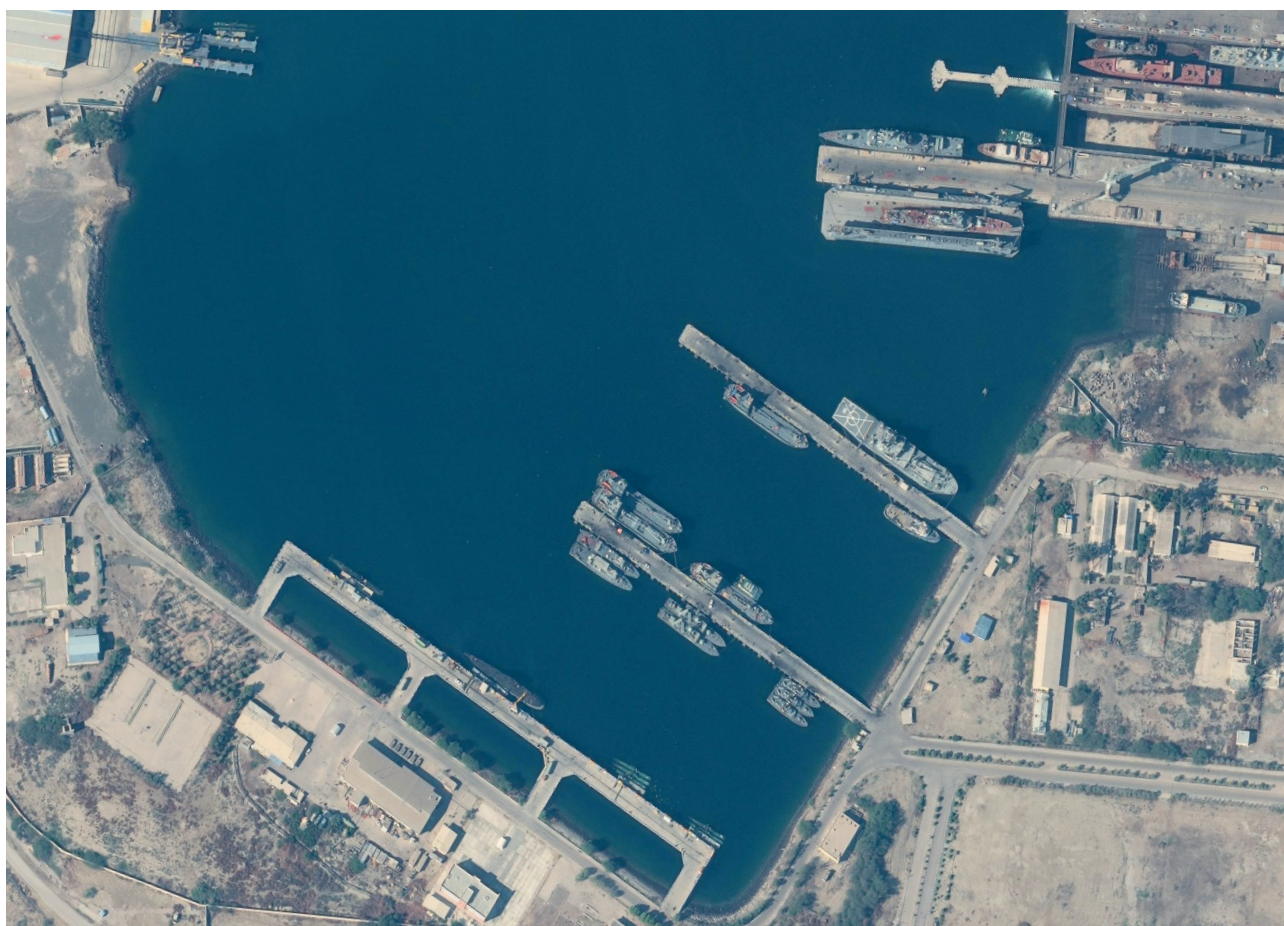


# Watching Iran: the ISR Gulf

---

Douglas Barrie, Nick Childs, Joseph Dempsey, Ester Sabatino and  
Timothy Wright

May 2023



# Contents

<b>Introduction</b>	<b>2</b>
<b>Chapter One: The Armed Forces</b>	<b>3</b>
The Islamic Revolutionary Guard Corps	3
Something old, little new	3
Unconventional conventions	4
Iran's missile forces	4
Survivable launchers	5
Underground storage sites	6
Iran's army: last in line?	6
Iran's air forces: sustaining obsolescence	7
Pivotal moment?	8
Weapons package	8
Independent air defence	9
Iran's naval forces: irregular advantage	9
Space for development	11
Gaining a boost	11
Launcher or missile?	12
Space for cooperation	12
<b>Chapter Two: Geospatial Exploitation</b>	<b>14</b>
Regional coverage	14
Maritime observation	15
Coastal defence	17
Air surveillance	18
<b>Chapter Three: Regional Demands and External Draws</b>	<b>21</b>
Ambitions and abandonment	22
Top-down and bottom-up approaches	22
The maritime domain	23
International and regional cross-currents	24
Task Force 59 and Gulf naval ambitions	25
Further horizons	27
Task Force 99 and airborne ambitions	28
<b>Conclusion</b>	<b>30</b>
<b>Notes</b>	<b>31</b>

---

Cover

Satellite image ©Maxar Technologies

# Introduction

Continuity can often be a welcome feature, but in the Gulf region it is also an issue. Iran remains the overwhelming security concern for the Gulf states, while their collective capacity to counter Tehran continues to be hampered by a reluctance to cooperate more closely. Four decades after its founding in 1981, the Gulf Cooperation Council (GCC) has yet to live up fully to its name.

The hesitancy over greater collective engagement in the defence and security realm is not new, but there has not been much progress either. And while this is problematic in and of itself, it is also being compounded by the demands of other regions on the United States, which is still the Middle East's primary security guarantor. Washington may use the language of optimising force posture, but in practical terms this means a reduction in its regional capabilities as these are drawn elsewhere.<sup>1</sup> Along with redeploying combat capabilities, the US is also shifting the focus of what are sometimes called 'high-value, low-volume enablers', including crewed and uninhabited intelligence, surveillance and reconnaissance (ISR) systems. When the region was the United States' priority, demand for ISR still could not be matched with available assets; even before Russia's full-scale invasion of Ukraine, the pull of the Indo-Pacific and concern over China were a draw on US ISR capacity. The war in Ukraine has served only to accelerate this move away from the Gulf region.

Unfortunately, the need to observe Iran to better understand its military activities and to help with intelligence assessments of the threat it poses has not lessened. This paper considers the value of ISR as both a contributor to regional deterrence and an essential element of armed forces' capacity in the event of war.

'Chapter One: The Armed Forces' reviews Iran's current military capabilities and the regional-security challenge Iran presents. It assesses how Tehran's armed forces and its equipment inventory may develop over the course of this decade and the wider regional ramifications of some possible outcomes. This section focuses on Iran's military rather than its use of proxies, though

it considers how proxies are supplied with weaponry and the contribution of ISR in efforts to interdict proxies and disrupt supply routes.

'Chapter Two: Geospatial Exploitation' uses available open-source imagery to illustrate the value of ISR, along with examples of imagery targets to show how ISR can be exploited. While this section uses only visual imagery, this is not intended to reflect any primacy over other parts of the electromagnetic spectrum. Rather, this is a function of the commercial availability of such products and their value for illustrative purposes. Although the images of sites of military interest are all derived from a commercial-satellite provider, and underscore the value of geospatial ISR, airborne platforms, crewed systems and uninhabited systems are at the very least valuable complements. These can provide an independent capability if a geospatial ISR component is not available at the national level. Though they have to be operated in national or international airspace, crewed and uninhabited systems are more responsive and can more easily be re-tasked. This chapter also considers in broad terms some of the kinds of data that can be acquired from a medium- to high-altitude platform being operated in international airspace off Iran's western seaboard.

'Chapter Three: Regional Demands and External Draws' reviews regional ISR capabilities at the national level along with the platforms deployed by the US and others. It also considers the continuing challenge of improving intra-GCC cooperation and what obstacles remain. US efforts to encourage broader information sharing among GCC countries have so far failed to fully meet this aim. While greater cooperation remains the goal in the near-term, the US now appears at least in some areas to be placing greater emphasis again on a hub-and-spoke approach as a means of supporting regional-security needs and laying the groundwork for improving regional cooperation. The chapter considers selected GCC ISR capabilities across domains, as well as US capacity within the region. Options for bolstering the regional capacity for ISR collection and exploitation are also appraised.

# Chapter One: The Armed Forces

Tehran continues to support two armed forces: the regular military and the Islamic Revolutionary Guard Corps (IRGC). The regular military is tasked with securing the territorial integrity of the state, while the IRGC is the regime's guarantor and guardian of the revolution. Formed in 1979, the IRGC has long been favoured over the once ideologically suspect conventional military. The IRGC has enabled Tehran to exert regional pressure through direct and indirect action and is responsible for the country's surface-to-surface missile (SSM) arsenal. The schism between the regular and the revolutionary armed forces, however, is economically inefficient and duplicative, spreading available funding thinner than otherwise would be the case.

## The Islamic Revolutionary Guard Corps

The IRGC mirrors all three of the regular armed forces, with ground, maritime, and air and space units, and it remains closely associated with Iran's leadership. Its Aerospace Force (IRGCASF) is also responsible for Tehran's short- and medium-range SSM inventory, which is at the heart of Iran's conventional deterrent. Its Quds Force, meanwhile, is tasked with supporting proxies or non-state actors in regional conflicts that further the aims of the Iranian leadership.

During the last decade, the IRGC (including its Quds units) was increasingly utilised to support President Bashar al-Assad in Syria. Several senior IRGC officers were killed during Iran's involvement in the Syrian civil war. The IRGC fought alongside regular Iranian army units, reflecting the increasing cooperation between the two forces over the last ten years.

## Something old, little new

While closely associated with the ruling elite, the IRGC suffers from many of the same equipment problems affecting the regular armed forces. Excepting some classes of missiles and uninhabited aerial vehicles (UAVs), its platform inventory is predominantly obsolescent.<sup>2</sup> Its main battle tanks (MBTs) and

infantry fighting vehicles (IFVs) are drawn from the same types available to the regular army and, therefore, it faces the same issues. Arguably the most 'modern' MBT available to the IRGC is the T-72S (an export version of the T-72B), which formed part of 1989–91 deals with the Soviet Union.<sup>3</sup> The T-72S has also served as the basis for several domestic MBT projects, including the *Karrar*. But while the latter has been displayed on numerous occasions, and Tehran claimed that it entered production in 2017, there is little open-source information indicating that the type has gone into service in any number.<sup>4</sup> IRGC armoured personnel carriers (APCs) and IFVs are predominantly of Soviet origin, with the former including the BTR-50 and BTR-60 and the latter the BMP-1 and BMP-2. The BTR-50 is a 1950s design, while the BTR-60 was produced early in the following decade.<sup>5</sup> The BMP-1 entered service in the Soviet Union in 1967, with the BMP-2 following 14 years later.<sup>6</sup>

The IRGC's air capability suffers from similar limitations.<sup>7</sup> Its fixed-wing combat capability is restricted to the Sukhoi Su-22 *Fitter* (as the Su-25 *Frogfoot* has been gifted to Iraq). The Su-22s were originally in Iraqi service but were relocated to Iran in 1991. Stored for many years, at least some of these aircraft have been returned

Iranian soldiers march during the annual military parade in Tehran marking the anniversary of the outbreak of the 1980–88 Iran–Iraq War, 22 September 2022.



(AFP/Getty Images)

to service since 2018.<sup>8</sup> They provide the IRGC with an air-to-surface capability, but one that is limited both in terms of number of Su-22s and the weapons integrated on the aircraft. Availability and reliability across the IRGC's fixed-wing inventory is likely an issue.

## Unconventional conventions

Though the IRGC and the regular forces share the same weaknesses in conventional weapons, the former has benefitted from being better able to embrace asymmetric or novel capabilities. The IRGC was an early adopter of UAVs – including in the armed role – as well as loitering and direct-attack munitions, at least in part to compensate for its lack of conventional air power. The IRGC operates a variety of medium and heavy UAV types and attack munitions, including the *Shahed* 129 heavy UAV and the *Shahed* 136 direct-attack munition.<sup>9</sup> Many of the latter have been supplied to Russia to support its war in Ukraine.

The IRGC was likely also the first arm of the Iranian military to field a long-range ground-launched cruise missile (GLCM). The Project 351 land-attack cruise missile (LACM) appears to have been an IRGC-supported project and was first seen in the guise of the *Quds* cruise missile supplied to Ansarullah in Yemen.<sup>10</sup> Various iterations of the basic design have emerged, although until earlier this year Tehran had not shown any imagery of the system. Footage of firings of a missile dubbed *Paveh*, however, was released at the end of February 2023, with the missile appearing to be a further iteration of the Project 351 design.<sup>11</sup> Unlike the versions used by Ansarullah (often referred to as the Houthis), the *Paveh*'s wing deployed post launch rather than being fixed.<sup>12</sup> This allows the missile to be placed more easily within a launch cannister.

The IRGCASF also includes ground-based air defence, with the IRGC units being better-equipped than the regular army. However, the Air Defence Force, despite being subordinate to the Islamic Republic of Iran Air Force (IRIAF), retains control of long-range surface-to-air missile (SAM) systems. The IRGCASF operates the *Ra'ad/3rd Khordad* (IR-SA-03) medium-range SAM, the system credited with the June 2019 shoot-down of the United States Navy Broad Area Maritime Surveillance Demonstrator intelligence, surveillance and reconnaissance UAV.<sup>13</sup>

Two Iranian-made *Shahed* 136s are displayed during a rally to mark the 44th anniversary of the 1979 Iranian Revolution, 11 February 2023.



(Morteza Nikoubazi/NurPhoto/Getty Images)

## Iran's missile forces

Although Iran relied heavily on foreign technical assistance and technology immediately after the establishment of its ballistic-missile programme in the 1980s, it has made significant strides in achieving self-sufficiency through illicit missile-technology acquisition and indigenous development. Recent developments in Iran's ballistic-missile programme can be summarised along the following points: an emphasis on improving the accuracy and, therefore, utility of its systems; developing survivable road-mobile and fixed-launcher sites; producing solid-fuelled missiles for a more reactive force; and constructing survivable underground storage and launch sites.

Iran's ballistic-missile arsenal has substantial breadth and depth. It is estimated that Iran operates at least 20 different types of systems, and the US Central Command estimated in 2022 that Iran possesses over 3,000 ballistic missiles of all different types and across close-, short- and medium-range thresholds.<sup>14</sup> Despite Iran's evident interest in possessing a large arsenal, its leaders have adopted a pragmatic approach by prioritising the development of increasingly advanced systems and discontinuing the production of legacy equipment once they have passed their prime. Iran's cessation of the production of the road-mobile, single-stage *Shahab-1/-2* short-range ballistic missiles (SRBMs) in 2015, and its shift to focus on developing improved variants such as the *Qiam-1*, is a pertinent example of this.<sup>15</sup>

This approach has been guided by the Iranian leadership's desire to improve the utility and lethality of its

The Iranian *Dezful* MRBM, *Qiam* SRBM and *Zolfaghar* SRBM are displayed in a military exhibition, 7 January 2022.



(Morteza Nikoubazl/NurPhoto/Getty Images)

ballistic-missile arsenal. Guidance improvements have been at the forefront of this effort and directives have been attributed to Iranian Supreme Leader Sayyid Ali Khamenei.<sup>16</sup> Accuracy has been improved by retrofitting guidance equipment, including ground-based, terminal and 'strap-down' guidance systems, onto some older missile types and installing these by design into newer types. The two-stage, road-mobile *Sajjil-2* medium-range ballistic missile (MRBM), for instance, may have benefitted from being retrofitted with a more modern 'strap-down' guidance system, considering Iranian claims that it can be guided all the way to the target.<sup>17</sup> Likewise, an upgraded version of the road-mobile, liquid-fuelled *Qiam-1* SRBM appears to have been fitted with a new guidance package, given the missile's evident accuracy when it was used in the 8 January 2020 attack against US forces at the Ayn al-Asad air base in Iraq.<sup>18</sup> The *Fateh* class of SRBMs also appears to have received various guidance upgrades, including the addition of an electro-optical seeker for terminal guidance for the road-mobile, solid-fuelled *Fateh Mobin* variant.<sup>19</sup>

As well as incorporating guidance improvements, accuracy improvements have been made on some of Iran's ballistic missiles by redesigning and adding fins to warheads and airframes to enable manoeuvring at different stages throughout the flight path. For instance, the upgraded *Qiam-1*, sometimes referred to as the

*Qiam-2*, is differentiated from the original version by the installation of moveable fins on its warhead, which suggest that the warhead can manoeuvre during the terminal phase of flight.<sup>20</sup> Likewise, the road-mobile, two-stage and solid-fuelled *Kheibar Shekan* MRBM appears to be an upgrade of, or at least partly based on, the *Dezful* MRBM, given the visible similarities between the two designs, with the exception of a redesigned, tapered and cylindrical warhead section featuring what appear to be larger fins.<sup>21</sup>

## Survivable launchers

According to US government reporting, Iran is believed to possess fewer than 100 road-mobile launchers for its SRBMs and around 50 launchers for its MRBMs, and it has made some effort to standardise the design of its transporter erector launchers (TELs) and mobile erector launchers (MELs).<sup>22</sup> However, owing to the large size of its ballistic-missile programme in terms of the quantity of systems it possesses and variants of different types of systems it deploys, as well as the substantial number of manufacturers that are involved in the development and production of military and dual-use equipment, the IRGCASF utilises a wide range of different launcher types, some of which can be camouflaged as civilian vehicles.

