

# US Army Heritage and Education Center



Historical Services Division

## TELL ME HOW THIS ENDS: THE US ARMY IN THE PANDEMIC ERA

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**Tell Me How This Ends: The US Army in the Pandemic Era**

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*“Everything we do before a pandemic will seem alarmist. Everything we do after a pandemic will seem inadequate. This is the dilemma we face, but it should not stop us from doing what we can to prepare.”*

*-Michael O. Leavitt, Secretary, US Department of Health and Human Services, 2005-2009<sup>i</sup>*

**Executive Summary**

After the 9/11 attacks, Americans yearned for a “return to normal.” The normal they longed for was the world as it was on September 10th, or status quo ante. That was impossible, however, because the events of that day irrevocably changed the world. The new normal, the status quo post, was the world as it was after 9/11. The same must be said for COVID-19. . . . We cannot return to the world before we understood the terms “social distance,” “herd immunity,” or “flatten the curve.” The Army was not prepared for the COVID-19 pandemic, but neither was the nation nor the world. Given the information now known about the virus and the expert predictions that a second wave might occur soon, the Army is better prepared to plan for potentially operating under pandemic conditions. Experts warn that a true second wave arriving in the fall or winter could be much worse than the first. If the

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coronavirus behaves as the Spanish flu virus did in 1918-1919, then a third wave might be expected as well.

With these events in mind, the Army may expect momentous changes in the coming years. Initially, the Army will be called upon for its vast resources, labor, and specific rapidly deployable capabilities, as has been demonstrated during the initial wave of the pandemic. The Army will also be viewed as an income generator by providing economic support to small contractors that will support both their local economies and the larger defense industry. But the pandemic's long-term effect on the world economy will be devastating and possibly catastrophic. The next administration will face the challenge of using military resources to support communities while reducing defense budgets. Though the defense budget is only a small part of the US budget, it forms a large part of the discretionary spending. The budget cuts, when they come, will fall, as always, disproportionately on the Army. Reducing the Army budget is, and always has been, quicker, easier, and less visibly economically damaging than cutting the budgets of the other services. This is because cuts to the other services' budgets means cancelling large multiyear contracts that employ thousands of workers while reducing the Army budget inevitably means reducing manpower. This study examines the Army's necessary steps over the next two years (see App. 1).

## Table of Contents

Executive Summary.....	i
The Black Swan: .....	1
The Army and Pandemics: Historical View .....	2
1. Introduction:.....	2
Table 1- World Health Organization (WHO) Classifications .....	2
2. Lessons Learned: Influenza 1918 .....	2
Figure 1- 1918 Spanish Flu Mortality Rate.....	3
3. Lessons Learned: World War II.....	4
4. Lessons Learned: Ebola Outbreak (2014-2015) .....	4
Looking Forward.....	6
1. Second Wave.....	6
Figure 2—Possible Pandemic Wave Scenarios for COVID-19 .....	7
2. Third Wave .....	7
3. Herd immunity .....	7
4. Health Outlook.....	8
• Development:.....	8
Doctrine & Readiness: .....	9
1. Short Term - 0-6 Months:.....	9
• Mission Command: .....	9
• Infection and Mortality Rate:.....	10
Table 2-- Table of COVID-19 Infection .....	10
• Reinfection and Recovery.....	10
2. Mid-Term - 6-12 Months:.....	11
• Natural Disasters .....	11
• Medical Support to Civilian Agencies (Borrowed Military Manpower): .....	11
3. Long Term - 12-24 Months:.....	11
• Training Deployments: .....	11
• COVID Testing for Readiness:.....	11
Figure 3-- Organization Vignette .....	12
Organization:.....	12
1. Short Term - 0-6 Months:.....	12
• ARNORTH as Joint Force Land Component Command (JFLCC): .....	12
2. Mid-Term - 6-12 Months:.....	13
• Storm Season: .....	13
Table 3- Probabilities for At Least One Major (Category 3-4-5) Hurricane Landfall .....	13

3.	Long Term - 12-24 Months:	13
•	Possible restructuring for greater DSCA:	13
	Training & Education:	14
1.	Short Term - 0-6 Months:	14
•	Loss of Unit Cohesion:	14
•	Cadet Summer Training:	14
2.	Mid-Term - 6-12 Months:	15
•	Blended learning:	15
•	Combat Training Centers (CTC):	15
•	ACFT:	15
3.	Long Term - 12-24 Months:	16
•	Initial Entry Training:	16
	Leadership:	17
1.	Short Term - 0-6 Months:	17
•	Preparation	17
•	Strategic communications:	17
2.	Mid-Term - 6-12 Months:	17
•	Adaptation	17
•	Leader Responsibility	17
3.	Long Term - 12-24 Months	18
•	Senior Leader Exposure	18
	Figure 5- Material and Sustainment Vignette	19
	Material and Sustainment:	19
1.	Short Term - 0-6 Months:	19
•	Masks and PPE	19
2.	Mid-Term - 6-12 Months:	19
•	Subsistence Stockpiling:	19
3.	Long Term - 12-24 Months:	20
•	Just in Time Logistics:	20
•	Destruction of food supply:	20
•	Defense mitigation actions:	20
	Personnel:	21
1.	Short Term - 0-6 Months:	21
•	Quarantine:	21
2.	Mid-Term - 6-12 Months:	21
•	Recruiting:	21
•	Army as Economic Engine	21
3.	Long Term - 12-24 Months:	21
•	Effects on Mental Health:	21

Facilities .....	22
1. Short Term - 0-6 Months: .....	22
• Screening and Testing .....	22
2. Mid-Term - 6-12 Months: .....	22
• Tracking Teams .....	22
3. Long Term - 12-24 Months: .....	22
• PCS Moves .....	22
• Quarantine -- .....	22
Policy .....	23
1. Short Term - 0-6 Months .....	23
• HPCON: .....	23
2. Mid-Term - 6-12 Months: .....	23
• BAS/Separate Rations: .....	23
3. Long Term - 12-24 Months: .....	23
• Coronavirus Survivors: .....	23
Modernization & Innovation .....	24
1. Short Term - 0-6 Months .....	24
• Interruptions: .....	24
• Sensors: .....	24
2. Mid-Term - 6-12 Months: .....	24
• Factory closures: .....	24
• Expanded Remote Access Capacity: .....	25
3. Long Term - 12-24 Months: .....	25
• Personal Protective Equipment (PPE): .....	25
• Routine and preventive medicine: .....	26
Figure 7- Increase in DoD Telework Capacity .....	26
• Defense Industrial Base Resiliency: .....	27
Figure 8 - Funding Vignette .....	28
Funding .....	28
1. Short Term - 0-6 Months: .....	28
• Executing FY 20 budget .....	28
2. Mid-Term - 6-12 Months: .....	28
• Executing FY 21 budget: .....	28
• Regulatory relief: .....	28
3. Long Term - 12-24 Months: .....	28
• Economic changes: .....	28
• Budget bubbles and POM problems: .....	29
Defense Support to Civil Authorities (DSCA): .....	30

1.	Short Term - 0-6 Months:.....	30
•	Continuing support to FEMA and DSCA:.....	30
2.	Mid-Term - 6-12 Months:.....	30
•	Continuing support to FEMA and DSCA:.....	30
3.	Long Term - 12-24 Months:.....	31
•	Continuing support to FEMA and DSCA:.....	31
	<b>Medical :</b> .....	33
1.	Short Term - 0-6 Months:.....	33
•	Identify medical treatment rules of engagement:.....	33
2.	Mid-Term - 6-12 Months:.....	33
•	Casualties among medical personnel.....	33
•	Limited resources.....	33
•	Strategic Medical Assets:.....	34
3.	Long Term - 12-24 Months:.....	35
•	Pre-positioning.....	35
•	MTOE Assigned Personnel (MAP):.....	35
•	Split based, Mass Casualty (MASCAL) Operations.....	35
•	Conversion to DHA.....	36
•	Army Medical Command MTOE (Modified Table of Organization and Equipment) Changes.....	36
•	Medical Stockpiling.....	37
•	Blood products.....	37
	Conclusion.....	38
	Appendix 1 – 2-year Pandemic Planning Cycle.....	39
	Appendix 2 - Testing Requirements.....	40
1.	Diagnostic Testing Challenges:.....	40
•	Specificity.....	40
•	Sensitivity.....	40
•	Positive Predictive Value (PPV).....	40
•	Negative Predictive Value (NPV).....	40
2.	Antibody testing challenges:.....	40
	Bibliography.....	41
	Notes.....	51

**The Black Swan:** Nassim Nicholas Taleb, a former Wall Street trader and now risk manager, coined the term “Black Swan,” based on a historical event. When the first European explorers landed in Australia, they encountered black swans for the first time. Nothing in their experience had prepared them for a black swan, because all swans known at the time were white. Taleb defines a Black Swan as a surprise event that could not have been predicted and gives it three properties:

- Low probability based on past knowledge.
- When it does happen, it has a massive effect.
- People do not see it coming before the fact, but after the fact, everybody saw it coming. It is prospectively unpredictable but retrospectively predictable.<sup>2</sup>

Some people might view the pandemic as a Black Swan event. While recent epidemics have given indications of a possible pandemic on the horizon, most people outside the medical community failed to take notice. Previous outbreaks of SARS and MERS did not widely affect the United States, and most Americans believed that this sort of thing could not happen here. Severe Acute Respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS) are both viral respiratory illnesses caused by coronaviruses. The World Health Organization (WHO) reported that SARS-CoV affected 8,098 people worldwide during the 2003 outbreak, with 774 deaths. Only eight people in the United States were affected, all of whom had travelled abroad in SARS-affected areas. MERS-CoV first appeared in Saudi Arabia in 2012 and spread to several other countries including the United States, but few were affected here.<sup>3</sup>

The current pandemic has certainly had a tremendous impact on the nation and the armed forces. The medical, scientific, and emergency management communities now say that it could have been predicted, and in fact, some of them had predicted it. Nassim Taleb himself argues that the COVID-19 pandemic is not a black swan event because he predicted a pandemic in 2008 in his book, *The Black Swan: The Impact of the Highly Improbable*. While that may well be true, for most non-specialists, the pandemic certainly was a Black Swan event.

In 1991, Army Chief of Staff Gen. Gordon R. Sullivan coined the phrase “No More Task Force Smiths” to be used as a metaphor and rallying cry to improve and sustain Army readiness. The Army’s new rallying cry could well be, “No More Black Swans,” a rallying cry akin to “Remember Pearl Harbor” from a previous generation. Now that the world is attuned to the reality of the pandemic and adapting to a new normal, preparation for the next event should be easier, but the next potential event could be right around the corner: Successive waves that cause continued illness and death for up to two more years; a mutation of the virus which causes another pandemic (COVID-19 is in fact a mutation of the SARS CoV2 virus); natural disaster; economic collapse; and war.



