Abstract

JMSDF's Military Technology Innovation in the Second Interwar Period

TAKEI Tomohisa

World has entered an era of new great power competition since the U.S. National Security Strategy issued in December 2017, which meant the end of 28 years post-Cold War era. If a war is waiting in the end of the great power competition, it must be a war between great powers. If so, future historians might call this period we live in now as the Second Interwar Period.

As in the previous interwar period, the difference in innovation over newly emerging technologies would affect the outcome of competition among major powers. Regarding innovation to adapt to new technologies, the Japan Maritime Self-Defense Force needs to take the lessons learned from the previous interwar period and shift its paradigm of defense capability buildup from the post-Cold War period to the interwar period.

The Imperial Japanese Navy's Aviation development and its problems: The emerging process of "strain" of technology and its effects

IWAMURA Kentaro

Imperial Japanese Navy Air Service is almost comparable to Army Air Service, because it has many land-based aircrafts. In this point, it is unique among other countries' navy.

Generally speaking, Imperial Japanese Navy Air Service failed in the Pacific War because of lack of ability to withstand attrition. But this is

not the only problem. U. S. Strategic Bombing Survey evaluated that they had failed fully to appreciate the strategic revolution brought about by the increased capabilities of air power. This problem reflected the “strain” of technology. Imperial Japanese Navy Air Service could produce aircraft with advanced fuselage design, but they were behind in many elements such as the ability to build airbases. How did the “strain” of technology emerge? How did it affect aerial warfare?

This article answers these questions, focusing on characteristics of Imperial Japanese naval air power development during the interwar period and aerial warfare in Solomon Islands and New Guinea during Pacific War, with care to components of military air power.

Impact and the Significance of Lessons from 1st Lebanon War on Unmanned Aerial Vehicle Development for U.S. Armed Forces

KUSUYAMA Hiroyasu

This paper attempts to understand the impact of Pioneer UAV (RQ-2) made from lessons of 1st Lebanon War on subsequent UAV development and the significance for U.S. Armed Forces, and the author explains in the following order.

a) Analyze how Israel proved the superiority of UAV on the battlefield and what U.S. armed forces learned in 4th Arab- Israeli War and 1st Lebanon War.
b) Unveil how Pioneer evolved since the Lebanon Civil War that U.S. intervened and how it was introduced in the later Gulf War.
c) Show the impact of Pioneer on the development of U.S. armed forces’ UAV and evaluate the significance and factors from viewpoint of innovation.

As the result of this research, the author gets the following conclusions.

a) Factors behind Pioneer innovation were the wisdom of SECNAV

Lehman who found value in technology from another country, Israel.

b) The success of Pioneer set the standard of UAV for the U.S. armed forces to acquire real-time images.

c) Significance of innovation by Pioneer will be it proved technology plays a key role in RMA through the Gulf War.

U.S. Navy and Cross-Domain Synergy Concepts and Resources
: Exploring new ways of fighting and force structure

TAKAHASHI Hideyuki

This paper examines the need for Cross-Domain Synergies (CDS) and the direction of solutions in the U.S. Navy, from a strategic operational perspective. The key of consideration was the integration process up to CDS, and the relationship between the battle concept and the force structure. The consideration was performed in the following order;

a) Section 1 examines the reasons why U.S. military needs CDS, considering the relationship between strategic issues and defense resources.

b) Section 2 examines why U.S. Navy needs CDS, considering the relationship between combat concepts and weapon systems.

c) Section 3 examines what solutions U.S. Navy is considering for the issue identified in Sections 1 and 2.

As the result of this research, the author gets the following conclusions.

a) U.S. military needs CDS because of the concept of operations that took into account both the integrated concept and anti-A2/AD resources.

b) U.S. Navy needs CDS to overcome the challenges arising from the history of combat concepts and budget constraints, and prepare for more realistic ‘quality and quantity’ issues that could retain its

dominance in all domains.

c) For that reason, U.S. Navy seeks to address current challenges by embracing new way of fighting with CDS concept and exploring a transition to force structure that combines new and old technologies.