Iran's road-mobile launchers can be broken down into two broad categories: dedicated military vehicles and civilian vehicles that have been adapted to launch missiles but are camouflaged as civilian vehicles. The former consists of launchers that are purposely designed as military vehicles, although some Iranian-produced designs are ultimately derived from civilian vehicles. A number of Iran's purpose-built, road-mobile launchers that are used to transport and launch different types of ballistic missiles, including the *Dezful* and *Zolfaghar Basir*, appear to be locally made modifications of the MAZ-543, a Soviet-designed TEL used to transport and launch *Scud B/C* SRBMs, the latter of which Iran received from North Korea in the 1980s.<sup>23</sup> While Iran has successfully produced some locally made road-mobile and fixed-canister-launched systems such as the *Fateh* SRBM, the majority of Iran's road-mobile launchers do not use canister systems for storage and launch.<sup>24</sup> Although this launch option is simpler, it provides less protection for the missile than a sealed and protected canister.

Iran has also repurposed original and locally made versions of Western-built trucks, especially the Mercedes-Benz 2624 and 2631, for its ballistic-missile arsenal.<sup>25</sup> In this role, some vehicles are designed to be camouflaged as civilian trucks but are capable of transporting and launching ballistic missiles. This has been achieved through modifications including the addition of folding screens that cover the missile and launch equipment, for instance, or placing the missile and associated launch rail within modified shipping containers.<sup>26</sup> For adversaries, this makes it challenging to correctly identify and target the launch platform. The drawback of this type of arrangement, however, is that it provides limited protection for the missile and launch crew and endangers civilians through the risk of misidentification. The mobility of some of these vehicles is also likely limited to paved roads, reducing opportunities for concealment and launch in rough terrain.

Multiple Iranian firms, such as Mammut Industries, Aerospace Industries Organization, Shahid Moghaddam Industries and Shahid Kalhor Industries, are believed to be involved in the production of Iranian road-mobile, ballistic-missile launchers and other ground-support equipment. Many of these manufacturers are on European Union, United Nations and US sanctions lists.<sup>27</sup>

### **Underground storage sites**

In addition to using road-mobile launchers to improve the concealment and survivability of its ballistic-missile arsenal, Iran has also constructed several underground missile-storage and -launch sites for similar purposes. This type of arrangement provides Iran with the ability to pre-position equipment that can act as a force multiplier; reduces the vulnerability of Iranian ballistic missiles to targeting; potentially forces an adversary to use significant amounts of ordnance to disable or hamper well-protected launch sites; increases Iran's ability to fire large salvos of missiles in quick succession; and reduces the risk to Iranian military personnel if command and control can be safely located away from launch sites.

Although the IRGCASF has used underground missile-storage sites for TELs since at least 2015, since then it appears that Iran has designed more advanced

complexes that incorporate reloading and launching equipment.<sup>28</sup> While the IRGCASF's earlier-designed underground storage sites are well-protected under mountainous terrain, their utility could be reduced if an adversary impeded the ingress and egress of mobile TELs by targeting tunnel entrances. Iran seems to have made some attempt to minimise this vulnerability, as a few of its newer facilities appear to feature internal automated railway systems for transporting missiles through tunnels along with rotating magazines and launch silos.<sup>29</sup> The IRGCASF claims that this arrangement allows it to move missiles rapidly within the tunnel complex, reload faster and launch barrages of missiles from within the complex in quick succession.<sup>30</sup> Storing missiles this way also increases the amount of space available, as the need for large TELs is obviated.

Iran also appears to have developed and implemented a system of burying ballistic missiles that is slightly distinct from a traditional underground missile silo. During Iran's *Great Prophet 14* exercise in July 2020, IRGCASF Brigadier-General Amir Ali Hajizadeh announced 'the successful launch of ballistic missiles from the depths of the Earth in a completely camouflaged way' and said that this could 'pose serious challenges to enemy intelligence organisations'.<sup>31</sup> Footage of the missile test shows the hot launch of an unnamed type of ballistic missile from a camouflaged hatch.<sup>32</sup> Unusually, the missile's launch angle is not vertical, as is common with a silo launch, but angled, suggesting that the launch platform was buried at an angle within a covered and camouflaged trench. If the missile was stored within a hermetically sealed cannister and utilised a solid-fuelled motor, it could potentially be buried for years without suffering degradation.

### **Iran's army: last in line?**

Primarily tasked with territorial defence, over the last decade the regular army has become more active beyond Iran's borders, most notably operating in Syria during the civil war. Numerically the largest of Tehran's armed services, it is conscript-based and remains comparatively poorly outfitted with ageing equipment. The IRGC ground force will almost certainly continue to take precedence for any investment.

An Iranian soldier sits atop a T-72 MBT as it rolls past a portrait of Iran's Supreme Leader Ali Khamenei during the Islamic Republic of Iran Army Day parade in Tehran, 18 April 2015.



(Behrouz Mehri/AFP/Getty Images)

The most 'modern' MBT in the army's inventory is the Russian T-72S, with the 1970s-era British *Chieftain* and the 1960s American M60A1 still retained. The Defense Industries Organization's responsibilities include the support, maintenance and development of land systems for the armed forces. Over the years, its subsidiaries have produced numerous MBT upgrade projects as well as 'new' designs. While likely successful in introducing modest upgrades to legacy equipment, efforts to develop a domestically designed and manufactured MBT have apparently faltered. The army's IFVs and APCs are similarly aged, as is its self-propelled and towed artillery.

The army has a small number of fixed-wing aircraft for light transport and liaison, with a much larger helicopter fleet. Again, these are all ageing, and maintenance and availability are likely to be increasing challenges. Its Boeing CH-47C *Chinook* heavy-lift helicopters were delivered in the early to mid-1970s, with less than a third of the total delivered still in service. Its Bell AH-1J *Cobra* attack helicopters were ordered at the end of 1971, as were its Bell 214 transport helicopters.<sup>33</sup>

The AH-1J has been the focus of domestic upgrade projects under the guise of the *Toufan I* and *Toufan II*. As with other Iranian programmes, the name is also publicly associated with different developments. *Toophan* is a name also used for the US-made BGM-71 tube-launched, optically-tracked, wire-guided (TOW) anti-tank missile in the Iranian inventory and carried by the AH-1J.

## Iran's air forces: sustaining obsolescence

Iran's conventional air power today still mainly relies on aircraft acquired before the fall of the Shah's regime in 1979, excepting some Chinese and Soviet-era combat aircraft acquired in the 1980s and at the beginning of the 1990s.<sup>34</sup> As an air arm it compares poorly to the equipment inventories of Saudi Arabia or the United Arab Emirates (UAE), and even more so to Israel.

Its combat-aircraft fleet is made up for the most part of Grumman F-14 *Tomcat*, McDonnell Douglas F-4 *Phantom* and Northrop F-5 *Freedom Fighter* aircraft, with smaller numbers of MiG-29 *Fulcrum*, Sukhoi Su-22 *Fitter K* (IRGC-operated), Su-24MK *Fencer D*, Chengdu F-7M *Airguard* and Dassault *Mirage F-1* aircraft.<sup>35</sup> Some of the aircraft that remain in inventory were 'confiscated' after they were flown by Iraq to Iran following the 17 January 1991 US-led air campaign at the beginning of *Operation Desert Storm*. Domestic efforts to produce a combat aircraft in operationally significant numbers have so far come to naught.

The IRIAF, and the IRGC's air wing, are further limited by a lack of modern air-to-air and air-to-surface guided weapons for many of their combat aircraft. In the ground-attack role, the IRIAF's Su-24MKs are likely the most capable, as they are able to carry several types of Russian short- and medium-range air-to-surface missiles. Efforts are also underway to provide this aircraft with an extended-range LACM.<sup>36</sup> The IRIAF is somewhat better off in terms of air-launched anti-ship missiles (AShMs), as Tehran used access to and support from China in the 1990s and early 2000s to build a credible national development and manufacturing capability

Iranian F-14 and F-4 fighter aircraft are demonstrated as part of the 9th International Iran Airshow held in Kish Island of Hormozgan Province, 27 November 2018.



(Fateme Bahrami/Anadolu Agency/Getty Images)



for these. The extent to which some of these weapons developments have been fully integrated on aircraft or helicopters, however, remains uncertain.

### Pivotal moment?

Iran began efforts to recapitalise its combat-aircraft fleets following the conclusion of its war with Iraq in 1988. Combat-aircraft losses during the war, combined with the difficulties of sourcing spares and support for the US designs, acted as a prompt. A lack of funding and political support – the latter because the regular air force was viewed with suspicion by some clerics – meant that only a comparatively small number of aircraft were acquired from the Soviet Union at the start of the 1990s. Since then, efforts to import combat aircraft from Russia have failed, but this may finally be about to change.

After the better part of a decade of interest, Tehran and Moscow have struck a deal to provide the IRIAF with a modern combat aircraft. An Iranian parliamentarian told a domestic news agency that deliveries of the Sukhoi Su-35 *Flanker* M will begin in the second quarter of 2023.<sup>37</sup> The delivery schedule indicates that the aircraft have already been built and are likely the Su-35s manufactured for Egypt, an order which was later cancelled. As of early April 2023, the aircraft, 24 of which were built to meet the 2018 deal, appear to remain at the Komsomolsk-on-Amur production site.<sup>38</sup>

The introduction of the Su-35 into the IRIAF inventory would mark a considerable improvement in its combat-aircraft capabilities. The aircraft is now the primary single-seat multi-role fighter in the Russian Air Force, having entered into service in the mid-2010s. Given the aged nature of most of the IRIAF's combat-aircraft fleet, the Su-35 might be introduced to replace several types.

In the air-defence role, the Su-35 could be used as a successor to the IRIAF's F-14s, though the shift from a two-seat to a single-aircrew aircraft could require changes in training and tactics. The rear seat in the F-14 is occupied by what was called the 'radar intercept officer', a role central to the combat operation of the aircraft. Previously, the IRIAF had shown interest in the Su-30 (a two-seat variant of the Su-27 family), which, as a possible successor to the F-14, would have retained the two-seat format.

While the IRIAF still notionally has up to 41 F-14s in its inventory, the number of aircraft in front-line service is almost certainly considerably lower than this total.<sup>39</sup> As such, the acquisition of 24 Su-35s could conceivably result in the complete replacement of the F-14s. Another option would be for the Su-35 to replace the MiG-29 *Fulcrum* A fighter aircraft. This would allow for an easier aircrew conversion, given that the *Fulcrum* A is a single-seat aircraft.

### Weapons package

What Russia is willing to provide in the weapons package associated with the supply of the Su-35 is as important as the platform itself. Whatever is included will also be indicative of the role(s) that the IRIAF intends to assign to the units that will operate the type. Russia introduced three upgraded air-to-air missiles (AAMs) in the middle of the last decade: the Vympel R-74M (RS-AA-11B *Archer*) infrared-guided short-range missile, the Vympel R-77-1 (RS-AA-12B *Adder*) active-radar-guided medium-range missile and the Vympel R-37M (RS-AA-13A *Axehead*) active-radar-guided long-range missile.<sup>40</sup> The R-77-1 has already been exported to China as part of the weapons package for its Su-35; delivery of the aircraft began at the end of 2016.<sup>41</sup> The R-74M has also likely been exported. As yet, there is no open-source evidence that the R-37M has been supplied to any force other than the Russian Aerospace Forces. The missile, however, is advertised for export by Russia, often under the generic acronym RVV-BD (AAM-long range). Were the export variant of the R-37M to be provided to the IRIAF, it would be a strong indication that the service plans to use the Su-35 in the role currently fulfilled by the F-14. One likely long-standing issue for the IRIAF is the lack of availability of a primary weapon for the F-14. Although a substantial number of the Raytheon AIM-54A *Phoenix* long-range AAM were provided to Iran, these missiles have been life-expired for decades.

Iran could also benefit from a variety of Russian air-to-surface weapons being integrated, or likely to be integrated, on the Su-35. One caveat to this though is that, as of the second quarter of 2023, the priority for Russian air-to-surface weapons production is almost certainly to backfill missile holdings already used in Ukraine.

While the IRIAF has an anti-ship capability with the Chinese C-801 (YJ-81/CH-SS-N-4 *Sardine*) and *Noor* – a derivative of the C-802 (CH-SS-N-6) – it now appears also to be seeking a long-range stand-off land-attack capability. Partial imagery of an Su-24MK released in February 2023 shows a missile dubbed *Asef*, carried on a wing pylon. The *Asef* appears similar to LACM designs that resulted from Tehran’s original *Meshkat* programme aimed at developing a GLCM. So far, no imagery has been shown of an Su-24MK in flight carrying the *Asef*, suggesting that the project may be at an early stage.<sup>42</sup> However, as with much of what is shown by Tehran or its armed forces, the unveiling of the missile may also have been for propaganda or disinformation purposes only.

### Independent air defence

Iran’s primary ground-based air defence has been an independent element of the regular armed forces for over a decade, as it was separated from the IRIAF in 2008. In comparative investment terms, the Islamic Republic of Iran Air Defense Force has arguably fared better than other elements of the regular forces. Funding has been channelled to domestic SAM system development and the acquisition, if limited, of systems from Russia. The long-range Almaz-Antey S-300PMU-2 (RS-SA-20C *Gargoyle*) was acquired from Russia in 2016.<sup>43</sup>

Iran now fields four battalions of the S-300PMU-2, with batteries seen at sites in Tehran, Isfahan and Bushehr.<sup>44</sup> In the case of the last, however, while batteries were visible from 2017 to 2019, there is no more recent imagery in which TEL vehicles are visible. As well as acquiring a

long-range system from Russia, Iran has also been fielding domestically developed SAM systems, including the long-range *Bavar-373* and the medium-range *Talash/15th Khordad* and *Ra’ad/3rd Khordad*.

### Iran’s naval forces: irregular advantage

Iran has two naval arms: the more conventional Islamic Republic of Iran Navy (IRIN), which is the successor to the Imperial Iranian Navy, and the Islamic Revolutionary Guard Corps Navy (IRGCN), which was established in the mid-1980s.<sup>45</sup> Their roles were shaped by the experiences and lessons of that decade – in the conflict with Iraq and their eventual engagement with much more powerful US conventional naval forces. These encounters spurred a drive towards an asymmetric maritime-defence strategy across both naval arms, but led chiefly by the IRGCN, which has steadily eclipsed the IRIN.

Against this backdrop, and an underlying sense of rivalry, the primary geographical areas of responsibility for the two services have been divided since 2008. The IRGCN has primary responsibility in the Gulf and the Strait of Hormuz, while the IRIN has primary responsibility in the Gulf of Oman, the Arabian Sea and the Caspian Sea and for the projection of influence and (albeit very limited) power further afield with more long-range deployments.<sup>46</sup> However, more recently, as the regional maritime environment has evolved, the IRGCN has been developing more capabilities to operate at a greater range as well, potentially encroaching on the role of the IRIN.

The key capability element of the IRIN is a force of legacy and domestically produced medium- and small-sized surface combatants, which have some anti-ship capability (including the C-802 missile) but overall have limited combat value. It also has a submarine force that is limited by Western naval standards but can pose significant tactical problems for naval forces operating in and around the Gulf. The force is centred around its three Project 877EKM *Kilo*-class conventionally powered submarines, which were bought from Russia in the 1990s and are now of uncertain reliability. It also has 14 North Korean-designed *Ghadir*-class (*Yono*) submarines equipped with *Jask-2* (C-704 (*Nasr*)) AShMs and a single domestically

A Russian-made S-300PMU-2 SAM is driven during a military parade marking the Islamic Republic of Iran Army Day, 18 April 2019.



(AFP/Getty Images)

Iranian and Russian navies attend a joint maritime drill in the Arabian Sea and northern Indian Ocean, 14 February 2021.



(Iranian Army/Handout/Anadolu Agency/Getty Images)

designed and built *Nahang* midget submarine, which lacks torpedo tubes and may serve as a special-operations platform.<sup>47</sup> In February 2019, the IRIN officially commissioned its first coastal submarine and largest indigenous-submarine design, the *Fateh*, which Tehran says can launch both torpedoes and ASHMs.<sup>48</sup> Otherwise, Iran's most potent systems in a maritime context are its shore-based coastal-defence ASHMs and its significant inventory of sea mines.

While the IRIN has undertaken some modernisation of its naval systems, its resources and access to advanced capabilities are limited. A notable recent acquisition has been a converted commercial tanker, the *Makran*, which is fitted with a large flight deck and is able to operate helicopters and UAVs as well as act as a transport.<sup>49</sup> It thus has a limited ability to act as an afloat expeditionary forward base and, with its imposing presence, has already been deployed on long-range 'showing the flag' missions, the latest voyage being a planned circumnavigation.<sup>50</sup> Its value may lie in such deployments and being able to support Iranian proxy groups around the Middle East, but otherwise its military capability for anything other than grey-zone and modest maritime-security tasks is probably quite low.