## The Army and Pandemics: Historical View

### 1. Introduction:

The words “epidemic” and “pandemic” are often used interchangeably, but they have specific definitions and the distinctions between them are important. The responsibility for classifying a disease as an epidemic or pandemic belongs with the WHO (see Table 1). COVID-19, caused by the novel coronavirus, first appeared in China in November 2019 and was officially designated a pandemic by the WHO in March 2020. Rampant disease has been a part of military life throughout history. The cramped quarters of garrison encampments, overseas troop transports, and warships were often breeding grounds for disease, especially in the era before bacteria and viruses were understood. The US Army’s recent experience with epidemics and pandemics begins with the Spanish Flu pandemic of 1918-1919 and includes operations as recently as the 2014-2015 Ebola epidemic in West Africa.<sup>4</sup>

<b>Endemic</b>	Disease found in or restricted to a certain area or population. Endemic diseases are often the source of an epidemic’s “patient zero.”
<b>Epidemic</b>	Regional or communal outbreak among a particular population.
<b>Pandemic</b>	An epidemic that affects multiple populations. For influenza, this involves the appearance of a new virus subtypes that are easily spread (e.g. through respiratory droplets) human-human transmission.

*Table 1- World Health Organization (WHO) Classifications<sup>5</sup>*

### 2. Lessons Learned: Influenza 1918

The United States’ entry into World War I in 1917 saw the largest mobilization in US Army history to that time, raising some four million men by the end of the war. The American Expeditionary Forces quickly assembled in military posts, camps, arsenals, airfields, and supply depots all over the country. This rapid, explosive growth produced an Army for war on a scale previously unknown in American history, but it also created an environment ripe for the incubation and fast spread of disease, especially the constant movement of troops to different camps, ports, and finally overseas.<sup>6</sup>

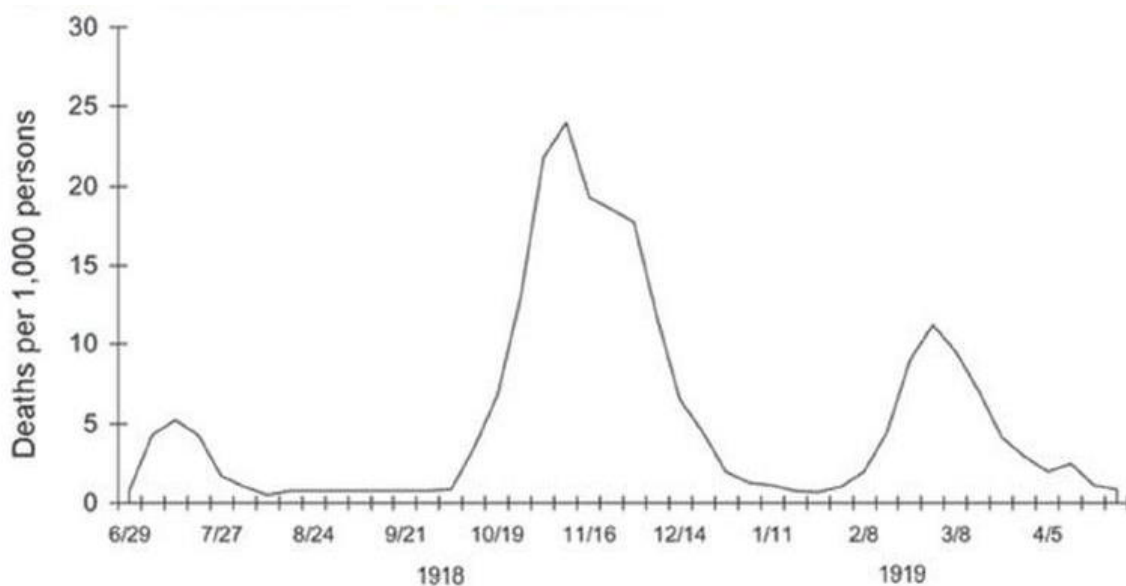
The Army used a variety of measures in overcrowded training camps to prevent the spread of influenza: quarantining camps, preventing overcrowding through tent hospitals, providing 100 square feet of floor space for all flu cases, stopping large assemblies of Soldiers, keeping patients warm, providing them with fresh air, feeding them, and trying to prevent pneumonia. Experimental vaccines were used, but virus identification was in its infancy. In Europe, the flu pandemic struck the Army hard during the Meuse-Argonne Offensive, depleting the force by an estimated 20 percent to 30 percent. Besides undermining unit strength during this offensive, sick men in the trenches overwhelmed field hospitals attempting to manage battle wounds and those suffering the flu and pneumonia. Evacuations from

frontline hospitals overwhelmingly consisted of flu patients compared to the battle wounded.<sup>7</sup>

In the United States, the 1918-1919 Influenza Pandemic arrived in three waves over the course of one year. The second wave was much worse than the first, with five times the number of deaths than the first wave. The Spanish Flu also included a third wave that produced more than twice the number of deaths than the first wave. The worldwide mortality rate for the first wave was just over 5 persons per 1,000, jumping to 25 deaths per 1,000 during the second wave, and the third wave at roughly 12.5 deaths per 1,000 (see Fig. 1).<sup>8</sup>

A study of the 1918 pandemic published in the Proceedings of the National Academy of Sciences concluded that the earlier pandemic was primarily stopped by non-pharmaceutical intervention, which in layman's terms includes social distancing, isolation, and quarantine:

Non-pharmaceutical interventions (NPIs) intended to reduce infectious contacts between persons form an integral part of plans to mitigate the impact of the next influenza pandemic.... These findings support the hypothesis that rapid implementation of multiple NPIs can significantly reduce influenza transmission, but that viral spread will be renewed upon relaxation of such measures.<sup>9</sup>



Source: CDC

*Figure 1- 1918 Spanish Flu Mortality Rate<sup>10</sup>*

The death toll in the United States reached 675,000, and the Army suffered as well. The War Department estimated that influenza sickened more than one million men, some 26 percent of the Army. The flu killed 55,322 Soldiers, nearly 30,000 of whom died before they even got to France. The mortality ratio of deaths from combat to those of disease was 1:1.1. In plain terms, for every 10 Soldiers killed in combat, 11 died of disease.<sup>11</sup>

### 3. Lessons Learned: World War II

During the interwar years, immunization and scientifically directed sanitation reduced the rates of many communicable diseases, but influenza, pneumonia, and the complications of these infections remained dangerous threats to the Army. Influenza remained a problem, especially in years when it spiked, five times between 1922 and 1937, but none of these reached pandemic proportions. In 1941, the Army organized a commission to develop a flu vaccine as part of broader effort to find vaccinations for measles, mumps, meningitis, neurotropic diseases, and others. Much of the groundwork for vaccines developed between the wars resulted from the advent of powerful microscopes and other scientific developments. The Armed Forces Epidemiological Board isolated and grew flu virus in order to develop a vaccination and received approval from the FDA in 1943.<sup>12</sup>

In preparing for mobilization during WWII, the Army implemented policies to prevent the widespread transmission of influenza. In ports of embarkation, a minimum of 60 square feet per soldier was recommended to avoid overcrowding and illness, though an average of 12 percent of Soldiers still contracted respiratory disease while enroute to theater. The Medical Corps stressed the need to increase the floor space per man in barracks and reduce the number of troops per car train. In fact, troop movements during flu season were kept to a minimum. In high-priority units, commanders advocated medical inspection of troops and the hospitalization of patients with emerging diseases.<sup>13</sup>

In its post WWII study on respiratory and alimentary tracts, the Army Medical Department did not cite new efforts in vaccination as preventing another pandemic, but rather focused on biology:

Circumstances were such that influenza comparable in severity to that of 1918 would be insusceptible to control. No other conclusion seems possible but that *the biology of the infectious agents was the decisive factor in avoiding such an event*. The disease and its prevention contributed greatly to a better understanding of its epidemiology and were responsible in a significant fashion for heightened efforts to identify and control respiratory diseases of all types. There was, as always, a somewhat fatalistic attitude towards prevention or control measures, but in many situations a true effort was made to gain what benefit could be had by early intuition of measures to limit crowding, to control transport of infected men, and at times to use sulfonamides prophylactically in the hope of reducing complications.<sup>14</sup>

### 4. Lessons Learned: Ebola Outbreak (2014-2015)

- DoD had teams and agencies in place to monitor infectious diseases, biological and chemical weapons, but did not anticipate the size of the military response needed to stem the Ebola epidemic. DoD bio-surveillance and modelling efforts were inadequate to rapidly identify, monitor and predict outbreak trends. For example, Defense Threat Reduction Agency (DTRA) analysts did not fully understand the complex dynamics of West African cultural practices such as burial rituals and social migration.<sup>15</sup>

- The US government worked with non-governmental organizations (NGOs), foreign nations, and other stakeholders to clearly define roles, but DoD needs to advocate for a national level framework so that it can establish priorities and expected levels of performance. DoD should also support efforts to continue public health and bio-surveillance capacities and increase planning for specific types of disease to prepare for actual crisis.<sup>16</sup>
- The US Army formed a large part of large interagency response to manage the epidemic, but the interagency process lacked defined roles and hindered initial efforts.<sup>17</sup>
- The Army had little proficiency with or knowledge of Personal Protective Equipment (PPE) and lacked general knowledge regarding infectious disease response capabilities. USNORTHCOM supervised medical support teams (MSTs) but lacked preparation time and training and needed to review equipment and its uses. Although MSTs went to Africa, they did not have any interaction with patients which would have been useful in the face of future outbreaks around the world or CONUS.<sup>18</sup>

*“It’s inevitable that the coronavirus will return next season. . . . When it does, how we handle it, will determine our fate.”*

*-Dr. Anthony Fauci*

*April 29, 2020<sup>19</sup>*

## **Looking Forward**

1. **Second Wave:** Many experts, including the WHO and the Centers for Disease Control (CDC) predict that there will be a second wave of the coronavirus that will arrive around the same time as the seasonal flu virus in the fall and winter of 2020-21. Before that, the Army may anticipate a small wave of infections as travel restrictions and social distancing regulations are relaxed, and testing becomes more prevalent. This “wave 1.5” is already prevalent in China as Chinese abroad return home.<sup>20</sup> If the second wave is as deadly as the second wave in 1918-1919, extrapolating the number of potential deaths based on the current number (62,000 as of May 1, 2020), a second wave of COVID-19 could produce more than 300,000 deaths. Experts differ, however, on the potential severity of the second wave, though most agree that it will coincide with the arrival of seasonal flu in the fall. The Center for Infectious Disease Research and Policy (CIDRAP) at the University of Minnesota presents three possible scenarios for how the pandemic may play out over the next two years (See Fig. 2):

- **Scenario 1 (Peaks and Valleys):** The first wave is followed by a series of repetitive smaller waves over the next two years. Depending on the height of the waves, this scenario might require periodic tightening and easing of mitigation measures for the next two years. They may also vary geographically.
- **Scenario 2 (Fall Peak):** The first wave is followed by a larger wave in the fall or winter of 2020 with smaller subsequent waves in 2021. This resembles the same pattern as the Spanish Flu of 1918-1919 and requires reinstatement of mitigation measures for reducing the spread of infection and preventing healthcare systems from being overwhelmed.
- **Scenario 3 (Slow Burn):** The first wave is followed by a “slow burn” of ongoing transmission and case occurrence, but without a clear wave pattern. This pattern may vary geographically. This pattern was not observed in past influenza pandemics but remains a possibility for COVID-19. This third scenario likely would not require the reinstatement of mitigation measures, although cases and deaths will continue to occur.

