innovation: The Rise of a Regional Challenger,” Royal Air Force Air Power Conference 2016, July 6-7, 2016, London, U.K.
12. November 18–19, 2016, Paper and Presentation to the RAND-CAPS Conference, Washington, DC: “Keeping Up with the Jundui: Reforming China’s Defense Acquisition, Technology, and Industrial System to Engage in Advanced Innovation.”
13. January 6, 2017, Presentation to Assistant Secretary of Defense for Research and Engineering Steven Welby, U.S. Defense Department, Washington, DC: “Assessing the Dynamics of China’s Intensifying Push for Defense Science and Technology Innovation.”
14. February 15, 2017, Presentation to the National Institute for Defense Studies, Tokyo: “Assessing the Dynamics of China’s Intensifying Push for Defense Science and Technology Innovation.”
15. February 21, 2017, Presentation to the Long-Term Strategy Program, National Defense University, Washington, DC: “Assessing the Dynamics of China’s Intensifying Push for Defense Science and Technology Innovation.”
16. February 21, 2017, Presentation to James Baker, Director, Office of Net Assessment, Pentagon: “Assessing the Dynamics of China’s Intensifying Push for Defense Science and Technology Innovation.”
17. March 29–31, 2017, Organizer of Workshop on Chinese Defense Science, Technology, and Innovation, UK Ministry of Defense.
18. May 31–June 2, 2017, Presentation at the Ruger Workshop on the 2017 Defense Industrial Base, Naval War College, Newport, Rhode Island: “Great Power Rivalry and Intensifying Military Technological Competition: Examining the U.S.–China Relationship.”
19. June 8–9, 2017, Presentation to the Japan-Europe Dialogue on Investment and Security, Berlin, Germany: “Chinese Outbound Foreign Direct Investment and the Impact on its Defense Science, Technology, and

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Innovation.”

20. July 14, 2017, Presentation to the Security and Export Control Policy Division, Trade and Economic Cooperation Bureau, Japanese Ministry of Economy, Trade and Industry, Tokyo: “The Current State of the Chinese Defense Industry and Reform Prospects.”
21. July 18, 2017, Panelist on the Workshop on Chinese Investment in Critical U.S. Technology: Risks to U.S. Security Interests, Council on Foreign Relations, San Francisco.
22. December 12 – 13, 2017, Organizer and Presenter at the Workshop on Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers, La Jolla, CA.
23. February 19, 2018, Presentation at Grands Enjeux Strategiques, Université Paris I Panthéon Sorbonne, Paris, France: “China’s Rise as a Global Military Technological Power: Geo-Strategic and Geo-Economic Implications.”
24. February 13, 2018, Presentation to the International Institute for Strategic Studies, London, United Kingdom: “The Chinese Defense Economy’s Accelerating Innovation Trajectory in Xi Jinping’s Second Term: Goals, Drivers, and Implications.”
25. February 8-9, 2018, Presentation, Washington, DC: Geo-Economic Implications of the Rise of China’s Techno-Security Base -New Approaches to Reviewing and Regulating Chinese High-Tech Investment: Prospects for Coordination?” UCSD Workshop in Collaboration with the MERICS institute.
26. May 3, 2018, Organizer and Presenter at the Workshop on Comparative Defense Innovation, Washington, DC.
27. May 22, 2018, Presentation at Airbus, Brussels, Belgium: “Assessing China’s Rise as an Innovative Science and Technology Power.”
28. July 13, 2018, Presentation at the Nixon Library, Yorba Linda, CA: “Intensifying U.S.-China Military Technological Competition.”
29. July 23, 2018, Presentation at the Centre for China Analysis and Strategy, New Delhi, India: “Overview of China’s Defense Science, Technology, and Industrial Establishment and Frameworks for Understanding Chinese Defense Innovation.”
30. July 23, 2018, Presentation at the Centre for China Analysis and Strategy, New Delhi, India: “Evolving Chinese Grand Strategic Thinking on Innovation, National Security and Development.”
31. July 24, 2018, Presentation at the Institute for Defense Studies and Analyses, New Delhi, India: “The Rise of China as a World-Class Military Technological Power -Geo-Strategic and Geo-Economic Implications.”
32. July 24, 2018, Presentation at the Vivekananda International Foundation, New Delhi, India: “Understanding China’s Progress in the Development of its Defense and Strategic Science, Technology, and Innovation Capabilities.”
33. July 14, 2018, Presentation to the Security and Export Control Policy Division, Trade and Economic Cooperation Bureau, Japanese Ministry of Economy, Trade, and Industry, Tokyo, Japan: “The Evolution of Civil-Military Integration/Military Civil Fusion Under Xi Jinping.”

