Distribution of Military Capabilities (rDMC) Codebook

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Data Collection Process

Goals of the project

This project aims to disaggregate military capabilities into military equipment portfolios for each country in a given year. By coding and consolidating military equipment data from The International Institute for Strategic Studies (IISS) Military Balance, we hoped to make equipment counts and force structure analysis more accessible (International Institute for Strategic Studies, n.d.). We hope that this dataset will 1) offer a new means of considering the role of military capabilities in geopolitics, 2) inform us more about the causes and consequences of military capabilities across time and space, and 3) more broadly, offer another way of analyzing conflict as a function of capabilities. We worked towards these goals by focusing on a simple, but arduous task: counting equipment.

Defining military capabilities

The following section presents the IISS definition of military capabilities. The broader IISS Military Balance reports include information on national defense spending, troop levels, military deployment, and military equipment. This dataset only includes the last of those -- military equipment. IISS data on military equipment is organized by its type.

We based our data entry off of the “Equipment” section alone, as the deployment sections were redundant with the equipment sections. By 2014, IISS had settled on categorizing a country’s military into “Forces by Role,” “Equipment,” and “Deployment,” although these sections were less distinguished in earlier years. Therefore, the deployment counts are already accounted for in the equipment counts. Changes in information between IISS editions primarily reflect changes in force, but may also reflect IISS reevaluation of evidence supporting past entries. Such IISS reevaluation is particularly important to note given that time-series comparisons are integral to this project.

When coding the data, our team excluded some capabilities where accurate counts seemed unfeasible. For example, rDMC does not include individual counts for ammunition and explosives because IISS does not record small arms at all and rarely records an actual count of the number of bombs/missiles. For the latter, IISS only records the presence of bombs and the counts for missiles in terms of launchers or whether they have a certain missile type. For missiles and rockets, we counted the number of launchers each country possessed rather than the exact number of missiles or rockets themselves (eg. the number of SA-16 Gimlet surface-to-air missile systems as opposed to the number of missiles). For other types of ammunition or explosives, we noted their presence rather than a count. This was coded as “NA” for “present” or 0 for “not present” in a given country-year. The reason for these changes are because the counts for single bombs, rockets, and missiles varied too greatly within a single

year, and is likely to be an unreliable count.[1] Additionally, we do not include small arms (individual-service firearms) such as handguns and rifles, or light/man-portable weapons in our data.[2]

Spatial temporal domain

We included all of the data from the IISS Military Balance reports from 1970-2014, inclusive. IISS reports equipment as of the time of publication, so the year of data corresponds to the year of the report.[3] We relied on the Gleditsch and Ward list of sovereign states to classify our country names.

Our dataset does not count equipment unavailable to sovereign states, for example, equipment seized by a non-state faction during a civil war, despite the fact that the military capabilities of such factions are listed by IISS. For example, the IISS data for Lebanon in 1987 includes counts of capabilities for a variety of non-state factions. Only the capabilities of forces fighting on the same side of the government of Lebanon have been included (Lebanese Forces militia, the Progressive Socialist Party, and the South Lebanese army). Data on opposition groups (the Sunni and Shi'a militias and the Palestinian Liberation Organization) have been excluded, because their status as non-state actors puts them beyond the scope of this project. While some IISS country-years produce information for non-state actors (rebel groups, multinational organizations, etc.), we do not include these counts in the final data. This project includes equipment either primarily used by or accessible to paramilitary groups within the state, including coast guards, royal guards, and police forces. This inclusion may not be useful for some research (for instance, on power projection) and thus the status of such paramilitary capabilities is noted in the service column.