An element of the IRIN's future potential (and, for that matter, also the IRGCN's) may lie in Iran's relations with both China and Russia. In March 2023, ships from the navies of all three countries took part in the latest in a series of (admittedly modest) joint manoeuvres that underscored the increasing complexity of the regional maritime scene and the relationships involved.<sup>51</sup>

The main inventory of the IRGCN comprises large numbers of fast patrol boats, many of them missile-armed and capable of mounting an unconventional maritime guerrilla-style campaign, potentially including swarm attacks, which are regularly practised in exercises. These craft have often been used to harass naval and other shipping vessels in and around the Gulf and even to carry out disrupting attacks, including using limpet mines. More significantly, since mid-2021, the IRGCN appears to have been employing explosive-laden UAVs such as the *Shahed* 136 to attack merchant shipping in the region, particularly vessels associated with Israel as part of a clandestine war of nerves between the two.<sup>52</sup>

Spurred in part by the conflicts in Yemen and Syria, the areas of potential tension at sea in the region have expanded considerably to include not just the Gulf and the Strait of Hormuz, but also the Gulf of Oman, the north Arabian Sea, the Bab el-Mandeb Strait, the Red Sea, the Suez Canal and potentially even the eastern Mediterranean. Thus, the areas of activity for Tehran have also been extended. The purpose of the cargo ship *Saviz*'s presence in the southern Red Sea for an extended period was widely assumed to be to carry out surveillance and provide other support for clandestine IRGC operations, and the vessel was replaced by another, the *Behshad*, in August 2021 after it was hit in April that year by an explosion suspected to have been the work of Israel.<sup>53</sup>

Other evidence of the IRGCN's enhanced and extended role, as well as a suspected increase in its funding, has been the advent of a new design of catamaran missile-armed corvettes, the first of which, the *Shahid*

A mural depicting the past conflicts between the IRGC and the US Navy in the Strait of Hormuz, 2 May 2017.



(Kaveh Kazemi/Getty Images)

*Soleimani*, was commissioned in September 2022, with at least three others thought to be under construction. The vessels are said by Tehran to have a reduced radar cross-section design. They also appear to be equipped with six larger systems and 16 vertical-launch systems, possibly for two different types of SAMs, as well as six launch canisters for AShMs. The vessels also have a flight deck for helicopter and UAV operations, and are said to be able to launch, recover and support small fast-attack craft. Thus, the vessels seem capable of supporting operations by groups of smaller IRGCN craft, while also being able to undertake longer-range operations.<sup>54</sup>

Like the IRIN, the IRGCN has also converted merchant hulls into base ships. These include a former cargo ship, now the *Shahid Roudaki*, that has a large open deck able to accommodate helicopters, UAVs, fast boats and even various weapons systems, including mobile surface-to-air launchers and AShMs. This vessel represents another asset that can extend the reach of IRGCN operations, albeit with limited combat capability beyond carrying out grey-zone missions.<sup>55</sup> A more ambitious plan seems to be the conversion (currently underway) of a former container ship into a dedicated helicopter and UAV carrier, including the fitting of an extended deck for operations. A second vessel may also be similarly converted.

Meanwhile, the IRIN also appears to be increasing its interest in UAVs; it paraded them aboard a series of platforms, including a submarine, in an exercise in July 2022, supposedly as part of a new unit.<sup>56</sup> The use of the UAVs would likely be both for surveillance and strike missions.

Thus, within the limits of constrained resources, Iran has been extending and diversifying its ability to pose asymmetric challenges, including to major naval units, in grey-zone scenarios at least. Moreover, these capabilities seem likely to focus not only on the development of conventional missile systems but also the use of UAVs in a weaponised role.

## Space for development

Space is playing an increasing role in Iranian national policy, and while initially claimed to be exclusively civil in character, Iran's space programme clearly has a significant military element. The civil programme is nominally under the auspices of the Iranian Space Agency

The Iranian satellite *Rasad-1* being launched into LEO, 15 June 2011.



(Mohsen Shandiz/Corbis Historical/Getty Images)

(ISA), while the IRGC controls military developments.

Iran was among the founding members of the UN Committee on the Peaceful Uses of Outer Space, although Tehran has an inconsistent record with ratifying treaties that regulate military and civilian space activities, including the 1967 Outer Space Treaty and the 1976 Convention on Registration of Objects Launched into Outer Space.<sup>57</sup> Iran's first foray into space was the launch of its *Sina-1* satellite in October 2005 aboard a Russian space-launch vehicle (SLV) from the Plesetsk Cosmodrome. The satellite had either a communication or an imaging payload. Subsequently in 2008, Iran conducted several launch tests in preparation for launching its first domestically produced satellite, *Omid*.<sup>58</sup> In February 2009, Iran successfully launched the satellite using a *Safir* SLV.<sup>59</sup> This SLV utilises a stretched first stage of the *Ghadr-1* MRBM, combined with a smaller, liquid-fuelled second stage. Launch success using the *Safir* over the past decade has been patchy at best. Iran, however, continued to develop its space-launch capabilities, eventually pursuing liquid-fuelled and solid-propellant-based SLVs, as well as a hybrid-propellant system that uses a combination of liquid and solid fuel. Iran has launched at least two military satellites into low Earth orbit (LEO), the *Noor-1* and *Noor-2* CubeSats, in 2020 and 2022 respectively, using the *Qased* SLV. Operated by the IRGC, both reportedly have an imaging payload.<sup>60</sup>

## Gaining a boost

Iran's current government appears to be investing more in the development of space capabilities than previous administrations. After just over a decade of dormancy, the Supreme Council of Space, Iran's highest-level

space-policymaking organisation, is once again meeting under Iranian President Ebrahim Raisi.<sup>61</sup> Tehran is also free now from the Joint Comprehensive Plan of Action framework, the stipulations and constraints of which had implications for Iran's SLV programme.<sup>62</sup> Iran remains bound by UN Security Council Resolution (UNSCR) 2231, which calls upon Iran to not 'undertake any activity related to ballistic missiles designed to be capable of delivering nuclear weapons'.<sup>63</sup> Given that there are many components which are used in both SLVs and ballistic missiles, some states have said that Iranian SLV launches are inconsistent with UNSCR 2231.<sup>64</sup> Iran's space council has reasserted the economic and technological value of space research and has set a target date of 2026 for Tehran to be in possession of an SLV capable of reaching geostationary Earth orbit (GEO).<sup>65</sup>

Raisi has said that such a technological development would improve Iranian economic relevance in the region and be a deterrent factor for the country's opponents.<sup>66</sup> The latter suggestion underscores the importance to Tehran of the defence and security component of its space efforts.<sup>67</sup> The Supreme Council of Space also recently approved a ten-year space programme with the lofty goal to transform Iran into a reference nation for the development of space-launch technology and the provision of related services in the region.<sup>68</sup> A core element of the ten-year plan is the *Martyr Soleimani Project*, meant to include a multi-role satellite constellation.<sup>69</sup>

The ambition to further develop Iran's military space capacity is also reflected in recent budget spending. In 2021, the IRGCASF command and other organisations involved in military space saw its allocated spending increase by a factor of 12 compared to 2020.<sup>70</sup> The overall US dollar figure at US\$35 million, however, remains modest when compared with other states in the Middle East that have notable space ambitions, such as the UAE.<sup>71</sup>

## Launcher or missile?

SLVs and long-range SSMs are not identical, especially because the former are not developed to survive the intensely hostile environment of atmospheric re-entry. However, many of the technologies and components used by both types of equipment, including rocket engines, strong and lightweight airframes and casings, inertial navigation and guidance units, and stage- and

payload-separation mechanisms, are closely related. This correlation is reflected in the fact that the ISA and affiliated research institutes are listed on the US government's sanctions lists, as Washington assesses Tehran is using its civilian programme to gain experience with various technologies that are necessary for the development of long-range ballistic missiles.<sup>72</sup>

Underlining the association between Iran's civilian and military programmes, the IRGC's *Noor* satellites, for instance, were launched using the *Qased* three-stage, hybrid-propellant SLV that utilises the first stage from the *Shahab-3/Ghadr* family of MRBMs and supersedes the *Safir* SLV.<sup>73</sup> Further *Noor* launches are expected to build upon the constellation and improve coverage.<sup>74</sup> Iran's civil and military space programmes are also both pursuing solid-propellant developments. Solid propellants are not used as often for SLVs as liquid-fuelled systems, because the former produce greater vibrations, produce increased g-forces due to faster acceleration and are not throttleable.

The *Zuljanah* SLV project is associated with the country's civilian space programme and was tested for the first time in February 2021. In June 2022, it successfully put a 220-kilogram satellite in LEO.<sup>75</sup> The *Zuljanah* is a three-stage, hybrid-propellant SLV: the first two solid-propellant stages are complemented by a third liquid-propellant stage.<sup>76</sup> In parallel, Iran has been testing the *Simorgh (Safir-2)* SLV, but development has been particularly troublesome. It suffered six failed tests between 2017 and 2022.<sup>77</sup>

The IRGC has also begun launch tests of a solid-fuelled, three-stage rocket, the *Qaem-100 (Ghaem-100)*. The *Qaem-100* is meant to be used to place the *Nahid-1* communications microsatellite into LEO. The launch of the *Nahid-1* using other SLVs has previously been postponed.<sup>78</sup> The *Qaem-100* appears to have been designed to be launched from a road-mobile launcher and uses solid propellant, an approach that has military utility. There are also suggestions that development of a four-stage variant of the *Qaem-100* could support the development of an intercontinental ballistic missile.<sup>79</sup>

## Space for cooperation

Iran has looked to international partners to support its ambitions in space, particularly China, North Korea and

Russia. Cooperation with Russia has been reinforced by a December 2022 bilateral space-industry agreement, which includes joint development of infrastructures, remote sensing and telecommunication satellites and appears intended to contribute to the implementation of Tehran's ten-year space programme.<sup>80</sup> The agreement comes just a few months after an Iranian *Khayyam* remote-sensing satellite was placed into orbit by a Russian *Soyuz* SLV launched from the Baikonur Cosmodrome.<sup>81</sup> Bilateral cooperation on the *Khayyam* satellite presumably included the designing and supervision of the construction of the unit by Iranian engineers.<sup>82</sup> Although the satellite is said to be used exclusively by Iranian authorities for civilian purposes, there were concerns over its potential use by Russia to acquire additional information on Ukraine to support its war, as well as Iran's possible use of it to monitor potential military targets in the Middle East. Furthermore, the launch is reportedly part of a four-year cooperation agreement between the two countries.<sup>83</sup>

Since 2005, Iran has been a member of the Chinese-led Asia-Pacific Space Cooperation Organization, which

has provided Tehran with satellite data.<sup>84</sup> China has also provided Iran with a telescope to track objects in LEO and GEO.<sup>85</sup> Cooperation between Iran and China on space has been less evident than with Russia but could develop further. A comprehensive strategic partnership agreement signed in March 2023 also includes a section on defence cooperation. Despite not being explicitly mentioned in terms of defence, space work is included in the 'executive cooperation domain'.<sup>86</sup>

Cooperation with North Korea on space launchers has been long-standing. The *Shahab-3/Ghadr* MRBM, on which the *Qased* SLV is based, is itself believed to be based on the North Korean *Nodong* mod 1 missile Iran bought from North Korea in the 1990s.<sup>87</sup> According to several UN reports, Tehran has received support and assistance from North Korea in the development of SLV technology.<sup>88</sup> This cooperation is considered to breach UNSCR 2231, and thus the UN and the US have responded by issuing new sanctions against the research entity receiving expertise and those experts providing it.<sup>89</sup>

# Chapter Two: Geospatial Exploitation

Until the 1990s, only a handful of countries had the ability to develop and launch satellites for military applications. As of 2023, more than 20 countries now operate intelligence, surveillance and reconnaissance (ISR) satellites, though China, Russia and the United States remain the three largest operators.<sup>90</sup> Furthermore, the commercialisation of many geospatial activities is providing states with access to militarily useful imagery even if they do not own or operate such systems. Commercially available imagery can also be used to supplement nationally owned or operated systems to increase either how regularly the images are taken or the area of coverage.

This chapter illustrates the utility of geospatial imagery as both a direct and an indirect means of providing information on developments within Iran that are of regional-security interest. The material used in this section has been supplied by Maxar Technologies, a US commercial company that provides satellite imagery to more than 50 governments.<sup>91</sup>

The US started using satellites to obtain imagery of the Soviet Union at the beginning of the 1960s as an alternative to crewed flights near or within Soviet airspace. Geospatial-imagery-collection activity has been a critical element of US ISR capacity for decades, complemented with a variety of air, ground and maritime systems.

The Gulf Cooperation Council (GCC) nations have also recognised the value of space-based ISR; the United Arab Emirates (UAE) *FalconEye 2* electro-optical (EO) imaging satellite was launched at the end of 2020.<sup>92</sup> The UAE Armed Forces operate the *FalconEye 2* and have had the ability to receive satellite imagery from a range of providers for over a decade through the Space Reconnaissance Center. The UAE also has a national space agency that is responsible for non-military activities, and Bahrain, Qatar and Saudi Arabia have space agencies as well.

## Regional coverage

The satellite imagery selected for this section is, for the most part, of sites in the coastal regions of Iran. This is intended to illustrate that many Iranian sites of interest

can be viewed not only using geospatial platforms but also from airborne and, in some cases, naval platforms. Satellite-derived intelligence can be used to 'cue' other capabilities to provide a closer or more-persistent view than from a platform in low Earth orbit. This cueing can also be used for platforms or payloads capable of gathering data through either communications or electronic intelligence.

ISR spans from the tactical to the strategic, with space-based gathering capabilities increasingly capable of being employed across this spectrum. Space-based systems, however, by their very nature, are less flexible and responsive when operated in isolation from other ISR systems. The more constellations to which an operator has access, the less of a limitation this is. Nevertheless, air-breathing and maritime platforms continue to have attributes that complement and supplement space-based ISR.

Iran's military activities, capabilities and developments remain a key interest for GCC states as well as for other countries with security interests in the region, including Israel and the US. Given the continuing emphasis Tehran places on its surface-to-surface missile arsenal for its security, gathering information on all aspects of Iranian ballistic-missile activity is a regional priority.

Figure 1 is an image of the Islamic Revolutionary Guard Corps' (IRGC) Hajiabad launch site taken in July 2022. This site underwent development from 2017 to 2019 and the work was identifiable in commercially available satellite imagery. The development was of particular interest given that it appeared to create a hardened launch site, possibly for solid-fuelled missiles.<sup>93</sup>

While Iran's ballistic missiles are typically road mobile, the IRGC also deploys some in hardened-launch sites. The design identified at Hajiabad includes seven hollowed structures that could provide protection for a slant-launched, canisterised, solid-fuelled ballistic missile. Were Iran to deploy only its shorter-range (up to 500 kilometres) solid-fuelled missiles at the site, then only parts of the UAE and Oman would be within

striking distance. Were it to deploy a missile such as the *Dezful*, which has a range of 1,000 km, then Riyadh would just be within reach.<sup>94</sup> While the Hajiabad site is almost certainly beyond the range of airborne EO payloads that could be operated from the international air space bordering Iran’s central-western coastline, a signals-intelligence-equipped (SIGINT-equipped) air platform could potentially offer the persistence and detection ranges required to pick up radio-frequency activity from the Hajiabad location.