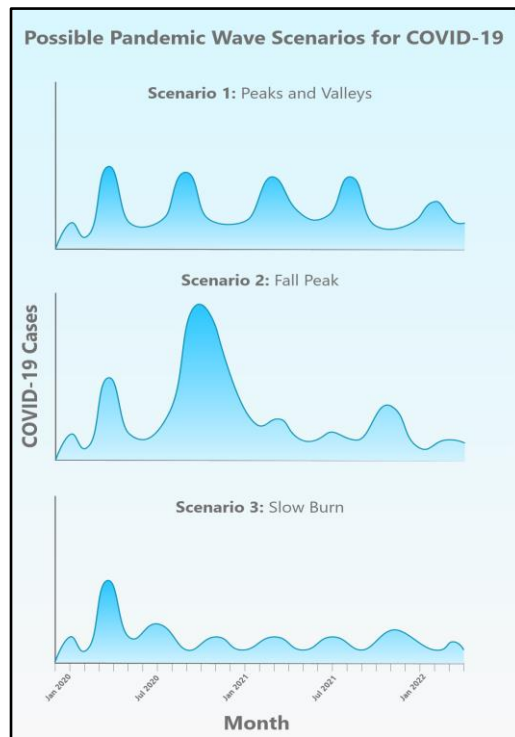


Figure 2—Possible Pandemic Wave Scenarios for COVID-19<sup>21</sup>

2. Third Wave: The 1918-1919 pandemic also included a third wave arriving some two months after the second wave. The third wave was less lethal than the second wave, but still killed twice as many as the first. The second wave is predicted to arrive in November 2020 and run through February 2021, which coincides with seasonal flu season. The second wave, in whatever form it comes, could also potentially disrupt the 2020 US general election, as the first wave disrupted many state primaries. If the coronavirus has a third wave that arrives on the same schedule as the 1918 pandemic, it will arrive in the spring of 2021. The first possible vaccine might be available around the same time.
3. Herd immunity: Herd immunity represents the degree to which the community is susceptible or not to an infectious disease because of the population having acquired active immunity from either previous infection or immunization. Determining herd immunity based on the observed transmissibility of SARS-CoV-2, 60 percent to 70 percent of the population may need to be immune to COVID-19 to reach herd immunity to halt the pandemic. In lieu of a vaccination, which is not expected for 18 months to two years, the Army will likely build herd immunity through the infection of Soldiers. The danger for the military, however, is not in Soldiers getting the virus, it is the speed with which it spreads and the debilitating effect it will have on units. Isolating infected Soldiers is easy during garrison-based operations, but that will not be the case in deployed environments. While most Soldiers are probably healthy enough to survive such exposures, it will be much more dangerous for those

Soldiers with family members who are immuno-compromised or others who have undiagnosed conditions.<sup>22</sup>

4. **Health Outlook:** There are certainly differences between the Army of 1918 and the Army of today. The soldier who joined the Army in 2018 was in much better shape, medically and physically, than his great-grandfather who was drafted in 1918. The Soldiers going to France in 1918 had been medically screened and some were eliminated, but those who did go were not necessarily in peak medical or physical condition. The Soldiers in World War I also experienced gas attacks and exposure to foreign climates that made them susceptible to lung damage. Many were physically strong due to the manual labor that characterized most professions at the time. But today's recruits, even the obese ones, have the benefit of a century of better nutrition and nutrition education, cleaner air and water, medical interventions, vaccines, prophylaxis, optimized treatment regimens, and they have a generally healthier lifestyle. This, however, does not mean that modern Soldiers are out of danger. The Army's tobacco cessation campaign of the 1980s has been largely successful, though the Army still has smokers. In addition to tobacco use, there are other methods endemic to military service that could degrade lung function, such as vehicle and weapon exhaust fumes, dust, smog, allergies, and the generally lower quality of air in places where Soldiers are expected to work.

5. **Vaccines:**

- **Development:** The best estimates say that a vaccine is at least a year away, and longer than that to make adequate stocks available. The development and production of those vaccines are consuming much of the pharmaceutical industry and has made for some unprecedented situations. Two of the largest drug manufacturers in the world, Sanofi and GSK, have formed an unusual partnership to develop vaccines for COVID-19. Each company contributes its own specialty: Sanofi contributes a protein-based antigen, which elicits a protective immune response against the pathogen. GSK contributes a proven adjuvant, which is an ingredient used to create a stronger immune response in people receiving the vaccine.<sup>23</sup>
- **Testing:** U.S. Army Medical Research and Development Command (USAMRDC) is now partnering with civilian companies to assist with necessary diagnostic testing. The command had previously done such testing on a cost reimbursable business model, but the Army is now moving to fund this organization so that it may continue to conduct this testing irrespective of clients.<sup>24</sup>

Once the vaccine is developed, full-scale production and distribution will also take time.

This case study also examines how the current pandemic will fundamentally change the Army in the long-term, look across the planning factors of Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities, and Policy that are familiar to Army leaders, as well as funding, Defense Support to Civil Authorities, modernization and innovation, and medical issues (see also App. 1).

*“We have to figure out how to use [COVID-19] testing to validate the readiness of our forces to deploy. Testing is going to become a critical part of that.”*

- Gen. John Hyten, VCJS<sup>25</sup>

**Doctrine & Readiness:** The Army’s emerging Multi-Domain Operations (MDO) doctrine needs to be updated. A pandemic is not a condition or domain under which the Army expected to operate, but it will be for at least two years and maybe longer. The specific conditions of the pandemic occupy a great deal of attention now, but the Army needs to pay more attention to the general conditions which produced the current emergency. The world has endured three pandemics in the last century since the Spanish flu: the Asian flu (H2N2), 1957-1958; Hong Kong flu (H3N2) 1968-1970; and swine flu (H1N1) 2009 to 2010. These three pandemics caused 2.1 million deaths worldwide. In addition to these pandemics, the WHO has designated epidemics for SARS, MERS, HIV/AIDS, and the Zika virus. With the Army’s growing interest in Africa and renewed interest in Asia, exposure to these diseases will become much more than merely a living condition. Some media outlets speculate that the current pandemic was either deliberately caused, or deliberately hidden, to weaken the United States. Regardless of the validity of these claims, biological warfare, or the threat of it is a real possibility. The MDO concept relies primarily on technology, and some may argue that the pandemic is an environment rather than a domain, but the effect of the pandemic has achieved one of the key goals of MDO: dis-integration.<sup>26</sup>

1. Short Term - 0-6 Months:

- *Mission Command:* In the early days of the outbreak, the Department of Defense and the Army appeared to give confusing guidance about how to protect Soldiers, resulting in reports that Army leadership was not taking the threat seriously. The global presence and very nature of the US military’s mission precluded issuing one standard guidance for all units worldwide, so the Secretary of Defense allowed local commanders to make prevention and containment decisions. While this is the essence of mission command, some units’ execution proved that stricter top-down guidance was necessary. There were several instances of commanders complying with the guidance and then immediately violating it with such things as keeping barbershops open. DoD & HQDA will need to provide specific guidance early, stating what commanders should and should not do.<sup>27</sup>



- Infection and Mortality Rate:** Soldiers are generally younger and healthier than the rest of the general population. Initial reports indicated that the illness affected primarily the very young and the very old, but that was a misconception: some people conflated infection rate with mortality rate. Recent statistics show that 34.5 percent of those *affected* are in age groups 18 to 44, the primary age cohort of most of the Army. The age cohort for senior officers and NCOs, 45 to 64, also contains more than 34 percent of the affected population. The average *mortality* rate of coronavirus is 3.2 percent, considerably higher than the 0.01 percent of the seasonal flu. This has caused a great deal of the reasonable concern in the country. However, an examination of the mortality rates for people in the age groups that include most of our soldier population show something quite different (see Table 2).

Age Group	Affected Percentage	Age Group	Mortality
18-44	34.5 percent	15-24	0.1 percent
		25-44	2.6 percent
45-64	34 percent	45-54	5.1 percent
		55-64	12.5 percent
65-74	10.6 percent	65-75	21.4 percent
75+	12 percent	75-84	27.3 percent
		85+	30.7 percent

Table 2-- Table of COVID-19 Infection<sup>28</sup>

- Reinfection and Recovery:** The Army may expect degraded readiness as the virus spreads across units throughout the force. As social distancing rules are relaxed, and the Army begins its normal summer PCS (Permanent Change of Station) cycle, we may expect to see larger numbers of Soldiers infected. At the beginning of the outbreak in winter 2020, the effect on the Army was uneven. Initially, for instance, Soldiers at Joint Base Lewis-McChord faced greater potential infection rates because of the outbreak in Seattle then did Soldiers at Fort Hood, Texas. Given a normal PCS season during the summer, the Army may expect those rates to go up rapidly. There is as of yet no proven immunity to the coronavirus, even for those who have had it once, so the danger of reinfection is possible as Soldiers began to move around. Moreover, current data indicate that some cases require a recovery period longer than expected. Some patients may relapse, and others may suffer permanent lung damage. These will present ongoing threats to personnel readiness for the foreseeable future.<sup>29</sup>

## 2. Mid-Term - 6-12 Months:

- *Natural Disasters:* The Army has often been called upon as a resource for seemingly inexhaustible labor. The current emergency, though seemingly unprecedented, also comes at a time where the military is not stretched too far. The current outbreak occurred in the spring and so far, the other natural disasters have been limited. The summer, however, heralds the arrival of wildfire season in the western states, which often requires use of both Regular Army and National Guard units. The arrival of fall marks the beginning of tornado season in the South and Midwest and may signal a new outbreak. Hurricane season from June through November might also affect operations.
- *Medical Support to Civilian Agencies (Borrowed Military Manpower):* National Guard (ARNG) units all over the United States cleaned and disinfected nursing homes and assisted at food banks. Although similar to their Title 32 missions during natural disasters, these highlight other ways in which ARNG units may be overtasked in future waves. These operations were possible only because the National Guard units of those states were not deployed in overseas rotations or responding to natural disasters. A second or third wave arriving during the winter may stretch some state National Guard units beyond the limits of their capabilities.<sup>30</sup>

## 3. Long Term - 12-24 Months:

- *Training Deployments:* The partial cancellation of recent exercises, such as DEFENDER 20 and Pacific Pathways, caused short-term logistical problems, such as unanticipated transportation requirements and the necessity of quarantining returning Soldiers. The long-term effects will be much greater because the cyclic and global nature of this pandemic is likely to prevent any large-scale exercises for at least two to three years. These training deployment plans will not only be potentially inhibited by the second and third waves of the virus, but also by the impending budget crunch that is sure to follow. This pandemic has also affected the United States' partners and allies, and they will have even more difficulty joining in such exercises because of even smaller forces and smaller budgets. The Army will likely be unable to schedule such exercises until the pandemic has completely dissipated and then planning for future large-scale operations such as these would require another year.<sup>31</sup>
- *COVID Testing for Readiness:* Widespread testing is not yet available in the military, but when it is, testing will become a critical component of readiness. Commanders must be able to identify Soldiers requiring either isolation or quarantine and have a means of assessing readiness based on the COVID infection rate. The testing procedure must include not just diagnostic testing to determine illness, but also antibody testing to determine potential immunity (see App. 2).

The Army Reserve (USAR) created 85 Soldier Urban Augmentation Medical Task Forces (UAMTF) to provide medical assistance in regions (New York City, Connecticut, New Jersey, and Washington state) heavily affected by COVID-19. UAMTFs include medical experts, provide low acuity care, and can staff a 250-bed field medical station (FMS). These task forces do not include medical equipment, medication, or ICU capabilities.