Coding Procedure

Data-generating process

The IISS Military Balance reports represent their judgement based on the information available to them at the time the annual reports are compiled. This involves cooperation and solicited comments from the defense ministries and armed forces of the countries included when possible. For governments with a proven record of transparency, the IISS cites official defence expenditure information as reported by national governments, the UN, the OSCE, or the IMF. Inconsistent or unreliable reporting is not a notable issue with data for countries in this

[1] This distinction is consistent with related work that differentiates Major Conventional Weapons (MCW) from Small Arms and Light Weapons (Efrat 2010; Caverley 2021).
[2] Examples of IISS equipment types and equipment names that are "ammunition and explosives" include bombs (Paveway II) and surface-to-surface missiles (AGM-84 Harpoon). An exhaustive list and concrete definitions is provided in the Datasets and Variables section below."
[3] For example, for the 1994 data, equipment is recorded as of June 1, 1994. Publication month for the IISS reports varies slightly over time, but for each year reports counts as of that month. For 2007-2012, since the reports publish data corresponding to November in the previous year, consider these to be as of January of the report year.

category. For countries that do not fall into the above category, official figures are an incomplete measure of total military-related spending. IISS evaluates additional data from a variety of sources to address circumstances of manipulation or falsification of data and arrive at a more accurate estimate of true defence expenditure. When necessary estimations are made, IISS employs a number of its own members and consultants who help compile and check material to ensure that data is as accurate and free from bias as possible. The Director-General and Chief Executive of IISS assume full responsibility for the data and judgements in the Military Balance. For this project, the relevant areas where supplemental data has been evaluated by IISS are primarily cases of manipulation or falsification related to equipment procurement, R&D, defence-industrial investment, covert weapons programmes, and paramilitary forces. However, IISS also evaluates additional data in cases of disparities related to pensions for retired military and civilian personnel and non-budgetary sources of military revenue arising from ownership of industrial, property and land assets.

There is notable IISS terminology regarding equipment holdings that influence our coding process consistently across the data:

- Total holdings - recorded equipment quantities are shown according to function designated by respective nation and type, and should be understood as total holdings, and include training units in addition to active forces. In some cases, training units are counted separately, in which case it is distinguished in the data.
- Not in use - recorded equipment quantities do not include units inactive, or otherwise unserviceable.
- In-store/in-reserve - in many cases, the IISS Military Balance report would note units "in store." For our dataset, we did not count these units as a part of the "unit_count." For example, if the entry in IISS notes (100 F-22, 3 in store) we only entered 100 into the unit_count column. This holds true for "in reserve" as well.
- Reserves - some countries also possessed brief "Reserves" sections at the end of each service section. The equipment listed in these sections was not included in country counts.
- Missiles - recorded quantities for missile systems refer to the number of launchers, not the number of missiles.
- Squadrons - some terms, such as 'squadron,' 'battery,' and 'regiment' can reflect different quantities depending on context. In such contexts where these terms are relevant and do not align with standard British usage, additional defining information is noted by IISS. Otherwise, standard British definitions are implied. We did not include squadron counts in our data, rather than counting equipment that was organized into squadrons as an absolute variable, "NA" was used to signify that the count was present, but not easily countable. In some cases where specific squadron definitions were provided within the country data, e.g. "30 aircraft per squadron," this number was multiplied by the number of squadrons to give an accurate count.

There is also terminology in the original IISS data source regarding qualifiers on equipment counts. That terminology is followed in the quantitative data when counts were entered.

- 'at least' - the total is no less than the number given.

- ‘up to’ - the total is at most the number given, but could be lower.
- ‘about’ - the total is potentially higher than the number given.
- ‘some’ - precise information about the total inventory is unavailable at the time of IISS press.
- ‘in store’ - equipment held away from front-line units. The readiness and maintenance on such equipment varies.

Coding process

Columns

We began with eight original columns to classify our equipment (year, country, service, equipment_name, equipment_type, unit_name, unit_count, and rawtext). This was indicated from the IISS Military Balance headings and subheadings within the text. We then expanded these categories to allow for discrepancies and further subdivisions within equipment and service types (subservice, subsubservice, equipment_subtype, and equipment_subname). For example, some countries have a distinct air wing within their navy, so the air wing is a subservice within the naval service. Further equipment subdivisions are also important because it allows us to distinguish between the capabilities of certain units within the same equipment type (eg. light transport vs. heavy transport). See Table 1 below on the dimensions of military technology.

