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INFECTIOUS DISEASES AT SEA – CREW MEMBERS AND PASSENGERS OF SHIPS IN THE FACE OF PANDEMIC COVID-19

SUMMARY

The fear of an invisible enemy, as bacteria and viruses often disrupt or take away health, has accompanied humanity for thousands of years. The article presents cases of illness caused by biological factor among passengers and crew members on board ships. Incidents that have occurred in the past have been mentioned. The Author's leading considerations focused on the current situation (Pandemic COVID-19) of biological hazard on vessels.

Keywords:
coronavirus, infectious disease, pandemic, ship, crew, passengers

INTRODUCTION

In 2002, a British government report stated that "at the beginning of the 21st century, infectious diseases remain a serious global threat to human health, prosperity, social stability and security."[327] Concerns were raised by the fact that 41% of all diseases in the world were infectious diseases, which claimed millions of lives[328]. If we look back, we will see a simple truth: all wars in human history have not taken as many victims as infectious diseases have consumed. At the moment, we are in an unusual, very undesirable situation, because each of us

[327] The Royal Society Inquiry, *Infectious Diseases in Livestock. Summary and main recommendations*, Reported, London 2002, dostęp internetowy: www.royalsoc.ac.uk/policy (access: 21.11.2019).
[328] Ibidem.

fears infection with a new coronavirus[329]. On 11.03.2020, the WHO announced the COVID-2019 pandemic[330].

The author will limit his considerations to analyzing the situation where carriers of viral infection appear on the vessel. Particular attention will be paid to the cases of ships affected by the most modern virus, i.e. COVID-19.

INFECTIOUS DISEASE ON BOARD

Infectious diseases have decimated humanity since the dawn of time. History remembers that they were equally willingly used to fight, and over the years the deliberate spread of diseases has reached the status of one of the greatest threats to health and life. Infectious diseases are also wreaking havoc nowadays – more than 17 million people (or 50,000 people a day) die every year at the hands of "invisible killers"[331].

An infectious disease that has been caused by a biological pathogen is defined[332], i.e. "cellular micro-organisms, or products produced by them, external, and internal human parasites, or products produced by them, non-cellular particles capable of replicating, or transferring genetic material,

[329] Coronaviruses (family Coronaviridae) are RNA viruses, i.e. those whose genome is ribonucleic acid (they have one of the largest genomes in the group of RNA viruses infecting humans). "There are numerous thick stick-like protrusions protruding from their casing, which in electron microscopy photos look as if they are forming a kind of crown or halo, resembling a solar corona (the name of coronaviruses comes from the Latin word for wreath or crown)." Quote from: E. Krawczyk *Koronawirus. Wszystko co musisz wiedzieć żeby się zabezpieczyć*, Pascal, Bielsko-Biała 2020, p. 28

"The first records of human coronaviruses date back to the 1960s, when two pathogens - HcoV-229E and HCoV-OC43 were isolated and described. Coronaviruses have been out of the way of mainstream research in virology and medicine for years, as these two species cause a mild cold that resolves without intervention within a few days. It was not until the beginning of the 21st century that the world experienced an epidemic of a disease caused by a previously unknown, highly infectious species of the SARS coronavirus (...) In 2012, 10 years after the SARS-CoV epidemic, there were cases of a new, severe and often fatal respiratory disease caused by the MERS coronavirus ". Quote from: K. Pyrć, *Ludzkie koronawirusy*, Postępy Nauk Medycznych 2015, Volume XXVIII, no. 4B, p. 48

[330] On 02/11/2020, the Director General of the World Health Organization (WHO), Tedros Adhanom Ghebreyesus, announced that the Wuhan coronavirus, temporarily named 2019-nCoV, was officially named COVID-19

[331] Their strains are officially stored for scientific purposes at the Centers for Disease Control and Prevention (CDC) in Atlanta, USA, and in a secret Russian government laboratory near Novosibirsk.

[332] The Act of 5 December 2008 on the prevention and combating of infections and infectious diseases in humans (Dz.U. z 2020 r. poz. 284, 322, 374), art. 2 point 3.

including genetically modified cell cultures, or products produced by them"[333].

The vast majority of all diseases referred to as infectious diseases are caused by viruses[334]. „Modern taxonomy includes several thousand pathogenic viruses for humans, animals, and plants. For many viruses, man is a natural host, for many others the natural hosts are animals, but man is also a link in the circulation of the virus"[335].

An infectious disease is associated with the term 'epidemic', i.e. 'the occurrence in a given area [or a given time] of infections, or infectious diseases in a number significantly higher than in the previous period, or the occurrence of infections, or infectious diseases not yet occuring"[336]. If the epidemic covers large areas around the world, spreading to many countries, and its concomitant feature is high population incidence, then it is referred to as a pandemic [337]. On 11.03.2020, the Director-General of the World Health Organization (WHO), Tedros Adhanom Ghebreyesus, announced the COVID-19 Pandemic, thus recognising that the epidemic of the new coronavirus, which began in November 2019 in Wuhan, China, had undergone a global SARS-CoV-2 coronavirus pandemic[338].

Infectious diseases spread in different environments. The cases of illness among passengers, or crew members on board should therefore not come as a surprise. However, in the wake of K. Kubiak, it is worth noting that "otherwise (...) the situation develops on land, or on a ship where there are several thousand people in confined space"[339]. Cruise ships, which are a kind of clusters of the population, are a particularly vulnerable object. "It should be remembered that modern passenger ships are able to accommodate several thousand people. The largest of these, MS Harmony of the Seas, holds up to 8,880 passengers – 6,780 passengers, and 2,100 crew members"[340]. „In such a situation, the appearance of

[333] Ibidem, point 2.
[334] In the sample quarter-century 1975-2000, infectious diseases of viral etiology accounted for 49,973,000. (93.8%) of all acute infectious diseases, i.e. 53,370,000. More: M. Kańtoch, *Człowiek a wirusy*, access: alergia.org.pl/pacjent/inne/człowiek.htm (17.03.2020).
[335] Ibidem.
[336] The act on preventing and combating infections and infectious diseases in humans …, pkt 9.
[337] A factor that differentiates a pandemic from an endemic should be mentioned here – the latter applies to a situation where a specific infectious disease persists in a specific area for many years at a similar level, e.g. the Ebola epidemic in West Africa in 2014.
[338] *WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020*, access: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (13.03.2020).
[339] K. Kubiak, *Przemoc na oceanach. Współczesne piractwo i terroryzm morski*, TRIO, Warszawa 2009, p. 106.
[340] D. Olender, *Terroryzm morski – przeciwdziałanie i zwalczanie*, Wyd. ASzWoj, Warszawa 2018, p. 125.

even one carrier of the virus immediately results in an epidemic"[341]. Mastering mass contagion on such a unit is a huge challenge. And while we are aware of plans for all sorts of threats, we know how often assumptions about dealing with a potential danger are nothing more than a real threat to life and health.

Diseases on cruise ships due to biological factor

In 2019, it was estimated that around 30 million passengers had crossed 272 cruise ships worldwide [342]. Cruise ships are a common place of outbreak of infectious diseases due to the hermetic environment, and contact between people from different parts of the world.

In mid-November 2006, *Carnival Liberty*[343] passengers were affected by a viral infection of the gastrointestinal tract. During a voyage from the Mediterranean to the Caribbean on a luxury cruise ship, a massive illness caused by the Norwalk virus infection was reported[344]. Symptoms of the disease were detected in 536 of the 2,804 passengers, and 143 of the 1,166 crew members [345]. The same situation occurred in December 2006 on board one of the largest passenger ships – *Freedom of the Seas*[346] (see Photo. 1). Symptoms of norovirus infection[347] were found in 338 of the 3,823 passengers, and 46 of the 1,402 crew members on a Caribbean cruise[348].

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[341] K. Kubiak, *Przemoc na oceanach...*, op. cit. p. 106.

[342] 2019 Cruise Trends&Industry Outlook, Cruise Lines International Association, Washington D.C., p. 18-19, access: https://cruising.org/news-and-research//media/CLIA/Research/CLIA-2019-State-of-the-Industry.pdf (12.04.2020).

[343] The ship is 290.2 m long and 35.4 m wide, with 13 decks; it accommodates 2,974 passengers and 1,160 crew members. see: https://www.carnival.com/cruise-ships/carnival-liberty.aspx (13.03.2020).

[344] Norovirus, which causes gastroenteritis (viruses like them are called gastrointestinal disease, acute non-bacterial gastroenteritis, food poisoning, or food infection).

[345] http://www.cdc.gov/nceh/vsp/surv/outbreak/2006/nov13carnivalliberty.htm (13.03.2020).

[346] The ship is 339 m long and 56 m wide, has 18 decks and 1,800 cabins; it accommodates 4,375 passengers, and 1,360 crew members. See: http://www.royalcaribbean.com/ (19.05.2015).

