



## **Humans First, Weapon Second? A Preliminary Assessment of People’s Liberation Army Air Force Pilot Health Support Systems**

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The United States Air Force (USAF) views its human warfighter as its most valuable assets.<sup>1</sup> USAF fighter pilots participate in preventive care programs, such as Optimizing the Human Weapon System (OHWS), which provide them with extra embedded physical and psychological support to improve readiness.<sup>2</sup> Does the People’s Liberation Army Air Force (PLAAF) have parallel effort underway? What are the key components of the PLAAF programs and how effective are they?

Although the PLAAF adopts a different set of terminologies for its pilot training and medical support programs, the idea of providing preventive care to its high-performing aircraft pilots is not new.<sup>3</sup> Most recently, PLAAF medical support teams provided physical therapy to PLAAF and Pakistan Air Force pilots participating in the 2019 Shaheen-VIII China-Pakistan joint exercise in China.<sup>4</sup> Similar to its centralized approach to pilot recruitment and training<sup>5</sup>, the PLAAF relies on a number of top-down directives and military regulations to preserve the overall wellbeing of its pilots. It also appears to be exploring new ways to accelerate integration of pilot health data and medical research platforms to enhance combat performance.

### ***Regulations and Medical Facilities***

On 16 July 2021, the Central Military Commission-issued new *Provisional Regulations on Military Rehabilitation and Health Promotion Work* (hereafter referred to as *Regulations*) took effect.<sup>6</sup> The *Regulations* seek to provide guidance on reforms of the overall PLA medical support system, with renewed emphasis on priorities given to warfighters from “front line/operational units, grassroots units, and ‘hardship and remote’ regions.”<sup>7</sup> While the new regulations may be seen as an integral component of the PLA’s systematic effort to improve the quality of life standard for service members<sup>8</sup>, it further institutionalizes medical support programs pilots receive under the category of “specialized service care”<sup>9</sup>. Pilots are awarded annual “medical retreat (leave)” that lasts at least 30 days in addition to annual leave at designated PLAAF medical facilities, called Aviation Medical Validation and Training Centers (AMVTCs), under Eastern, Southern, Northern, and Central Theater Command Air Force (TCAF) Logistics Departments.<sup>1</sup> The AMVTCs, which consolidated previously dispersed medical resorts, hospitals, and health service sites, were created

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<sup>1</sup> As of 2021, Southern TCAF does not manage an Aviation Medical Validation and Training Center (航空医学鉴定训练中心), while Northern TCAF manages two.

in 2008-2009 under former Military Regions (MRs) prior to the PLA reform transforming MRs into TCs in 2016.<sup>10</sup> Interestingly, it appears that female fighter pilots historically participated in similar medical retreat programs only at non-AMVTC sites.<sup>11</sup>

<i>TCAF Subordination</i>	<i>Facilities</i>	<i>Location</i>
<i>Eastern</i>	<i>Hangzhou</i>	<i>Zhejiang</i>
<i>Western</i>	<i>Dujiangyan</i>	<i>Sichuan</i>
<i>Northern</i>	<i>Dalian</i>	<i>Liaoning</i>
	<i>Qingdao</i>	<i>Shandong</i>
<i>Central</i>	<i>Lintong</i>	<i>Shaanxi</i>

Table 1 PLAAF AMVTCs



Figure 1 PLAAF Hangzhou AMVTC Facility (Credit: PLA Social Media Source)

### ***Health Promotion Programs***

PLAAF AMVTC's key missions include: pilot preventive care and rehabilitation support, aviation medicine validation, aviation medical training, as well as research and applications of (training) techniques.<sup>12</sup> Pilot mental fitness concerns appear to be one of the driving forces for the creation of the AMVTCs, and remain a priority area of its missions.<sup>13</sup> Constrained by personnel shortages and a general lack of knowledge of aviation medicine, most AMVTCs likely struggled to meet their mission requirements when first created. However, the overall quality of care has likely improved thanks to increased education and training of healthcare personnel, and PLAAF policy incentives put in place to attract and retain talent from civilian sectors over the past decade.<sup>14</sup>

AMVTCs maintain routine contacts with operational units within its geographic proximities, and likely manage health records of PLAAF pilots subordinate to these units.<sup>15</sup> But it is unclear if they have on-base sites to make services more accessible. Official PLA sources highlight specialized training programs developed by different AMVTCs. For instance, the Dujiangyan center was noted to have developed specialized training programs to guide both PLAAF and PLA Navy pilots conduct G-force training and cope with hypoxia more effectively.<sup>16</sup> The Hangzhou center was known for its award-winning simulated flight illusion/spatial disorientation training programs.<sup>17</sup> But reports on preventive care programs remain scarce.