Sheet Structure

We structured the data into a single Google Sheet for each IISS year (1970-2014), with individual tabs within each sheet for each country. This is due to capacity limitations in Google Sheets, which prevented us from utilizing a single spreadsheet for all of the data. In each of these sheets, there was a designated column for each of the “Column Naming” designations as well as three columns for coder organization (new_row, notes, old_row). Those three rows are omitted from the final version of the raw dataset, but are available to those interested in replication.

Coding Procedure

Every country-year was completed by a single coder, with most coders assigned to all of the years of their assigned countries, with some exceptions. This allowed some degree of coding continuity between years for each country.

In order to best track when equipment was acquired/retired, our coders worked backwards from the 2014 IISS report to the 1970 IISS report. For example, after completing the 2014 data, the coder would move on to the 2013 data for that same country. The details of this procedure are explained below, using Mali 2013 as an example.

First, the coder would open the 2013 IISS Military Balance report and would create a new tab for Mali in the 2013 Equipment Data Spreadsheet. Next, the coder would copy all of the cells from the 2014 sheet for Mali and paste them into the 2013 sheet for Mali. The coder would then

delete the data under the “year,” “rawtext,” “notes,” “new_row,” and “old_row” columns. The coder would then delete any equipment rows that had a “0” in the “unit_count” column, effectively getting rid of any equipment that did not exist in 2014 (as it would likely not exist in 2013). Then, the coder would delete all counts (either a number or “NA”) left in the “unit_count” column. From here, the coder would proceed to enter in the counts from the 2013 IISS Military Balance Report into “unit_count.” (coding decisions detailed under the “Coding Decisions” section). For new equipment, the coder would add a row and fill out the service and equipment information for the new equipment. **Table 1** and **Figure 1** demonstrate how the data from the pdf would be coded. The coder would then copy and paste the text from relevant section of the IISS PDF into the “rawtext” column.

Table 1: Sample equipment categorization for New Zealand’s navy, corresponding to the raw data shown below in **Figure 1**.

Country	Year	Equip Type	Equip Subtype	Equip Name	Equip Subname	Unit Name	Unit Count
New Zealand	2014	Aircraft	-	ASW	-	P-3K2 Orion	3
New Zealand	2014	Aircraft	-	TPT	medium	C-130H Hercules	5
New Zealand	2014	Helicopters	-	TPT	light	AW109	5

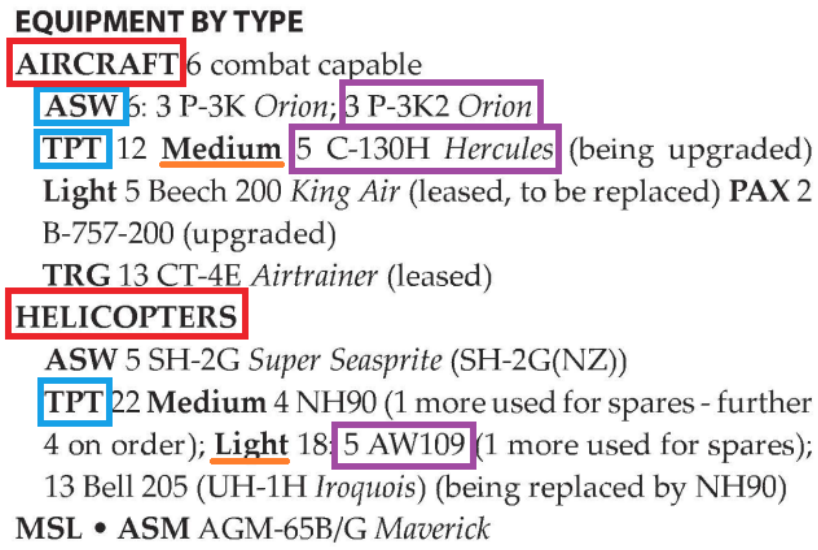
EQUIPMENT BY TYPE
AIRCRAFT 6 combat capable
ASW 6: 3 P-3K *Orion*; 3 P-3K2 *Orion*
TPT 12 **Medium** 5 C-130H *Hercules* (being upgraded)
Light 5 Beech 200 *King Air* (leased, to be replaced) **PAX** 2 B-757-200 (upgraded)
TRG 13 CT-4E *Airtrainer* (leased)
HELICOPTERS
ASW 5 SH-2G *Super Seasprite* (SH-2G(NZ))
TPT 22 **Medium** 4 NH90 (1 more used for spares - further 4 on order); **Light** 18: 5 AW109 (1 more used for spares); 13 Bell 205 (UH-1H *Iroquois*) (being replaced by NH90)
MSL • ASM AGM-65B/G *Maverick*