## Maritime observation

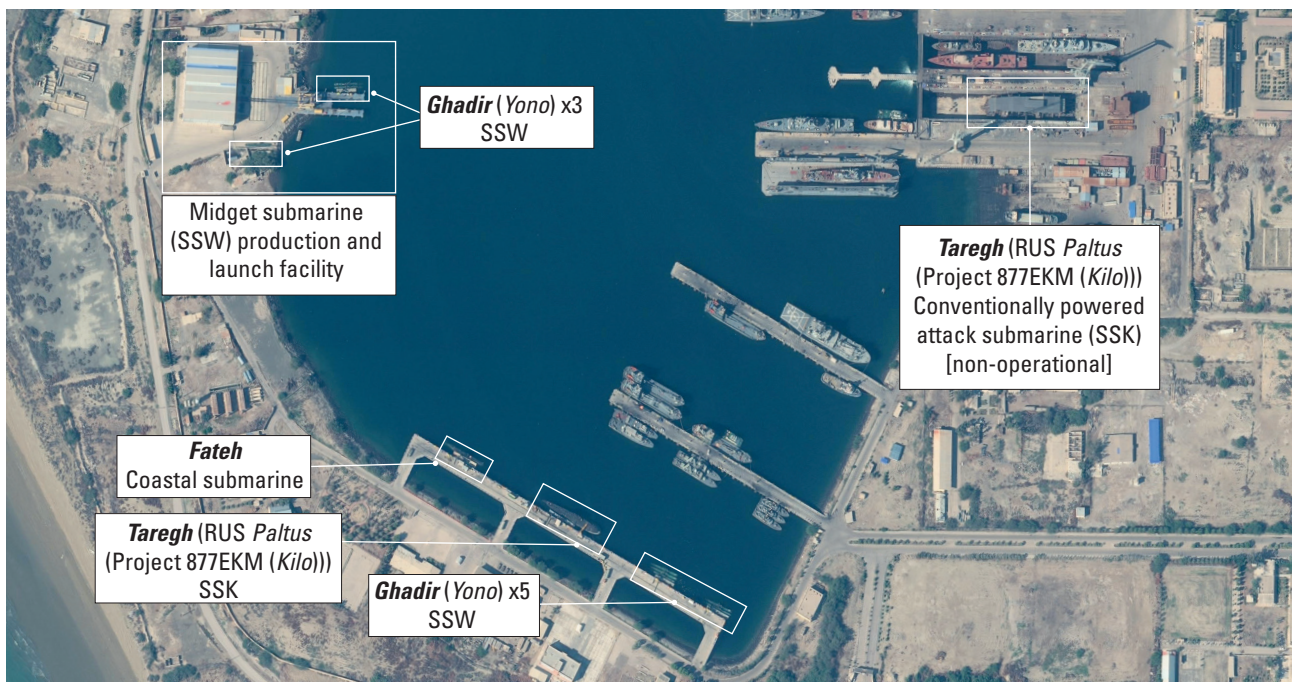
The Strait of Hormuz is of geostrategic significance as a trade (especially oil-trade) thoroughfare. It is a bottleneck that Tehran has looked to exploit on numerous occasions either directly or via the activity of allied non-state actors. While it was Iraq that initially attacked shipping in what became known as the ‘Tanker War’ during its 1980–88 conflict with Iran, Tehran later began to target vessels as well. This element of the war likely, in part, prompted Iran to acquire anti-ship missiles (AShMs) from China,

Figure 1: Suspected ballistic-missile base near Hajiabad (28.329, 55.94286), 5 July 2022



(Satellite image ©Maxar Technologies)

Figure 2: Submarines at Bandar Abbas naval base (27.14306, 56.21309), 19 January 2023



(Satellite image ©Maxar Technologies)



with a deal signed between the two countries in 1985 that arguably marked the beginning of the cooperation and development underpinning Tehran's current range of ASHM systems.<sup>95</sup>

The Bandar Abbas facility hosts the regular Islamic Republic of Iran Navy (IRIN) and the IRGC Navy, and both forces' 1st Naval Districts have their headquarters there. Besides being a home-port location for surface vessels from both naval arms, the location is Iran's principal submarine-operating base (Figure 2) and is well positioned for Strait of Hormuz operations.

Iran's most conventionally capable and only ocean-going submarines are its three Russian *Kilo*-class vessels. However, satellite imagery suggests that, over the last three years, at best two have remained operational. More numerous are the much-smaller *Ghadir*-class midget submarines (SSWs), of which at least 14 are in service.<sup>96</sup> Though they were produced at Bandar Abbas, these are reportedly based on the North Korean *Yono* design. While Iran has ambitions to produce larger indigenous designs, such as the *Fateh* coastal submarine, only one of this type has been launched to date.

The ability to carry out surveillance of the naval facilities at Bandar Abbas is of obvious value. As the example of the *Kilo*-class submarines suggests, imagery-derived information on patterns of operation, capabilities and platform availability has utility in building an

intelligence picture of Iran's naval capacity. Given the location, the site also offers the opportunity for persistent surveillance using airborne platforms with EO and SIGINT payloads in international air space. This of course is not without risk, as the June 2019 shoot-down of a US Navy Broad Area Maritime Surveillance ISR uninhabited aerial vehicle (UAV) demonstrates.<sup>97</sup> Tehran claimed, and the US disputed, that the UAV had entered Iranian air space. Whether the Iranian regime would in peacetime ever engage uninhabited or crewed GCC aircraft capable of being used for such missions, while they are being flown in international air space, has yet to be determined.

That IRIN activity with its *Kilo* submarines is limited to one, or perhaps two, of its three hulls has intelligence value. Any indication that the navy was starting to increase its operational tempo by using one, or both, of the two non-operational boats again would be less reassuring for GCC states.

Iran's hovercraft fleet comprises British-built *Wellington*- and *Winchester*-class hovercraft delivered prior to the Iranian Revolution. The *Tondar* designation is assessed to have been applied to reactivated *Winchester* craft. Examples of both classes have been observed to be armed with ASHMs.

Iran remains one of a handful of countries that operate hovercraft in the amphibious-assault role. The

Figure 3: Hovercraft at Bandar Abbas (27.15456, 56.16388), 19 January 2023



(Satellite image ©Maxar Technologies)

main operating base for these is also located at Bandar Abbas (Figure 3). The larger of the two types operated, the *Wellington*, has been seen participating in exercises. It has also been shown fitted with the launch cannister for the C-802 (*Noor*) (CH-SS-N-6) AShM, though none of the three *Wellington*-class hovercraft in Figure 3 appear to have the C-802 cannister fitted.

Southeast of Bandar Abbas, on the Iranian coastline of the Gulf of Oman, is the IRIN facility at Jask. When the location was opened in 2008, Tehran portrayed it as providing Iran with a greater capability to control access to the Strait of Hormuz. The location also provides direct access to the Arabian Sea.

There was initial speculation that the IRIN might locate some of its SSWs at Jask, which has turned out to be correct. One of the navy's *Ghadir*-class SSWs is visible in a satellite image (Figure 4) taken in February 2023. The base, however, is home mainly to Iranian patrol boats (PBs) and fast patrol boats. All the PBs in Figure 4 were originally foreign designs, indicating the extent to which the navy remains dependent on ageing platforms.

The image also shows different missile launch-tube configurations on the three *Combattante II*-based PBs. The two *Sina*-class (*Kaman* mod) ships have twin C-802

launchers trained port and starboard, while the *Kaman* (FRA *Combattante II*) has a different configuration. At least one of the *Kaman*-class, *Gorz*, was test fitted with SM-1 surface-to-air missile (SAM) launchers.

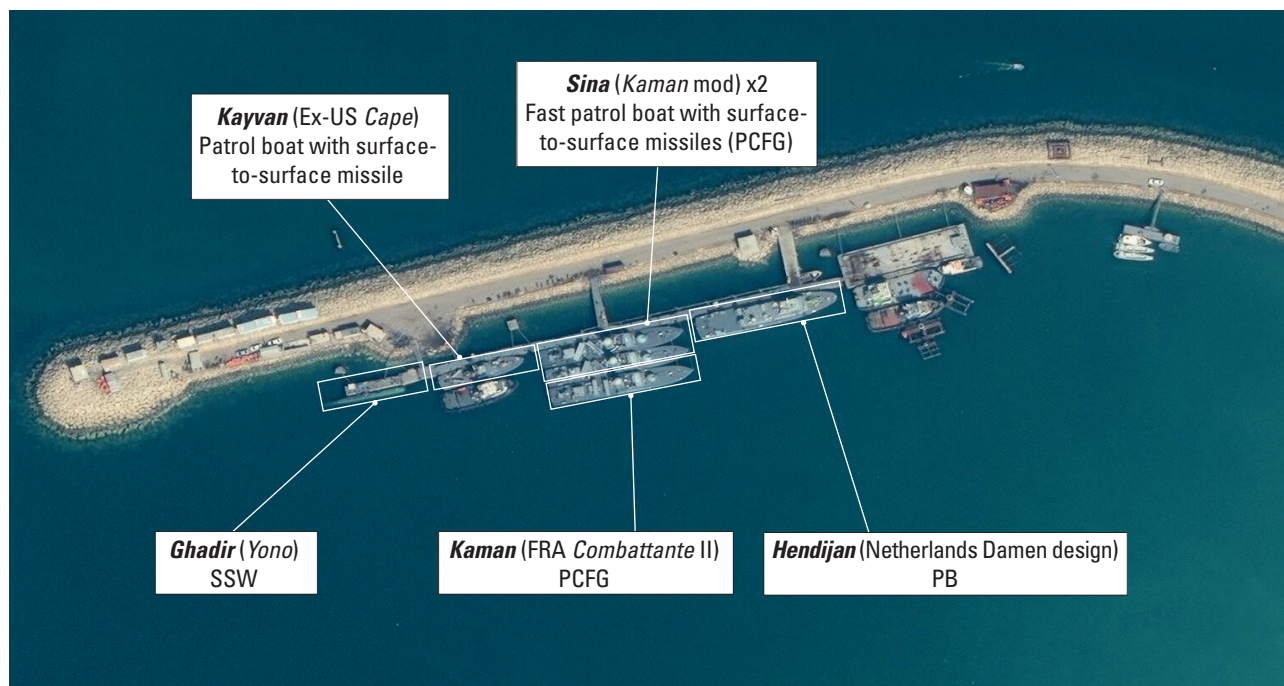
## Coastal defence

The geography of the Strait of Hormuz is eminently suitable for coastal-defence missile systems and is a challenge for those who might wish to transit through the area during periods of tension or war. While Iran's coastal-defence missile systems are road mobile, they do also appear to use pre-prepared deployment sites. The location in Figure 5 is less than 9 km southeast of the Jask naval base and has been identified as that shown in 2021 footage of a missile firing.<sup>98</sup>

Iran's inventory of coastal-defence cruise missiles is based on several Chinese designs that have been domestically manufactured and upgraded over time. Along with the previously mentioned 120 km-range C-802, other members of this family include the 200 km-range *Ghader* and the 300 km-range *Ghadir*. The far-shorter-range C-701 (*Kosar*) and C-704 (*Nasr*) are also deployed in the coastal-defence role.<sup>99</sup>

Imagery of the site at Jask shows several buildings connected to the firing area by roads. These could

Figure 4: Jask naval base (25.65013, 57.76778), 26 February 2023



(Satellite image ©Maxar Technologies)

Figure 5: Coastal-defence deployment site near Jask (25.6763, 57.83798), 3 March 2023



(Iranian state-affiliated media; satellite image ©Maxar Technologies)

conceivably house AShM launch vehicles. One of the challenges in addressing Iranian coastal-defence systems is not only their mobility and the relative ranges of the missile systems operated, but also Iran’s use of commercial trucks as transport vehicles. Persistent airborne ISR would offer one means of regular surveillance of potential movements, building up a pattern of operation and deployment, along with identifying and mapping potential launch sites.

### Air surveillance

The Islamic Republic of Iran Air Force’s (IRIAF) most southerly base is near to Iran’s border with Pakistan. Along with the air base at Bandar Abbas, it provides a potential location from which to carry out operations over the Gulf of Oman or provide air-defence coverage for some of the naval facilities on the country’s southern coast.

The air-force base at Chabahar (Figure 6) is co-located with the civilian Konarak airport. Satellite imagery illustrates recent aircraft activity at this base, including a number of McDonnell Douglas F-4D or F-4E *Phantom* II fighter ground-attack aircraft (FGA) located outside hardened shelters on the flight apron, likely for training exercises. Chabahar is also associated with the IRIAF’s Dassault *Mirage* F-1s. The air base has a considerable

number of hardened shelters so, while satellite imagery can capture an aircraft on the apron, taxiways or runway, the intermittent nature of the coverage makes this less likely than with more continuous coverage. Complementing satellites with more-persistent airborne ISR when activity is identified could provide a better ‘take’ of material.

The IRIAF has integrated the C-801 and likely the C-802 AShMs on the F-4. Thus, given its location, Chabahar would provide a useful location to support maritime-strike operations in the Gulf of Oman.

The air base has also on occasion been used for UAV operations. A *Mohajer*-series combat ISR UAV was visible in satellite imagery (Figure 6) from February 2023, along with its mobile ground control station. This UAV was most likely operated by the IRGC, with the IRGC Navy now operating this type along with the IRGC Air Force. Given the coastal location, a naval unit and over-water operation is a credible option. During the IRGC’s *Great Prophet 17* 2021 exercise, *Mohajer* 6 footage appeared to show the UAV being used against a maritime target.<sup>100</sup>

In addition to many of its airfields having hardened shelters, Iran has worked in recent years on an underground shelter for aircraft (Figure 7). In February 2023,

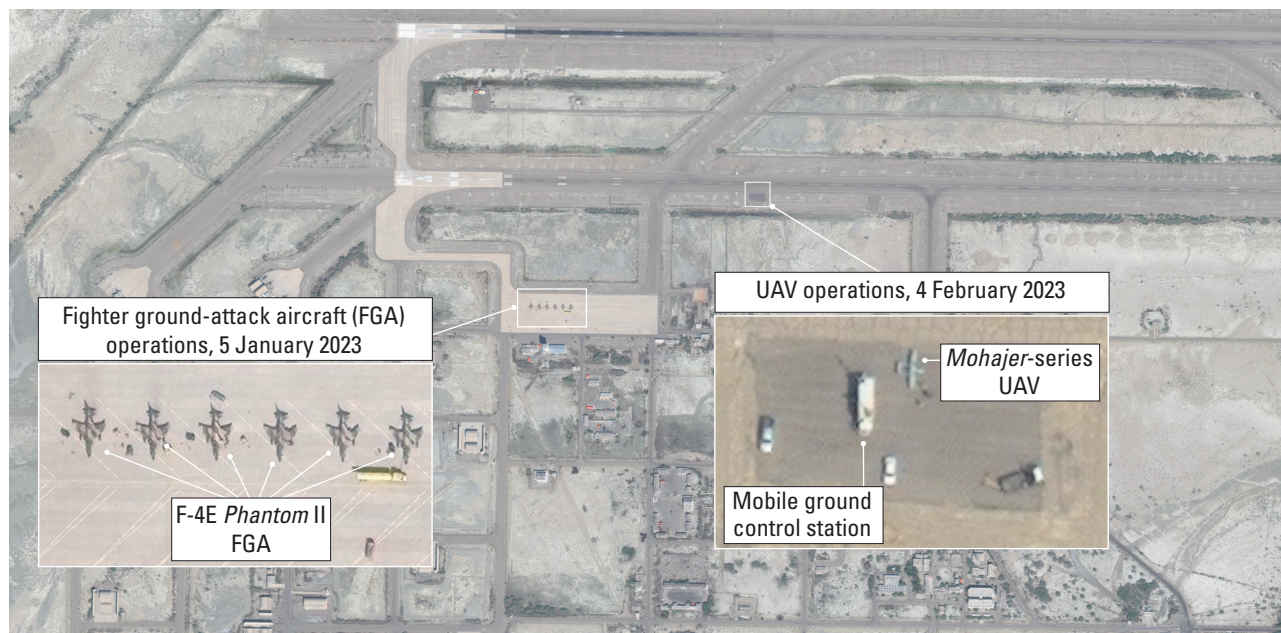
Iranian broadcast television showed footage of a previously publicly unseen hanger complex. The location of the complex, referred to as Oqhab (Eagle) 44, was not given, but it appears to be 120-km northwest of Bandar Abbas.<sup>101</sup>

The site seems to have been under development since no later than 2014. Contrary to Iranian reporting, construction does not appear to be complete, nor is the

site operational. The role of the 'base' has also not yet been determined.

While the IRIAF's air-defence aircraft are ageing, the country's ground-based air-defence inventory has benefited from acquisitions and national development. Tehran purchased the S-300PMU-2 (RS-SA-20C *Gargoyle*) from Russia in 2016, but in parallel has also been developing its own short-, medium- and long-range SAM

Figure 6: Chabahar/Konarak air base (25.43644, 60.37547), January and February 2023



(Satellite image ©Maxar Technologies)

Figure 7: Oqhab 44 air base (under construction) (28.04558, 55.52038), 21 February 2023



(Satellite image ©Maxar Technologies)

Figure 8: Suspected *Ra'ad/3rd Khordad* medium-range SAM deployment site (27.17151, 56.17291), 19 January 2023



(Satellite image ©Maxar Technologies)

systems.<sup>102</sup> Some of the latter appear to draw on Russian designs. Ground-based air defence is provided primarily by the Islamic Republic of Iran Air Defense Force, an independent arm of the regular armed forces.

Figure 8 is a satellite image of an SAM site just to the north of the naval air base at Bandar Abbas. Formerly associated with the HQ-2 (CH-SA-1) variant of the Russian S-75 *Dvina* (RS-SA-2 *Guideline*), recent imagery suggests this site is now being used with the *Ra'ad/3rd Khordad* medium-range SAM system. The *Ra'ad/3rd*

*Khordad* resembles the Russian *Buk* SAM system in design and capability, though it is operated on domestic launchers.

This ability to locate and map the deployment of Iran's SAM systems, as well as patterns of operation and exercises, is of significant value to any country with security interests in the region. Space-based ISR systems, complemented by air and maritime ISR, can provide the surveillance capabilities to help build an Iranian air-defence order of battle.

# Chapter Three: Regional Demands and External Draws

United States ‘big wing’ intelligence, surveillance and reconnaissance (ISR) is always in demand, and for the past two decades, the regional priority has been the Middle East. While it remains a key requirement, the United States’ priorities have since changed; today, the Gulf region is third in importance behind Europe and the Indo-Pacific.

A confluence of events is posing questions regarding the United States’ and its regional partners’ ability to meet their ISR needs in the Gulf. Russia’s full-blown invasion of Ukraine has pulled US airborne ISR resources and tasking to Europe, while China remains the threat in the Indo-Pacific. At the same time, the regional challenge from Iran and its associated non-state allies has arguably grown.