[347] "They are a very common cause of food infections. Symptoms of the disease generally begin 12-48 hours after exposure to the virus, and usually last from 1 to 3 days, sometimes may last longer. The main symptoms are abdominal pain, vomiting, and diarrhea. The source of infection is sick people who excrete a huge number of viral particles. It should be remembered, that viruses are excreted from the body even after the symptoms of the disease have resolved, and they are still a source of infection. Infection can occur through direct contact with a sick person or contact with objects on which the patient "left" viruses. As the name of the disease suggests, infection occurs through the ingestion (contaminated hands, food)". Quote from: *Norowirusy*, access: https://www.pzh.gov.pl/norowirusy/ (09.04.2020).

[348] http://www.cdc.gov/nceh/vsp/surv/outbreak/2006/dec3freedom.htm (11.01.2015), and K. Kubiak, *Problem na pokładzie*, „Nasze Morze" 2007, no. 2, pp. 40-41.

Photo. 1. *Freedom of the Seas*

source: http://www.smartcruiser.com/royal-caribbean/freedom-of-the-seas/staterooms/ (30.06.2015).

In both cases, larum was raised due to the suspicion that biological agents were used against the population. However, these were not individual cases (see Table 2), but the scale of the phenomenon raised relevant assumptions, and concerns.

On January 21, 2014, she sailed on a 10-day *Explorer of the Seas*[349] cruise, where there was also an epidemic of viral gastrointestinal infection. The disease statistics were as follows: 634 out of 3071 passengers, and 55 of the 1166 crew members[350]. In the last year, the highest number of cases due to norovirus occurred during the cruise, which took place on 6-13 January 2019. At that time, 561 passengers, and 31 *Oasis of the Seas* crew members[351].

Table 1. Cases of morbidity caused by a biological agent among passengers, and crew members of cruise ships

Year	Cruises	Sickness (passengers)	Sickness (crew)	Sickness (total)
2004	32	2643	479	3122
2005	17	1982	294	2276
2006	34	4507	561	5068

[349] The ship is 311 m long and 38.6 m wide, with 15 decks; accommodates 3,114 passengers and 1,180 crew members. See: https://www.royalcaribbeancruises.pl/statki/klasa-voyager/explorer-of-the-seas/ (19.03.2020).

[350] http://www.cdc.gov/nceh/vsp/surv/outbreak/2014/january21_explorer_seas.htm (11.01.2015).

[351] The ship is 362 m long, and 47 m wide, with 16 decks; it accommodates 6,630 passengers and 2,160 crew members. See: http://www.royalcaribbeancruises.pl/statki/klasa-oasis/oasis-of-the-seas/ (19.03.2020).

2007	21	2749	276	3025
2008	15	1737	191	1928
2009	15	1759	212	1971
2010	14	2608	233	2841
2011	14	1325	131	1456
2012	16	2791	273	3064
2013	9	1409	96	1505
2014	9	1612	156	1768
2015	12	1406	130	1536
2016	13	1476	128	1604
2017	11	1296	90	1386
2018	11	575	83	658
2019	10	1201	114	1315
2020 (do 19 III)	4	711	83	794

source: own research: http://www.cdc.gov/nceh/vsp/surv/gilist.htm (11.04.2020).

An analysis of the cases indicated in Table 1 indicates that it is not uncommon for ships to become infected with a viral infection (in 98% of cases with noroviruses).

However, it is not only norovirus that poses a potential, and real threat to ship crews and passengers. The COVID-19 virus, which attacked on November 17 in the small Chinese town of Wuhan (Hubei Province, central China), and spread to other cities, neighbouring countries until it finally reached more continents, also hit the seas and oceans.

The first cruise ship to have an outbreak of coronavirus was the *Diamond Princess* [352] (see Photo. 2). This occurred shortly after the outbreak in China. Diamond Princess sailed from Yokohama on 20.01.2020. Along the way, 2,666 passengers from more than 50 countries around the world were to visit Kagoshima, Hong Kong, Vietnam, Taiwan, and Okinawa before returning to Yokohama port.

[352] The ship is 290 m long and 37.5 m wide, with 18 decks; it can accommodate 2,670 passengers and 1,100 crew members. At the beginning (launched in 2004) it was cruising the Pacific Ocean between Asia and Australia, since 2018 it also takes passengers on trips around the world. More: https://www.princess.com/ships-and-experience/ships/di-diamond-princess/ (09.04.2020).

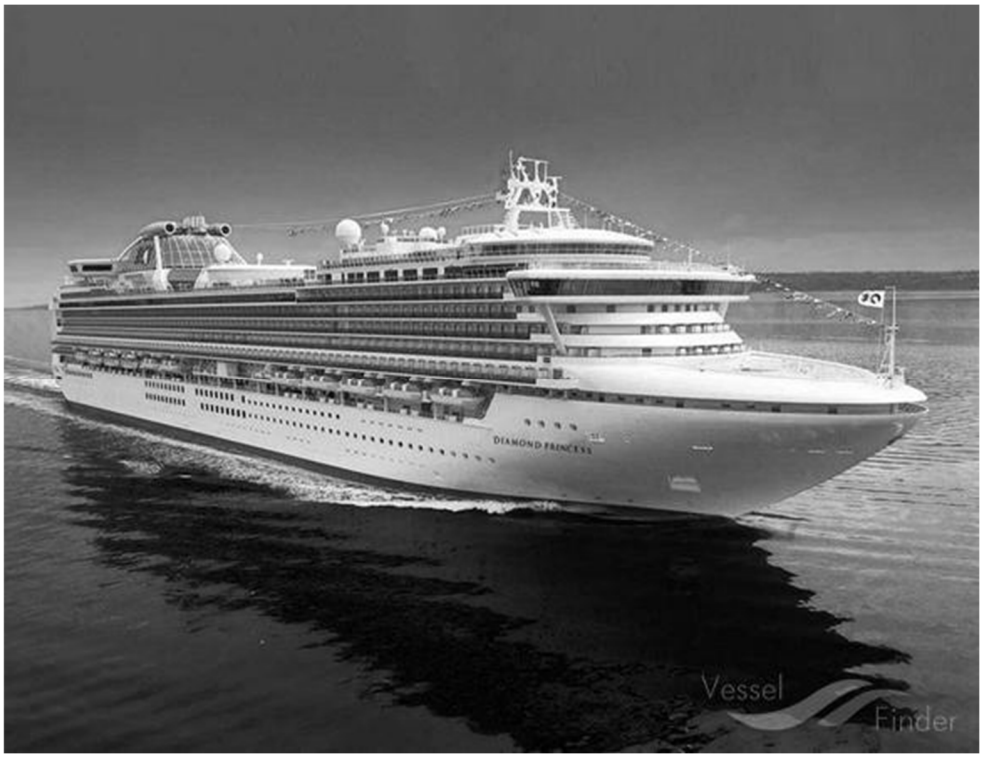

Photo. 2. *Diamond Princess*

source: https://www.vesselfinder.com/pl/ship-photos/5762 (18.04.2020).

After a few days of sailing, an 80-year-old Chinese national had symptoms indicating coronavirus infection. The man was left in medical care in the port of Hong Kong on 25.01., as it turned out – 01.02. tested positive for COVID-19 infection. While still in Hong Kong, the shipowner decided to send the ship to Yokohama's final port, and carry out medical examinations of the entire state of the cruise ship. The Japanese authorities have decided that the ship will remain in port, without passengers and crew members being able to dissuade. From 03-4.02. the state of health of all persons was checked by the relevant services by means of a questionnaire, samples were taken for the coronavirus test. The following day (05.02) the case of COVID-19 was confirmed, which influenced the decision of the Ministry of Health, Labour and Social Welfare (Kosei Rhodes) to quarantine 3711 people[353] on board at the time (2666

[353] Among them, three Poles (one crew member, and two passengers) whose test for the presence of coronavirus turned out to be negative.

passengers, and 1045 crew members) [354]. Protection of the population on land was cited as a basis for such a security measure, not another, by preventing the spread of the virus, regardless of the consequences it would have on those on board. It should be borne in mind that vessels are obliged by international treaties to comply with port rules and protocols. In this case, *Diamond Princess* had to follow the instructions of the Japanese Health Organization working closely with the U.S. Centers for Disease Control and Prevention (CDC).

The event was not only a surprise, an unexpected, and unwanted situation on board, but also an unprecedented one – the quarantine on the *Diamond Princess* cruise ship lasted more than two weeks. Prof. Kentaro Iwata, infection control specialist[355] at Kobe University Hospital (Infectious Diseases at Kobe University), strongly criticized the management of the situation during the COVID-19 infection incident on the *Diamond Princess* cruise ship. He made his comments available to the public by posting videos on the youtube.com[356]. There, he pointed to the prevailing chaos, the lack of a quick, and adequate response required by the situation, and the profession of doctor, epidemiologist, expert on difficult situations, prepared to work under stress, and in difficult conditions. In his speech, he also used the statement that, through the actions taken, "the *Diamond Princess* ship has become a mill for COVID-19"[357]. He pointed, among others, the lack of separation of green, infection-free zones, and red zones where infection may have occurred, and the failure of health and safety officials who left the ship, and returned to land in a crowd of healthy people [358].