Figure 1: Equipment inventory for New Zealand’s navy, 2014 (Source: IISS Military Balance)

In the final version of the data, every country possesses a row for every piece of equipment that existed in that year, even if it did not have this equipment in its possession. This allows us to

display which pieces of equipment a country actually had in a given year out of every possible piece of equipment that a country *could* have in a given year. For example, in 1982, Luxembourg had only four pieces of equipment in its possession. However, the data will show N amount of rows under Luxembourg because N pieces of equipment existed in 1982. However, N-4 of those rows will have a unit_count of 0. Therefore, just because a country has a row for a certain piece of equipment, does not mean that it ever possessed that equipment; it is simply a means of comparing equipment within a given year between countries. This also means that equipment is only present for comparison if it existed in that given year. If an equipment did not exist in Year X, then it will not be present in any of our data for Year X. This is modeled after a similar approach done for granular trade data (Kim, Liao, and Imai 2020). We assume that IISS data is exhaustive: if a country is missing a piece of equipment in a given year, we assume that they did not possess that piece of equipment. However, this could be a misrepresentation if data was miscounted or unreported by the country.

Warnings and caveats

While we have made the best possible attempt to intuitively organize the data and ensure its quality, a few considerations are worthy of note for scholars using the data.

- Temporal changes in the original data - IISS has changed the definitions of some categories over time, such as changing full load displacement requirements for primary surface combatants. This project has honored the changes to IISS definitions over time, and therefore some designation of forces may change over time even when no change in forces has actually occurred. There are some military capabilities that may be of scholarly interest that this project has excluded, despite collection of data on these capabilities by IISS. Forces in this category include dual-use technology and cyber weapons.

  Furthermore, from 2005-2014, IISS organized a country's equipment in three ways: "forces by role" (brigades, squadrons, etc.), "equipment by type," and "deployment." Our data only reflects the "equipment by type" section because the other two are only useful for organizational data, not counts. Prior to 2005, these categorizations were more implicitly categorized into "equipment" and "deployment." Again, here we only dealt with the "equipment" section.
- Aggregate units - for cases in which the IISS Military Balance report listed the sum of several units, but no aggregated counts, we combined these counts into a single row. For example, if IISS listed a country as having 1000 122mm, 130mm, and 150mm artillery, under "equipment_subname" we would enter 122mm, 130mm, and 150mm, and under "unit_count" we would enter 1000. In some countries, this was coded as aggregated "NA" counts underneath this summed count. (eg. three subsequent rows for 122mm, 130mm, and 150mm, respectively, each with "NA" in the "unit_count" column). An example of this is shown in **Figure 2**.