AMVTCs' mental health promotion and research work has evolved over the past decade. In the late 2000s and early 2010s, mental health work was carried out mainly to help reduce flight risks and facilitate pilots' post-flight accident psychological recovery.<sup>18</sup> Mental health promotion programs gradually integrated more "preventive" elements to supplement its "treatment" practices. Research into psychological effects of certain training programs, such as G-force training and biofeedback training, was conducted and its findings have likely been used to improve physical care programs.<sup>19</sup> Notably, AMVTCs developed "field psychological support vehicle" to be used for monitoring and supporting pilots' mental fitness on the battlefield. Such vehicles are equipped with psychological counseling and treatment software systems that can be operated via wired and wireless networks in the field.<sup>20</sup>

PLAAF pilots' annual "medical retreat" program at AMVTCs are supported by a dedicated team of medical staff, physical therapists, massage therapists, athletic trainers, dieticians, and possibly also aviation medicine researchers.<sup>21</sup> As an added benefit, mandated by the *Regulations*, family members are allowed to accompany pilots during such retreats.<sup>22</sup>





Figure 2 Life during “Medical Retreat” (Credit: Various PLA Social Media Sources)

Besides providing physical and mental health support to its pilots, the PLAAF has taken steps to utilize its pilot training and medical data to inform research on combat psychology and pilot combat emotions. The PLAAF Dingxin Test and Training Base, roughly equivalent to the USAF’s Nellis Air Force Base, and the PLAAF Specialty Medical Center (formerly the PLAAF General Hospital) created a “Joint Research Base for Aviators Psychological Qualities” in 2018.<sup>23</sup> The “Research Base” is reportedly made possible because Dingxin Base has created a combat psychological performance information database for PLAAF pilots based on data collected through the key training events, such as “Red Sword” and “Golden Helmet,”<sup>24</sup> the base has hosted over the years.<sup>25</sup>

## Assessment

It remains difficult to accurately assess the effectiveness of PLAAF health promotion programs due to inadequacies of publicly-available data. However, anecdotal reports from official PLA sources and published medical studies by PLAAF healthcare personnel provide useful insights into the state of pilot health promotion programs. Wang Wenchang, a famed PLAAF fighter pilot who reportedly holds the longest safe flying hours in PLAAF fighter pilot history<sup>26</sup>, openly acknowledged that he suffers from serious shoulder, neck, and knee pains due to high-intensity flight training throughout his career, and he has relied on his wife’s self-taught acupuncture and pressure-point massage therapies to find relief – not PLAAF-provided health promotion programs.<sup>27</sup>

In one report based on data released by the PLA Xingcheng Medical Research Center in 2015, it was noted that more than 30% PLA pilots have neck, shoulder, and back diseases.<sup>28</sup> In a 2016 study of randomly selected 455 high-performance aircraft pilots from various PLAAF operational units show that 38.7% of them have neck and back diseases and 28.1% suffer from metabolic disorders.<sup>29</sup> In another 2019 study jointly conducted by PLAAF Specialty Medicine Center -- formerly the PLAAF General Hospital and an authority on aerospace medicine -- and a local medical center affiliated with an operational unit stationed in Northeast China, 65.6% of the subjects in a controlled survey of 40 high-performance aircraft pilots suffer from neck, shoulder, back, and leg pains.<sup>30</sup> Most notably, according to a 2020 study published by the *Medical Journal of Air Force*, fighter pilots aged under 30 are found to suffer the most physical injuries based on data collected between 2009-2019.<sup>31</sup>