For many days, the number of people infected was growing rapidly – from 5 to 22.02. increased from 25 to 634 cases [359].The justified spike in the

[354] E. Dahl, *Coronavirus (Covid-19) outbreak on the cruise ship Diamond Princess*, "In Marit Health" 2020, 71, 1, p. 5.

[355] He conducted research, and participated, inter alia, in work during the Ebola epidemic in Africa, and SARS in China. He was also summoned aboard the Diamond Princess; after two people working on the ship on behalf of the government contracted the coronavirus, After leaving the unit, prof. Iwata submitted to a 14-day quarantine.

[356] The films were removed by the author (investigating the causes is not important from the point of view of the issue discussed in this article), nevertheless, materials circulate in the worldwide network, e.g.. *Professor Kentaro Iwata Kobe University, on Covid-19/SARS-CoV-2 Diamond Princes*, access: https://www.youtube.com/watch?v=v_jksM-NTWM (11.04.2020) or material from the press conference on February 20, 2020., See: K. Iwato, *Aboard the Diamond Princess*, access: https://www.youtube.com/watch?v=V29eNY_0kWQ (11.04.2020).

[357] *Professor Kentaro Iwata Kobe University, on Covid-19/SARS-CoV-2 Diamond Princes*, access: https://www.youtube.com/watch?v=v_jksM-NTWM (11.04.2020).

[358] Ibidem.

[359] 10.02. of 99; 11.02 of 88.

This is very well illustrated by the graph in the article by Chinese scientists, where additionally there is a comparison with the Covid-19 incidence curve in Wuhan. See: J.-W. Xu,

number of cases was due to the gradual testing of the number of passengers on board the *Diamond Princess*. Finally, 712 (567 passengers, and 145 crew members) tested positive for the virus, of which 331 were asymptomatic at the time of the tests and 13 died[360].

The public (not only within Japan) criticized the authorities for the misuse of quarantine measures on the virus infected cruise ship. There have been voices about the need to establish a cell along the lines of the US CDC[361]. Although Japan already has a certain equivalent of the *National Institute of Infectious Diseases* (NIID), experts point out that the institute lacks autonomy from state authorities[362]. The media even christened *Diamond Princess* as "Floating Prison." This was facilitated by social media. Thanks to them, the participants of the cruise were able to maintain communication with the world, and the world could see the dramatic appeals sent by passengers, and crew members through videos, records, and photographs of the ship, on board which hung banners with a tragic cry for help. Michael Mina, a physician and professor of epidemiology, and immunology at Harvard School of Public Health & Harvard Med School, described the quarantine ordered on the *Diamond Princess* as uneasy, and completely inappropriate, pointing out that most likely the infection had moved between individuals, putting everyone at great risk of getting sick, and even, dying [363].

Researchers from Sweden's Umeå University (Umeå Universitet) believe that quarantine on the *Diamond Princess* has led to more passengers, and crew being infected[364]. An in-depth analysis by scientists[365] led by epidemiologist

X.-Y Wang, Z. Qin, H.L. Song, H. Wang, H.-Y. Luo, L. Ye, Z.-H. Feng, *Deep thought of COVID-19 based on Diamond Princess's quarantine and home quarantine*, "European Review for Medical and Pharmacological Sciences" 2020, 24, p. 4028.

[360] *Cumulative numer of coronavirus-positive (COVID-19) patients confirmed on Diamond Princess cruise ship docked in Japan as of April 16, 2020*, access: https://www.statista.com/statistics/1099517/japan-coronavirus-patients-diamond-princess/ (16.04.2020).

[361] https://www.cdc.gov (16.04.2020).

[362] K. Mizumoto, K. Kagaya, A. Zarebski, G. Chowell, *Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan 2020*, access: https://www.eurosurveillance.org/docserver/fulltext/eurosurveillance/25/10/eurosurv-25-10-1.pdf?expires=1588329483&id=id&accname=guest&checksum=8594CF0C8E6EF8E1F44AE50D0BCAEFE5 (11.04.2020).

[363] https://twitter.com/michaelmina_lab/status/1227031352568143872 (08.04.2020).

[364] J. Rocklöv, H. Sjödin, A. Wilder-Smith, *COVID-19 outbreak on the Diamond Princess cruise ship: estimating the epidemic potential and effectiveness of public health countermeasures*, "Journal of Travel Medicine" 2020, 1-7, access: https://academic.oup.com/jtm/advance-article/doi/10.1093/jtm/taaa030/5766334 (04.04.2020).

[365] In the presented studies using the SEIR epidemiological model (Susceptible, Exposed, Infectiuos, Recovered = susceptible individuals, individuals with latent disease, individuals

Professor Joackima Rocklöv shows, that the infection rate on board the *Diamond Princess* was four times higher than that of china's most infected regions, so the presumed cause of the avalanche was the proximity between people on board [366]. Scientists argue that immediate boarding, as soon as the first case of illness is revealed would be less tragic.

Diamond Princess is not the only ship to have a coronavirus. From 07.03. the escalation of COVID-19 infections on cruise ships sailing near the US has increased. In the sample time, 07.03.-01.04. The U.S. Coast Guard conducted 31 rescue operations related to COVID-19 infection [367]. On the list of cruise ships on which quarantine was ordered, and/or people complaining of breathing problems were evacuated to hospitals m.in.: *Costa Smeralda, WorldDream, Grand Princess*[368], *Braemar, Golden Princess, Ruby Princess, Zaandam, Rotterdam, Coral Princess, Lambelu*, *Oasis of the Seas*, *Symphony of the Seas*, *Costa Favolosa,* and *Costa Magica*.

Despite recent restrictions restricting operations, such as port closures, the introduction of quotas on the movement of people, and eventually the suspension of activities from the tourism industry, including cruises, many cruise ships are still in the waters. At the beginning of April this year, the U.S. Coast Guard reported that there were a total of 114 cruise ships in U.S. ports, anchorages, and in the waters there, totalling 93,000 crew members on board [369]. A detailed breakdown is illustrated in Figure 1.

suffering from infections, and spreading infections, convalescent individuals); assuming a relatively homogeneous mixing of people on board), scientists presented solutions based on the assumption that the virus is transmitted from person to person, other routes of transmission, such as water infected with feces, were not taken into account.

[366] Ibidem, p. 5.

[367] *250,000 Cruise Passengers Disembarked in U.S.*, access: https://www.maritime-executive.com/article/250-000-cruise-passengers-disembarked-in-u-s (11.04.2020).

[368] 98 people infected, 1 fatal.

[369] *250,000 Cruise Passengers Disembarked…*, access: https://www.maritime-executive.com/article/250-000-cruise-passengers-disembarked-in-u-s (11.04.2020).

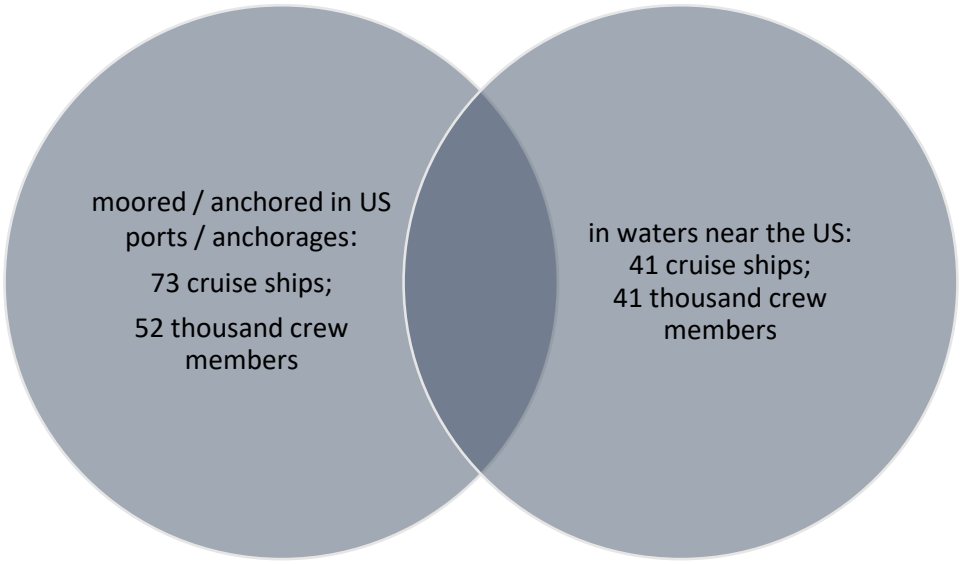

Fig 1. The situation of American cruise lines – as of April 1, 2020

source: 250,000 Cruise Passengers Disembarked in U.S., access: https://www.maritime-executive.com/article/250-000-cruise-passengers-disembarked-in-u-s (11.04.2020).

On March 14, CDC Director Robert R. Redfield [370] issued a 'Non sail' order for cruise ships, to take effect on March 14.2020[371] At the same time, he praised the Cruise Lines International Association (CLIA), a leading industry trade group, for its willingness to voluntarily suspend cruise ships at U.S. ports for a period of 30 days, announced at March 13.