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI

Participant: Tai Ming Cheung

Person Months Worked: 6.00

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

Participant Type: Faculty

Participant: David Meyer

Person Months Worked: 1.00

Project Contribution:

International Collaboration:

Funding Support:

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International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Non-Student Research Assistant

Participant: Eric Anderson

Person Months Worked: 13.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Participant Type: Other Professional

Participant: Lynne Bush

Person Months Worked: 12.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Participant Type: Other Professional

Participant: Christine Kerns

Person Months Worked: 1.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Participant Type: Other Professional

Participant: Deborah Ogle

Person Months Worked: 15.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Participant Type: Other Professional

Participant: Deborah Ogle

Person Months Worked: 15.00

Funding Support:

Project Contribution:

International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Participant Type: Other Professional

Participant: Sylvia Plummer

Person Months Worked: 15.00

Funding Support:

Project Contribution:

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International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Other Professional

Participant: Elizabeth Santillanez

Person Months Worked: 13.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Other Professional

Participant: Thai Quang

Person Months Worked: 1.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Non-Student Research Assistant

Participant: Fan Yang

Person Months Worked: 8.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: Chutian Zhou

Person Months Worked: 6.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Other Professional

Participant: Evan Dowden

Person Months Worked: 6.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Other Professional

Participant: Marie Stewart

Person Months Worked: 15.00

Funding Support:

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Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: William Fuller

Person Months Worked: 4.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: Binlu Song

Person Months Worked: 6.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: Taseul Joo

Person Months Worked: 2.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Graduate Student (research assistant)

Participant: Dana Kozhakmetova

Person Months Worked: 11.00

Funding Support:

Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

CONFERENCE PAPERS:

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as of 15-Apr-2019

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC, San Diego, La Jolla, California
Paper Title: Best Frenemies Forever: Artificial Intelligence, Emerging Technologies, and Sino-U.S. Strategic Competition.
Authors: 1. Alderman, Daniel; Ray, Jonathan.
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: The Sino-American Competition, the "Third Offset" Strategy, and Implications for the Global Arms Industry
Authors: 2. Bitzinger, Richard, A.
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Long-Term Defense Budget Trends and Implications for Defense Technological Innovation
Authors: 3. Blakeley, Katherine
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: US-China Military Technological Competition and the Making of Chinese Weapons Development Strategies and Plans
Authors: 4. Cheung, Tai Ming
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Chinese Defense Industry Reforms and Their Implications for US-China Military Technological Competition
Authors: 5. Cheung, Tai Ming; Anderson, Eric; Yang, Fan
Acknowledged Federal Support: **Y**

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as of 15-Apr-2019

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla
Paper Title: Strategic Competition Between the United States and China in the Maritime Realm
Authors: 6. Clark, Bryan; Wilson, Jordan
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Chinese Perspectives on the U.S. Third Offset Strategy and Development of Its Defense Technological Capabilities
Authors: 7. Fan, Gaoyue
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: UC San Diego, La Jolla, CA
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 28-Jul-2016
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Russian Perspectives on the Third Offset Strategy and the Implications for Russia-China Defense Technological Cooperation
Authors: 8. Kashin, Vasily
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: UC San Diego, La Jolla
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 02-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Forces Shaping the U.S. Defense Industry
Authors: 9. Lucyshyn, William; Rigilano, John
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 01-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Frameworks for Examining Long-Term Strategic Competition Between Major Powers
Authors: 10. Mahnken, Thomas, G.
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 01-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Long-Term Strategic Competition Between the United States and PRC in Military Aviation
Authors: 11. Mastro, Oriana Skylar; Chase, Michael
Acknowledged Federal Support: **Y**

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as of 15-Apr-2019

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 01-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: U.S.-China Competition in Defense Technological and Industrial Development: Implications for the Balance of Power Over the Long Term
Authors: 12. Montgomery, Evan Braden
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: UC San Diego, La Jolla, CA
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 01-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: The U.S.-China Reconnaissance-Strike Competition: The Security Dilemma, Missiles, Space, and Counterspace.
Authors: 13. Pollpeter, Kevin
Acknowledged Federal Support: **Y**

Publication Type: Conference Paper or Presentation **Publication Status:** 1-Published
Conference Name: IGCC 2016 Conference on U.S.-China Strategic Competition in Defense Technological and Industrial Development
Date Received: 31-Aug-2017 Conference Date: 28-Jul-2016 Date Published: 01-Feb-2017
Conference Location: UC San Diego, La Jolla, CA
Paper Title: Long-Term Economic, Financial, and Industrial Trends in the United States and China
Authors: 14. Snelder, Julian
Acknowledged Federal Support: **Y**

ACCOMPLISHED UNDER GOALS

In Year 1 of the project, work was initiated on the projects addressing the study of US–China Strategic Competition in Defense Technological and Industrial Development (Project 2). A policy briefing workshop was held in Washington, D.C., on March 16, 2016, and a research conference on “US–China Strategic Competition in Defense Technological and Industrial Development” was held at UC San Diego July 26–28, 2016. Additionally, a training workshop on the Study of Innovation and Technology in China was held in conjunction with the conference July 20–26, 2016.