Gulf Cooperation Council (GCC) member states do hold some ISR systems within their national inventories, but the level of capability varies. The United Arab Emirates (UAE), for instance, has the *FalconEye 2* satellite fitted with an electro-optical (EO) payload, and its air force operates the Saab *GlobalEye* airborne early warning and control (AEW&C) aircraft, which also has a wider ISR capability, along with a Bombardier *Global 6000* in the signals-intelligence (SIGINT) role.<sup>103</sup> Saudi Arabia also has two SIGINT Boeing RE-3A/B aircraft, along with five Boeing E-3A *Sentry* AEW&C aircraft,

again with a secondary ISR capability.<sup>104</sup> Both countries operate Chinese medium-altitude long-endurance uninhabited aerial vehicles (UAVs) that can be used for ISR. GCC states, however, continue to be reluctant to cooperate more fully in tasking available assets and sharing the take when it comes to watching Iran or other areas where national interests appear to align.

While, as discussed elsewhere in this paper, Iran’s overall conventional military capacity largely rests on ageing or obsolescent equipment, pockets of capability do exist that pose potential problems for GCC states and for the US and its allies. Iran fields a growing surface-to-surface missile inventory, demonstrating increased levels of accuracy, which is now complemented by the introduction (or pending introduction) of a 1,000 kilometre-plus-range land-attack cruise missile.<sup>105</sup> Its ground-based air defence, meanwhile, is also benefiting from domestic investment and the acquisition of more capable surface-to-air missile systems.

The US characterises the threat picture from Iran as different to ‘even just five years ago’, with its regional bases held at risk by Tehran’s ballistic-missile inventory – an offensive capability complemented by capable ground-based air defence systems.<sup>106</sup> At the same time, however, the US is having to manage the impact of its ‘reduction in the footprint of traditional ISR capabilities in the region’, according to Lieutenant-General Alexis G. Grynkewich, the commander of US Air Forces Central Command (AFCENT).<sup>107</sup> Although the pressure to provide ISR resources to continue to secure sustained coverage of Iran has not abated, even Washington has finite resources, particularly concerning high-demand, low-density platforms. There has been a drawdown in the United States’ key crewed ISR platforms, including the Boeing RC-135V/W *Rivet Joint*, Northrop Grumman E-8 Joint Surveillance Target Attack Radar System and Lockheed Martin U-2, as well as variants of the Northrop Grumman RQ-4 *Global Hawk*. Given the ongoing concern about Tehran and its potential to still pursue a nuclear weapon, however, Washington

A Lockheed Martin U-2 high-altitude reconnaissance aircraft descends into Royal Air Force Fairford in Gloucestershire, England, 22 August 2020.



(Jon Hobley/MI News/NurPhoto/Getty Images)

will almost certainly continue to provide adequate geo-spatial resources to monitor Iranian sites of interest and related developments. AFCENT is now exploring how to fill the 'gaps' in supporting regional coverage of Iran, as well as, for example, Iraq and Syria.<sup>108</sup> It is considering both partnerships and novel approaches to bolster ISR capacity.

### **Ambitions and abandonment**

For years Washington has encouraged the GCC states to cooperate in key capability areas, notably ballistic-missile defence (BMD), where ISR has a contributory role. Positive rhetoric in response to this suggestion, however, has not been matched by progress. A decade on from the formation of the US–GCC Strategic Cooperation Forum, discussions continue, accompanied by post-meeting communiqués suggestive of progress. Beyond this constructive language, though, it is hard to discern where real progress has been made. For instance, a US Department of Defense (DoD) statement following the February 2023 US–GCC working group meeting asserted that 'the United States and GCC members agreed on the shared objectives of improving collective early warning, streamlining coordination against shared threats, and building towards regional integration'<sup>109</sup> These are laudable aims, as they effectively were in 2012, but meeting them remains only an ambition. The DoD readout did mention 'GCC efforts to bolster defense cooperation, in concert with the United States', but did not elaborate.<sup>110</sup>

An even less positive outlook is depicted by some observers in the region, who point to continuing issues and, in certain cases, suggest worsening relations between GCC states. Several have alluded to tensions between the UAE and Saudi Arabia. Any impetus to cooperate has long been constrained by a lack of trust and a reticence to share sensitive information among GCC countries. Despite US encouragement for over a decade to foster greater intra-GCC cooperation, Washington clearly remains central to any approach in key areas. A hub-and-spoke architecture, with the US as the hub, is still the most likely route to increased cooperation. It is a hub, however, which has fewer resources to provide to the region. There are therefore concerns locally regarding Washington's continuing commitment to the Middle East. The 'abandonment'

A *Qiam-1* short-range ballistic missile, the type fired at US forces at the Ayn al-Asad air base in Iraq, is displayed at the Grand Mosalla Mosque of Tehran, 7 January 2022.



(Fatemeh Bahrami/Anadolu Agency/Getty Images)

narrative is one that the US refutes, but the rebalancing of capabilities and resources, including ISR platforms, is one that requires careful explanation.

### **Top-down and bottom-up approaches**

US efforts to encourage greater GCC cooperation in the BMD realm were built on the basis of diplomatic and senior military relations, as well as the provision of high-end and expensive air- and missile-defence systems.<sup>111</sup> Qatar, Saudi Arabia and the UAE all operate US-designed missile interceptors and associated radars and command-and-control infrastructure. However, these systems remain embedded only in national architectures and not within an inter-GCC capability – an approach that is less than ideal in optimising the chances of a successful intercept. In discussing BMD during a 'fireside chat' earlier this year, Grynkeiwich raised a situation in which 'regional partners ... might be on the avenue of approach of a particular (missile) threat coming from Iran or an Iranian proxy or partner as it goes to another country'.<sup>112</sup> His question in this scenario was 'how do we share data, or information or intelligence?', and he noted that 'it's always at the seams where issues happen'.<sup>113</sup>

While the US continues to advocate at the senior level for greater GCC cooperation, it is also now pursuing a grass-roots-level approach to addressing some of the region's ISR challenges. In the air domain, AFCENT's Task Force 99 (TF99) is looking at novel and low-cost

approaches using UAVs to provide ISR, predominantly, though not exclusively, at the tactical level. In the maritime space, the US Navy's Task Force 59 (TF59) is similarly exploring using uninhabited platforms to help provide greater domain awareness.

## The maritime domain

The persistence of sporadic attacks against shipping in and around the Gulf, like that against the oil tanker *Pacific Zircon* off the coast of Oman in November 2022, is a reminder that the simmering tensions in the region have often been played out in the maritime arena. The manner of that attack, undertaken by an explosive-laden direct-attack munition (sometimes referred to as a one way or 'suicide' UAV), also underscored how the threats at sea are evolving and presenting new challenges for defenders.<sup>114</sup>

The Gulf itself is essentially a closed and crowded waterway extending to some 241,000 km<sup>2</sup>; it is nearly 1,000 km in length and is approximately 340 km across at its widest point. It is bounded by eight littoral states, of which Iran has the longest coastline and Iraq the shortest. It is relatively shallow, rarely exceeding 90 metres in depth, with the Iranian side enjoying relatively deeper waters than the shallower Arabian side.<sup>115</sup> At its mouth is the Strait of Hormuz, which is confined and congested, though also easily deep enough to accommodate the largest bulk carriers; thus, it remains the most significant strategic maritime chokepoint for seaborne oil and gas shipments.<sup>116</sup> All of this makes for

**The UK-flagged tanker *Stena Impero* is seized and detained by the Iranian Revolutionary Guard Corps as it passes through the Strait of Hormuz, 22 July 2019.**



(Contributor/Getty Images)

a complex maritime picture, increasing both the vulnerability of shipping and the ability of would-be attackers or malign actors to hide among the clutter of maritime-traffic flows and offshore installations.

While the Gulf and the Strait of Hormuz remain a major focus of attention and concern, the regional maritime environment has become even more complex and extended. The maritime domain has taken on an increasing role as an arena for and enabler of the competition for power and influence in the region, including via proxies, and it has also increasingly become a conduit for trafficking of various kinds and other illegal activities. Significant drivers of this have been the conflicts in Syria and Yemen, with the latter including disruptive activities by the Iran-backed Houthi rebels in the Gulf of Aden and the Red Sea. The international-coalition withdrawal from Afghanistan in 2021 has added further to the challenges posed by the illicit use of sea routes for trafficking in the region. Thus, the area of regional maritime concern has expanded to include the Gulf of Oman; the north Arabian Sea and the north-west Indian Ocean more broadly; the Bab el-Mandeb Strait and the Red Sea; the Suez Canal; and even the eastern Mediterranean Sea.

Setting aside deliberate threats, inadvertent incidents such as the temporary blocking of the Suez Canal by the grounding of the container ship *Ever Given* in March 2021 have also underscored how vulnerable maritime chokepoints and key waterways – and therefore global-trade flows – can be to even relatively simple threats.<sup>117</sup> At the same time, changing global-trade patterns, including the increased reliance of China and other major Asian economies on Gulf hydrocarbons, are drawing new international maritime actors such as China, India and Japan into the picture. Upheavals in international and regional political dynamics are doing the same, with two recent examples being Russia's ambition to establish a Red Sea naval facility in Sudan and the increasingly overt role of Israel in Gulf defence and security developments.<sup>118</sup>

All of this is adding to the value of improved ISR in the maritime context and the ability to maintain a persistent maritime presence; increase maritime-domain awareness; and identify, attribute and respond in a timely fashion to potential or actual threats at or from



the sea. Information has become an ever-more significant front in the competition and confrontation space, including in the maritime arena. Technology may be opening up new opportunities to deliver a more comprehensive maritime picture. Meanwhile, regional political dynamics may, in some ways, be an increasing complicating factor.

### International and regional cross-currents

For a considerable period, the US has been the predominant naval power in the Gulf, having inherited that role from the United Kingdom in the 1970s. Maritime-security efforts have also been pursued chiefly under a US-led umbrella. At the same time, there has been a long-standing ambition to transition to an increasingly multinational approach – involving more international partners, but also seeing the regional states take on a greater responsibility for their own maritime security.

As well as being an arena for a long period of escalation and de-escalation in naval and maritime tensions, the region has provided the catalyst for the creation of some of the archetypal recent examples of cooperative maritime initiatives. Admittedly, these were chiefly developed in a period when state-on-state competition was largely in abeyance; the maritime domain itself was less contested; navies in effect were less busy; cooperative maritime-security engagement was reaching a high watermark globally; and the perceived threats for the Gulf were focused much more on non-state actors.

Even then, the main framework for increased cooperation has not been, as one might have assumed, the GCC, whose promise of greater unity of purpose has been taking a long time to bear fruit. The main framework for increased cooperation has been the US-led Combined Maritime Forces (CMF) grouping, established in the wake of the 11 September 2001 terror attacks on the US. This has grown into a loose collaborative organisation of 34 nations, including five of the six GCC members, with a focus on non-state threats and member nations operating under national caveats as to which activities they will undertake. The most-established CMF formations have been Combined Task Force (CTF) 150, dealing with maritime security in the Gulf of Oman and the Indian Ocean; CTF 151, with a focus on counter-piracy; and CTF 152 for maritime security in the Gulf, but again

aimed chiefly at non-state threats.<sup>119</sup> More recently, as a reflection of the expanding area of concern, CTF 153 was established on 17 April 2022 and is centred on the Red Sea and Gulf of Aden.<sup>120</sup>

In addition, in order to combat the heightened piracy threat off the Horn of Africa, the European Union in December 2008 established a naval presence under *Operation Atalanta* – which continues, albeit at a significantly lower force level than at its height.<sup>121</sup> Meanwhile, from 2009 until 2016, NATO conducted a similar operation known as *Operation Ocean Shield*.<sup>122</sup> Other interested states have also mounted their own national counter-piracy missions, notably China, which has maintained a sustained rotational presence since 2008 and in the process also established its first overseas naval-basing facility in Djibouti.<sup>123</sup>

While the limits of CMF operations reflect the political sensitivities of many of its members, not least among the GCC, and their reluctance to make a firm commitment to take specific action, particularly in the context of a threat from Iran, there is no doubt that concern about Tehran's activities and ambitions loom large in the background. For various reasons, this concern may come increasingly to the fore for regional actors. In that case, the expectation will be that the experience of working together will pay some operational dividends.

Over the past several years, incidents that were either openly undertaken by or attributed to Iran have underscored some of the added hurdles to international cooperative responses in the context of heightened state-on-state scenarios. Such incidents include the spike in

**Ships assigned to CTF 150 are assembled in a formation in the Gulf of Oman between the Arabian Sea and the Persian Gulf, May 2004.**



(Bart Bauer/US Navy/Getty Images)

attacks against shipping in and around the Gulf in 2019, particularly the use of explosive devices against vessels both moored at anchorages and underway, as well as the seizure of a number of vessels and their crews. While there was general concern, in response to these incidents, about the threat to navigation, different political agendas got in the way of coordinated action. The CMF framework, focused on countering non-state activities, was not deemed appropriate. At the same time, potential international partners hesitated to support a US-led initiative to create a new naval formation for fear of being too closely associated with the Donald Trump administration's position on Iran. This included the administration's 'maximum pressure' political and diplomatic stance and its withdrawal from the Joint Comprehensive Plan of Action nuclear agreement, which many saw as having sparked the Iranian escalation at sea.<sup>124</sup> This period of increased tension also saw on 20 June 2019 the shoot-down by Iranian forces of a US Broad Area Maritime Surveillance UAV, triggering US preparations for a retaliatory strike. This was called off at the last minute. However, less than month later, the US said one of its warships operating in the Strait of Hormuz brought down an approaching Iranian UAV, apparently with the use of electronic-jamming equipment.<sup>125</sup>

There was some enhanced GCC maritime coordination as a result of this flare-up.<sup>126</sup> However, the main responses came first in the form of the US-led International Maritime Security Construct (IMSC), established in July 2019, and its associated operational element, CTF *Sentinel*, established in November 2019 with responsibilities stretching from the Gulf to the Red Sea.<sup>127</sup> This was then followed by the European Maritime Awareness in the Strait of Hormuz initiative (led mainly by France) in January 2020, which operates under a somewhat more limited mandate, with its patrolling mission provided under *Operation Agénor*.<sup>128</sup>

The IMSC currently comprises a rather unlikely collection of eleven nations including Albania, Romania and Seychelles. Again, this is perhaps a reflection of the challenges of coalition building in this context. CTF *Sentinel* is now under UK operational command and, along with the US, the other members are Bahrain, Saudi Arabia and the UAE. Each IMSC member provides a different level of contribution, with larger

and more capable 'Sentinel' ships provided by the UK and US, and smaller combatants and patrol vessels – dubbed 'Sentry' vessels – provided by the three regional member states.

Against this backdrop, broader efforts to develop cooperative activity and greater cohesion between regional and international maritime partners have continued. This has included a series of regular, large multinational exercises, which were initially focused primarily on the Gulf and, in particular, mine-countermeasures operations. More recently, this has broadened to encompass also the Red Sea and northern Indian Ocean, including East African coastal regions, and to cover a wider range of maritime-security activities. These exercises are now held under the joint rubric of *International Maritime Exercise/Cutlass Express (IMX/CE)*. The latest iteration of the manoeuvres, IMX23/CE23, which took place from late February to mid-March 2023, brought together more than 50 partner nations and international organisations, 7,000 personnel, 35 ships and several artificial-intelligence (AI) and uninhabited systems.<sup>129</sup>

### **Task Force 59 and Gulf naval ambitions**

While there has been a long-term aim to increase the multinational and particularly the regional burden-sharing element of maritime security in and around the Gulf, events have conspired to produce a strategic change which has added new urgency to this goal. With the increased draw on US resources as Washington refocuses on the Indo-Pacific and the rise of China, US officials have had to counter a rising fear among Gulf states that the US is becoming a less reliable partner.<sup>130</sup> The added pull of the Russia-Ukraine War has reinforced a perception that the Middle East has fallen to third, at best, on Washington's list of strategic priorities. One manifestation of this has been the absence from the region of a US Navy aircraft carrier, or indeed any US capital ship, for more than a year. The last US carrier deployed was the USS *Ronald Reagan*, which left the region in September 2021, while the last capital ship was the large-deck amphibious-assault ship (LHD) USS *Essex*, which departed in early January 2022.<sup>131</sup>

In and of itself, the absence of a carrier represents a significant depletion of maritime ISR capacity from the region. However, in early 2023, the French aircraft

Fighter jets aboard the USS *Ronald Reagan*, a *Nimitz*-class aircraft carrier and part of the US Navy 7th Fleet, at the naval base in Busan, South Korea, 23 September 2022.



(SeongJoon Cho/Bloomberg/Getty Images)

carrier *Charles de Gaulle* operated in the Indian Ocean.<sup>132</sup> One option to compensate for the prolonged absence of a US carrier from the Middle East could be for the *Charles de Gaulle*, or one of the two UK *Queen Elizabeth*-class aircraft carriers, to fill the gap on a periodic basis. Such an approach could also supplement maritime ISR capacity in the region.