Ship diseases due to biological factor

Diamond Princess is a flagship example of a cruise ship, on which the fight against the coronavirus was fought. Unfortunately, vessels in the service of the state have not been able to remain free from danger.

[370] It is worth noting that the virologist also holds the position of Administrator of the *Agency for Toxic Substances and Disease Registry* – ATSDR.
[371] U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC), *No sail order and other measures related to operations*, access: https://www.cdc.gov/quarantine/pdf/signed-manifest-order_031520.pdf (16.03.2020).

In mid-April, the rapid spread of the coronavirus was revealed aboard the French nuclear aircraft carrier *Charles de Gaulle*[372] (see photo 3). It turned out that almost half of the 2.3,000 crew members of the French nuclear aircraft carrier are infected with the COVID-19 virus. The Minister of the Armed Forces of France, Florence Parly, confirmed 1081 positive cases, and indicated that a further 545 sailors had symptoms, and 24 were hospitalised. The ship was on a mission in the Atlantic Ocean, had no contact with external factors since 16 March, and was reported to be returning to the coast of France on 8 April after signs of infection were revealed. Earlier, *Charles de Gaulle* held a three-day stop in Brest in the northwest of France.

Photo. 3. *Charles de Gaulle* (R91)

source: https://www.defense.gouv.fr/var/dicod/storage/images/base-de-medias/images/marine/batiments/charles-de-gaulle/charles-de-gaulle/233022-1-fre-FR/charles-de-gaulle.jpg (18.04.2020).

[372] Joined in French service in 2001, *Charles de Gaulle* is the showpiece of the French Navy; it is the only nuclear aircraft carrier built by a country other than the United States.

One of the sailors, who requested anonymity, told Radio France Bleu that the aircraft carrier's commander, Guillaume Pinget, had offered to notify the superiors immediately after the Brest stop, that he needed to abort the mission, but his demands were rejected by the authorities. Initially, Minister Florence Parly – like a spokesperson for the French Navy – officially denied the sailor's reports. Nevertheless, Parly soon announced that the information on board the *Charles de Gaulle* aircraft carrier was informed on April 7 by Admiral Christophe Prazuck. The Director of *Service de Santé des Armées Security Administration* (SSA), Marilyne Gygax Genero MD, quoted in a press release from the French Senate Committee, stressed that infection on the aircraft company is an important event and that "at the end of this crisis, there will undoubtedly be consequences"[373]. However, in parallel, it stated that at the moment it is not possible to test all French military units, or order the wearing of masks. In turn, the chairman of the Senate committee, Christian Cambon, announced that he would ask the Minister of the Armed Forces to systematically examine the soldiers before launching the mission. The Chairman expressed a lack of understanding of the fact that "the military does not use pre-mission tests" in both their security, and [operational] capabilities [374]. This is a flagship example that does not apply to just one particular country. This case shows chaos, and a lack of preparation for an unprecedented situation, but the creation of a state army would have to expect precisely preparation for the worst-case scenarios.

It should be noted that the aircraft carrier is an excellent place for transmission of the virus – crew members share cramped cabins, and use the same bathrooms, canteens, or workstations every day. The command has no chance of isolating all cases, as a result of which the virus has room to show off – it can spread at a much faster rate than on land[375].

Unfortunately, this is not an isolated case of a unit remaining in the state navy, where the cases of COVID-19 have been revealed. Such cases, although less than discussed above, occurred on board of *the San Giusto, San Giorgio, USS Theodore Roosevelt*, *USNS Comfort*[376].

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[373] *Koronawirus u prawie połowy załogi francuskiego lotniskowca Charles de Gaulle*, access https://www.portalmorski.pl/bezpieczenstwo-granice/44949-koronawirus-u-prawie-polowy-zalogi-francuskiego-lotniskowca-charles-de-gaulle (17.04.2020).

[374] Ibidem.

[375] *Marynarz z lotniskowca USS Theodore Roosevelt zmarł na Covid-19*, access: https://www.portalmorski.pl/inne/44909-usa-marynarz-z-lotniskowca-uss-theodore-roosevelt-zmarl-na-covid-19 (16.04.2020).

[376] Supertanker transformed by the events of September 11, 2001 into a hospital ship of the US Navy. The unit was involved in the fight against COVID-19, and was to admit patients uninfected with the virus in order to relieve New York hospitals. Unfortunately, an oversight by staff members led to five people being admitted onto the ship with suspected coronavirus.

Finally, it should be mentioned that the coronavirus has also affected merchant ships. An example would be a South African mass carrier called, *nomen omen – Corona*[377].

CONCLUSIONS

Since the early 1990s, humanity is particularly fearful of infectious diseases, as it is plagued by deadly diseases caused by The Ebola, SARS, MERS, Marburg viruses. "Existing vaccines are often ineffective, cause side effects, or their protective properties last only a few months. For some diseases (...) there is still a lack of specific prevention"[378]. As Mr Krawczyk rightly points out, "Although the new SARS-CoV-2 coronavirus, which is now spreading around the world, and has been followed by uncertainty, fear and panic, is at the level of genetic material similar to the SARS virus that attacked humanity 17 years ago, it is brand new [379]. Fighting it is a huge challenge, and time is inexorable here, every day there are victims affected by the virus – in the form of more infected and fatalities.

As many as two – *Diamond Princess,* and *Grand Pricess* – of the many ships on which COVID-19 appeared revealed 800 laboratory confirmed cases of the disease. The limited space on board promotes an increase in infections, and thus carries the risk of an epidemic at sea. In addition, outbreaks on board pose a risk of infection spreading beyond travel – both passengers, and crew are multinational groups.

The case studies contained in this article point to the need to constant analyse past cases of illness, and the behaviour of the population (crew, passengers, shipowners, medical services, and finally state authorities) in the face of the threat, to verify and assess so that in the future the response is more adequate, more structured[380]. An important place in this respect is occupied by the principle of good practices in the area of learning from the experiences of others, cooperation, exchanging views, and adapting solutions. On this basis, plans, and procedures for preparing, preventing, and responding to a threat should be verified, modernized, and changed. The truth is, reality likes to verify plans. However, the implementation of safety assurance, following appropriate

[377] *Statek objęty kwarantanną z powodu Covid-19. To masowiec o niefortunnej nazwie „Corona"*, access: https://tech.wp.pl/statek-objety-kwarantanna-z-powodu-covid-19-to-masowiec-o-niefortunnej-nazwie-corona-6490239619291265a (20.03.2020).

[378] Z. Dziubek, A. Zieliński, D. Naruszewicz-Lesiuk, *Zagrożenia epidemiczne dla człowieka* [at:] *Katastrofy i zagrożenia we współczesnym świecie*, W. Baturo (edit.), PWN, Warszawa 2008, p. 154.

[379] E. Krawczyk, *Koronawirus…*, op. cit., p. 13.

[380] See also: *Coronavirus disease (COVID-19) Pandemic*, access: http://www.imo.org/en/MediaCentre/HotTopics/Pages/Coronavirus.aspx (13.04.2020).

planning, remains a significant challenge. In the implementation of the above-mentioned projects, it is important to raise the awareness of the average citizen about the threats (both real, and potential), and the possibilities of protecting against them (both individual, and group).

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[12] *Coronavirus disease (COVID-19) Pandemic*, access: http://www.imo.org/en/MediaCentre/HotTopics/Pages/Coronavirus.aspx (13.04.2020).

[13] *Cumulative number of coronavirus-positive (COVID-19) patients confirmed on Diamond Princess cruise ship docked in Japan as of April 16, 2020*, access: https://www.statista.com/statistics/1099517/japan-coronavirus-patients-diamond-princess/ (16.04.2020).

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[15] https://www.cdc.gov (16.04.2020).

[16] http://www.cdc.gov/nceh/vsp/surv/gilist.htm (11.04.2020).

[17] http://www.cdc.gov/nceh/vsp/surv/outbreak/2006/dec3freedom.htm (11.01.2015)

[18] http://www.cdc.gov/nceh/vsp/surv/outbreak/2006/nov13carnivalliberty.htm (13.03.2020).

[19] http://www.cdc.gov/nceh/vsp/surv/outbreak/2014/january21_explorer_seas.htm (11.01.2015).

[20] https://www.defense.gouv.fr/var/dicod/storage/images/base-de-medias/images/marine/batiments/charles-de-gaulle/charles-de-gaulle/233022-1-fre-FR/charles-de-gaulle.jpg (18.04.2020).

[21] https://www.princess.com/ships-and-experience/ships/di-diamond-princess/ (09.04.2020).

[22] http://www.royalcaribbean.com/ (19.05.2015).

[23] http://www.royalcaribbeancruises.pl/statki/klasa-oasis/oasis-of-the-seas/ (19.03.2020).

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[38] U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC), *No sail order and other measures related to operations*, access: https://www.cdc.gov/quarantine/pdf/signed-manifest-order_031520.pdf (16.03.2020).