Figure 3-- Organization Vignette<sup>32</sup>

### Organization:

The Army will need to review its force structure in the coming years to determine whether it is appropriate, particularly regarding medical units. The establishment of Urban Augmentation Medical Task Forces (UAMTF) (see figure 3) were a stopgap, Title 10 measure to assist local hospitals, but whether these types of units should be offered on a larger scale and for a longer time remains in question. The National Guard in several states also provided decontamination teams to clean nursing homes. This was another valuable service that the Army might not be able to duplicate on a large scale. The brigade level focus of the last 20 years has created brigade combat teams (BCT) of unprecedented power and complexity. Manpower allocations for the BCTs were created at the expense of support echelons above brigade (EAB) and echelons above division (EAD) units that are critical to the sustainment of the force. The current emphasis on large-scale combat operations includes a return to some of the force structures familiar during the Cold War Army, such as the division artillery (DIVARTY). The pandemic has shown that there is an enduring need for those medical and sustainment units that have been cut out of the force structure.

#### 1. Short Term - 0-6 Months:

- *ARNORTH as Joint Force Land Component Command (JFLCC):* ARNORTH, activated as a JFLCC for the first time in its history, controls seven regional and functional task forces designed to support the FEMA regions. JFLCC COVID Response had approximately 8,200 personnel directly supporting COVID operations. The JFLCC had supported 128 FEMA mission assignments, including four Disaster Mortuary Response Teams in New York City, as well as 3,100 medical professionals providing support at 23 civilian hospitals and seven Alternate Care Facilities in 11 cities across the country. Some of these facilities, such as the Javits Center in New York City, are now being inactivated as the peak infection seems to have passed and resources are being dedicated elsewhere.<sup>33</sup>

2. Mid-Term - 6-12 Months:

- Storm Season:* With the approach of hurricane season and the potential for a second wave, the JFLCC is likely to remain active throughout the mid-term and into the long term. The mix of units allocated to the JFLCC is likely to change based on conditions, and if a considerable number of natural disasters (hurricanes, floods, tornadoes) occur simultaneously with the second wave of COVID, the JFLCC could become a significant force requirement. The National Oceanic and Atmospheric Administration (NOAA) reported that the month of April 2020 saw the deadliest outbreak of tornadoes in six years. NOAA recorded 140 tornadoes in the month of April, with more than half of them between April 12 and 13. The Department of Atmospheric Science at Colorado State University predicts it will be above normal. Scientists there predict sixteen named storms, of which eight will reach hurricane strength, and four of which will be major hurricanes. The probability of those hurricanes making landfall is also high (see Table 2). This institution has been predicting hurricane seasons for the last 38 years, and for the last five years (2015-2019), its estimates were lower than the actual observed number of hurricanes.<sup>34</sup>

Location	Probability 2020	Average Last Century
Entire continental US coastline	69 percent	52 percent
US East Coast including Peninsula Florida	45 percent	31 percent
Gulf Coast from Florida to Texas	44 percent	30 percent
Caribbean	58 percent	42 percent

Table 3- Probabilities for At Least One Major (Category 3-4-5) Hurricane Landfall<sup>35</sup>

3. Long Term - 12-24 Months:

- Possible restructuring for greater DSCA:* Global disease outbreaks continue to increase, and some are associated with natural or man-made disasters such as outbreaks of *E. coli* due to flooding and the spread of communicable diseases through overcrowding. The Army is reacting effectively to the current COVID-19 outbreak, but these experiences may require senior Army leaders to review the structure and organization of the total Army, ensuring that it contains the right capabilities for a variety of missions, and that sustainment capabilities do not become sub-optimized in the BCT-centric force.<sup>36</sup>

Soldiers from D Troop, 6th Squadron, 9th Cavalry, third ABCT based at Fort Hood are using the *War Thunder* massive, multiplayer online (MMO) game to practice both armor doctrine and teamwork. The troop uses the MMO technology during the quarantine to fill a temporary capability gap as the unit transitions between tanks. The unit turned in its older series M-1 Abrams main battle tanks and is awaiting delivery of newer M1A2s. In *War Thunder* each Soldier from a tank crew operates his own tank and each crew forms a platoon. Since every soldier is a tank commander in the game, the younger Soldiers get new insights on what their leaders do, as well as gain additional training they will need as they grow inexperienced.

*Figure 4- Training Vignette*<sup>37</sup>

**Training & Education:** The way the Army trains and educates its Soldiers is changing and will evolve even further over the coming years. Social distancing requires individuals and units to use alternate communications platforms, and many have discovered the efficiency of these platforms. This coincides with a concurrent effort to explore different means of experiential education. In recent years, the military has been examining methods used in civilian colleges and universities. These technologies are acceptable for classroom-based education, but much of the Army's training must be done in the field or deployed environments. The biggest challenge to Army training will be continuing to do it properly while doing it safely to prevent contamination.

1. Short Term - 0-6 Months:

- *Loss of Unit Cohesion:* The quarantine is affecting unit cohesion due to lost training time. Units should maximize electronic and whatever other means required to maintain morale and esprit de corps. Collective training activities are necessary but must be conducted safely and in a manner that demonstrates to Soldiers that leaders are considering their health and welfare.
- *Cadet Summer Training:* Cadet Summer Training 2020 implemented training modifications, which will create second and third order effects. Arrangements have been made to conduct some instruction for some cadets during the fall and spring, but with the coming second wave, this may not be possible. Assuming that such training can be conducted, it will affect the training and readiness of the units on the installations that are tasked to support it. When ROTC Advanced Camp was conducted at Fort Lewis, Fort Riley, and Fort Bragg, garrison units were disrupted for a four to six-week period in the summer. Under the proposed arrangement, cadets from designated college and university programs would move to military installations for four-day weekends of training. This will pose logistical problems not only for the host units, but also for the ROTC

battalions and the students themselves. Cadet Basic Training and Cadet Field Training at the US Military Academy (USMA) will also likely be affected, because of the substantial number of troops are assigned to support it. Although upperclassmen conduct most of the training, Soldiers are required for specialized training. If the US experiences a very severe second wave or a third wave, these difficulties with summer training will be repeated in 2021.<sup>38</sup>

## 2. Mid-Term - 6-12 Months:

- *Blended learning*: The quarantine has forced units to use alternate methods of training, and units are becoming more proficient at using virtual capabilities to practice communications and other warfighting skills. As units become more comfortable with these training techniques, they will likely remain in place even after all restrictions are lifted. Though nothing replaces the individual attention of the sergeant to the Soldier, some units have discovered that some training can be taught using distributed techniques and modern platforms with no loss of effectiveness. For example, a unit at Fort Hood completed a rotation to Korea and then turned in their M1s and are awaiting new equipment issue of M1A2s. The unit has since gone into quarantine and is using the massive multi role online (MMO) game *War Thunder* as a training tool (see Fig. 4). This sort of commercial application can build on previous success of such devices as the Close Combat Tactical Trainer (CCTT), and Integrated Visual Augmentation System (IVAS).<sup>39</sup>
- *Combat Training Centers (CTC)*: Cancelling rotations to the CTCs is one of the immediate and most visible effects on training. The 81st Stryker Brigade's (SBCT) rotation to the National Training Center at Fort Irwin was cancelled because the SBCT was recalled to Washington state on the governor's orders. In the near term, units will likely not be able to resume Combat Training Center (CTC) rotations immediately, due to lost training time resulting from coronavirus mitigation protocols. Assuming units begin a recovery process in early June, the Army may expect a 90-day recovery period to ensure that a unit is capable of completing a CTC rotation. The CTC rotation schedule might need to be adjusted based on which previously scheduled units are affected, although how severely is yet to be determined.<sup>40</sup>
- *ACFT*: The postponement of the Army Combat Fitness Test (ACFT) for this training year requires an additional training period so that Soldiers will be ready for next year. The closure of gyms and other activities prevented Soldiers from training for specific activities for the ACFT, resulting in an expected loss of fitness. Training for the ACFT is more complex and extensive than the previous Army Physical Fitness Test (APFT). Logistics requirements for conducting training and testing are also more significant, so the full implementation of the ACFT might need to be delayed for as much as two years. The Army's decision on that is due in June 2020.<sup>41</sup>

3. Long Term - 12-24 Months:

- *Initial Entry Training:* The Army recently instituted a two-week pause on sending recruits to basic training to work out details for curriculum modification and conducting health screenings. After resuming training with new procedures in place, the Army will likely need to continue these processes in the near future. The Army developed new closed movement procedures, using both buses and military air, to safely move Soldiers from basic training to Advanced Individual Training (AIT), and then from AIT to first duty stations. These procedures are also likely to be necessary for the foreseeable future.<sup>42</sup>

*“We can’t telework to combat.”*

-Gen. James McConville<sup>43</sup>

**Leadership:** The sudden, worldwide spread of COVID-19 challenged all instruments of national power. It has also made things easier, in a sense, for Army leaders. The far-reaching quarantine requirements have already sketched a worst-case scenario in terms of the scope and scale of individual and unit isolation measures. The pandemic could potentially grow worse in terms of infected numbers and lethality, which could have a devastating effect on units, including widespread illness and death. Army leadership, in the coming months, must be prepared to make timely and accurate decisions. The virus cannot be killed by adding an appropriate level of “HOOAH,” so leaders must demonstrate the flexibility required to adapt to a continually changing environment.

1. Short Term - 0-6 Months:

- *Preparation:* Leaders should assume the worst by planning and preparing for additional quarantine periods during the second wave. If a unit is scheduled for a major training exercise, CTC rotation, or deployment, it should incorporate all the prophylactic measures currently being used to combat COVID-19.
- *Strategic communications:* In addition to communicating the mission, senior leaders must communicate both the risks to the mission and the risk to the force presented by such threat as another viral outbreak. Readiness assessments, though classified, should be realistic in terms of current status and potential recovery. Strategic messaging must portray a position of strength to potential enemies, while not understating the seriousness of the situation.

2. Mid-Term - 6-12 Months:

- *Adaptation:* With the assumption of a second wave arriving in approximately six months, there is time for leaders to advocate to adapt both training and operational systems to the environment, using innovative techniques that have either been developed or discovered during the current emergency.
- *Leader Responsibility:* Commanders should be aware of what local civilian leaders are doing about quarantine, but they remain responsible for the health and well-being of their Soldiers. Based on the experiences of the first wave, DoD is not likely to issue blanket guidance in subsequent waves for all commands around the world. Because of the geographical variances in the first wave, military commanders will need to follow the guidance of local civilian authorities. A leader should not order a less restrictive Health Protection Condition than the local civilian authorities; however, he or she may order a more restrictive one. DoD has recognized “the essential need to protect installations, facilities, and personnel in the event of a public health emergency due to biological warfare, or terrorism or other public health emergency communicable disease epidemic.”<sup>44</sup>



### 3. Long Term - 12-24 Months

- *Senior Leader Exposure* Recent exposures of White House staff and the Chief of Naval Operations demonstrate that leaders at all levels must prepare for their own potential quarantine or isolation. While units have experience with “man down” drills after years of combat, leaders must plan for distinct kinds of casualties, including senior civilian and uniformed personnel. Leaders must prepare for key staff, commanders, or themselves being quarantined.<sup>45</sup>

The immediate need for masks at the beginning of the outbreak required some ingenuity, and many people and units stepped in to help. The XVIII Airborne Corps launched Operation Dragon Mask, using parachute riggers from the 647<sup>th</sup> QM Co. to create and sew masks, while units from the 18th Field Artillery Brigade worked with donated material face shields. Even civilians and families got involved, as two people were noted for making 300 each.