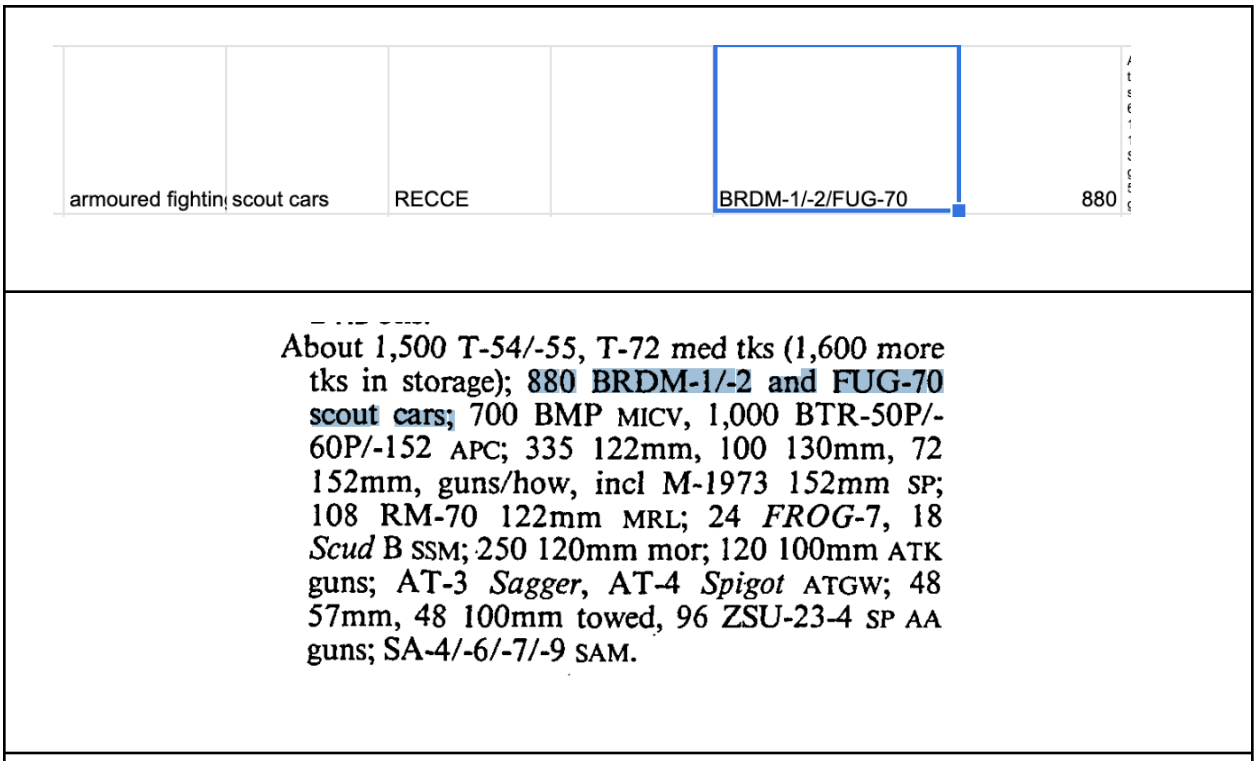

Figure 2: Screenshot showing how aggregated unit names were coded

- Inconsistency in unit names - the unit_name column was very unstable in IISS reports across years. Because of this, coders edited the "unit_name" column quite often to reflect IISS's nomenclature, provided it described the same piece of equipment. Sometimes this was edited to match previously-coded years, but sometimes it was not, as a result of individual coding discrepancies and coder familiarity with certain unit names.

  For example, the Soviet Union's SSBN may be called "Delta-III" in one year, but "D-III" in the previous year. Or the SAM SA-8 Gecko may be classified as "SA-8," "Gecko," "SA-8 Gecko," or as a part of a summed count such as "SA-6, SA-7, SA-8." For this reason, we would caution against analysis based entirely upon the unit_name column for time series or cross-sectional analysis, as there may be many names for the same unit throughout the years. However, the other columns do not pose this problem, as they are standardized throughout the dataset and reflective of that country's use of the equipment. A future version of this project aims to similarly standardize the unit names.