[39] *WHO Director-General's opening remarks at the media briefing on COVID-19 – 11 March 2020*, access: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020 (13.03.2020).

CHOROBY ZAKAŹNE NA MORZU – CZŁONKOWIE ZAŁÓG I PASAŻEROWIE STATKÓW W OBLICZY PANDEMII COVID-19

ABSTRACT

Strach przed niewidzialnym wrogiem, jak zwykło się określać bakterie i wirusy nierzadko zaburzające lub zabierające zdrowie, towarzyszy ludzkości od tysięcy lat. W artykule przedstawiono przypadki zachorowań spowodowanych czynnikiem biologicznym wśród pasażerów i członków załóg na statkach. Wspomniano o incydentach, które miały miejsce w przeszłości. Wiodące rozważania Autora skupiły się na obecnej sytuacji (Pandemia COVID-19) zagrożenia czynnikiem biologicznym na jednostkach pływających.

Słowa kluczowe:

koronawirus, choroba zakaźna, pandemia, statek, załoga, pasażerowie

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RUSSIAN ANTI-ACCESS POTENTIAL (A2 / AD) ON THE CRIMEAN PENINSULA

ABSTRACT

The purpose of the following article is to present the military capabilities of the Russian Federation located on the Crimean peninsula, and to define in this context Russian A2/AD anti-access capabilities and their impact on the security architecture of the Black Sea region, in particular NATO's south-eastern flank.

Key words:

Russian Federation, A2/AD, NATO

INTRODUCTION

The development of Russia's A2/AD anti-access capabilities is a huge challenge for the Euro-Atlantic security architecture. The Russian Federation, aware of the conventional superiorance of NATO forces, is seeking to develop certain A2/AD capabilities on its western limits (a corridor allowing Russia to influence the security architecture of the countries lying on the Baltic-Black Sea platform). These extensive actions are aimed at neutralising NATO's military superiorities and creating a regional advantage for the Armed Forces of the Russian Federation. The implementation of these objectives may hinder the effective defence of countries on NATO's eastern outskirts, thereby undermining the credibility of the North Atlantic Alliance, particularly in terms of carrying out the tasks of Article 5 of the Washington Treaty.

In the Black Sea region, the Russian bastion A2/AD is played by the Crimean Peninsula, which in recent years has become an area of comprehensive and broad militarization. Numerous units have been deployed in the region, armed with modern means of destruction, which allow the Russian armed forces to project force in multiple domains. The scope and scale of the projects in this

area have radically changed the power structure in the Black Sea region and opened up new prospects, limited to 2014, for Moscow's strategic objectives in the Black Sea region and NATO's south-eastern flank, and even the Mediterranean.

The aim of the article is to show Russia's A2/AD capabilities in the Black Sea region, and to present the complications arising from them for NATO and the countries on the alliance's south-eastern flank. The publication consists of three parts. The first part of the article conceptualises issues related to the definition of A2/AD anti-access capabilities. The second part focuses on defining the geostrategic role of the Crimean peninsula in the context of the implementation of the Strategy for Political and Military Action of the Russian Federation in the Black Sea region. This section also analyses the military capabilities of the Russian Federation in Crimea. The last part of the publication outlines the scope of key Russian A2/AD capabilities in the Black Sea region and their direct impact on the security architecture of NATO's south-eastern flank.

ANTI-ACCESS DOCTRINE A2-AD – DEFINITION

Anti-access capabilities include operating in two areas – "Anti-Access" and "Area-Denial". The "Anti-Access" sphere (A2) refers to actions and abilities, usually long-range, designed to prevent enemy forces from entering the operational area. Counter-access measures are aimed at eliminating enemy forces approaching by air, sea, and land.. "Area-Denial" (AD) refers to actions and capabilities, usually of shorter range, designed to restrict the freedom of action of enemy forces already in the operational area. In addition, activities in both areas can be supported by a multidimensional operation in cyberspace [381].

Depending on the perception of the subject's challenges and threats, anti-access capabilities can be developed and shaped to conduct both defensive and offensive operations. In the first case, the expansion of these abilities is closely related to the fear of armed aggression of the enemy. The construction of A2/AD systems is designed to de-indue the enemy from a possible attack. The potential aggressor must reckon with the fact that a possible attack will involve large losses. In the case of offensive operations, projects in this area are determined by the ambition of the entity to create a new, own security architecture, most

[381] A. Erdogan, *Russian A2AD Strategy and Its Implications for NATO*, https://www.behorizon.org/russian-a2ad-strategy-and-its-implications-for-nato/, (access 7.03.20).

often along its limits (border areas). Capabilities in this area limit the possibility of intervention by external forces (support forces). The catalogue of resources used to build the A2/AD makes defensive capabilities also available for offensive operations and vice versa[382].

Tabela 1 Anti-access doctrine A2/AD

A2/AD Anti-Access/Area Denial	
A2 Anti-Access	**AD Area Denial**
Prevent, or de-prevent an enemy from entering the operational area	restriction of freedom of manoeuvre in the operational area

Source: own research.

Actions in two areas – 'Anti-Access' and 'Area-denial' – require the development of adequate weapons systems to ensure effective operations both in closer (AD), and long-range (AA). In the area of "Anti-Access", key capabilities include [383]:

- multi-layered integrated air defence systems (IADS) consisting of modern combat aircraft, ground, and mobile ground-to-air systems;
- long-range artillery systems and mlrs multi-propelled rocket launchers; Multi-platform ballistic missiles (air, sea, and land) against land and sea targets;
- submarines armed with supersonic cruise missiles;

The "Area-Denial" sphere includes actions, shorter range, designed to make it difficult for the enemy to conduct operations in the immediate area of a potential crisis, or armed conflict. As part of the AD actions, key capabilities can be [384]:

- short-range air defence systems;
- armored combat vehicles;

[382] T. Kelly, D.C. Gompert, D. Long, *Smarter Power, Stronger Partners, Volume I,* RAND Corporation 2016, p. 38.
[383] A. Erdogan, *Russian A2AD Strategy and Its Implications for NATO*, https://www.behorizon.org/russian-a2ad-strategy-and-its-implications-for-nato/, (access 8.02.20).
[384] J. Gordon, J. Matsumura, *The Army's Role in Overcoming Anti-Access and Area Denial Challenges,* RAND Corporation 2013, p. 28.

- attack helicopters armed with m.in precision ammunition;
- large number of short-range guns (heavy mortars, rocket launchers) armed with precision-guided missiles;
- extensive minefields. unmanned aerial vehicles.

CRIMEA – MILITARY ROLE AND POTENTIAL

The annexation of Crimea in 2014 demolished the security architecture of the Black Sea region at the time. Russia currently controls the second most important strategic point on the Black Sea map, right across the Turkish Bosphorus and Dardanelles – Crimean Peninsula. Russian control of this key area is changing the existing arrangement of forces in the Black Sea. The inclusion of the peninsula in the structure of the Russian Federation has increased its military capabilities in the region, and Crimea itself has undergone deep and comprehensive militarisation – by the end of 2025, a large troop component is planned to be deployed (around 43 000)[385][386]. The militarisation of Crimea serves two complementary sets of objectives, implemented in two dimensions – in the Black Sea region and in the Mediterranean. In the Black Sea region, these include: [387]

- building an anti-access zone (A2/AD);
- counterbalance NATO's anti-ballistic missile (ABM) activities in The Romanian Deveselu;
- creating a threat to US troops stationed at the Romanian Kogalnicean Air Base; the creation of a pressure platform and future operations in southern Ukraine and Georgia;
- strengthening Russia's position as the most important actor in the South Caucasus.

In a broader perspective, the militarization of the Crimean peninsula is intended to enable the Russian Federation to project multidimensional forces, including the Mediterranean sea and even part of the northern Levee. These

[385] P. Mickiewicz, *Strategiczne znaczenie aneksji Krymu dla rosyjskiej polityki bezpieczeństwa*, [at:] *Rosyjska myśl strategiczna i potencjał militarny w XXI wieku,* P. Mickiewicz (edit.), Warszawa 2018, p. 283.
[386] R. Minich, *Russia Shows its Military Might in the Black Sea and Beyond*, www.atlanticcouncil.org/blogs/ukrainealert/russia-shows-its-military-might-in-the-black-sea-and-beyond,(access 6.02.20).
[387] G.Visan, O.Manea, *Crimea's transformation into an access-denial base*, http://bsad.roec.biz/portfolio-item/crimeas-transformation-into-an-access-denial-base/, (access 14.02.20).

assumptions determine the further development of military capabilities to ensure:[388]

- the possibility of exerting political and military pressure on Turkey in order to enforce the expected formula for the use of the Bosphorus and the Dardanelles;
- the permanent presence of the Russian navy in the eastern Mediterranean; military authority in Syria (A2/AD capability building);
- integration with other military resources in the Caspian Sea, Iran, and the Mediterranean the possibility of exerting political and military pressure on Turkey in order to enforce the expected formula for the use of the Bosphorus and the Dardanelles; the permanent presence of the Russian navy in the eastern Mediterranean; military authority in Syria (A2/AD capability building); integration with other military resources in the Caspian Sea, Iran, and the Mediterranean.