Figure 5- Material and Sustainment Vignette<sup>46</sup>

## Material and Sustainment

### 1. Short Term - 0-6 Months:

- *Masks and PPE* Within 48 hours of the Secretary of the Defense's order to begin wearing masks, Pine Bluff Arsenal began producing masks for all its Soldiers and employees. PBA already produces Chemical Patient Protective Wrap Integrated Footwear System and neck dams, so shifting to face masks was easy. Most people were able to create or buy their own masks, but that was only a temporary measure. Medical personnel all over the country ran short of material and PPE became the most important and visible requirement for everyone. PPE is now a pacing item for the pandemic, and the Army must procure sufficient stocks for all its Soldiers, civilians, family members, and especially medical personnel to include replacement stocks.<sup>47</sup>

### 2. Mid-Term - 6-12 Months:

- *Dining Facilities:* Many restaurants remained open but were restricted to carry out. The restaurant industry suffered as much as a 90 percent reduction in its business. The Army will need to develop a long-term solution for treating Soldiers in garrison. Soldiers in the barracks do not have the same options that married Soldiers do and require a dining facility.
- *Subsistence Stockpiling:* The first wave caused acute supply problems across the United States and around the world, and the Army needs to adapt its subsistence procurement system to accommodate the shortages. Stockpiling critical foodstuffs guarantees a supply for the DoD and assists in maintaining a subsistence reserve. Here are two examples of food supply challenges that occurred during the pandemic:
  - The dramatic reduction in restaurant usage resulted in greatly decreased supply requirements, especially for fresh items such as milk. That lack of demand has required dairy farmers to dump milk did they could not sell. The reduced production from the farmers in turn affected the specialized milk trucking industry, which very suddenly did not have enough business to sustain it.
  - In another example, meat processing plants across the country have been forced to shut down because of the sickness of their workers. The meat shortages resulting from that shut down started to ripple across the country in early May 2020. Tyson Foods CEO John Tyson

purchased a full-page ad in newspapers in late April declaring, “the, “The food supply chain is breaking.” Ten percent of the nation’s beef production capacity, and 25 percent of its pork production capacity had closed by the third week of April 2020. The situation became so bad that some companies began euthanizing flocks and herds that could not safely be slaughtered and processed. Larger grocery stores including Kroger, Costco, and military commissaries began rationing meat purchases to ensure availability.<sup>48</sup>

### 3. Long Term - 12-24 Months:

- *Just in Time Logistics*: One of the things the pandemic has demonstrated is that the “just-in-time” logistics concept requires an intact sustainment chain. Now that the worldwide logistics chain is breaking in multiple areas, the necessity for stockpiling is evident. The closure of non-life sustaining businesses and the radical reduction in the amount of food used by them had, by May 2020, begun to cause cascade failure of the entire logistics system with the world's economy teetering on the brink of collapse. Even industries that deemed life sustaining were affected.
- *Destruction of food supply*: The plant closures and drastically reduced requirements and caused many farmers to begin destroying crops in the field and even euthanizing animals that could not be sold or safely processed. This may eventually cause an even greater food shortage later. The shortages are already affecting military commissaries and will doubtless begin affecting dining facilities across the force.<sup>49</sup>
- *Defense mitigation actions*: The DOD should immediately abandon the “just in time” logistics model and return to stockpiling of all critical materials, especially food supplies. This will provide the following:
  - Ensure adequate stocks for dining facilities, commissaries, and ships at sea.
  - Provide a reliable source of supply for overseas garrisons.
  - Help sustain the nation's food supply by providing a reliable market.

*“We are committed to maintaining the Army’s fighting strength by reducing the spread of the virus while simultaneously maintaining dynamic force employment capabilities.”*

- GEN James C. McConville, CSA<sup>50</sup>

## **Personnel**

### 1. Short Term - 0-6 Months:

- *Quarantine:* Allowing Soldiers to carry over leave into next fiscal year due to the inability to take leave because of quarantine was the right move. Commanders may be faced, however, with large numbers of Soldiers who want to take leave as soon as the quarantine is lifted, in some instances, to visit affected family members. Depending on conditions, this might require another quarantine. Successive quarantines could affect the readiness and morale of the unit.

### 2. Mid-Term - 6-12 Months:

- *Recruiting:* While the quarantine has limited the ability of recruiters to meet directly with prospective Soldiers, Army Recruiting Command (USAREC) continues to use e-mail, text, video conferencing, and other technologies with a prospect population that is familiar with these communication means. The quarantine forced the Army to adjust basic training ship dates for recruits, but the recruiting mission continues. The latest indications are, however, that USAREC has experienced difficulty recruiting electronically and will need to return to face to face recruiting as soon as possible.<sup>51</sup>
- *Army as Economic Engine:* Because of the worsening economy, the Army may expect an increase in the number of recruits, especially in the younger, low, or no skilled demographics. This might assist in making the recruiting mission, but the Army needs to be prepared to handle an influx of recruits while maintaining standards. The weakening economy and loss of jobs might push political authorities to encourage greater enlistment to provide economic relief. The Army has already begun paying contracted recruits who were delayed from attending basic training.<sup>52</sup>

### 3. Long Term - 12-24 Months:

- *Effects on Mental Health:* The initial fear of the unknown that accompanied the first outbreak has largely dissipated. Other factors, however, can increase the strain on Soldiers’ mental health: high casualty rates, including widespread fatalities; lengthy quarantines in barracks; mass casualty situations, such as the USS *Theodore Roosevelt* incident; illness or death of extended family members or friends; the near-certain arrival of a second or third wave; and the potential for the virus to mutate into something worse are all factors that weigh on the minds of Soldiers. Commanders should be alert to these and use some of the same resiliency tools used after combat or deployment. Leaders will also need to carefully craft strategic messaging to counteract misinterpreted data or “fake news” medical reports.

*“Once COVID-19 gets inside the gate, inside the door, it spreads, and spreads very significantly.”*

-Gov. Mike DeWine (Ohio)<sup>53</sup>

## **Facilities**

### 1. Short Term - 0-6 Months:

- *Screening and Testing:* While most installations developed screening procedures, testing is not yet universal. The development of widespread testing procedures will reveal even more positive cases and potentially signal the start of a second wave.
- *Permanent Change of Station (PCS) Moves:* The nation is beginning to reopen slowly as the military moves into the normal summer PCS season. While stop move and other actions designed to halt virus spread, not all moves can be stopped. Many Soldiers can be extended in place, but that will be detrimental for many and impossible for others. Commanders and other key leaders should move on schedule, as Soldiers do with schooling requirements. This is imperative for senior leaders attending such yearlong programs as Senior Service Colleges (SSC). Fort Jackson developed the capability to test 700 Soldiers per day for basic training, but this capacity should be required for the rest of the force.<sup>54</sup>

### 2. Mid-Term - 6-12 Months:

- *Tracking Teams:* -- Several installations created COVID-19 tracking and tracing teams to monitor the movement of infected personnel, help quarantine them, and clean any potentially infected areas. These units are based on models created in Italy and Europe to limit the spread of the disease. The Army should publish standard operating procedures (SOP) for the creation and standardization of all installation tracking teams.<sup>55</sup>

### 3. Long Term - 12-24 Months:

- *PCS Moves:* The difficulties caused in 2020 with universal PCS moves are likely to cause ripple effects throughout the next two to three years.
- *Quarantine* -- The necessity to quarantine Soldiers will continue for at least two years. Installations will need to provide facilities and support for these quarantine activities. Some of the quarantine may involve civilians or other nonmilitary personnel, as demonstrated by the need to quarantine cruise ship passengers during the initial outbreak.

*“We’re [DoD] going to have to be able to operate in a COVID-19 environment . . . there will need to be changes.”*

-Deputy SECDEF David Norquist<sup>56</sup>

## **Policy**

### 1. Short Term - 0-6 Months

- *HPCON*: DoD ordered all installations to Health Protection condition (HPCON) Charlie on March 25, 2020, but bases may not be able to reduce HPCON at the same rate. Local commanders may need to raise or lower the HPCON based on local conditions. Because of the way infection moves, commanders should coordinate with state and local health authorities for assignment of HPCON.<sup>57</sup>

### 2. Mid-Term - 6-12 Months:

- *BAS/Separate Rations*: The difficulties with supply and requirements for social distancing might require new arrangements for dining facilities. But if successive waves require dining facilities to be closed, extending separate rations to individual Soldiers in the barracks might be necessary for periods of time.

### 3. Long Term - 12-24 Months:

- *Coronavirus Survivors*: DoD's recent announcement that COVID-19 survivors would be permanently disqualified from enlistment, followed just days later by an announcement from the Chairman, Joint Chiefs of Staff that no such final decisions had been made point to the confusion in the Pentagon about how to handle the coronavirus. Such a decision would have second and third order effects, such as what would happen to currently-serving Soldiers who survived the virus and whether they would be barred to re-enlistment or perhaps administratively discharged.<sup>58</sup>

Combat Capabilities Development Command (CCDC), a subordinate, command of Army Futures Command (AFC), assisted COVID-19 relief efforts through the development and distribution of advanced personal protective equipment (PPE), including ventilators and issuing updated software systems to aid National Guard units providing direct support to infected populations. The CCDC facilitated equipment modernization by connecting experts from the academic, scientific, and military communities.

Figure 6 - Modernization and Innovation Vignette<sup>59</sup>

**Modernization & Innovation:** The difficulty with innovation has never been finding innovative thinkers or resourcing. The challenge is convincing leaders with established mindsets. They outnumber the innovators in the Army by a large margin. The quarantine, however, is giving a boost innovation. In February 2020, most people in the Army, and certainly the older and more experienced people, had never heard of Zoom, Slack, MS Teams, or similar platforms. By March they were holding daily meetings on these platforms with little degradation or effectiveness.

1. Short Term - 0-6 Months

- *Interruptions:* Overseas subsidiaries of American defense contractors are also impacted by the COVID-19 pandemic. The US aerospace industry, which relies on sub-contractors in Mexico, is one example. There were more than 346,700 jobs eliminated between March and April due to virus-related concerns. These layoffs have affected large DoD contracting firms including Honeywell, General Electric, and Lockheed Martin.<sup>60</sup>
- *Sensors:* The Army has deployed some sensors as stopgap measures in key locations such as the Pentagon, using infrared sensors to check for elevated temperatures. The new Integrated Visual Augmentation System (IVAS) system has also been modified to check body temperatures. These, however, are temporary measures and not fully deployed across the force. The efficacy of temperature screening is still in debate among medical professionals due instrument variations and usage, but the Army Futures Command should continue to develop quick solutions to be deployed across the force.<sup>61</sup>

2. Mid-Term - 6-12 Months:

- *Factory closures:* Even with ambitious plans in place, the Army will find its progress toward modernization slowed. Boeing recently closed the manufacturing facility in the Philadelphia area that builds the CH-47 for the Army, the V-22 Osprey for the Marine Corps, and the new MH-139 for the Air Force. The closure only lasted two weeks, but it doubtless caused a ripple effect throughout its supply chain as well as a delay in fielding finished helicopters. It will not be the last such closure. The big manufacturers such as Boeing, Lockheed-Martin, General Electric, Honeywell, and Eurocopter are dependent upon smaller companies to supply parts, and some of those companies have also shut down due to the virus. Due to lack of stockpiling, some of these manufacturers may be

forced to shut down because of lack of parts. Some of them are located outside the United States, which complicates the process even further.<sup>62</sup>