At the same time, after a long period in which the naval investments of GCC states (excepting, possibly, Saudi Arabia) lagged behind those enjoyed by the land and air forces, GCC naval forces are now receiving increased attention and funding. This is particularly true of Qatar, Saudi Arabia and the UAE. Some of this investment has included expeditionary and blue-water capabilities, in part spurred by fallout from the conflict in Yemen.<sup>133</sup>

Qatar's investments include new frigates, corvettes and an LHD that, like the frigates, will be fitted with a Leonardo *Kronos* multifunction radar, as well as the *Kronos* Power Shield L-Band unit for air and ballistic-missile defence and early warning.<sup>134</sup> In conjunction, the frigates and LHD potentially could provide a significant integrated naval air-defence capability, at least in a Qatari national context. In addition, also with Leonardo, Qatar is investing in a new Naval Operation Centre to enhance its maritime-surveillance capability.<sup>135</sup>

The UAE's naval enhancements include new *Gowind*-type frigates built by Naval Group, the first of which began sea trials in March 2023.<sup>136</sup> Meanwhile, the Royal Saudi Navy is also engaged in a major modernisation and upgrade programme. This includes the acquisition

of Lockheed Martin's Multi-Mission Surface Combatant (MMSC), a much-modified version of the US Navy *Freedom*-class Littoral Combat Ship, four of which have been ordered by Riyadh and are being built at the Fincantieri Marinette Marine shipyard in the US. In addition to the MMSC ships, Spain's Navantia is in the process of delivering five *Al-Jubail*-class (*Avante* 2200 design) frigates. Navantia and Saudi Arabia's General Authority for Military Industries also signed a memorandum of understanding on 30 November 2022 for five 'multimission combat ships'.<sup>137</sup>

All told, these new acquisitions will represent a significant uplift in the naval capability of the GCC states and, theoretically, should improve their ability to take on more of the burden of regional maritime security and to maintain a persistent presence at sea to deter threats.<sup>138</sup> However, these all remain essentially national approaches. Knitting these together into a coherent whole that is greater than the sum of its parts remains a challenge. If anything, regional sensitivities and frictions, including in light of the Yemen conflict, may have augmented some of the barriers to greater regional integration.

In this context, the initiative by the US to bolster maritime security in and around the Gulf by demonstrating the value of uninhabited systems in the maritime domain and, in so doing, encouraging the participation of regional navies and other partners, represents a potentially significant move. TF59 was set up in September 2021 under the US Navy 5th Fleet headquartered in Bahrain to experiment with and develop real-world experience operating small, contractor-supplied uninhabited platforms, such as the wind- and solar-powered Sairdrone *Explorer* and MANTAS T-12 uninhabited surface vehicles (USVs), linked to AI capabilities and teamed with crewed assets. These capabilities have also been incorporated in operations and exercises with partners.<sup>139</sup>

As the leading element of a broader effort within US Central Command to explore the utility of uninhabited and autonomous systems and platforms in the future battlespace, TF59 has a number of key objectives. Firstly, it aims to help boost support back in the US for the navy's wider efforts to develop uninhabited and autonomous systems as a major and integral part of its future fleet make-up. Secondly, it seeks to demonstrate

the potential future shape of the US Navy commitment within the region to provide reassurance and introduce the idea that, through innovation, it will be able to maintain a credible and effective future contribution, even if the presence of traditional platforms may be reduced compared to the past. Thirdly, it intends to provide a catalyst to encourage increased cooperation, engagement and (particularly) information-sharing by regional partners, chiefly through the deployment of relatively modest, affordable, commercially available and contractor-operated technologies, exchanging unclassified information but delivering a significantly enhanced overall maritime picture.

The concept is that the persistence and surveillance capabilities of the platforms and sensors, linked to operations hubs and using data analytics enhanced by AI, can provide dramatically improved situational awareness of a complex maritime scene to identify potential threats. Part of this is developing a 'pattern of life' understanding of maritime traffic flows. For now, the concept also involves the teaming of crewed and uninhabited platforms. This should allow those crewed platforms to be deployed and operated more effectively. By the same token, in terms of the current assets being tested, uninhabited systems still require a traditional destroyer, frigate or patrol vessel to respond to and handle any identified threats or suspicious vessel or activity.

The recent seizures at sea of drugs and, more significantly, considerable weapons consignments have underscored the importance of the maritime ISR requirement. It was notable that a recent seizure in the Gulf of Oman by the UK Royal Navy frigate HMS *Lancaster* was said to have been supported by airborne ISR provided by US forces.<sup>140</sup> It is also notable that, in most of these seizures, it has been US and other international naval forces that have been the most actively involved. It must surely be an ambition that regional naval forces will take a larger role in these activities in the future.

TF59 was declared fully operational in January 2023, at which point it was said to have accumulated '30,000 hours of safely operating ... around the Arabian Peninsula'.<sup>141</sup> The widely publicised US Central Command ambition is to create a network of some 100 uninhabited platforms and systems by the end of the

summer of 2023, about 80% of which would be provided by US allies and partners.

Alongside real operational experience, the ideas behind TF59 have been pursued through numerous multinational and bilateral exercises throughout the region. Uninhabited systems played a significant part in both the 2022 and 2023 editions of IMX/CE.<sup>142</sup> Another key development in the wake of the Abraham Accords has been the increasingly overt incorporation of Israel into such exercises, following the first joint naval manoeuvres involving Israeli and Gulf naval vessels in November 2021.<sup>143</sup> Israel has significant capabilities and technology to offer in the area of uninhabited naval systems.

For Gulf navies, the uninhabited systems approach would appear to be a potentially attractive option to deliver some of the sustained patrolling and surveillance capacity that they have previously struggled to maintain using crewed platforms. A number of Gulf states, notably the UAE, have shown interest in such systems.<sup>144</sup> Indeed, the UAE unveiled a new medium USV developed with Israeli technology input at the combined International Defence Exhibition and Naval Defence Exhibition 2023.<sup>145</sup>

A key component of all these developments is the United States' role chiefly as an instigator and facilitator. This remains a vital element. Allies and partners may be encouraged to build their own national capabilities or deliver elements of any network built around the same types of platforms as TF59, and in time they may increasingly take on the responsibility of providing the platforms to respond and prosecute targets of concern. However, the US will likely still need to operate as the 'hub' in terms of providing command and control and facilitating information sharing.

## Further horizons

In general terms, largely due to the geographical characteristics of the regional waters and the activities of international and regional naval forces supporting ISR capabilities, it has been assessed that there is good domain awareness in the Strait of Hormuz and, to some extent, the central Gulf. In the Gulf of Oman, the Bab el-Mandeb Strait and the Red Sea, however, coverage is more limited.

The GCC states to varying degrees appear to be

Yemeni fishing boats float along the Yemeni side of the Bab el-Mandeb Strait, which separates the Arabian Peninsula from East Africa, 10 August 2018.



(Karim Sahib/AFP/Getty Images)

engaging in the initiative centred on TF59. It has been suggested that, given states' current coastal systems and patrol craft, acquiring surveillance USVs of the type currently being employed could essentially triple the reach of states' domain awareness from around 32 km to perhaps 96 km miles off their coasts.<sup>146</sup> However, such a framework is still limited. It delivers persistence at an affordable price compared to more-traditional approaches, but the range and the capability of sensors is relatively low in part due to the power available. This also means that there are constraints on the ability to redeploy swiftly if tactical changes require this.

In grey-zone scenarios, surveillance USVs may also be vulnerable to being interdicted or captured, as was illustrated when Iranian naval vessels attempted to seize the Saildrone *Explorer* USVs in the Gulf and the Red Sea.<sup>147</sup> The risks involved with this may be low, as the USVs are equipped only with commercially available devices and do not store sensitive information; they therefore can be considered relatively expendable. However, this vulnerability does potentially represent an operational and information challenge and may limit the use of such assets unless they are supported by crewed platforms that can intervene if required.

Thus, while the TF59 model clearly adds capability and some deterrent value, as well providing a framework to encourage more regional engagement and innovative thinking, there clearly remains a deficit in more high-end maritime ISR capacity. This is true for the US itself; other like-minded international

naval forces deployed to the region, which have also been heavily reliant on US-supplied ISR capacity; and regional navies.

This may see the US Navy and others look to deploy more capable USVs, perhaps operating from 'mother ships' including existing naval platforms. However, the main objective still seems to be to enhance airborne maritime ISR capacity in the region in order to provide greater reach in terms of surveillance. The UK Royal Navy is bringing into service the Schiebel S-100 *Camcopter* rotary-wing UAV, equipped with a Thales surveillance package, to operate in conjunction with its shipborne Leonardo *Wildcat* helicopters, with an initial deployment aboard its Gulf-based frigate in 2024.<sup>148</sup> For some, this is an overdue development which will provide some added persistent airborne-surveillance capacity. Beyond that, however, there remains a likelihood that naval forces in the region will be looking for further enhanced persistent airborne ISR capacity. This could somewhat fill gaps that may be left by the US, though it will likely remain a requirement that the US continues to provide the framework role for linking capabilities together.

In some ways, this is a familiar scenario playing out in other arenas. As has happened in the past, the Gulf may be the testing ground for the kinds of solutions that could be applied elsewhere.

### Task Force 99 and airborne ambitions

The US Air Force's 'version' of TF59 is TF99. A year younger than its maritime equivalent, TF99 is a small unit located at Al Udeid Air Base in Qatar.<sup>149</sup> As with TF59, it is in part intended as a hothouse of ideas to encourage and explore novel approaches to traditional challenges using deliberately low-cost uninhabited systems.<sup>150</sup> It is meant to include as many partners as possible, both among NATO allies contributing to regional security and locally. Qatar and Jordan are currently understood to be interested in participating. TF99 is also an operational unit, and it has already taken UAVs and payload packages out into the field to stress test them.

One of the aims of the task force is to look at potential options and identify the extent to which commercially available off-the-shelf UAVs can be used as gap fillers when equipped with the appropriate mission

payloads, helping to meet operational requirements that were previously addressed by some of the more elaborate ISR assets that have been drawn to other theatres. Grynkewich noted that TF99 offers a potential route to identifying and being able to field a 'larger volume of capacity in places where we might not need high-end capability'.<sup>151</sup>

The types of UAVs that TF99 is already using, or has an interest in using, are, as would be expected, at least initially at the smaller end of the scale, with applicability in the tactical realm. Application payloads could include SIGINT or electronic-warfare packages as well as EO systems. Air surveillance and the continuing requirement to generate a recognised air picture are, however, also areas that the task force will explore.

An additional advantage of US commercial off the shelf UAVs is that they are generally not covered by International Traffic in Arms Regulations (ITAR)

legislation.<sup>152</sup> ITAR can slow the process of acquisition and sometimes cause a purchase to be dropped. With one element of TF99 aimed at exploring the regional potential of some of the approaches it takes, smoothing the acquisition path would be a benefit. US sales of larger, far more capable UAVs into the region have been long constrained by the US government's restrictive approach to the release of this class of systems. This approach has inadvertently allowed China to capitalise on US reticence by selling its own UAVs to several GCC countries.

Given TF99's small size (it will likely only ever have around 20 personnel attached to it at any one time), it will not be able to come up with all of the answers to meet regional ISR needs. Larger classes of UAVs and crewed platforms will still be required, which should also drive considerations within the GCC. However, it may be able to provide some key solutions.

# Conclusion

‘Nobody likes being watched’, noted one regional official during discussions on this paper’s topic; therefore, intelligence, surveillance, and reconnaissance (ISR) coverage of Iran is and will continue to be a central element of bolstering regional security. ISR can provide a valuable element of conventional deterrence, contributing to ground truth about Tehran’s activities, capabilities and aspirations and to the intelligence assessment of the potential threat Iran poses.

The capacity to observe, however, is under pressure from the greater demand for United States ISR resources elsewhere, with assets previously allocated to the region now drawn to other areas of concern. Gulf countries, while holding some ISR capacity at the national level, currently lack the overall resources to fully replace those elements that Washington is redeploying, as do their allies. Furthermore, the Gulf Cooperation Council (GCC) states continue to struggle in moving beyond national approaches to the challenge of Iran, not only in terms of ISR but also, for instance, ballistic-missile defence, despite Washington’s best efforts to encourage a more collaborative approach.

Uninhabited systems in the maritime and air domains offer one route to improving regional capabilities, and it is a path that the US is now further advocating, as this paper has highlighted, through Task Force 59 (TF59)

and Task Force 99 (TF99). Both task forces are exploring the use of uninhabited platforms to improve awareness in their respective domains. Neither will provide a panacea, but if they gain greater traction in the region, they could help to at least narrow the gaps left by those more traditional ISR platforms and gathering capabilities that the US is having to direct elsewhere.

In the uninhabited aerial vehicle (UAV) realm, TF99 efforts could provide valuable capacity at the tactical level, offering affordable, and perhaps attritable, persistence in monitoring Iranian activity. Such systems would provide a helpful adjunct to larger, more capable and therefore more expensive ISR UAVs. The GCC already has some of these in its inventory, but additional numbers would always be beneficial. Likewise, TF59 represents a start in filling some of the gaps in the picture at sea. Greater cooperation in ISR tasking activity among at least some of the GCC states would also provide one route to facing Tehran with more persistent surveillance of its activities.

In the near term at least, the greatest promise of increased cooperation remains indirect, with the US acting as the hub supporting a number of bilateral relations with GCC states and other international partners. Encouraging intra-GCC cooperation absent the presence of Washington remains an ambition.

## Notes

---

- 1 US Central Command, 'Posture Statement of General Kenneth F. McKenzie, JR., Commander, United States Central Command, Before the Senate Armed Services Committee', 16 March 2022, <https://www.centcom.mil/ABOUT-USPOSTURE-STATEMENT/>.
- 2 IISS, *The Military Balance 2023* (Abingdon: Routledge for the IISS, 2023), p. 326.
- 3 Michael Eisenstadt, 'Russian Arms and Technology Transfers to Iran: Policy Challenges for the United States', The Washington Institute for Near East Policy, 1 March 2001, <https://www.washingtoninstitute.org/policy-analysis/russian-arms-and-technology-transfers-iran-policy-challenges-united-states>.
- 4 'Iran Unveils Advanced Homegrown Tank,' *Tehran Times*, 12 March 2017, <https://www.tehrantimes.com/news/411883/Iran-unveils-advanced-homegrown-tank>.
- 5 US Central Intelligence Agency, 'Intelligence Report: Increased Complexity in Soviet Land Arms', September 1975, <https://www.cia.gov/readingroom/docs/CIA-RDP86T00608R000700080019-8.pdf>.
- 6 *Ibid*; Directorate of Intelligence, 'USSR Monthly Review', US Central Intelligence Agency, December 1983, p. 9, <https://www.cia.gov/readingroom/docs/CIA-RDP84T01083R000100120005-1.pdf>; and Gabriel Dominguez and Dmitry Fediushko, 'Russia Completes Deliveries of SU-35 Fighter Aircraft to China', *Janes Defence Weekly*, 16 April 2019, <https://www.janes.com/defence-news/news-detail/russia-completes-deliveries-of-su-35-fighter-aircraft-to-china>.
- 7 *Ibid*.
- 8 Scramble Magazine, Facebook post, 25 July 2018, <https://www.facebook.com/Scramblemagazine/posts/on-25-july-2018-the-islamic-revolution-guards-corps-air-force-irgcaf-took-delive/2316883551671499/>.
- 9 IISS, *The Military Balance 2023*, p. 326.
- 10 Douglas Barrie, 'Range Anxiety: Iran's Route to a Longer Cruise', IISS Military Balance Blog, 24 February 2023, <https://www.iiss.org/blogs/military-balance/2023/02/range-anxiety-irans-route-to-a-longer-cruise>.
- 11 'IRGC Aerospace Says New "Paveh" Cruise Missile Operationalized', Iran Press News Agency, 25 February 2023, <https://iranpress.com/content/74409/ircg-aerospace-says-new-paveh-cruise-missile-operationalized>.
- 12 *Ibid*.
- 13 US Central Command, 'U.S. Central Command Statement: Iranians Shoot Down U.S. Drone', 20 June 2019, <https://www.centcom.mil/MEDIA/STATEMENTS/Statements-View/Article/1881682/us-central-command-statement-iranians-shoot-down-us-drone/>.
- 14 IISS, 'Addressing the Iranian Missile Threat: A Regional Approach to Risk Reduction and Arms Control', March 2022, p. 9, <https://www.iiss.org/globalassets/media-library---content--migration/files/research-papers/2022/03/addressing-the-iranian-missile-threat-a-regional-approach-to-risk-reduction-and-arms-control.pdf>; and US Central Command, 'Senate Armed Services Committee Hearing on the Posture of United States Central Command and United States Africa Command, March 15, 2022', 15 March 2022, <https://www.centcom.mil/MEDIA/Transcripts/Article/2968166/senate-armed-services-committee-hearing-on-the-posture-of-united-states-central/>.
- 15 'Toulid-e mushak-e Shahab yek va do motavaghef shod. Hich yek az mo'afaghiyatha-ye Iran ba sazesht bedast nayamade ast' [The production of Shahab 1 and 2 missiles was stopped / none of Iran's successes have been achieved through compromise], Mashregh News, 3 December 2015, <https://www.mashreghnews.ir/news/658451/>.
- 16 'Iran Defends Plan to Improve Missile Accuracy', Deutsche Welle, 21 January 2019, <https://www.dw.com/en/iran-defends-plan-to-improve-missile-accuracy/a-47272806>.
- 17 'Mushak-e balistik-e Sejil. Namad-e tavanmandi-ye mushaki-ye durbord va daghigh-e Iran + film' [Sajil ballistic missile; a symbol of Iran's long-range and accurate missile capability + film], Mashregh News, 21 January 2019, <https://www.mashreghnews.ir/news/1171101/>.
- 18 IISS, 'Open-source Analysis of Iran's Missile and UAV Capabilities and Proliferation', April 2021, p. 3, <https://www.iiss.org/globalassets/media-library---content--migration/files/research-papers/open-source-analysis-of-irans-missile-and-uav-capabilities-and-proliferation.pdf>.
- 19 Amir, 'Fateh Mobin Elevates Iranian Precision Ballistic Missile Capabilities', Iran GeoMil, 13 August 2018, <https://irangeomil.blogspot.com/2018/08/fateh-mobin-elevates-iranian-precision.html>.
- 20 Ralph Savelsberg, "'Massive Improvement" in Accuracy of Iran Missiles Over Scud-B', *Breaking Defense*, 15 January 2020, <https://breakingdefense.com/2020/01/massive-improvement-in-accuracy-of-iran-missiles-over-srud-b/>.
- 21 'Kheibar Shekan Ballistic Missile', Iran Press News Agency,