The potential of the Russian armed forces in the Crimean peninsula continues to increase. The authorities in Moscow almost immediately, after the annexation of Crimea, took steps to locate new military units in the region. In the nine months since Crimea was seized, 40 new units have appeared there [389]. It is currently estimated that around 30,000 people are stationed on the peninsula[390]. The troops of the Russian Federation, which are largely subject to the Ministry of Defence of the FR, in the operational subordination of the Headquarters of the Black Sea Fleet. In addition, the capabilities located in the region are strengthened units by other force ministries, e.g. fsb border troops, or 112. The Brigade of Internal Troops of the so-called Rosgwardia[391].

GROUND COMPONENT OF GROUPING IN CRIMEA

The main binder of land assets in Crimea is the command of the 22nd Army Corps with its headquarters in Simferopol, established in February 2017. The

[388] J. Sherr, *Ukraine and the Black Sea Region: The Russian military perspective*, [at:] *The Russian Military in Contemporary Perspective,* S J. Blank (edit.), The Strategic Studies Institute (SSI) 2019, pp.802-803.
[389]K. Czerniewicz, *Obwód Kaliningradzki i Krym czyli ufortyfikowane twierdze Rosji,* oaspl.org/2016/01/28/obwod-kaliningradzki-i-krym-czyli-ufortyfikowane-twierdze-rosji/, (access 15.02.20).
[390] *International security and Estonia 2019*, Estonian Foreign Intelligence Service, Tallin 2019, p. 30.
[391] M. Gawenda, *Twierdza Krym. 5 lat po aneksji [ANALIZA],* https://www.defence24.pl/twierdza-krym-5-lat-po-aneksji-analiza, (access 17.02.20).

Army Corps itself is the basis for commanding land forces, incl. for the defense of the coast of the Crimean peninsula. The 22nd Army Corps consists of:[392]

- **810th Independent Marine Brigade of the Black Sea Fleet (Sevastopol) –** consisting of three battalions of marines, a reconnaissance company and sharpshooters. The brigade also includes an artillery squadron and other subdivisions;
- **501st Independent Marine Battalion (Theodosia) –** consists of three Marine companies, and a mortar battery. This battalion was created on the basis of two battalions of the Ukrainian marines.
- **475. Radioelectronic Warfare Center (Sevastopol) –** a key center of electronic struggle in the Black Sea region. Units included in the structure of this unit are equipped with new means of radio-electronic combat, e.g. Murmansk-BN, R-330Ż disturbance station, R-934BMW disturbance station, WRE RB-531B mobile system;
- **126th Independent Coastal Protection Brigade (Perevalne) –** consists of three battalions (mountain battalion, mechanized battalion, and marine infantry), and support units (armored battalion (T-72B3), and squadrons of barrel, rocket, and anti-aircraft artillery. The brigade was created on the basis of Ukrainian 36. Coastal Army Brigades;
- **15th Independent Coastal Artillery and Missile Brigade (Sevastopol) –** consists of three anti-ship missile squadrons, armed, among others, with in K 300P Bastion-P mobile coastal defense systems and 3K60 Bal mobile anti-ship systems;
- **854th Independent Coastal Missile Regiment (Sevastopol) –** armed with a mobile anti-ship coastal defense system 4K51 Granitsa;
- **127th Reconnaissance Brigade (Pargolovo) –** a tactical compound intended for reconnaissance activities. It consists of a command battalion, a special-purpose battalion, a radio-electronic reconnaissance battalion, and a company of unmanned aerial vehicles;
- **1096. Independent Missile Anti-Aircraft Regiment (Sevastopol) –** a tactical compound designed to protect, inter alia, infrastructure essential for security and ships of the Black Sea Fleet. The regiment is equipped with Buk-M2 ground-air missile systems;
- **8. Independent Coastal Artillery Regiment (Simferopol / Perevalne) –** the regiment consists of three squadrons: barrel (2S19 Msta-S - 152 mm self-propelled howitzer), missile (BM-21 and 2B26 Grad, 9P140 Uragan) and anti-tank (MT- 12 Rapira, 9K123 Krizantiema-S);

[392] M. Gawenda, *Twierdza Krym. 5 lat po aneksji [ANALIZA],* https://www.defence24.pl/twierdza-krym-5-lat-po-aneksji-analiza, (access17.02.20).

- **388. Sea Reconnaissance Point (Sevastopol) –** reconnaissance unit of the nature of naval special-purpose forces. It consists of two companies of the special forces, and an underwater mining company;
- **68th Independent Marine Engineering Regiment (Yevpatoria) –** consists of three battalions: engineering, engineering and sapper, engineering and technical;
- **4th Radiation, Chemical and Biological Defense Regiment (Sevastopol) –** consists of three battalions equipped with, among others: thermobaric rockets (flamethrowers) type TOS-1 and TOS-1A, and subunits of flamethrowers on BMO-T transporters;
- **133. Material and Technical Security Brigade (Bakhchisaray) –** a unit intended to carry out tasks resulting from ensuring the combat readiness of the Armed Forces of the Russian Federation in the area of the Crimean Peninsula;
- **171st Independent Battalion of the 7th Division of VDV, Jankoj;**
- **47th Territorial Defense Division, Sevastopol.**

When analyzing the military potential of the land forces in Crimea, one should also take into account the prospects of rearming the region with Iskander-M ballistic missiles. Although the Russian Federation has not yet confirmed the information about the deployment of such systems in Crimea, according to numerous reports and analyzes, the Iskander-M systems are already installed in the region (in the strength of one squadron)[393].

WKS ANTI-AIRCRAFT DEFENSE

The anti-aircraft and anti-missile defense over the Crimea is provided by the 31st Anti-Aircraft Defense Division, which consists of two regiments armed with S-400 systems and a radio engineering regiment. Elements of the division are located in Sevastopol, Feodosia and Yevpatoria[394].

- **3. Radiotechnical Regiment (Sevastopol);**
- **12. Anti-Aircraft Regiment (Sevastopol / Yevpatoria) –** equipped with two squadrons of S-400 systems (24 launchers in total);

[393]*Russia amasses 32,000 troops, Iskander and S400 systems in Crimea – Ukraine* https://www.unian.info/politics/10093373-russia-amasses-32-000-troops-iskander-and-s400-systems-in-crimea-ukraine.html, (access 17.03.20).
[394]M. Dura, *Twierdza Krym. Rosja cementuje wojskową architekturę półwyspu,* https://www.defence24.pl/twierdza-krym-rosja-cementuje-wojskowa-architekture-polwyspu, (access 17.03.20).

- **18th Guard Anti-Aircraft Regiment (Teodosia / Jankoy) –** armed with two squadrons equipped with S-400 systems – in Feodosia and Jankoy (8 launchers per squadron). Additionally, the regiment has a Pancyr-S1 anti-aircraft systems squadron in stock.

AVIATION OF THE BLACK SEA FLEET

The aviation of the Black Sea Fleet is based on the recently appointed 2nd Air Force Division of the Naval Fleet – VMF (Voyyenno-Morskoy Flot), whose command is stationed on a daily basis at the Novofiodorovka base. The structures of the division on the Crimean Peninsula include: the 43rd Naval Assault Regiment, and the 318th Mixed Aviation Regiment[395].

- **43rd Naval Assault Aviation Regiment (Sevastopol, Saki)** – the main strike component of the Black Sea Fleet Aviation. The equipment includes Su-30SM, Su-24M and Su-24MR combat aircraft. In 2015, the regiment began to be equipped with multi-role Su-30SM fighters.
- **318th Mixed Aviation Regiment (Sevastopol, Kacha)** – the regiment has, among others, Mi-8 and Ka-27 helicopters, An-26 transport aircraft and Be-12 flying amphibians.

AIR-SPACE FORCE (*VOZDUSHNO-KOSMICHESKAYA SILA*, VKS)

At the end of 2014, the Ministry of National Defense of the Russian Federation officially announced the formation of the 27th Mixed Air Division with staff at Belbek Airport near Sevastopol. Currently, this division is made up of three regiments[396].

- **37th Mixed Air Regiment (Gwardejskoje)** – consists of two squadrons, bomb, and assault, 12 aircraft each. Equipped with the Su-24M, and Su-25SM regiments.
- **38th Hunting Regiment (Sevastopol/Belbek)** – consists of two squadrons. The regiment is equipped with Su-27P, Su-27UB, Su-27SM,

[395]M. Dąbrowski, *Nowe dywizje lotnicze w Obwodzie Kaliningradzkim i na Krymie*, https://www.defence24.pl/nowe-dywizje-lotnicze-w-obwodzie-kaliningradzkim-i-na-krymie, (access 17.02.20).
[396] M. Dura, *Twierdza Krym. Rosja cementuje wojskową architekturę półwyspu,* https://www.defence24.pl/twierdza-krym-rosja-cementuje-wojskowa-architekture-polwyspu, (access 17.02.2020).