The PLAAF's increased operations tempo over the past decade has likely contributed to the uptick of pilots' physical injuries. But this suggests that the PLA health promotion programs certainly have room to improve. Indeed, many PLA medical professionals called for flight training being conducted "more scientifically."<sup>32</sup> The PLA Academy of Military Medical Sciences (AMMS) and the PLAAF Specialty Medicine Center have worked to develop a unified aviation medicine evaluation system to optimize fighter pilot training.<sup>33</sup> However, a fundamental shift of mindset is most likely needed to ensure better care provided to PLAAF pilots and other personnel alike. The institutionalized "medical retreat" program is a good start but more routine preventive care offered at the operational unit level may bring more direct support and benefits to its pilots. Most tellingly, in a *PLA Daily* report from 2015, a PLAN East Sea Fleet unit has a "100% completion rate" of fulfilling "specialized service medical retreat (leave)" on paper, but most of them only spend less than a week there even counting in travel time due to "workload pressure."<sup>34</sup> Pilots "have to go" because they are required to complete the annual physical exams at the AMVTCs, but "once they complete their physicals, they often head back to their units to resume training."<sup>35</sup> Scheduling conflicts between medical leave and operations also happen often, according to the same report, because the medical organizations in charge of scheduling retreats "are unfamiliar with military training schedules."<sup>36</sup>

## Conclusion

Looking ahead, perhaps a "human first, weapon second" approach – to borrow the terms used in the USAF OHWS - will help PLAAF better preserve its human weapon systems and improve its overall readiness. Despite renewed attention paid to quality of life issues of its service members in recent years, it remains to be seen if the PLA is truly willing to invest in the human development of its warfighters.<sup>ii</sup> The PLA continues to be dominated by a highly-centralized command and control culture, which, by default, leaves individual needs and wants at the bottom of the military's priority list. For the PLAAF, in addition to developing more "targeted care" delivered to high-profile training events and exercises,<sup>37</sup> providing preventive care, such as opening up acupuncture clinics or installing pressure-point massage services at pilots' home bases, may be a simple and effective move that will be welcomed by its pilots. Ultimately, the PLAAF, just like the USAF, relies on its human weapon systems to win future wars.

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<sup>ii</sup> The renewed attention likely also indicates the PLA is following the USAF model of improving the quality of life of service members in order to increase retention for future conflicts. The author thanks MSgt Samantha Payne for this point.

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## Endnotes

<sup>1</sup> CSAF Action Orders, *To Accelerate Change Across the Air Force*, at:

[https://www.af.mil/Portals/1/documents/csaf/CSAF\\_Action\\_Orders\\_Letter\\_to\\_the\\_Force.pdf](https://www.af.mil/Portals/1/documents/csaf/CSAF_Action_Orders_Letter_to_the_Force.pdf).

<sup>2</sup> Staff Sgt. Delaney Gonzales, 633rd Air Base Wing Public Affairs, "Preserving fighter pilot readiness through preventative care," November 23, 2020, at: <https://www.acc.af.mil/News/Article-Display/Article/2426277/preserving-fighter-pilot-readiness-through-preventative-care/>.

<sup>3</sup> For a historical overview of PLAAF pilot care policies and developments, see: Luo Yongchang (罗永昌), PLAAF Health Service Units Effectively Support New-type Aircraft Pilot Health (中国空军卫勤部队有效保障新型战机飞行员健康), 4 November 2009, PLAAF Logistics(中国空军后勤), accessed at: <http://mil.news.sina.com.cn/2009-11-04/1510572539.html>.

<sup>4</sup> It is reportedly the first time PLAAF added the "targeted medical support (专项保障)" component to this joint exercise series. See: Qi Huiming (齐辉明), Ling Tao (凌涛), Ding Huan (丁欢), "Reflections on Pilots' Neck and Back Disease Monitoring and Treatment during 2019 Shaheen-VIII China-Pakistan Air Force Joint Training (2019 雄鹰-VIII"中巴空军联合训练飞行员颈腰伤病防治的做法与体会)," *Chinese Aerospace Medicine Magazine* (中华航空航天医学杂志), 2019, 30(4): 298-300. DOI: 10.3760/cma.j.issn.1007-6239.2019.04.012, at: <http://rs.yiigle.com/CN113854201904/1309818.htm>.

<sup>5</sup> Marcus Clay, *China's "Little Eagles:" People's Liberation Army Developing its Next-Generation Pilots*, CASI, October 2019.

<sup>6</sup> The General Office of the Central Military Commission issued the newly revised "Provisional Regulations on Military Rehabilitation and Health Promotion Work" (中央军委办公厅印发新修订的《军队疗养工作暂行规定》), *PLA Daily*, 13 July 2021. Accessed at: [http://www.mod.gov.cn/topnews/2021-07/13/content\\_4889281.htm](http://www.mod.gov.cn/topnews/2021-07/13/content_4889281.htm).