Study of Cyber Reserve

: Comparison of consciousness between Estonian cyber defence unit and Reserve Self-Defense Force serving in cyber domain

HIDAKA　Tomoo
IDE　Tatsuo

The purpose of this paper is to clarify the reasons why the members of the Cyber Reserve apply for it and what considerations are necessary for its effective operation. Using the historical background of Estonia as a framework for research, in the first part, the position, purpose and activities of the Cyber Defense Unit and the Reserve SDF are introduced. After examining previous research, both the target of the survey and the questionnaire's content are explained. Following, the results of the survey are presented and analyzed. Regarding the reasons behind the application to the cyber reserve it has been found that their members have a high awareness of national defense and aim to obtain high IT skills. To address the issue of the conditions for the effective operation of cyber reserves, it would be necessary to consider a flexible setting for the activities of the unit members and the creation of a community for them.

Next generation EW
— EMS activities utilizing machine learning and networks —

AMAGAI Takaki

The EW (electronic warfare) system established in the Vietnam War to secure the platform has lost its effectiveness today. Conventional EW equipment, such as RWRs (radar warning devices) and jammers, rely on a library of EW information that is updated on a daily basis, and these have been evaluated as inadequate for radar evolution. In addition, the narrowing of the frequency due to the development of consumer electronics has seriously affected EW activities.

In light of these circumstances, new forms of EW are being explored. Of particular note are the researches being conducted at the Defense Advanced Research Project Agency (DARPA) and the like. A system called cognitive EW, which has built a network of small drones by identifying signals using ML (machine learning), aims to be a system that does not depend only on the stored library, and is expected to be responsible for the next generation of EW.

The purpose of this paper is to consider how EW should be based on the characteristics of cognitive EW.

Development of ASBM in China
: Focusing on the DF-21D

YAMASHITA Nana

This report aims to provide an overview and analysis of Chinese ASBM with a focus on the DF -21 D. I summarize the current status of Chinese ASBM and consider future development trends. It was believed that DF -21 D has been in service since 2010, but there was a question of the ability to attack a moving target at high sea. Also, it was believed that China didn't have enough ISR sensor ability required for the operation of the ASBM.

However, ASBM with different ranges are appearing one after another and there are signs that new ASBM launch platforms are being developed after about 9 years the DF -21 D was deployed. Also, ASBM's ISR sensors may be well developed, such as the artificial satellites. China operates a large number of satellites that can provide accurate information on the offshore targets needed to operate the ASBM. If ASBM can attack a moving taget in the high sea far away, it will be great effect around the world.

On the Use of Satellite Remote Sensing to Maritime Security

WATANABE　Hideaki

Recently, various satellite technologies have been intensively developed in the US and Europe. Especially, satellite constellation whose orbit is LEO (Low Earth Orbit) is about to be used for satellite communication and remote sensing.

As for satellite communication, Oneweb and Space-X are two big powers that will launch more than thousands of satellites. Although most of satellite constellation companies are doing business for commercial applications, some companies' satellites are considered to be applicable to MDA (Maritime Domain Awareness).

In Japan, the government stipulated its defense guideline and the mid-term defense program in 2018 which insisted that the government would introduce Multi-domain battle including cyber, space, and electromagnetic spectrum.

As for space, the government would introduce Space Situational Awareness System, set up Space Mission Unit in JASDF, and improve information gathering capabilities of satellites.

As Japanese exclusive economic zone is very large, the use of satellite remote sensing will be indispensable in the near future. In Japan, a few companies started to use satellite constellation for their commercial business. It's a good time for MSDF to study and develop satellite technologies for their maritime security application.

Information security for the quantum computer era
: Quantum noise stream cipher Y-00 (Yuen2000 protocol)

HARASAWA　Katsuyoshi

At present, quantum technology is being actively developed around the world, and tests for its practical use have begun. On the other hand, the current cryptography, which uses the currently used amount of computation as the basis of security, will be exposed to the threat of decryption. In the modern information society, the role of information and communication, which is the center of economic activities such as controlling the lifeline by IoT and AI and cashless accounting, is very important. The network that supports this information and communication will be the lifeblood of maintaining a safe and secure nation stably. For this reason, it is essential that the information and communication infrastructure be protected with robust security. This paper describes trends in quantum technology and the practical use of quantum noise stream cipher (Y-00: Yuen2000 protocol) that can build information security for the future quantum computer era.