Su-30M2 aircraft. The unit is gradually reused for new Su-30SM aircraft (one squadron). The regiment is scheduled to have about 30 machines.

- 39th Helicopter Regiment (Jankoj) **– consists of three squadrons: a transport and combat squadron (Mi-8) and two strike squadrons (Mi-35M and Ka-52).**

NAVAL COMPONENT OF THE BLACK SEA FLEET IN CRIMEA

The annexation of Crimea has also increased the operational capabilities, and capabilities of the Russian Black Sea Fleet. The previous Russian-Ukrainian agreements of 1997 governed the rules for the stationing of the Black Sea Fleet on Ukrainian territory. As a result of the events of 2014, Russia has been given full freedom to build its capacity and location on the peninsula[397]. More importantly, Russia, with its annexation of Crimea, has regained the strategic port of Sevastopol, which is home to about 80 percent of the Black Sea Fleet's total capabilities. This port is the only year-round, non-frozen, and deep-water Russian port in the region where large warships are able to moor[398]. Today, the Black Sea Fleet consists of about 21 main naval battleships and 7 submarines and about 200 auxiliary ships, located mainly in Sevastopol, as well as in smaller bases in Feodosia (also in Crimea) and Novorossiysk[399].

- **The 30th Naval Division –** is a key impact component of the Black Sea Fleet, which brings together the largest naval vessels in its resources. This division is regularly rearmed. In 2016, admiral Grigorowicz and Admiral Essen were commissioned, and admiral Makarov in 2017. It is worth adding that with offensive potential 30. The Black Sea Fleet Division is not only determined by water-based ships armed with Calibr-class cruise missiles, but also by submarines, which can also target targets with such missiles.
- **41st Small Rocket Ship Brigade –** equipped with several small missile ships, project 1239 and 12341, and several rocket cutters, project 12411/M.
- **68. District Water Protection Ship Brigade –** having smaller ships and mines trawl, auxiliary, security, rescue, hydrographic, etc.

[397] A. Wilk, *Militarne konsekwencje aneksji Krymu,* www.osw.waw.pl/pl/publikacje/analizy/2014-03-19/militarne-konsekwencje-aneksji-krymu, (access 7.03.20).
[398] A. Schneider, *Russia's Black Sea Fleet Buildup,* https://www.maritime-executive.com/editorials/russias-black-sea-fleet-buildup, (access 14.02.20).
[399] S. Wezeman, A. Kuimova, Russia and Black Sea security, „SIPRI Background Paper", December 2018, p. 9.

- **102. Special Purpose Division for the fight against underwater diversion –** the branch consists of the special forces scuba divers, and anti-diversionary cutters of the project 21980 Graczonok. The task of the detachment is to protect the infrastructure and ships of the Black Sea Fleet
- 197th Amphibious Ship Brigade – **consists of several amphibious vehicles, project 775/775M and 1171.**

AIR-SPACE DEFENSE

There are also space control, and reconnaissance measures on the Crimean peninsula. The main units of this type of armed forces in the region include 40. Command and Measurement Centre in Eupatoria, Composed of 40 The centre also enters 808. Radiotechnical Node in Sevastopol. Part of the Air and Space Defence forces is also an outpost near Sevastopol with long-range radar type 5N86 Dnepr[400].

CRIMEA – RUSSIAN STRONGHOLD A2/AD

The annexation of Crimea has increased the military capabilities of the Russian Federation in the Black Sea region. A key element in this dimension, enabling the implementation of the Kremlin's strategic interests in the region, has been the development of instruments for isolating the battlefield, defined by the Western nomenclature with A2/AD anti-access capabilities. An analysis of the military capabilities located in Crimea shows that the Russian Federation has many instruments that can interact in many domains (air, sea, land, and cyberspace) in terms of A2/AD capabilities. Key ones include:

- **S-400 air defence systems –** mobile anti-aircraft and anti-missile system, which can simultaneously target multiple targets. Its maximum range is 400 kilometers [401].
- **Calibr maneuvering missiles –** all versions of the Calibr range of maneuvering missiles (3M-54, 3M-14) can be fired from submarines, and water-based ships from a vertical launch pad. In addition, this system can be operated from ground and air platforms. Depending on their configuration, they are able to destroy enemy ships (water and

[400] M. Gawenda, *Twierdza Krym. 5 lat po aneksji [ANALIZA],* https://www.defence24.pl/twierdza-krym-5-lat-po-aneksji-analiza, (access 17.02.20).
[401] T. Smura*, Rosyjskie zdolności w zakresie środków izolowania pola walki (A2AD) – wnioski dla NATO,* Fundacja Pułaskiego, Warszawa 2017, p. 4.

underwater) with 3M54 maneuvering missiles (NATO: SS-N-27 Sizzler) with a range of up to 250 km (155 miles), or target land targets with 3M-14 maneuvering missiles (NATO: SS-N-30A Calibr) within 2,500 km[402].

- **Oniks-class missiles (from the "Bastion" system) –** mobile coastal defence system, designed mainly for tasks in the field of combating water ships. The system is armed with P-800 Oniks missiles, the range of which varies, depending on the flight altitude, from 120 km to 300 km. Bastion-P also has the ability to destroy land targets[403].
- **Missile anti-ship complexes "Bal"–** mobile coastal missile systems, designed primarily for the defence of naval bases, land facilities, and coastline. Rockets have a maximum range of up to 120 km[404].
- **mobile launcher system "Iskander-M" –** mobile system, designed to destroy, using ballistic missiles, targets in the operational depth of the formation of enemy forces (range up to 500 km). It is a dual-use system designed to carry out both conventional, and tactical nuclear strikes (range up to 700 km)[405].
- **Murmansk-BN Krasucha-4 –** reconnaissance systems interfering with great power. A system that provides for "access" to the area, and its effective mirroring. They provide the possibility of jamming radiolocation signals (interception, interfering with signals emitted by reconnaissance satellites, early warning aircraft, unmanned aircraft, and ground stations) within a radius of 150 to 300 km[406].

In the land domain, mobile Iskander – M ground-based missile systems play a key role, which are designed to prevent, or significantly impede enemy forces' access to territories controlled by the Russian Federation, or allied countries. These systems are capable of destroying the key infrastructure, bases, and concentration of NATO countries Bulgaria and Romania (located on the outskirts of the Black Sea). Although in the current configuration, the range of Iskander-M systems does not directly threaten the Romanian Deveselu air base,

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[402] B. Hodges, J. Bugajski, P. B. Doran, *"Securing the Suwalki Corridor. Strategy, Statecraft, Deterrence and Defense*", Center for European Policy Analysis CEPA, Washington 2018, p. 20.
[403] *P-800 Oniks,* http://www.military-today.com/missiles/p800_oniks.htm, access 18.02.20.
[404] M. Dura, *Rosjanie testują „nowe" nadbrzeżne wyrzutnie rakietowe Bał,* www.defence24.pl/rosjanie-testuja-nowe-nadbrzezne-wyrzutnie-rakietowe-bal, (access 6.03.20).
[405] R. McDermott, T. Bukkvoll, *Russia in the Precision-Strike regime– military theory, procurement and operational impact,* Norwegian Defence Research Establishment (FFI) 2017, p. 11.
[406] T. Smura*, Rosyjskie zdolności w zakresie…, op. cit.,* p. 4

where NATO missile defence assets are installed, as part of the European Phased Adaptive Approach programme (EPAA)[407] it should be noted, that the same system may pose an imminent threat to the key Romanian air base Mihail Kogălniceanu. This base is located in eastern Romania. It was used by American troops as a logistical base during the wars in Afghanistan and Iraq. Following the annexation of Crimea, the base hosts US and NATO troops on a daily basis, and accepts air assets as part of NATO's "Air Policing" mission in the Black Sea region[408]. The situation is similar for the Bulgarian logistics base in Aitos, where both Bulgarian, and American soldiers are stationed. It should be noted, however, that key military bases in both Bulgaria and Romania are beyond the range of Russian Iskander-M missile systems. The possible location of these systems, e.g. in Sevastopol, will result in the Russian Federation being able to destroy critical transport hubs (ports, airports), and the infrastructure necessary for the adoption of North Atlantic Alliance troops located exclusively in the eastern areas of Romania and Bulgaria (near the Black Sea). Iskander-M systems pose a much greater threat to Ukrainian positions. Within the scope of such systems at, among others, the third largest city in Ukraine - Odessa[409]. It should be stressed that Iskander-M systems can be armed with a nuclear warhead. This fact enables Russia to use these systems as a tool of psychological pressure, or intimidation.

While ground forces can capture, control and maintain the area, it should be taken into account, that air strikes are the main challenge, and threat to the assets of air landing landers. In view of the devastating effects that an effective air operation may have on land targets, it is necessary to provide comprehensive air defences within the A2/AD network. The capabilities in this area are intended to help repel the aggression of the enemy air force, and to ensure the defence of objects and troops deployed in the area against air strikes. With regard to Russia's A2/AD capabilities in this area in Crimea, it should be noted that the Integrated Air Defence System (IADS) involves functioning particularly in two

[407] EPAA (more: Phased Adaptive Approach, which EPAA i san European part) is the flagship program in the field of missile defense of European NATO members, based on the technical solutions of the American anti-ballistic system Aegis Ashore. M. Maciejewski, *Druga faza EPAA wykonana,* http://zbiam.pl/artyku%C5%82y/druga-faza-epaa-wykonana/, (access 8.03.20).