<sup>7</sup> For a historical overview of PLAAF pilot care policies and developments, see: Luo Yongchang (罗永昌), PLAAF Health Service Units Effectively Support New-type Aircraft Pilot Health (中国空军卫勤部队有效保障新型战机飞行员健康), 4 November 2009, PLAAF Logistics(中国空军后勤), accessed at: <http://mil.news.sina.com.cn/2009-11-04/1510572539.html>.

<sup>8</sup> For a detailed discussion of PLA personnel benefits and overall quality of life issues, see *Understanding the "People" of the People's Liberation Army*, CASI, August 2018.

<sup>9</sup> Besides pilots, "specialized services/branches (特勤)" in the PLA also include astronauts, submariners, military divers, and possibly also nuclear force operators. For reference to "specialize service care (特勤疗养)," see: Li Nai (李柰), Sun Jie (孙婕), "Our Military's Care for Specialized Services Revealed (揭秘:我军特殊兵种的特勤疗养)", *PLA Daily*, 16 February 2016, accessed at: [http://www.xinhuanet.com/mil/2016-02/16/c\\_128721890.htm](http://www.xinhuanet.com/mil/2016-02/16/c_128721890.htm). Also see: "Visit Nanjing Military Region's Hangzhou Rehabilitation Center; Understand Our Military's Care for Specialized Services (走进南京军区杭州疗养院 揭秘我军特勤疗养)", *China Youth Daily*, 24 May 2009, accessed at: <http://news.cctv.com/military/20090524/101725.shtml>. Under the new regulations, there are four categories of care: rehabilitation care (康复疗养), specialized service care (特勤疗养), preventive care (保健疗养), and designated (personnel) care(专项疗养), which refers to medical retreat benefits awarded to service members who are stationed in hardship and remote regions and/or have provided major contributions to critical missions.

<sup>10</sup> For a reference to the AMVTC under former Chengdu MRAF, for example, see: Ren Liyun (任立耘), Wan Wenjun(万文军), "Improve Combat Capability Standard; How Chengdu MRAF Pilots Improve Combat Standard Through Specialized Therapy and Rehabilitation Training (提升战斗力标准 揭秘成空飞行员疗养康复专项训练提升战斗力标准)," *KJ.81.cn*, 6 July 2014. Accessed at: [http://www.81.cn/syjd/2014-07/06/content\\_6036433.htm](http://www.81.cn/syjd/2014-07/06/content_6036433.htm). For a reference to the former Nanjing MRAF Hangzhou Rehabilitation Resort (杭州疗养院) prior to it being renamed AMVTC, see: Pan Zhengjun (潘正军), Yu Wei (于伟), Li Nai (李柰), "Create a Modern 'Aircraft Carrier' for Specialized Service Health Promotion -- the Hangzhou Rehabilitation Resort of the Nanjing MR Explores a New Model of Specialized Service Recuperation Support for the Navy and Air force (打造特勤疗养的现代“航母”—南京军区杭州疗养院探索海空军特勤疗养保障新模式)," *Guangming Daily* (《光明日报》), 7 May 2009, p. 3, accessed at: [https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrb\\_20090507\\_2-03.htm](https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrb_20090507_2-03.htm).

<sup>11</sup> Female fighter pilots reportedly participated a medical retreat at Xingcheng Medical Retreat Center (兴城疗养院) and Qingdao 1<sup>st</sup> Medical Retreat Center (青岛第一疗养院). Today, Xingcheng is managed by the PLA Strategic Support Force (PLASSF) under the name of PLASSF Specialized Medical Center; and the 1<sup>st</sup> Qingdao Center is managed by the PLAN. See: "Our Country's First Batch of Female Fighter Pilots Participated in Medical Support Retreat as a Group (我国首批女歼击机飞行员集中疗养)," Xinhua Net, 4 November 2009, accessed at: <http://news.sohu.com/20091104/n267963397.shtml>; and "PLA Has Trained the Most Female Pilots in the World: Including Two that have Gone to Space (解放军培养女飞行员数量世界第一: 两名升空)," 8 March 2016, China Military Net (中国军网), accessed at: [http://www.xinhuanet.com/mil/2016-03/08/c\\_128782723.htm](http://www.xinhuanet.com/mil/2016-03/08/c_128782723.htm).