- 26 February 2022, <https://iranpress.com/content/55890/kheibar-shekan-ballistic-missile>.
- 22 National Air and Space Intelligence Center and the Defense Intelligence Ballistic Missile Analysis Committee, '2020 Ballistic and Cruise Missile Threat', July 2020, p. 21, <https://irp.fas.org/threat/missile/bm-2020.pdf>; and Stephen M. McCall, 'Iran's Ballistic Missile and Space Launch Programs', IF10938, Congressional Research Service, 9 January 2020, <https://crsreports.congress.gov/product/pdf/IF/IF10938>.
- 23 Central Intelligence Agency, 'National Intelligence Daily', 17 November 1987, <https://www.cia.gov/readingroom/document/cia-rdp88t01422r000100130003-1>; and 'Eftetah-e park-e meli-ye havafaza' [Opening of the National Aerospace Park], Fars News Agency, 13 September 2020, <https://www.farsnews.ir/photo/13990706000712>.
- 24 "'Fath," Iran's Small Ballistic Missile With High Firepower, Accuracy', Iran Press News Agency, 7 November 2021, <https://iranpress.com/content/49774/fath-iran-small-ballistic-missile-with-high-firepower-accuracy>.
- 25 Howard Altman, 'Ukraine Situation Report: Iranian Officials Admit to Selling Russia Ballistic Missiles (Updated)', The Drive, 18 October 2022, <https://www.thedrive.com/the-war-zone/ukraine-situation-report-iranian-officials-admit-to-selling-russia-ballistic-missiles>; and Galen Wright, 'The 840th Missile Group', The Arkenstone, 9 February 2014, <http://thearkenstone.blogspot.com/2014/02/the-840th-missile-group.html>.
- 26 'Great Prophet 17 Exercise - Missile and Drone Attack - Simulation of Attack on Dimona Nuclear Base', YouTube video, posted by IRAN Military Power, 25 December 2021, <https://youtu.be/lf6SoYKDtHU?t=31>.
- 27 US Department of the Treasury, 'Treasury Sanctions Key Ballistic Missile Entities in Iran', 28 July 2017, <https://home.treasury.gov/news/press-releases/sm0136>; and US Department of the Treasury, 'Iran-related Designations Removals; Non-proliferation Designations Removals', 8 October 2021, <https://home.treasury.gov/policy-issues/financial-sanctions/recent-actions/20211008>.
- 28 'Rastakhiz-e mushaki dar Iran / Ghatar-e balistikhiha-ye «Esra'il zan-e» Sepah dar zir-e zamin' [Missile resurrection in Iran / A row of the IRGC's 'Israel-striking' ballistic missiles underground], Fars News Agency, 14 October 2015, <https://www.farsnews.ir/news/13940703000642/>.
- 29 'Khashabgozari-ye mushaki dar shahrha-ye zirzamani-ye Sepah / Gozaresh-e Tasnim az dastavard-e jadid-e mushaki' [Missile storage in the underground cities of the IRGC / Tasnim's report on the new missile achievement], Tasnim News, 14 November 2019, <https://www.tasnimnews.com/fa/news/1399/08/14/2382928/>.
- 30 *Ibid.*
- 31 'Iran Fires Underground Ballistic Missiles for First Time', Al-Jazeera, 29 July 2020, <https://www.aljazeera.com/news/2020/7/29/iran-fires-underground-ballistic-missiles-for-first-time>
- 32 هاز ی جاح علی عزم رادرس (@Hajizadeh\_org), tweet, 29 July 2020, [https://twitter.com/Hajizadeh\\_org/status/1288398979592593408](https://twitter.com/Hajizadeh_org/status/1288398979592593408)
- 33 IISS Military Balance+, accessed 3 April 2023.
- 34 IISS, *The Military Balance 2023*, p. 327.
- 35 *Ibid.*
- 36 Barrie, 'Range Anxiety: Iran's Route to a Longer Cruise'.
- 37 Dubai newsroom, Kevin Liffey and Jamie Freed, 'Iran to Buy Su-35 Fighter Jets From Russia - Iranian Broadcaster', Reuters, 12 March 2023, <https://www.reuters.com/world/middle-east/iran-buy-su-35-fighter-jets-russia-iranian-broadcaster-2023-03-11/>.
- 38 Tim Martin, 'Suspected Collapse of Su-35 Deal Sees US Agree Egyptian F-15 Order', Shepard, 18 March 2022, <https://www.shephardmedia.com/news/air-warfare/collapsed-su-35-deal-sees-us-agree-f-15-order-with/>.
- 39 IISS, *The Military Balance 2023*, p. 327.
- 40 Douglas Barrie, 'Moscow Dusts of Decades-delayed "Dogfight" Missile', IISS Military Balance Blog, 26 February 2021, <https://www.iiss.org/blogs/military-balance/2021/02/russia-air-to-air-missile>; and Douglas Barrie, 'Russia's *Foxhound* Finally Gets its Bite Back', IISS Military Balance Blog, 30 April 2019, <https://www.iiss.org/blogs/military-balance/2019/05/russia-foxhound-upgrades>.
- 41 'Russia Completes Deliveries of Su-35 Fighter Jets to China', TASS Russian News Agency, 16 April 2019, [https://tass.com/defense/1053967?utm\\_source=google.com&utm\\_medium=organic&utm\\_campaign=google.com&utm\\_referrer=google.com](https://tass.com/defense/1053967?utm_source=google.com&utm_medium=organic&utm_campaign=google.com&utm_referrer=google.com).
- 42 Barrie, 'Range Anxiety: Iran's Route to a Longer Cruise'.
- 43 Jeremy Binnie, 'First S-300 Components Delivered to Iran', *Janes Defence Weekly*, 13 April 2016, <https://customer.janes.com/display/jdw61573-jdw-2016>; and 'China, Russia and Iran Hold Joint Naval Drills in Gulf of Oman', Al-Jazeera, 15 March 2023, <https://www.aljazeera.com/news/2023/3/15/china-russia-iran-hold-joint-naval-drills-in-gulf-of-oman>.
- 44 IISS, *The Military Balance 2023*, p. 327.
- 45 Office of Naval Intelligence, 'Iranian Naval Forces: A Tale of Two Navies', February 2017, <https://www.oni.navy.mil/Portals/12/Intel%20agencies/iran/Iran%20022217SP.pdf>.

- 46 Christopher Harmer, 'Iranian Naval and Maritime Strategy', Middle East Security Report 12, Institute for the Study of War, June 2013, <https://www.understandingwar.org/sites/default/files/Iranian%20Naval%20and%20Maritime%20Strategy.pdf>.
- 47 IISS, *The Military Balance 2023*, p. 326.
- 48 Jeremy Binnie, 'Iran Commissions Fateh Submarine', *Janes*, 18 February 2019, <https://www.janes.com/defence-news/news-detail/iran-commissions-fateh-submarine>.
- 49 Jeremy Binnie and Alex Pape, 'Iranian Navy Commissions Converted Tanker', *Janes Defence Weekly*, 14 January 2021, [https://customer.janes.com/Janes/Display/FG\\_3866871-JDW?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Firanian-navy-commissions-converted-tanker](https://customer.janes.com/Janes/Display/FG_3866871-JDW?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Firanian-navy-commissions-converted-tanker).
- 50 Andrew Greene, 'Australia Monitoring Iranian Warships Transiting South Pacific in Global Show of Force' ABC News Australia, 2 January 2023, <https://www.abc.net.au/news/2023-01-03/iranian-warships-transiting-south-pacific-global-show-force/101822792>.
- 51 'China, Russia, Iran Conduct Four-day Naval Exercise in Gulf of Oman', *Reuters*, 15 March 2023, <https://www.reuters.com/world/china-russia-iran-conduct-four-day-naval-exercises-gulf-oman-2023-03-15/>.
- 52 Sam LaGrone, 'US Blames Iran For Tanker Attack Near Oman', *US Naval Institute News*, 16 November 2022, <https://news.usni.org/2022/11/16/u-s-blames-iran-for-drone-attack-on-tanker-near-oman>.
- 53 Oren Liebermann, 'US Watching as Iran Quietly Replaces Red Sea Spy Ship Damaged in April Attack', *Cable News Network*, 6 August 2021, <https://edition.cnn.com/2021/08/06/politics/us-monitor-iran-spy-ships/index.html>.
- 54 Jeremy Binnie, 'Iran's IRGCN Unveils Shahid Soleimani Catamaran', *Janes Defence Weekly*, 7 September 2022, [https://customer.janes.com/display/BSP\\_38750-JDW](https://customer.janes.com/display/BSP_38750-JDW).
- 55 H. I. Sutton, 'Iran Inducts New Special Operations Ship', *US Naval Institute News*, 19 November 2020, <https://news.usni.org/2020/11/19/video-iran-inducts-new-special-operations-ship>.
- 56 'Iran Navy Announces Indian Ocean Drone Division During Biden's Middle East Visit', *Reuters*, 15 July 2022, <https://www.reuters.com/world/middle-east/iran-navy-announces-drone-division-indian-ocean-during-bidens-middle-east-visit-2022-07-15/>.
- 57 UN Office for Outer Space Affairs, 'Committee on the Peaceful Uses of Outer Space: Membership Evolution', <https://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html>.
- 58 Gunter D. Krebs, 'Sina 1', *Gunter's Space Page*, [https://space.skyrocket.de/doc\\_sdat/sina-1.htm](https://space.skyrocket.de/doc_sdat/sina-1.htm); and Stephen Clark, 'Iran Launches Omid Satellite into Orbit', *Space.com*, 2 February 2009, <https://www.space.com/5432-iran-launches-omid-satellite-orbit.html>.
- 59 Missile Threat Center for Strategic & International Studies (CSIS) Missile Defense Project, 'Safir', 2 August 2021, <https://missilethreat.csis.org/missile/safir/>; and John Krzyzaniak, 'Part 1: Explainer - Iran's Space Program', *The Iran Primer*, 9 August 2022, <https://iranprimer.usip.org/blog/2022/jun/03/explainer-irans-space-program>.
- 60 Gunter D. Krebs, 'Noor 1, 2', *Gunter's Space Page*, [https://space.skyrocket.de/doc\\_sdat/noor.htm](https://space.skyrocket.de/doc_sdat/noor.htm).
- 61 President of Iran, 'The First Meeting of the Supreme Council of Space in the 13th Government', 26 November 2021, <https://www.president.ir/en/132868>.
- 62 Farzin Nadimi, 'Iran Takes Next Steps on Rocket Technology', *PolicyWatch 3576*, The Washington Institute for Near East Policy, 11 February 2023, <https://www.washingtoninstitute.org/policy-analysis/iran-takes-next-steps-rocket-technology>.
- 63 UN Security Council, 'Resolution 2231 (2015)', 20 July 2015, <https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/225/27/PDF/N1522527.pdf>.
- 64 UK Government, 'Statement by France, Germany, the United Kingdom and United States: Iran's Space Launch Vehicle Inconsistent With UNSCR 2231', 29 July 2017, <https://www.gov.uk/government/news/statement-by-france-germany-the-united-kingdom-and-united-states-irans-space-launch-vehicle-inconsistent-with-unscr-2231>.
- 65 Krzyzaniak, 'Part 1: Explainer - Iran's Space Program'.
- 66 'Jalase-ye shura-ye ali-ye faza'i pas as yazdah sal bargozar shod / Ta'kid-e Ra'isi bar shetabbakhshi be barnameha-ye faza'i-ye keshvar' [A meeting of the Supreme Space Council was held after 11 years / Raisi's emphasis on accelerating the country's space programs], *Alef*, 27 November 2021, <https://www.alef.ir/news/4000906072.html>.
- 67 Farzin Nadimi, 'Iran Takes Next Steps on Rocket Technology'.
- 68 Vali Kaleji, 'Why Iran-Russia Space Collaboration Is Reaching New Heights', *Amwaj.media*, 26 February 2023, <https://amwaj.media/article/why-iran-russia-space-collaboration-is-reaching-new-heights>.
- 69 'Soleimani Satellite Constellation Operational Phase Launched', *Mehr News Agency*, 22 January 2023, <https://en.mehrnews.com/news/196478/Soleimani-satellite-constellation-operational-phase-launched>.

- 70 'Iran Boosts Space Program Budget as Nuke Talks Go On', Iran International, 15 December 2021, <https://www.iranintl.com/en/20211215974897>.
- 71 *Ibid.*; 'UAE Establishes \$817 Million Fund to Support Space Sector', Reuters, 17 July 2022, <https://www.reuters.com/world/middle-east/uae-establishes-817-mln-fund-support-space-sector-2022-07-17/>.
- 72 US Department of State, 'New Sanctions Designations on Iran's Space Program', 3 September 2019, <https://2017-2021.state.gov/new-sanctions-designations-on-irans-space-program/index.html>.
- 73 Zhanna L. Malekos Smith, 'Iran's Space Program and the Wall Between "Peaceful Purposes"', CSIS Technology Policy Blog, 1 October 2020, <https://www.csis.org/blogs/strategic-technologies-blog/irans-space-program-and-wall-between-peaceful-purposes>; and Gunter D. Krebs, 'Qased', Gunter's Space Page, [https://space.skyrocket.de/doc\\_lau/qased.htm](https://space.skyrocket.de/doc_lau/qased.htm).
- 74 Krzyzaniak, 'Part 1: Explainer - Iran's Space Program'.
- 75 Nargiz Mammadli, 'Iran Conducts Second Test Launch of Domestic Satellite Carrier', Caspian News, 29 June 2022, <https://caspiannews.com/news-detail/iran-conducts-second-test-launch-of-domestic-satellite-carrier-2022-6-29-0/>.
- 76 Michael Segall, 'Iran Accelerates Its Space Program as It Prepares a Ballistic Missile for a Satellite Launch', Jerusalem Center for Public Affairs, 15 December 2021, [https://jcpa.org/iran-accelerates-its-space-program-as-it-prepares-a-ballistic-missile-for-a-satellite-launch/#\\_edn8](https://jcpa.org/iran-accelerates-its-space-program-as-it-prepares-a-ballistic-missile-for-a-satellite-launch/#_edn8).
- 77 Krzyzaniak, 'Part 1: Explainer - Iran's Space Program'.
- 78 Gunter D. Krebs, 'Nahid 1', Gunter's Space Page, [https://space.skyrocket.de/doc\\_sdat/nahid-1.htm](https://space.skyrocket.de/doc_sdat/nahid-1.htm).
- 79 Defence Intelligence Agency, '2022 Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion', March 2022, [https://www.dia.mil/Portals/110/Documents/News/Military\\_Power\\_Publications/Challenges\\_Security\\_Space\\_2022.pdf](https://www.dia.mil/Portals/110/Documents/News/Military_Power_Publications/Challenges_Security_Space_2022.pdf).
- 80 Iran Watch, 'Iran, Russia Sign Space Cooperation Document', 14 December 2022, <https://www.iranwatch.org/news-brief/iran-russia-sign-space-cooperation-document>; 'Iran, Russia Sign Deal to Develop Space Industry', Iran International, 14 December 2022, <https://www.iranintl.com/en/202212141352>; and 'Iran, Russia Agree to Exchange Space Experience', *Tehran Times*, 14 December 2022, <https://www.tehrantimes.com/news/479740/Iran-Russia-agree-to-exchange-space-experience>.
- 81 'Russia Puts Iranian Satellite Into Orbit', Reuters, 9 August 2022, <https://www.reuters.com/world/russia-launches-iranian-satellite-into-space-under-shadow-western-concerns-2022-08-09/>.
- 82 Kaleji, 'Why Iran-Russia Space Collaboration Is Reaching New Heights'.
- 83 Neil MacFarquhar, Ronen Bergman and Farnaz Fassihi, 'Russia Launches Iranian Satellite, a Sign of Closer Cooperation', *New York Times*, 9 August 2022, <https://www.nytimes.com/2022/08/09/world/middleeast/russia-iran-launch-satellite.html>.
- 84 Spacewatch.global, 'Asia-Pacific Space Cooperation Organisation Members Celebrate Tenth Anniversary', <https://spacewatch.global/2018/11/asia-pacific-space-cooperation-organisation-members-celebrate-tenth-anniversary/>.
- 85 Maziar Motamedi, 'Russia Launches Iranian Satellite into Space From Kazakhstan Base', Al Jazeera, 9 August 2022, <https://www.aljazeera.com/news/2022/8/9/russia-launches-iranian-satellite-into-space-from-kazakhstan-base>.
- 86 President of Iran, 'Full text of Joint Statement on Comprehensive Strategic Partnership between I.R. Iran, P.R. China', 2016, <https://www.president.ir/EN/91435>; and see also President of Iran, 'Old Friends the Best Partners for Bright Future/ Iran, China Friends in Difficult Situations', 13 February 2023, <https://www.president.ir/en/142404>.
- 87 Missile Threat CSIS Missile Defense Project, 'Shahab-3', 31 July 2021, <https://missilethreat.csis.org/missile/shahab-3/>.
- 88 David Wainer, 'Iran and North Korea Resumed Cooperation on Missiles, UN Says', Bloomberg, 8 February 2021, <https://www.bloomberg.com/news/articles/2021-02-08/iran-and-north-korea-resumed-cooperation-on-missiles-un-says#xj4y7vzkg>; and see, for example, 'Iran Denies Getting Missile Technology From NKorea', FoxNews, 11 December 2015, <https://www.foxnews.com/world/iran-denies-getting-missile-technology-from-nkorea>.
- 89 US Embassy in Israel, 'Sweeping U.S. Measures to Support Return of UN Sanctions Relating to Iran's Nuclear, Missile, and Conventional Arms Programs', 21 September 2020, <https://il.usembassy.gov/sweeping-u-s-measures-to-support-return-of-un-sanctions-relating-to-irans-nuclear-missile-and-conventional-arms-programs/>; and 'UN Report Reveals Iran, North Korea Have Resumed Collaboration on Missiles', 09 February 2021, *Arab Weekly*, <https://theArabweekly.com/un-report-reveals-iran-north-korea-have-resumed-collaboration-missiles>.
- 90 IISS Military Balance+, accessed 15 March 2023.
- 91 Maxar Technologies, 'Our Customers', <https://www.maxar.com/customers>.