Datasets and Variables

Formats and identifier variables

Formats of the data

The rDMC data is released in three basic formats. The first version of the data is the **unit level data** (*rDMC_raw*). Here, the unit of analysis is the country-year-unit, where the unit is defined as the most disaggregated equipment categorization level. This data thus includes a different entry for F-16 fighter jets and F-14 fighter jets within the same country-year. We describe this data, summarized in **Table 2**, as "raw" since it represents the IISS data in its truest form. The only coding decisions made here involved cosmetic changes by fixing typos and standardizing the higher-level equipment categories. Please see the warnings and caveats section above concerning this version of the data.

The second and third versions of the data are the primary and most readily usable versions of the data aggregated to the technology level. Here, the 5-level equipment categorizations produced by IISS are aggregated to a new 2-level categorization system described below. These categories are consistent across time and space and rely on the original definitions provided by IISS, with some modifications. The procedure for those categorizations is described below and the accompanying spreadsheets identify exactly which 5-level equipment categorizations were placed into each 2-level categorization. These new categories are theoretically motivated by existing work on differences in state military capabilities based on their strategic purpose and distinct operational functions. We recognize that scholars and practitioners may disagree about these 2-level categorizations and may subsequently wish to alter the groupings or categorization themselves. To encourage this process, the technology categories are modular, so scholars can alter the 2-level technology where each 5-level equipment is characterized and re-run the code to produce a new dataset better suited to their needs.

The second version of the data is the **technology level data** (*rDMC_long*). Here, the unit of analysis is the country-year-technology. The third version of the data is at the **country-year level data** (*rDMC_wide*). Both versions of the data are identical, and simply reshaped. Their column values are defined in detail below. Definitions of the technologies for the technology level (*rDMC_long*) are provided in the country-year level (*rDMC_wide*) since the latter has each technology represented as a unique column, with each cell thus providing a numeric value of that technology for the corresponding country-year.

Identifier variables

The following identifier variables exist in all three versions of the data and help identify each country-year observation. See Table 2 for an example of identifier variable coding.

Table 2: Dimensions of Military Technology			
	Column name	**Description**	**Example**
Identifier columns	Year	Year of interest	1973
	Country	Country of interest	united states
Within-state organization	Service	Organization or branch of the military within a given country to which an equipment belongs	stratcom
	Subservice	Subdivision of the service	air force
	Subsubservice	Further subdivision of the subservice	space command
Equipment categorization	Equipment type	The broadest classification of a piece of equipment, standardized across countries	ballistic missiles
	Equipment subtype	Used to distinguish variations within an equipment_type	for equipment_type “principal surface combatants,” some equipment_subtypes are: aircraft carriers, frigates, destroyers, and cruisers
	Equipment name	The next major level of equipment aggregation	ICBM
	Equipment subname	Used to distinguish variations within a given equipment_name	nuclear
	Unit name	The name of a specific piece of equipment, can provide information about the manufacturer or host country	Minuteman I
Count	Unit count	Count of unit_names	140
Other	Notes	Notes that the coder may have added regarding special cases	“Minimum” if the count is the minimum number of units

Year
Variable: year
Type: numeric
Definition: Calendar year to which the data corresponds.

Country
Variable: country
Type: character
Definition: Country name.

Country code
Variable: ccode
Type: numeric
Definition: Numeric country code from the Gleditsch and Ward revised list of independent states. This is consistent with the COW country codes, but excludes microstates (Gleditsch and Ward 1999).

Continent
Variable: continent
Type: character
Definition: Continent on which the country is located. This value is coded using the countrycode R package which relies on continent categorizations from the World Bank Development Indicators (Arel-Bundock, Enevoldsen, and Yetman 2018). The exhaustive list of variable values is: Africa, Americas, Asia, Europe, and Oceania.