- *Expanded Remote Access Capacity*: The requirements for social distancing forced the DOD to rapidly expand its telework capabilities (see Fig. 7). The Army has the largest number of teleworkers, numbering 800,000. The USN currently has 250,000 personnel online and the Air Force has 100,000 users and expects to double that number shortly. The US Marine Corps plans to increase from its current number of 70,000 to 105,000. The Army has moved many functions to virtual platforms, including meetings and conferences, spiritual activities, and the routine medical activities that were foreshadowed by telemedicine years ago. As the crisis continues, the Army continues to discover a greater variety of activities that can be conducted virtually, and those activities become more routine through repetition. The initial rush to get enough equipment for everyone to use has passed, but other potential requirements loom. A second or third wave might require even greater capacity and possibly even classified capabilities. The Army's greatest need now is to examine architecture that supports teleworking. The explosion of teleworking has strained the networks and increased the service's vulnerability to cyber attack. That vulnerability has become even greater, as many government workers discover that their government issued computers are not capable of operating the necessary software or are slowed unnecessarily by use of Army networks. This pushes them to use civilian laptops, which are generally faster, more powerful, more capable, and more vulnerable than government issued machines.<sup>63</sup>

### 3. Long Term - 12-24 Months:

- *Personal Protective Equipment (PPE)*: The coronavirus pandemic is likely not the last such event the nation will face in the coming years. As the Army looks to modernize and innovate, it is rightly focused on combat systems that are now decades old. But the current emergency demonstrates the need to look at other equipment which in normal times would be considered too mundane to receive focused attention. The Army should look to modernize its entire range of PPE, not just the N95 PPE that is necessary for medical personnel, but the full range of uniforms and equipment necessary for hazardous materials handling and for operating in a contaminated environment. The current suit used for operations in the chemical, biological, radioactive, and nuclear (CBRN) environment, the Joint Services Lightweight Integrated Suit Technology (JSLIST), has been in use for 20 years but differs little in weight and function from its predecessor dating back to the 1960s. Even the most physically fit soldier operating in Mission Oriented Protective Posture (MOPP) condition 4 is seriously degraded, and any unit operating for extended periods of time under conditions of high temperature can be rendered combat ineffective very quickly. The Army Futures Command should survey the available civilian market to determine what innovative technologies are available or emerging to improve the current PPE.



- Routine and preventive medicine:* In the clear medical emergency presented by the pandemic, most routine or preventive health care was postponed to prevent overwhelming health care facilities both military and civilian. Many states expressly forbade conducting any sort of medical activities beyond emergency care, and therefore health care providers lost the ability to manage their patients' chronic conditions, and patients lost the ability to seek preventive care. Even where non-emergent treatments were not prohibited, patients elected not to come in to avoid overloading the system. Limiting access to some non-urgent health care was required in some hospitals, but patients and providers will begin to see the consequences of delayed treatment or lack of prevention in the coming months. A second wave coming potentially at the same time as a seasonal flu outbreak will greatly exacerbate the problems created by this lack of routine care. Military members are perhaps more disciplined than civilians about preventive medicine because personnel readiness is baked in, but if those Soldiers do not have access to preventive, readiness will suffer, even if those Soldiers do not get the coronavirus. Secretary of Defense Chuck Hagel ordered a review of the military health system to see if the access to care standards established by Federal regulation (Title 32 CFR 199.17) were being met. That report concluded that DoD, as a whole, met the access to care standards but the performance varied across the system. A DoD report in 2017 concluded that DoD did not consistently meet standards for acute and routine appointments at the several MTFs, even though the MHS used virtual health tools and, at the time, employed a sufficient number of providers. AI and other tools will help, but the loss of 17,000 uniformed medical personnel billets will further degrade access to care.<sup>64</sup>

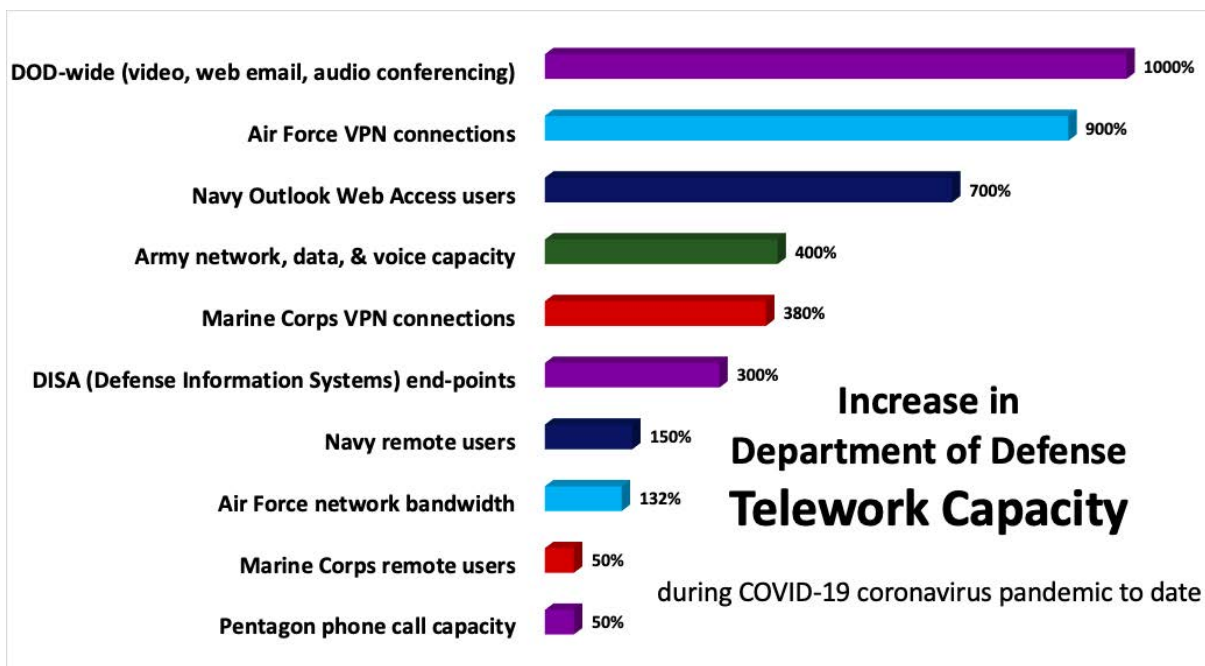


Figure 7- Increase in DoD Telework Capacity<sup>65</sup>

- *Defense Industrial Base Resiliency*: Contracting officers worked to identify supply chain impacts to determine feasibility of telework arrangements for contractors, which required contract modification in some cases. This is an opportunity for Army Futures Command to develop new and expand existing linkages to leverage corporate research labs, university research labs, government research labs, and private research labs. Much of the defense industrial base consists of smaller subcontractors that provide components and parts to the larger manufacturers such as Boeing, BAE Systems, and Sikorsky. Many of those businesses have sustained much greater economic damage from the pandemic than the larger corporations, and in some cases might not survive without assistance. The DoD should consider a similar process to the Air Force's Special Acquisition Task Force which was created to help manage industrial base support both during and after the current COVID-19 pandemic. That task force is operating on 4 lines of effort:
  - **“Relief.”** Planning for potential external assistance requests and how best to apply contracting to move out “billions of dollars if needed.”
  - **“Resilience.”** Focusing on defense industrial base health issues such as small businesses with severely strained cash flow and how to apply contracting to move out “billions of dollars if needed
  - **“Recovery.”** Post-crisis planning to figure out what funding programs might need to get back on track after a schedule slip.
  - **“Being rapid for small businesses.”** Rapidly completing contracts for small businesses.<sup>66</sup>

The COVID-19 financial relief package, Coronavirus Aid, Relief, and Economic Security (CARES) provided \$2 trillion to compensate both unemployed personnel and businesses forced to close to help contain the spread of COVID-19. This included \$17 billion for defense and loans totaling \$80 billion for aerospace defense contractors

Figure 8 - Funding Vignette<sup>67</sup>

## Funding

### 1. Short Term - 0-6 Months:

- *Executing FY 20 budget:* Many units and organizations are likely to have difficulty executing the FY20 budget due to the quarantine. The Department of Defense was recently allocated \$1 billion as part of the Coronavirus Aid, Relief, and Economic Security Act, \$750 million of which is reserved for medical supplies. Because the government prioritizes small and disadvantaged businesses, many of which were put at extraordinary risk by the pandemic, the remaining \$250 million is earmarked to keep specific suppliers in business. This is a boon to the DOD, and the Army should reap the benefits; however, it also exacerbates the problem of unspent funds at the end of the fiscal year. The Army should direct units to purchase personal protective equipment for (PPE) for stockpiling throughout the force, especially medical units, and for specific medical equipment requirements. The opportunity for fraud waste and abuse is obvious.<sup>68</sup>

### 2. Mid-Term - 6-12 Months:

- *Executing FY 21 budget:* The second wave is expected to hit and potentially occupy the first six months of FY21 creating the same challenges for next year. Some of this problem may be ameliorated by unplanned expenditures on DSCA, but additional spending will be necessary to completely exhaust fiscal years funds. Recommend that the Army allocate funds for purchasing stockpiles of PPE and related medical equipment that can be stored with unit equipment in pre-positioning stocks.
- *Regulatory relief:* The Army should also seek regulatory relief from DoD to turn in unexpended funds at the end of the fiscal year. The DOD should also use the opportunity to pursue legislative relief from the requirement to expand all funds in the fiscal year in which they were appropriated.

### 3. Long Term - 12-24 Months:

- *Economic changes:* The economic changes due to the quarantine are going to affect the Army in other ways besides recruiting. Some businesses will not recover from long shutdowns. Others will reopen, but they will have taken the opportunity to automate as many functions as possible and therefore will not need many of the workers they furloughed. Even before the Coronavirus crisis, the retail shopping industry had fully embraced automation, reducing the number of attended cash registers and replacing them with self-checkout kiosks. Those jobs and others

replaced by automation will not come back when the quarantine is over. At the other end of the technological spectrum, many highly skilled workers could also see themselves permanently out of work due to changes in their industry. For instance, the airline industry as of May 2020 was shrinking rapidly, with several airlines eliminating entire aircraft types from their inventory. Other smaller, regional carriers are going out of business entirely. This will put many highly skilled workers and white-collar employees with formerly well-paying jobs out of work. Losing these well-paying jobs will hurt the economy even more, and the government will be simultaneously called upon to provide relief for those unemployed and to cut government spending. The budget will therefore be shrinking more dramatically than had already been predicted.<sup>69</sup>

- *Budget bubbles and POM problems*: The Pentagon is likely to encounter a boom and bust cycle with budgets in the next few years. Initial budget predictions will remain unchanged, and the services might even benefit from small end strength increases granted by Congress to offset catastrophically high civilian unemployment. The DOD will in some ways be viewed as an income generator for small businesses that do defense-related work and economic stimulant for local economies. As the federal deficit continues to grow, however, accelerated by stimulus payments to taxpayers, bailouts to companies to keep them in operation, and greatly reduced tax revenues due to record unemployment, the Defense Department will be viewed as a drain on the nation's economy and steeper budget cuts will follow. The Army might anticipate even steeper budget cuts in the out years than had been expected previously. The budget cuts will fall disproportionately on the Army because Navy, Air Force, and Space Force budgets support large-scale weapons programs that also provide large-scale civilian employment.

"Sir, I got a lot of building to do."