- 92 ThalesAleniaSpace, 'Launch Success for UAE's Falcon Eye Satellite', 2 December 2020, <https://www.thalesgroup.com/en/worldwide/space/press-release/launch-success-uae-falconeye-satellite>.
- 93 Joseph Dempsey, 'Silo Mentality: Iran's Haji Abad Missile Base', IISS Military Balance Blog, 4 May 2021, <https://www.iiss.org/blogs/military-balance/2021/04/iran-haji-abad-missile-base>.
- 94 *Ibid.*
- 95 Central Intelligence Agency, 'Iran's Silkworm Antiship Missile Capability', NESAS M 87-20069, 2 July 1987, <https://www.cia.gov/readingroom/docs/CIA-RDP90T00114R000700410001-6.pdf>.
- 96 IISS, *The Military Balance 2023*, p. 326.
- 97 US Central Command, 'U.S. Central Command Statement: Iranians Shoot Down U.S. Drone'.
- 98 ELINT News (@ELINTNews), tweet, 25 December 2021, <https://twitter.com/ELINTNews/status/1474807908403761156?s=20>.
- 99 US Defense Intelligence Agency, *Iran Military Power 2019: Ensuring Regime Survival and Securing Regional Dominance* (Washington DC: U.S. Government Publishing Office, 2019), p. 55, [https://www.dia.mil/Portals/110/Images/News/Military\\_Powers\\_Publications/Iran\\_Military\\_Power\\_LR.pdf](https://www.dia.mil/Portals/110/Images/News/Military_Powers_Publications/Iran_Military_Power_LR.pdf).
- 100 Iran Press News Agency, via Yuri Lyamin (@imp\_navigator), tweet, 21 December 2021, [https://twitter.com/imp\\_navigator/status/1473266682869293061?lang=en](https://twitter.com/imp_navigator/status/1473266682869293061?lang=en).
- 101 'Iran Reveals Underground Fighter Jet Base', YouTube video, posted by Al Arabiya English, 7 February 2023, <https://www.youtube.com/watch?v=33UNorcZ2aQ>.
- 102 Binnie, 'First S-300 Components Delivered to Iran'.
- 103 IISS, *The Military Balance 2023*, pp. 359–61
- 104 *Ibid.* p. 352
- 105 *Ibid.*, p. 326; and 'IRGC Aerospace Says New "Paveh" Cruise Missile Operationalized'.
- 106 'Warfighters in Action With AFCENT Commander Lt. Gen. Alexis G. Grynkewich', YouTube video, posted by Air & Space Force Association, 14 February 2023, <https://www.youtube.com/watch?v=05mHX3tR6pI>.
- 107 *Ibid.*
- 108 *Ibid.*
- 109 US Department of Defense, 'Readout of the New Round of U.S.-Gulf Cooperation Council Working Groups on Integrated Air and Missile Defense and Maritime Security', 14 February 2023, <https://www.defense.gov/News/Releases/Release/Article/3298553/readout-of-the-new-round-of-us-gulf-cooperation-council-working-groups-on-integ/>.
- 110 *Ibid.*
- 111 *Ibid.*
- 112 'Warfighters in Action With AFCENT Commander Lt. Gen. Alexis G. Grynkewich'.
- 113 *Ibid.*
- 114 'U.S. Centcom Says Iranian-made Drone Hit Pacific Zircon Tanker off Oman', Reuters, 17 November 2022, <https://www.reuters.com/world/us-centcom-says-iranian-made-drone-hit-pacific-zircon-tanker-off-oman-2022-11-17/>.
- 115 Encyclopedia Britannica, 'Persian Gulf', <https://www.britannica.com/place/Persian-Gulf>.
- 116 US Energy Information Agency, 'The Strait of Hormuz is the World's Most Important Oil Transit Chokepoint', 20 June 2019, <https://www.eia.gov/todayinenergy/detail.php?id=39932>.
- 117 Elisabeth Braw, 'What the Ever Given Taught the World', *Foreign Policy*, 10 November 2021, <https://foreignpolicy.com/2021/11/10/what-the-ever-given-taught-the-world/>.
- 118 Samy Magdy, 'Sudan Military Finishes Review of Russian Red Sea Base', AP News, 11 February 2023, <https://apnews.com/article/politics-sudan-government-moscow-803738fba4d8f91455f0121067c118dd>.
- 119 Combined Maritime Forces (CMF), <https://combinedmaritimeforces.com/>.
- 120 NAVCENT Public Affairs, 'New International Naval Task Force to Enhance Red Sea Security', US Naval Forces Central Command, 17 April 2022, <https://www.cusnc.navy.mil/Media/News/Display/Article/3001660/new-international-naval-task-force-to-enhance-red-sea-security/>.
- 121 EU Naval Force Operation ATALANTA, <https://eunavfor.eu/>.
- 122 NATO Allied Maritime Command, 'Operation OCEAN SHIELD', <https://mc.nato.int/missions/operation-ocean-shield>.
- 123 Dzirhan Mahadzir, 'Chinese Navy Piracy Patrol Shepherds Fishing Fleet Through Gulf of Aden', US Naval Institute News, 6 January 2022, <https://news.usni.org/2022/01/06/chinese-navy-piracy-patrol-shepherds-fishing-fleet-through-gulf-of-aden/>; and Reuters Staff, 'China Formally Opens First Overseas Military Base in Djibouti', Reuters, 1 August 2017, <https://www.reuters.com/article/us-china-djibouti-idUSKBN1AH3E3>.
- 124 John W. Miller, 'How to Build a Gulf Coalition to Counter Iranian Regime Aggression', Atlantic Council, 25 September 2019, <https://www.atlanticcouncil.org/blogs/iransource/how-to-build-a-gulf-coalition-to-counter-iranian-regime-aggression/>.
- 125 US Central Command, 'U.S. Central Command Statement: Iranians Shoot Down U.S. Drone'; and Kate O'Flaherty, 'US Warship Took Down Iranian Drone Using New "Jamming" Technology', *Forbes*, 22 July 2019, <https://www.forbes.com/sites/>

- kateoflahertyuk/2019/07/22/u-s-warship-took-down-iranian-drone-using-new-jamming-technology/?sh=7e2dbed73363.
- 126 Reuters Staff, 'GCC States Begin Enhanced Maritime Security Patrols:U.S.FifthFleet', Reuters, 19 May 2019, <https://www.reuters.com/article/cnews-us-gulf-security-idCAKCN1SPoIR-OCATP>.
- 127 International Maritime Security Construct, <https://www.imscsentinel.com/>.
- 128 Ministry for Europe and Foreign Affairs, 'European Maritime Awareness in the SoH (EMASOH): Political Statement by the Governments of Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, and Portugal (20 January 2020)', 20 January 2020, <https://www.diplomatie.gouv.fr/en/french-foreign-policy/europe/news/article/european-maritime-awareness-in-the-soh-emasoh-political-statement-by-the>.
- 129 Naval News Staff, 'U.S. Navy, 50 Partners Start International Maritime Exercise IMX 2023', Naval News, 27 February 2023, <https://www.navalnews.com/naval-news/2023/02/us-navy-50-partners-start-international-maritime-exercise-imx-2023/>.
- 130 'Austin: US Commitment to Middle East "Strong and Sure"', VOA News, 20 November 2021, <https://www.voanews.com/a/austin-us-commitment-to-middle-east-strong-and-sure-/6321021.html>.
- 131 Sam LaGrone, 'Essex Amphibious Ready Group Leaves 5th Fleet; No U.S. Capital Ship in Middle East', US Naval Institute News, 10 January 2022, <https://news.usni.org/2022/01/10/essex-amphibious-ready-group-leaves-5th-fleet-no-u-s-capital-ship-in-middle-east>.
- 132 Dzirhan Mahadzir, 'Charles de Gaulle Carrier Strike Group Operating in Indian Ocean, Deploys Fighters to Singapore', USNI News, 18 January 2023, <https://news.usni.org/2023/01/18/charles-de-gaulle-carrier-strike-group-operating-in-indian-ocean-deploys-fighters-to-singapore>
- 133 Tom Waldwyn, 'Qatar, Saudi Arabia and the UAE: Expanding Naval Horizons?', IISS Military Balance Blog, 26 October 2018, <https://www.iiss.org/blogs/military-balance/2018/10/qatar-saudi-arabia-uae-naval-horizons>.
- 134 Xavier Vavasseur, 'Fincantieri Launches Qatar's Air Defense LPD', Naval News, 24 January 2023, <https://www.navalnews.com/naval-news/2023/01/fincantieri-launches-qatars-air-defense-lpd/>.
- 135 Naval Technology, 'Leonardo to Build Naval Operation Centre for Qatar', 23 March 2022, <https://www.naval-technology.com/news/leonardo-to-build-naval-operation-centre-for-qatar/>.
- 136 Dimitris Mitsopoulos, 'New Gowind Corvette for the UAE Starts Sea Trials', Naval News, 23 March 2023, <https://www.navalnews.com/naval-news/2023/03/new-gowind-corvette-for-the-uae-starts-sea-trials/>.
- 137 Jeremy Binnie, 'Navantia Signs MoU to Deliver More Saudi Naval Vessels', *Janes Defence Weekly*, 5 December 2022, [https://customer.janes.com/Janes/Display/BSP\\_51077-JDW?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Fnavantia-signs-mou-to-deliver-more-saudi-naval-vessels](https://customer.janes.com/Janes/Display/BSP_51077-JDW?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Fnavantia-signs-mou-to-deliver-more-saudi-naval-vessels).
- 138 Lee Willett, 'GCC Navies Build for Persistent Presence in Home Waters', *Armada International*, 24 February 2021, <https://www.armadainternational.com/2021/02/gcc-navies-build-for-persistent-patrols-in-home-waters/>.
- 139 Nick Childs, 'Gulf Maritime Security Testing Waters for an Uncrewed Future', IISS Military Balance Blog, 9 December 2022, <https://www.iiss.org/blogs/military-balance/2022/12/gulf-maritime-security-testing-waters-for-an-uncrewed-future>.
- 140 U.S. Naval Forces Central Command Public Affairs, 'US Forces Assist UK Seizure of Missiles Shipped From Iran', U.S. Naval Forces Central Command, 2 March 2023, <https://www.cusnc.navy.mil/Media/News/Display/Article/3315919/us-forces-assist-uk-seizure-of-missiles-shipped-from-iran/>.
- 141 Caitlin M. Kenney, 'As a Groundbreaking Unmanned Task Force Hits Stride, Navy Mulls the Next One', *Defense One*, 10 January 2023, <https://www.defenseone.com/technology/2023/01/ground-breaking-unmanned-task-force-hits-stride-navy-mulls-next-one/381683/>.
- 142 Harry Lye, 'Gulf Task Force Tests AI and Uncrewed Vessels', Shephard Media, 16 January 2023, <https://www.shephardmedia.com/news/uv-online/gulf-task-force-tests-ai-and-uncrewed-vessels/>.
- 143 Frank Gardner, 'First Joint Naval Exercise by Israel and Gulf States Signals Iran Worries', *BBC News*, 15 November 2021, <https://www.bbc.co.uk/news/world-middle-east-59289341>.
- 144 Albert Vidal, 'Drones, AI and Task Force 59: A Solution for the UAE Navy's Lack of Manpower', The Arab Gulf States Institute in Washington, 29 June 2022, <https://agsiw.org/drones-ai-and-task-force-59-a-solution-for-the-uae-navys-lack-of-manpower/>.
- 145 Olivia Savage, 'Update – IDEX 2023: ADSB Unveils New USV', *Janes Defence Weekly*, 22 February 2023, <https://www.janes.com/defence-news/news-detail/idx-2023-adsb-unveils-new-usv>.
- 146 Elisabeth Gosselin-Malo, 'Gulf Nations Summon Sea Drones to Curb Illicit Trafficking', *DefenseNews*, 9 March 2023, <https://www.defensenews.com/global/mideast-africa/2023/03/09/gulf-nations-summon-sea-drones-to-curb-illicit-trafficking/>.

- 147 NAVCENT Public Affairs US Naval Forces Central Command / US 5th Fleet, 'U.S. Navy Statement on Iranian Incident in Red Sea', Defense Visual Information Distribution Service, 2 September 2022, <https://www.dvidshub.net/news/428582/us-navy-statement-iranian-incident-red-sea>.
- 148 Kate Tringham, 'Thales and Schiebel to Supply UK Royal Navy With Rotary UAS Solution to Meet Peregrine UCR', *Janes Navy International*, 10 February 2023, [https://customer.janes.com/Janes/Display/BSP\\_53595-JNI?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Fthales-and-schiebel-to-supply-uk-royal-navy-with-rotary-uas-solution-to-meet-peregrine-ucr](https://customer.janes.com/Janes/Display/BSP_53595-JNI?ReturnUrl=https%3A%2F%2Fwww.janes.com%2Fdefence-news%2Fnews-detail%2Fthales-and-schiebel-to-supply-uk-royal-navy-with-rotary-uas-solution-to-meet-peregrine-ucr).
- 149 Kayshel Trudell, 'AFCENT's Innovation Task Force 99 Establishes Ops, HQ', US Air Force, 5 December 2022, <https://www.af.mil/News/Article-Display/Article/3235960/afcents-innovation-task-force-99-establishes-ops-hq/>.
- 150 *Ibid.*
- 151 'Warfighters in Action With AFCENT Commander Lt. Gen. Alexis G. Grynkewich'.
- 152 See, for example, Florida International University Export Control, 'Unmanned Aircraft Vehicles and Systems', <https://exportcontrol.fiu.edu/export/topics/unmanned-and-autonomous-vehicles/>.



**The International Institute for Strategic Studies – UK**

Arundel House | 6 Temple Place | London | WC2R 2PG | UK

**t.** +44 (0) 20 7379 7676 **f.** +44 (0) 20 7836 3108 **e.** [iiss@iiss.org](mailto:iiss@iiss.org) [www.iiss.org](http://www.iiss.org)

**The International Institute for Strategic Studies – Americas**

2121 K Street, NW | Suite 600 | Washington DC 20037 | USA

**t.** +1 202 659 1490 **f.** +1 202 659 1499 **e.** [iiss-americas@iiss.org](mailto:iiss-americas@iiss.org)

**The International Institute for Strategic Studies – Asia**

9 Raffles Place | #49-01 Republic Plaza | Singapore 048619

**t.** +65 6499 0055 **f.** +65 6499 0059 **e.** [iiss-asia@iiss.org](mailto:iiss-asia@iiss.org)

**The International Institute for Strategic Studies – Europe**

Pariser Platz 6A | 10117 Berlin | Germany

**t.** +49 30 311 99 300 **e.** [iiss-europe@iiss.org](mailto:iiss-europe@iiss.org)

**The International Institute for Strategic Studies – Middle East**

14th floor, GBcorp Tower | Bahrain Financial Harbour | Manama | Kingdom of Bahrain

**t.** +973 1718 1155 **f.** +973 1710 0155 **e.** [iiss-middleeast@iiss.org](mailto:iiss-middleeast@iiss.org)

---