The policy briefing in Washington examined major developments and medium- and long-term trends in the rapidly evolving Chinese defense science and technology landscape. Participants included DoD and other defense government specialists, academics, and other non-governmental research and policy specialists. Sessions were held on the following topics: 1) “The Restructuring of the PLA High Command and the Implications for the Defense Science and Technology System;” 2) “Moving Up the Innovation Ladder: Reforming China’s National and Defense Science and Technology Systems to Engage in Higher-End Innovation;” 3) “Making and Implementing Chinese Military Long-Term Armament Development Strategies and Plans;” and 4) “The Remaking of the Central Military Commission.”

The research conference on “US-China Strategic Competition in Defense Technological and Industrial Development” provided an opportunity for research specialists to present papers for discussion and review. The primary objective of the conference was to examine the drivers, dynamics, trends, and implications of long-term strategic competition between the United States and China in defense technological and industrial development.

In Year 2 of the project, ongoing research focused on the following two topics:

1. US–China Strategic Competition in Defense Technological and Industrial Development

After a research conference on the topic that was held at UC San Diego in July 2016, a number of follow-on activities took place to prepare and disseminate the research findings. They included:

- a. ***The publication of a research briefs compendium in February 2017 titled *The Gathering Pacific Storm: Intensifying US–China Strategic Competition in Defense Technology, Innovation, and Economics*.*** The collection of 5–6 page summary briefs from the 14 research papers presented at the July 2016 conference is intended for the policy community.
- b. ***A one-day workshop in Washington, D.C., on February 22, 2017 to present July 2016 conference findings to the policy community.*** The workshop was held in conjunction with the Center for Strategic and Budgetary Assessments. It featured 10 speakers who addressed the issue of growing US–China military and strategic competition. Both countries have been actively engaged in formulating plans and promoting programs over the past few years to boost their long-term defense and strategic technological and innovation capabilities. While historically these two countries have not regarded each other as primary targets in the design, development, and acquisition of armaments, this seems to be changing. There are growing indicators of direct and intensifying US–China competition in the development of their defense technological and industrial capabilities.
- c. ***Preparation of research papers from the July 2016 conference for publication as a conference volume.*** Cambria Press expressed interest in reviewing the manuscript.

2. Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers

A workshop was held December 12–13, 2017, at UC San Diego. The workshop examined how countries have become, or are seeking to become, advanced defense technological and industrial powers. The goal of the workshop was to identify the triggers, tipping points, and essential political, economic, strategic, and institutional conditions and factors required for states to embark successfully on significant programs of military technological and industrial development that could lead them to make major advances.

The workshop was comparative in nature. Researchers sought to identify activities, patterns, processes, structures, and other sources that will help in developing a more generalizable analytical framework to provide nuanced and robust indicators and explanations as to why, how, and when catch-up countries decide to develop indigenous or joint defense technological and industrial capabilities.

Research on defense innovation has been surprisingly limited, especially as to how it might occur in latecomer states. Studies undertaken to date have tended to be focused on the United States or the Soviet Union during the Cold War, historical in nature, or concentrated on portions of the innovation process and subsets of the actors involved. These have lacked comparative application across different countries, although there have been efforts in recent years to develop analytical tools that can be used for such comparisons.

The genesis of this workshop came from research funded by the US Defense Department's Minerva Initiative examining China's efforts to become a world-class defense technological power. China has been successful at using a top-down, techno-nationalist model to rapidly modernize its military, but other paths to military modernization for developing countries may exist that are more efficient or better suited to local circumstances. This project developed an innovation model that charts China's defense technological transformation from copycat imitation to disruptive innovation across a number of clearly defined stages. The project also identified a number of different categories of factors that exert important influence in China's defense innovation efforts, such as the importance of top-level leadership support, the nature of external threats to the country's national security, access to foreign sources of technology and knowledge transfer, and how the research and development apparatus approaches risk-taking in technology development. This innovation framework has so far been applied to China, but can be applied to other countries.