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- <sup>12</sup> Ren Liyun (任立耘), Wan Wenjun(王文军), “Improve Combat Capability Standard; How Chengdu MRAF Pilots Improve Combat Standard Through Specialized Therapy and Rehabilitation Training.”
- <sup>13</sup> Wang Lanyou (王兰友), Li Guangjun (李广君), Xu Sheng(徐生), “PLAAF Equipped with High-Performing Aircraft Has Reduced Flight Risks Significantly (中国空军装备高性能战机 飞行隐患大大减少),” *PLA Daily*, 2 July 2012. Accessed at: <http://www.chinanews.com/mil/2012/07-02/3999769.shtml>; also see: Ren and Wan, July 2014.
- <sup>14</sup> Ibid.
- <sup>15</sup> Wang, Li, and Xu, July 2012.
- <sup>16</sup> Ibid.
- <sup>17</sup> The program has reportedly become an element included in the *PLAAF Flight Training Outline* (空军飞行训练大纲). See: Pan Zhengjun (潘正军), Yu Wei (于伟), Li Nai (李柰), “Create a Modern ‘Aircraft Carrier’ for Specialized Service Health Promotion -- the Hangzhou Rehabilitation Resort of the Nanjing MR Explores a New Model of Specialized Service Recuperation Support for the Navy and Air force (打造特勤疗养的现代“航母”- 南京军区杭州疗养院探索海空军特勤疗养保障新模式),” *Guangming Daily* (《光明日报》), 7 May 2009, p. 3, accessed at: [https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrB\\_20090507\\_2-03.htm](https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrB_20090507_2-03.htm).
- <sup>18</sup> Wang, Li, and Xu, July 2012.
- <sup>19</sup> Ren and Wan, July 2014.
- <sup>20</sup> See: Pan Zhengjun (潘正军), Yu Wei (于伟), Li Nai (李柰), “Create a Modern ‘Aircraft Carrier’ for Specialized Service Health Promotion -- the Hangzhou Rehabilitation Resort of the Nanjing MR Explores a New Model of Specialized Service Recuperation Support for the Navy and Air force(,打造特勤疗养的现代“航母”—南京军区杭州疗养院探索海空军特勤疗养保障新模式),” *Guangming Daily* (《光明日报》), 7 May 2009, p. 3, accessed at: [https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrB\\_20090507\\_2-03.htm](https://epaper.gmw.cn/gmrb/html/2009-05/07/nw.D110000gmrB_20090507_2-03.htm).
- <sup>21</sup> Ke Wencai (柯文才), Liu Jianzhong (刘建忠), “All in One WeChat Post: PLAAF Aviator’s Medical Retreat Life (空军飞行人员的疗养生活啥模样? 一条微信告诉你),” *Dongxian Liaowang* (ETCAF WeChat Account), 16 May 2019, accessed at: [https://www.sohu.com/a/314414836\\_600546](https://www.sohu.com/a/314414836_600546).
- <sup>22</sup> Ibid.
- <sup>23</sup> Zhang Mimi (张汨汨), Yao Chunming (姚春明), “Air Force Units Jointly Formed ‘Joint Research Base for Aviators’ Mental Fitness’ (空军部队联合组建‘飞行员作战心理品质联合研究基地’),” 12 November 2018, Xinhua Net (新华网), at: [http://m.xinhuanet.com/2018-11/12/c\\_1123701982.htm](http://m.xinhuanet.com/2018-11/12/c_1123701982.htm).
- <sup>24</sup> For more details on the PLAAF’s “Red Sword” and “Golden Helmet” exercises, see: Jana Allen and Kenneth Allen, *The PLA Air Force’s Four Training Brands*, CASI, 2018, at: <https://apps.dtic.mil/sti/pdfs/AD1082745.pdf>.
- <sup>25</sup> Ibid.