[408] *Romania plans to spend EUR 2.5 bln to rebuild military base at NATO standards,* https://www.romania-insider.com/romania-rebuild-mihail-kogalniceanu-military-base, access 18.02.20.

[409] O. Manea, G. Visan, A. Gosu, E. Gusilov, *Black Sea in access denial age. Special report,* Romania Energy Center (ROEC) 2016, p. 13.

dimensions. In the first main role play fighter aircraft and bombers. The second dimension focuses on land-based ground-to-air missile systems (Surface To Air Missile). IADS measures are intended to prevent all aircraft, including aircraft, manoeuvring missiles, and other systems, from operating freely[410].

The first layer of airspace protection under the Russian A2/AD is provided by aircraft with the ability to conduct operations over long distances with the ability to attack both air, and land targets of the enemy. The key in this respect is the assets held by: 43. Naval Assault Air Regiment, 37. Mixed Air Regiment and 38. Hunting Regiment. The Su-27SM Flanker and four Su-30 Flanker-C aircraft are fourth-generation fighters, and some of the best aircraft in the State of the Russian Air Force. Their effective range is more than 3,500 km, and both aircraft can carry up to ten air-to-air missiles (firing range up to 80 km). However, this potential will be increased. According to official information, the Russian Federation has been consistently seeking to re-image these resources with Su-30SM aircraft, which are a slightly modified version of the Su-30 aircraft since 2015. The Su-30SM multirole has the capability to both fighter, and attack ground, and water targets with a wide range of means of destruction[411]. Along with fighter aircraft, the Russian Federation also deployed a squadron of Tu-22M3, Tu-95, and Su-34 bombers (fighter-bombers) to Crimea. US and NATO bases, and command centres in the Black Sea region will be one of the main targets of potential bombing. From a political point of view, the presence of a strategic bomber fleet will be used by Moscow to try to intimidate, and blackmail weaker NATO members in the region[412].

The last, and perhaps most important part of the Russian A2/AD in the area of integrated air defence, focuses on the S-400 ground air defence systems, which are equipped with 12. Anti-Aircraft Regiment, and the 18th The Guard Anti-Aircraft Regiment. The S-400 systems provide a multi-layered, comprehensive air defence network capable of protecting important targets from attacks by enemy aircraft and combating ballistic, and maneuvering missiles. The S-400 covers much of Ukraine, including the territory of the

410 Francis, T., & Manea, O, *The Black Sea and NATO in the Age of Access-Denial*, *The Black Sea and NATO in the Age of Access-Denial*. „Studia Politica: Romanian Political Science Review", Vol. 18, No. 3, 2018. p. 492-494.

411 *Squadron of Russia's newest Su-30SM fighters formed in Crimea,* https://tass.com/defense/860398, (access 20.02.20).

412 G.Visan, O.Manea, *Crimea's transformation into an access-denial base*, http://bsad.roec.biz/portfolio-item/crimeas-transformation-into-an-access-denial-base/, (access 14.02.20).

separatist self-proclaimed Donetian People's Republic, as well as much of the Black Sea, as far as the northernmost promontory of Turkey and the east coast of Bulgaria, and much of Moldova and Romania. All these countries, with the exception of Ukraine, are members of NATO [413]. Given the importance of air superiorance in any conventional conflict, Russia's A2/AD assets in this regard represent a very serious obstacle to strengthening, and defending NATO's south-eastern flank countries. Capabilities in this area may result in countries in the Black Sea region being deprived of NATO air support in the first phase of a possible conflict, or crisis.

However, the most valuable area for Russian A2/AD operations in the Black Sea and the Eastern Mediterranean is probably the maritime area. After the annexation of Crimea, there was a significant expansion of the Russian military presence in the Black Sea region. Most ships in the Black Sea Fleet have been armed with Calibr missiles, which, depending on their configuration, are capable of destroying enemy water, and submarine ships with 3M54 maneuvering missiles, with a range of up to 250 km (155 miles), or destroying land targets with 3M-14 cruise missiles within a range of 2,500 km. Adding to this the capabilities of the submarine fleet also armed with such missiles, one gets
a picture in which Russia has developed a huge A2/AD "bubble" for land and sea forces, covering the whole of Eastern Europe, and much of the Mediterranean.

Capabilities in the maritime domain are also strengthened by bastion-P coastal defence systems, and "Bal" anti-ship missile complexes. The "Bal" systems themselves are primarily designed to defend naval bases, land facilities, and the coast. From the point of view of A2/AD, the Russian capabilities acquired under the Bastion – P coast defence systems are particularly important. In addition, it should be noted that these systems are also capable of destroying land targets. In this configuration, the missile range also includes ground-based targets off the coasts of NATO countries Romania and Turkey[414].

[413] *Russian Forces Strengthen their Defences in Crimea; State of the Art Weapons Systems Deployed to Protect Newest Province*,
https://militarywatchmagazine.com/article/russian-forces-strengthen-their-defences-in-crimea-state-of-the-art-weapons-systems-deployed-to-protect-newest-province, (access 20.02.20).
[414] M. Zaniewicz, *Znaczenie i konsekwencje militaryzacji Krymu przez Rosję,*
https://pism.pl/publikacje/Znaczenie_i_konsekwencje_militaryzacji_Krymu_przez_Rosje, (access 7.03.2020).

An integral part of the A2/AD doctrine is the action taken in cyberspace to paralyse, among others, of reconnaissance and counter-command systems. According to previous information, Russia has reconnaissance systems in Sevastopol that interfere with the great power of Murmansk-BN, which can affect, among others, all NATO ships within range of even the Mediterranean region[415].

Table 2. Key Russian A2 / AD capabilities in Crimea

MILITARY COMPONENT	RANGE AND EFFECTIVENESS	POTENCIAL
FORCES OF THE BLACK SEA FLEET	• CAPABILITY TO SHOOT THE WHOLE BLACK SEA WATER • LOCKING CAPACITY, INCLUDING, BOSFOR AND DARDANEL STRAINS, AND KERCHIN STRAINS	DEFENSIVE OFFENSIVE
"ISKANDER - M" ROCKET SYSTEM	• ABILITY TO DAMAGE TERRESTRIAL AND COASTAL TARGETS: UKRAINE, ROMANIA, BULGARIA	OFFENSIVE
MARINE AND LAND "CALIBR" ROCKET SYSTEMS	• CAPABILITY TO HIT SEA (250KM) AND LAND TARGETS AT 2,500 KM	OFFENSIVE
K-300 BASTION COAST PROTECTION SYSTEM	• BLOCKADE OF NATO MARITIME FORCES IN BLACK SEA PORTS • CAPABILITY TO HIT SEA UNITS IN THE BLACK SEA WATER • DESTROYING TERRESTRIAL TARGETS ON THE COAST OF TURKEY AND ROMANIA	DEFENSIVE OFFENSIVE
ANTI-DRIVE ROCKET COMPLEX "BAL"	• DEFENSE OF MARINE BASES, LAND, AND COASTAL FACILITIES	DEFENSIVE

[415] R. Minich, *Russia Shows its Military Might in the Black Sea and Beyond*, www.atlanticcouncil.org/blogs/ukrainealert/russia-shows-its-military-might-in-the-black-sea-and-beyond, (access 6.03.2020).

S-400 ROCKET SYSTEMS	• POSSIBLE TO DESTROY THE AIR TARGETS WITHIN 400 KM	DEFENSIVE OFFENSIVE
MURMANSK-BN RADIOELECTRONIC WARFARE SYSTEMS	• JAMMING OF RADIOLOCATION SIGNALS WITHIN 300 KM.	DEFENSIVE OFENSIVE

Source: *own research*

CONCLUSIONS

The analysis of capabilities located on the Crimean peninsula, presented in the article shows, that Russia has a wide range of armaments, which is part of the assumptions of the anti-access concept A2/AD. The capability characteristics in this area have shown that the Russian Federation in the Black Sea region is building a universal Model A2/AD, which can be used for both offensive, and defensive purposes. However, it can be seen that most of A2/AD's key assets have the ability to conduct offensive operations. This fact is crucial in the perception of the challenges to modern security architecture in the Black Sea region. The development of Russian A2/AD capabilities determines the immediate threat to countries on the south eastern flank of the North Atlantic Alliance. The armed forces of the Russian Federation have acquired the ability to project a multidimensional force, including the use of precision-destroying means, within reach of most strategic positions in the Black Sea region. These factors may condition NATO's potential operations in the Black Sea. In the event of a potential conflict, or crisis, Russia's A2/AD capabilities may hinder, or even prevent the free access of NATO support forces to the area of operations on the North Atlantic Alliance's south-east flank.

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