A key goal of this project was to develop a comparative analytical framework to assess where countries and technological sectors are in the global innovation landscape and to determine whether they have the critical capabilities and policies required to be able to advance towards the global technological frontier. This framework included a broad array of factors that have been identified as pivotal in enabling the development of defense technological and industrial capabilities, such as:

1. Top-level leadership support;
2. A severe threat environment;
3. High-level scientific and technological talent;
4. Securing access to external technology and knowledge transfers;

5. High levels of funding for science and technology research and development;
6. The ability to effectively mobilize a country's science and technology system; and
7. Adoption of governance norms that encourage innovation, such as high levels of risk taking.

The framework incorporated the nature of the technology development models that countries have established, especially looking at whether they were geared for absorption or original innovation. Countries examined included China, Russia, Israel, the United States, India, North Korea, and Western European countries such as Sweden and France. Key technological and historical areas were reviewed.

In Year 3, ongoing research was focused on the following two topics:

1. Emerging US–China Strategic Competition in Defense Technological and Industrial Development

The publication of research papers from the July 2016 conference was completed as a conference volume with Cambria Press that was published in July 2018. The book, titled *The Gathering Pacific Storm*, contains the following chapters:

1. Introduction: The Emergence of Direct US–China Defense Technological Competition (Tai Ming Cheung)
2. Chapter 1: Frameworks for Examining Long-Term Strategic Competition Between Major Powers (Thomas Mahnken)
3. Chapter 2: A Chinese Military Perspective on the US Third Offset Strategy (Fan Gaoyue)
4. Chapter 3: The “Cinderella” Transformation (Tai Ming Cheung, Eric Anderson, and Fan Yang)
5. Chapter 4: The US-China Reconnaissance-Strike Competition (Kevin Pollpeter)
6. Chapter 5: Long Term Strategic Competition between the United States and China in Military Aviation (Michael Chase and Oriana Skylar Mastro)
7. Chapter 6: Strategic Competition between the United States and China in the Maritime Realm (Bryan Clark and Jordan Wilson)
8. Chapter 7: Artificial Intelligence, Emerging Technologies, and China-US Strategic Competition (Daniel Alderman and Jonathan Ray)
9. Chapter 8: Russian Perspectives on the Third Offset Strategy and Its Implications for Russian-Chinese Defense Technological Cooperation (Vasily Kashin)
10. Conclusion: Long-Term Implications of Future US Strategy for China and Chinese Strategy for the United States (Tai Ming Cheung and Thomas Mahnken)

2. Applying Lessons Learned from China to Understand How Other Countries Become Military Technological and Industrial Powers

Following the project plan, in Year 3 work was completed on Project 2. A number of activities took place to prepare and disseminate the research findings. They included:

- a. ***The publication of a research briefs compendium in May 2018 titled Leaders, Laggards, and Followers: The Global Competition for Defense Innovation.*** The collection of twelve 5–6 page summary briefs from research papers presented at the December 2017 conference is intended for the policy community.
- b. ***Presentation of research findings at a policy briefing in Washington, D.C.*** The briefing “Comparing Defense Innovation in Advanced and Catch-up Countries” was held May 13, 2018. Participants included DoD and other defense government specialists, academics, and other non-governmental research policy specialists. Sessions were held on the following topics: 1) methodological approaches; 2) centrally planned, authoritarian, and developing regimes; 3) developed and market regimes; and 4) historical perspectives and emerging technologies. Additional detailed information about the outcomes of the conference is provided in the attachment document titled “Scientific Progress.”
- c. ***Preparation of research papers from the December 2017 workshop for publication as a conference volume.*** Based on feedback at the briefing, the papers were revised for inclusion in an edited volume. A manuscript for review will be disseminated to publishers in early fall 2019. The proposed chapters are:
 1. Frameworks for Analyzing Defense and Military Innovation (Tai Ming Cheung, Thomas G. Mahnken, and Andrew L. Ross)
 2. How China’s Defense Innovation System Is Advancing the Country’s Military Technological Rise (Tai Ming Cheung)
 3. Military-Technological Innovation in Small States: The Cases of Israel and Singapore (Richard A. Bitzinger)
 4. The Very Healthy US Defense Innovation System (Eugene Gholz and Harvey M. Sapolsky)
 5. Military-Technological Innovation in Middle-Level Industrialized States: The Quest for Autonomy and Excellence in France and Sweden (Martin Lundmark)
 6. Defense Innovation in Russia in the 2010s (Vasily Kashin)
 7. North Korea’s Approach to Defense Innovation: Foreign Absorption, Domestic Innovation, and the Nuclear and Ballistic Weapons Industrial Base (Stephan Haggard and Tai Ming Cheung)
 8. Examining India’s Defense Innovation Performance (Laxman Kumar Behera)
 9. New Frontiers for Chinese Defense Innovation: Artificial Intelligence and Quantum Technologies (Elsa Kania)
 10. Innovation in the Inter-War Years (Thomas G. Mahnken)