-LTG Todd Semonite, Chief of Engineers<sup>70</sup>

April 20, 2020

**Defense Support to Civil Authorities (DSCA):** The pandemic has driven a degree of civil-military cooperation unseen in recent history. Army support to FEMA begins with the activation of defense support to FEMA regions, and all ten FEMA regions have been activated for the first time in history. Since the beginning of the emergency the US Army Corps of Engineers (USACE) has completed 32 of 37 projects (as of May 15 2020) which included developing four distinctive designs to convert existing college dorms, hotels, sports arenas, and convention centers to hospitals. In various alternative care facilities, such as the Javits Center in New York, USACE has completed 15,066 beds, using a total of 37 contracts, to convert arenas, hotels, and dorms to alternate care facilities.<sup>71</sup>

The Army may expect continued challenges for the next 18 to 24 months as COVID-19 potentially comes back in waves. Defense Support to Civil Authorities (DSCA), especially the support the Army has provided, may continue well after the immediate danger has passed. The work of the Army Corps of Engineers in converting hotels, dormitories, and large event centers into makeshift hospitals has been tremendous, but it underlines the need for a hospital in a box that can be quickly and easily deployed again in the future if necessary. Most of the Army Corps of Engineers is civilian and relies on contractors for the construction, but future emergencies might require the deployment of Army units for this construction.

1. Short Term - 0-6 Months:

- *Continuing support to FEMA and DSCA:* In the short term, US Army Corps of Engineers should continue completing facilities where necessary and closing out those facilities that are no longer necessary. It should also establish quick contracting arrangements in all major population areas to quickly build alternate care facilities again if the need arises. None of the assessments were done on military installations, so USACE should conduct some assessments of potential alternate care facilities on military installations before the second wave arrives. This is especially true for overseas installations, and the Army should stockpile necessary materials in advance.

2. Mid-Term - 6-12 Months:

- *Continuing support to FEMA and DSCA:* USACE should be prepared to continue to do assessments and supervise construction of alternate care facilities. The field Army should be prepared to provide Soldiers to assist in construction efforts where necessary.
- *Civilian Infrastructure Support:* The devastation after Hurricane Katrina was so severe as to cause the breakdown of the social order in many areas surrounding New Orleans, and local law enforcement and first responders were themselves incapacitated by either damage, injury, or the

chaos of a mass evacuation. The combination of catastrophic wind damage, unprecedented flood levels, and a poorly handled evacuation resulted in the deaths of over 1800 people and the injury or serious illness of countless others. The potential for natural disaster occurring during the second wave is high, and the combination of considerable damage and the high rate of illness will require the Army to augment civilian disaster response operations. This is a traditional National Guard mission, but the expanding requirements may entail augmentation from some Regular Army and the US Army Reserve units. There is a precedent for Regular Army support to non-*posse comitatus* activities, such as the wildfires that habitually plague the Western US every season. The Regular Army also deployed under extraordinary circumstances to quell riots in Detroit in 1967 and Los Angeles in 1992.

- *Possible Additional Missions:*
  - Augment public health and medical services
  - Provide logistic support and distribution of commodities to quarantined and/or isolated persons
  - Provide labor and security support to points of distribution and ports of entry
  - Provide subject matter experts, manpower, and technical assistance to augment mortuary affairs operations
  - Provide transportation support
  - Provide continuity of government
  - Augment communications for local, state, tribal and federal communications resources for interoperability
  - Provide base and installation support to other local, state, and federal agencies
  - Ensure protection of defense industrial base, critical infrastructure, and mission assurance
  - Provide military assistance to civil disturbance for restoration of civil order as it relates to quarantine and isolation enforcement<sup>72</sup>

### 3. Long Term - 12-24 Months:

- *Continuing support to FEMA and DSCA:* The pandemic emergency created problems in other industries that may require Army assistance. Recent discussions of difficulties with the US Postal Service (USPS) recall the Postal Strike of 1970, and the potential for the Army to be used for other DSCA missions. While the circumstances with the postal strike were very different, the situation demonstrated the Army's flexibility and potential for nontraditional missions. While the Army does have a great deal of adaptability, including the capability to surge quickly and react to contingencies with substantial number of troops, units deployed must always have an exit strategy. Units supporting civilian authorities in the absence of civilian capability must be prepared to redeploy as soon as the

required capability is established. The quarantine displaced workers and, in some cases, entire industries, dramatically affecting the economy. The timely and proper removal of Army unit from a civilian support mission, will allow the local civilian economy to recover faster.<sup>73</sup>

*“This is our war. Never in the history of the United States military has medical been the warfighter, but we are the warfighter. We are the tip of the spear.”*

–MG Joe Robinson. CG, 3rd MEDCOM<sup>74</sup>

**Medical** : Medical support is the most visible development of temporary alternative medical facilities. This includes the deployment of three Army field hospitals and the Navy's hospital ships' deployment to cities overburdened by the medical workload. All three hospitals were alerted for deployment on 23 March 2020. The 627th Hospital Center deployed to Seattle, set up a 250-bed hospital using the unit's MTOE (Modified Table of Organizational Equipment) and began treating patients on 30 March 2020. The 9th and 531st Hospital Centers deployed to New York and established a 750-bed hospital in the Jacob Javits Center by 2 April 2020.<sup>75</sup>

1. Short Term - 0-6 Months:

- *Identify medical treatment rules of engagement:* Despite this rapid deployment capability and large bed capacity, the effort was somewhat wasted. Failure to properly utilize these DoD provided medical assets tainted the military's image in the public eye. Not using these facilities to capacity appeared to the public that the military was either not involved or did not support the public. After deploying two of the military's greatest strategic medical assets in a great show of support, the military suddenly seemed unsupportive. This situation requires a well-executed strategic communications plan to explain to the public how and why these assets are being used. Future planning efforts must incorporate better prior planning to fully maximize the hospitals. The 627th Hospital Center began to re-deploy only one week after it was deployed, because it arrived after the peak infection in Seattle, and local hospitals were able to handle the surge. The Javits Center was never fully used to its capacity, and the hospital ship USNS *Comfort* redeployed after only two weeks on station, never having come close to using its capacity. The initial planning for the military hospitals was to treat only non-COVID-19 patients, but the process of screening patients at civilian hospitals before they could be transferred to military facilities became too cumbersome. By the time military facilities were authorized to accept COVID-19 patients, the surge had passed, and they were not needed as much.<sup>76</sup>

2. Mid-Term - 6-12 Months:

- *Casualties among medical personnel:* The continued treatment of coronavirus patients will eventually take its toll on military medical personnel, as it had on civilian medical personnel. The Army must be prepared for potentially debilitating casualties for a low-density unit.
- *Limited resources:* During the current emergency, three active duty field hospitals deployed to various cities to assist with patient treatment. These were short term deployments, but when the medical personnel deployed



with them, it reduced the medical coverage at the bases where they were assigned. If there is a second wave of the coronavirus, more deployments of medical personnel may be expected. With less than 1/3 of the Army's medical infrastructure assigned to Compo 1, the potential to stretch the available resources beyond the breaking point is obvious. Moreover, the total Army contains only 36 Preventive Medicine detachments, only 12 of which are assigned to the active component. Any large deployments for or during a second corona virus outbreak could potentially exceed the capabilities of the Defense Health Agency (DHA) and Army Medical Command (MEDCOM) units.<sup>77</sup>

- *Strategic Medical Assets:* The USNS *Comfort* and USNS *Mercy* were some of the most visible symbols of the pandemic. Not just because of their size and appearance, but also because of the symbol they represented: the military providing large scale support to the civilian world. But in a future conflict, the value of those assets could easily be negated by chemical or biological weapons used on them, or by the same weapons used on a port they intended to use. These assets need not be destroyed to be rendered ineffective: their crews can be affected by virus, and they can be denied entry to ports in the same way that cruise ships have been denied in the current crisis.
- *Artificial Intelligence:* AI allows machines to perform normal human tasks such as recognizing patterns, learning from experience, drawing conclusions, making predictions, or taking action. AI depends on large data volumes, advanced algorithms, and computing power and storage. AI is also already being used in the fight against COVID-19, but it does not yet have the large body of data that has been collected over years from other diseases. The proteins that make up viruses are arranged in a sequence of amino acids that give the protein its shape. Understanding a protein's structure helps scientists develop drugs that work with the protein's unique shape. AI can assist that research by examining possible other shapes:<sup>78</sup>

In January [2020], Google *DeepMind* introduced *AlphaFold*, a cutting-edge system that predicts the 3D structure of a protein based on its genetic sequence. In early March, the system was put to the test on COVID-19. DeepMind released protein structure predictions of several under-studied proteins associated with SARS-CoV-2, the virus that causes COVID-19, to help the research community better understand the virus.<sup>79</sup>

Researchers are using the relatively recent information from COVID-19 to identify other viruses with similar elements and then determine which drugs could be used against the virus.<sup>80</sup>

### 3. Long Term - 12-24 Months:

- *Pre-positioning*: Future planning for this kind of operation should include prepositioning of hospital equipment, much in the same way that tactical equipment is prepositioned overseas. This would speed the deployment of hospital units to crisis areas. Pre-positioned equipment sets overseas should also include hospital equipment sets to ensure that they are ready for large scale operations.
- *MTOE Assigned Personnel (MAP)*: MEDCOM has recently changed how it assigns doctors and other medical professionals to hospitals in units. Previously, doctors and other medical professionals were assigned to hospitals and Military Treatment Facilities (MTF) and then attached to units for deployment or training under the professional filler system (PROFIS). Under MAP, or reverse PROFIS, medical professionals will be assigned to tactical units and then attached to hospitals to maintain their medical proficiency. The recent deployment of hospital center personnel along with their assigned field hospitals identified a potential problem. If the hospital center, its component field hospital, and augmentation units deploy, either in CONUS to support another pandemic or overseas for combat or training, the MTF might then be overwhelmed by a second or third wave of the coronavirus, or a new, undiscovered pathogen.
- *Split based, Mass Casualty (MASCAL) Operations*: The initial wave of the Coronavirus affected the military with some 10,000 Soldiers affected by the first week of June 2020. These casualties did not overwhelm the military medical system, but the second wave might hit the military harder than before. The Army Medical Command should be prepared to deploy in support of mass casualty operations in civilian population centers, and also deal with internal MASCAL operations. This will place a severe strain on an already overtaxed and short-handed medical system. The DHA should use the opportunity to establish or solidify local relationships between military medical treatment facilities and civilian hospitals. Mass casualty operations in either place would require cooperation and coordinated planning between the two. DHA should also examine specific areas where Military capacity specifically exceeds civilian capacity, such as Fort Leonard Wood, Missouri. Protocols and operating procedures need to be in place to allow the treatment of civilians in military facilities.<sup>81</sup>
- *Re-examine Medical Force Structure Changes*: DoD should reconsider the current efforts to restructure medical forces. The 2018 National Defense strategy eliminated 17,000 uniform medical billets across all services, resulting in a 13% reduction of the uniform medical strength. The pandemic has shown the great need for medical personnel, and the decision to cut 17,000 spaces from the military health system MHS in order to build combat capabilities further weakens a medical force structure that will be critical for MDO operations. The theater medical structure in place for Operation Desert Storm included more than 18,500 hospital beds, 13,000 of which belonged to the Army. Current planning for large-scale combat operations recalls the large operations plans during the Cold War, but the recent force structure changes relied too heavily on civilian sector health care facilities and recalling reserve units. The loss of

such a large number, even when apportioned across the services, is particularly devastating in a field in which most, if not all, military occupational specialties (MOS) are low density.<sup>82</sup>