- <sup>26</sup> Wang reportedly has accumulated 5,290 flying hours at the time of his retirement from flying in July 2020. “5,290 Hours! He Set a Record for the Longest Safe Flight Time of a Chinese Air Force Fighter (5290 小时! 他创造出中国空军歼击机安全飞行时间最长纪录),” 31 July 2020, *PLA Daily* (解放军报), accessed at: [http://www.xinhuanet.com/politics/2020-07/31/c\\_1126307065.htm](http://www.xinhuanet.com/politics/2020-07/31/c_1126307065.htm).
- <sup>27</sup> Ibid.
- <sup>28</sup> Fang Guangfeng (方光锋), Sun Quncai (孙群才), “Flight Training Needs Better Protection of Neck, Shoulder, and Back (飞行训练, 需防护好颈肩腰椎),” *PLA Daily*, 26 March 2015, accessed at: [http://www.xinhuanet.com/mil/2015-03/26/c\\_127623757.htm](http://www.xinhuanet.com/mil/2015-03/26/c_127623757.htm).
- <sup>29</sup> Li Xuan (李暄), Wen Xinguang (温新光), Cheng Xudong (程旭东) et al, “High-performance Aircraft Pilot Health Survey (高性能战斗机飞行员健康状况调查),” *People’s Military Medicine* (人民军医), Issue 9, 2016, at: [https://r.cnki.net/kcms/detail/detail.aspx?filename=RMJZ201609003&dbcode=CRJT\\_CJFD&dbname=CJFDLAST2016&v=.](https://r.cnki.net/kcms/detail/detail.aspx?filename=RMJZ201609003&dbcode=CRJT_CJFD&dbname=CJFDLAST2016&v=.)
- <sup>30</sup> Unit 93011 is likely PLAAF Yanji airfield station in Yanji, Jilin Province. See: Zhang Long (张龙), Yang Lei (杨蕾), Li Haodong (李号东), “Investigation on neck, shoulder, waist and leg pain in high-performance fighter pilots (高性能战斗机飞行员颈肩腰腿痛情况调查).” *Chinese Aerospace Medicine Journal* (中华航空航天医学杂志), 2019, 30(4): 293-295. DOI: 10.3760/cma.j.issn.1007-6239.2019.04.010, at: <http://rs.yiigle.com/CN113854201904/1309816.htm>.
- <sup>31</sup> Shen Jiangjie (沈江洁), Wu Huihui (吴卉慧), Shi Hua (石桦), “High-performance Aircraft Pilot Athletic Disease Spectrum Analysis (高性能战斗机飞行员运动系统疾病谱分析),” *Medical Journal of Air Force* (空军医学杂志), Issue 3, 2020, at: [https://r.cnki.net/kcms/detail/detail.aspx?filename=ZJZY202003003&dbcode=CRJT\\_CJFD&dbname=CJFDLAST2020&v=.](https://r.cnki.net/kcms/detail/detail.aspx?filename=ZJZY202003003&dbcode=CRJT_CJFD&dbname=CJFDLAST2020&v=.)
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- <sup>33</sup> Huang Jing (黄婧), Wang Dongjun (汪东军), Wang Huishu (王惠淑), et al, “Construction of Comprehensive Effectiveness Evaluation System for Aviation Medical Training of High-Performance Fighter Pilots (高性能战斗机飞行员航空医学训练综合效能评价体系的构建),” *Military Medical Sciences* (军事医学), Issue 12, 2018, at:

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<http://www.cqvip.com/qk/94344x/201812/7002010511.html>

<sup>34</sup> Wang Tianyi (王天益), “News Investigation: How To Make Medical Retreat Become ‘Gas Station’ for Combat Power (新闻调查: 如何让疗养成为战斗力“加油站”), *PLA Daily*, 2 July 2015, at: [http://www.xinhuanet.com/mil/2015-07/02/c\\_127977423.htm](http://www.xinhuanet.com/mil/2015-07/02/c_127977423.htm).

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

<sup>37</sup> See: Qi Huiming (齐辉明), Ling Tao (凌涛), Ding Huan (丁欢), “Reflections on Pilots’ Neck and Back Disease Monitoring and Treatment during 2019 Shaheen-VIII China-Pakistan Air Force Joint Training (2019 雄鹰-VIII) 中巴空军联合训练飞行员颈腰伤病防治的做法与体会,” *Chinese Aerospace Medicine Magazine* (中华航空航天医学杂志), 2019, 30(4): 298-300. DOI: 10.3760/cma.j.issn.1007-6239.2019.04.012, at: <http://rs.yiigle.com/CN113854201904/1309818.htm>.