Domain
Variable: domain
Type: character
Definition: Based solely on the value of “service,” not on any intrinsic properties of the unit itself. “Domain” can take on the following values that correspond to service divisions: air, cyber, land, nuclear, sea, or space.

rDMC_raw

Service
Variable: service
Type: character
Definition: Organization or branch of the military within a given country to which an equipment belongs.

Subservice
Variable: subservice
Type: character

Definition: Further subdivision of the subservice. For example, the subservice “air wing” may fall under the service “navy”.

Subsubservice
Variable: subsubservice
Type: character
Definition: Subdivision of the subservice. For example, the subsubservice “customs” falls under the subservice “carabinieri” (the Italian domestic police/law enforcement agency) which falls under the service “paramilitary”.

Domain
Variable : domain
Type: character
Definition: Based solely on the value of “service,” not on any intrinsic properties of the unit itself. “Domain” can take on the following values that correspond to service divisions: air, cyber, land, nuclear, sea, or space.

Equipment type
Variable: equipment_type
Type: character
Definition: The broadest classification of equipment that is standardized across countries. Below is an exhaustive list of equipment types as well as their definitions[4]:

- Air defence - guns and missiles designed to engage fixed-wing, rotary-wing and unmanned aircraft.
- Air-launched missiles* - missiles launched from a military aircraft designed to deliver one or more warheads to a specific target on land, sea, or air.
- Aircraft - fixed-wing platforms.
- Amphibious - vessels designed to transport personnel and/or equipment onto shore.
- Anti-tank/anti-infrastructure - guns, guided weapons and recoilless rifles designed to engage armoured vehicles and battlefield hardened targets.
- Armoured fighting vehicles - a self-propelled vehicle with armoured protection and cross-country capability.
- Artillery - weapons (including guns, howitzers, gun/howitzers, multiple-rocket launchers, mortars and gun/mortars) capable of engaging ground targets with indirect fire, with a calibre greater than:
    - 100mm for artillery pieces and 80mm and above for mortars (2011-2019).
    - 100mm for artillery pieces, and 60mm and above for mortars (2009-2010).
    - 100mm (1990-2008).

[4] Where possible, the original definitions in the IISS Military Balance are provided. Asterisks (*) denote equipment types not explicitly defined by IISS, where a new definition was created. The new definitions are consistent with the equipment and unit names that fall under each the scope of each equipment type.

- Ballistic missiles* - missiles designed to deliver one or more warheads to a specific target via a high, arching trajectory. They are initially guided, but then fall to their target through the force of gravity.
- Bombs* - guided or unguided munitions designed to destroy a target when detonated.
- Engineering and maintenance vehicles* - Armoured fighting vehicles which fulfil a support role, namely in recovery, construction, or the dispensing of combat engineers.
- Helicopters - rotary-wing platforms.
- Logistics and support* - ocean-going surface vessels performing an auxiliary military role, supporting combat ships or operations.
- Mine warfare - all surface vessels configured primarily for mine laying or countermeasures.
- Patrol and coastal combatants - surface vessels designed for coastal or inshore operations.
- Principal surface combatants - all surface ships designed for combat operations on the high seas, with an FLD satisfying:
    - Above 1,500 tonnes (2012-2019)
    - Usually above 1,500 tonnes (2011)
    - Above 1,000 tonnes (1988-2010)
    - FLD irrelevant prior to 1988. Instead, national designation alone is used
- Radars* - a system, either land-based or space-based (satellites), used for detecting information about objects or areas at a distance by releasing and then detecting the reflection of high-frequency electromagnetic waves.
- Submarines - all vessels designed to operate primarily under water. Submarines with a dived displacement below 250 tonnes are classified as midget submarines; those below 500 tonnes are coastal submarines.
- Surface-to-surface missile launchers* - missiles launched from fixed or mobile land units designed to deliver one or more warheads to a specific target on land.
- Unmanned aerial vehicles - remotely piloted or controlled unmanned fixed- or rotary-wing systems. Light UAVs are those weighing 20-150kg; medium: 150-600kg; and large: more than 600kg.