- *Conversion to DHA:* A study in 2015 determined that more than 20,000 Soldiers were medically non-deployable due to health-related issues. With healthcare costs exceeding ten percent of the DoD budget, Congress ordered the consolidation of medical assets into a joint command to reduce expenses. The National Defense Authorization Act (NDAA) of 2017 directed the transfer of all fixed medical treatment facilities from the services to the newly formed Defense Health Agency which was established to manage costs and ensure integration between the services, and also to coordinate with the Veteran's Administration (VA). The process for that is not yet complete and, in fact, has been temporarily halted due to the COVID-19 response. This initiative's success is currently undetermined. The overweening focus on managing budgets at fixed facilities, however, comes at a cost: it obscures the Army's critical tactical mission.<sup>83</sup>
- *Army Medical Command MTOE (Modified Table of Organization and Equipment) Changes:* All Combat Support Hospitals (CSH) are converting to Hospital Centers (to be completed by FY22). The conversion of combat support hospitals to field hospitals has made the system more responsive, modular, scalable, and easily deployable, but it has also drastically reduced available bed space. The deployment of the 9th, 531<sup>st</sup>, and 627th Hospital Centers to New York and Seattle validated the new Hospital Center structure that is replacing the Combat Support Hospital. While this is designed for future multi-domain operations, its capability to augment civilian medical facilities in a crisis is evident. The Army should accelerate the conversion of the remaining CSHs where possible to add flexibility to the system but consider whether the resulting structures will have sufficient bed space for large-scale operations.<sup>84</sup>

- *Medical Stockpiling Vaccines:* The best estimates for a coronavirus vaccine place it at one year away, but more realistic assessments show that at least two years will be required to develop, test, approve, and widely administer a vaccine. The current crisis has shown the necessity for having adequate stocks of critical medical supplies on hand. The shortage of PPE demonstrated that medical supply of some commodities can be a zero-sum game: stocks going to the civilian sector will not be available for the military sector, and vice versa. This is not the first instance in which critical medical supplies were in short supply. The great fear of the anthrax threat after 9/11 caused a shortage of ciprofloxacin during Operation Iraqi Freedom. In addition to the other crises previously mentioned, natural disasters also require large amounts of normal saline and other supplies. Both civilian and military health care systems are also subject to the dangers of a potentially small number of suppliers. Sanofi Pasteur, the manufacturer of the only yellow fever vaccine (YF-Vax) licensed in the United States, has announced a total depletion of YF-Vax as they transition to a new production facility. Sanofi Pasteur is reassessing the timing of YF-Vax return to supply and expect to provide an update by the second quarter of 2020.<sup>85</sup>
- *Blood products:* The supply of blood and blood products is always a critical issue, and blood and its associated components are pacing items. The military generally regards its blood supply as a closed system, since donations can come from within. However, the current pandemic raises questions about who will be eligible to donate and when. Research is currently underway to determine whether or not previously infected soldiers can donate blood to healthy soldiers, and, if so, if the antibodies carried in the blood will be effective in the recipient. Blood transfusion is not a typical means of transferring antibodies.

## Conclusion

Writing a historical study about an event that is still in progress is a flawed approach and potentially dangerous, especially when the events under examination lack precedent. The true value of a historical case study is the perspective that comes from the passage of time. The present case, however, allows an exception. The Spanish Flu of 1918 - 1919 provides a clear precedent, and the lessons from that experience and more recent experiences have already proved invaluable. The value of historically minded study of contemporaneous events lies in the insights and reasoned projections based on identifiable patterns and relevant experiences.

The pandemic has affected the Army across all the DOTLMPF-P, and some of the impacts are not yet fully known. As the country starts a return in early June 2020 toward a somewhat more normal schedule, other political and societal events began to divide the Army's attention. Nationwide riots and simmering racial problems captured the public's attention, and Regular Army and National Guard units were deployed in support of local police forces. It is just this sort of divided mission the Army must consider as part of its nearly certain future. The civil disorder spreading across the country, with large crowds gathering in major cities will likely cause flare-ups of the coronavirus again. Army leaders should consider the potential multiple challenges conducting training and operational missions, complicated by civil unrest at home, potential natural disasters, and successive waves of the virus.

The speed with which the nation and the Army moved from fully open to quarantine and then began to develop adaptations, bodes well for the future. The Army and various other agencies have conducted exercises in the past to prepare for a pandemic event, but many of the projected actions doubtless seemed unrealistic even to the most invested participants. The Cold War planning from the 1980s often centered on the phrase, "when the balloon goes up." It was a dreaded yet somewhat mythical time that would indicate that the nation was at war with the Soviet Union, and what would doubtless become World War III. Before COVID-19, most people outside the epidemiology community considered a pandemic a "when the balloon goes up" type event possible, but unlikely. Before COVID-19, just as after the 9/11 attacks, the unthinkable has already happened. It is now possible to think much more realistically about potential safety measures that would have been difficult to comprehend before the pandemic. "Tell me where this ends" is difficult to do as the nation recovers from the first wave, and exact predictions are impossible. Nevertheless, however, insights from the past and evidence from the present allow for reasonable forecasts for the future

# Appendix 1 – 2-year Pandemic Planning Cycle

External Influences	Hurricane Season (1 Jun-30 Nov)		Seasonal Flu (Nov-Mar)		Tornado Sea. (1 May-31 Jul)		Hurricane Season (1 Jun-30 Nov)		Seasonal Flu (Nov-Mar)		T S H S S	
	PCS Season		PCS Season		PCS Season		PCS Season		PCS Season		PCS Season	
	TS	PCS Season	Seasonal Flu (Nov-Mar)	PCS Season	Tornado Sea. (1 May-31 Jul)	PCS Season	Hurricane Season (1 Jun-30 Nov)	PCS Season	Seasonal Flu (Nov-Mar)	PCS Season	T S H S S	
<b>Doctrine and Readiness</b>	<ul style="list-style-type: none"> <li>Mission Command</li> <li>Infection and Mortality Rate</li> <li>Potential for Reinfection</li> </ul>		<ul style="list-style-type: none"> <li>Natural Disasters</li> <li>Medical Support to Civilian Agencies (Borrowed Military Manpower)</li> </ul>		<ul style="list-style-type: none"> <li>Training Deployments</li> <li>COVID Testing for Readiness</li> </ul>							
<b>Organization</b>	ARNORTH as CJLFCC		Storm Season		Possible restructuring as for greater DSCA							
<b>Training and Education</b>	<ul style="list-style-type: none"> <li>Loss of Unit Cohesion</li> <li>Cadet Summer Training</li> </ul>		<ul style="list-style-type: none"> <li>Blended Learning</li> <li>Combat Training Centers</li> <li>ACFT</li> </ul>		Initial Entry Training							
<b>Leadership</b>	Preparation		<ul style="list-style-type: none"> <li>Adaptation</li> <li>Leader Responsibility</li> </ul>		Senior Leader Exposure							
<b>Materiel and Sustainment</b>	Masks/PPE		Sustenance Stockpiling		<ul style="list-style-type: none"> <li>Just in Time Logistics</li> <li>Destruction of Food Supply</li> <li>Defense Mitigation Actions</li> </ul>							
<b>Personnel</b>	Quarantine		<ul style="list-style-type: none"> <li>Recruiting</li> <li>Army as Economic Engine</li> </ul>		Effects on Mental Health							
<b>Facilities</b>	Screening/Testing		Tracking Teams		<ul style="list-style-type: none"> <li>PCS Moves</li> <li>Quarantine</li> </ul>							
<b>Policy</b>	HPCON		<ul style="list-style-type: none"> <li>BAS/ Separate Rations</li> </ul>		Coronavirus Survivors							
<b>Modernization and Innovation</b>	<ul style="list-style-type: none"> <li>Interruptions</li> <li>Sensors</li> </ul>		<ul style="list-style-type: none"> <li>Factory Closures</li> </ul>		<ul style="list-style-type: none"> <li>Personal Protective Equipment (PPE) ; Expanded Remote Access Capacity</li> <li>Defense Industrial Base Resiliency</li> </ul>							
<b>Funding</b>	Executing FY20 Budget		<ul style="list-style-type: none"> <li>Executing FY21 Budget</li> <li>Regulatory Relief</li> </ul>		<ul style="list-style-type: none"> <li>Economic Changes; Budget Bubbles and POM Problems</li> </ul>							
<b>DSCA</b>	Continuing Support to FEMA & DSCA		<ul style="list-style-type: none"> <li>Continuing Support to FEMA &amp; DSCA</li> </ul>		<ul style="list-style-type: none"> <li>Continuing Support to FEMA &amp; DSCA</li> </ul>							
<b>Medical</b>	Identify Medical Treatment Rules of Engagement		Casualties among Medical Personnel		<ul style="list-style-type: none"> <li>Pre-positioning; Reverse PROFIS</li> <li>Prepare for Split-based Operations; Conversion to DHA</li> <li>Army Medical Command MTOE Changes</li> </ul>							
	<b>SHORT TERM</b>		<b>MID-TERM</b>		<b>LONG TERM</b>							
	JL	AG	SP	OC	NO	DE	JA	FE	MR	AP	MA	JN
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
	4 <sup>th</sup> Quarter, FY20		1 <sup>st</sup> Quarter, FY21		2 <sup>nd</sup> Quarter, FY21		3 <sup>rd</sup> Quarter, FY21		4 <sup>th</sup> Quarter, FY21		1 <sup>st</sup> Quarter, FY22	
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## Appendix 2 - Testing Requirements

### 1. Diagnostic Testing Challenges:

Despite the nationwide testing now underway, the procedure remains inexact. In addition to the five to fourteen-day incubation period after exposure, the diagnostic testing procedure remains inexact.

Diagnostic testing is based on two principles: specificity (SPIN) and sensitivity (SNOUT).

- *Specificity*: Based on the concept of a Specific test that is Positive to Rule In (SPIN), or how often a test is negative when a patient is well. Specificity tells how good a test is at identifying the well. If a test is 80 percent specific, 80 percent of healthy people will test negative.
- *Sensitivity*: Based on the concept of a Sensitive test that is Negative to Rule Out (SNOUT), or how often a test is positive when a patient has disease. Sensitivity tells how good a test is at identifying the sick. If a test is 80 percent sensitive, 80 percent of sick people will test positive.

The quality of the test is based on two factors:

- *Positive Predictive Value (PPV)*: Tells how often a patient who tests positive for disease is sick. A PPV of 80 percent means 80 percent of people who test positive will be sick.
- *Negative Predictive Value (NPV)*: Tells how often a patient who tests negative for disease is well. An NPV of 80 percent means 80 percent of people who test negative will be healthy.<sup>86</sup>

In layman's terms, these tests seek to differentiate the following:

- *True positive*: The patient has the disease and the test is positive.
- *False positive*: The patient does not have the disease, but the test is positive.
- *True negative*: The patient does not have the disease and the test is negative
- *False negative*: The patient has the disease, but the test is negative.<sup>87</sup>

- ### 2. Antibody testing challenges:
- An antibody is a defensive protein created by the body's immune system in recognition of the specific antigens present in a virus. When the immune system detects these antigens, it deploys these antibodies to fight off the virus. The problem with the novel coronavirus is that it is so new, that the data are unclear as to whether the presence of antibodies represents full immunity.

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