Equipment subtype
Variable: equipment_subtype
Type: character
Definition: Variable used to distinguish variations within an equipment_type

Equipment name
Variable: equipment_name
Type: character
Definition: The next major level of equipment aggregation (after equipment_type).

Equipment subname
Variable: equipment_subname
Type: character

Definition: Variable used to distinguish variations within a given equipment_name

Unit name
Variable: unit_name
Type: character
Definition: The name of a specific piece of equipment. Unit_name can also provide information about the manufacturer or host country

Unit count
Variable: unit_count
Type: numeric
Definition: This variable reports the number of [unit_name]s that a country possessed in a given year. The "unit_count" for any given type of equipment could yield one of two values:

- Numeric (n > 0): the number of that unit_name.
- NA: no numbers were given (often the unit_name by itself), but the equipment was listed in the IISS Military Balance report, indicating the country had an unknown non-zero quantity of that technology.

rDMC_long

Technology
Variable: tek
Type: character
Definition: The technology category to which unit_count corresponds. The technology categories are consistent across all countries in a given year. If any country possessed > 0 of a given technology in a given year, every country for that year has a row for that technology even if it did not possess any amount of that technology.

Unit count
Variable: unit_count
Type: numeric
Definition: Numeric count corresponding to the amount of that technology possessed by the corresponding country-ear. The "unit_count" for any given type of equipment could yield one of three values:

- Numeric (n > 0): the number of that unit_name.
- Numeric (n = 0): this technology did not exist in that country in Year X. If a piece of equipment has a unit_count of "0", the equipment existed in another country during Year X, but the country of interest did not have that equipment in its possession. (See "Coding Process").
- NA: no numbers were given (often the unit_name by itself), but the equipment was listed in the IISS Military Balance report, indicating the country had an unknown, but positive quantity of that technology.

rDMC_wide

Cell values here are identical to the unit_count column in *rDMC_long.*

Air defence

Guns and missiles designed to engage fixed-wing, rotary-wing and unmanned aircraft.

Air-to-air missiles
Variable: airdefence_airtoairmissiles
Definition: Missiles launched from an aircraft and designed to engage fixed-wing, rotary-wing and unmanned aircraft.

Surface-to-air artillery
Variable: air defence_surface to air artillery
Definition: Ground-based munitions launchers, designed to engage fixed-wing, rotary-wing and unmanned aircraft.

Surface-to-air missiles
Variable: air defence_surface to air missiles
Definition: Guided missiles, launched from the ground, which are designed to engage fixed-wing, rotary-wing and unmanned aircraft.

Aircraft

Fixed-wing military platforms.

Airborne early warning (AEW)
Variable: aircraft_aew
Definition: Fixed-wing aircraft capable of providing airborne early warning (detection of aircraft/ships/vehicles at long ranges through a radar picket system), which may have some degree of on board command-and-control depending on the platform.

Attack
Variable: aircraft_attack
Definition: Fixed-wing aircraft with the primary function of carrying out airstrikes, which are equipped to respond to air defenses and are distinguished from bombers through their greater capacity for precision. They also provide close air support for friendly ground troops

Bomber
Variable: aircraft_bomber
Definition: Comparatively large fixed-wing aircraft intended for the delivery of air-to-surface ordnance.

Communication (Comm)

Variable: aircraft_comm
Definition: Fixed-wing aircraft capable of gathering communications.

Electronic warfare (EW)
Variable: aircraft_ew
Definition: Fixed-wing aircraft intended for electronic countermeasures, including degrading the effectiveness of radar and radio systems.

Fighter
Variable: aircraft_fighter
Definition: Fixed-wing aircraft designed primarily for air-to-air combat, which may also have a limited air-to-surface capability.

Maritime patrol
Variable: aircraft_maritimepatrol
Definition: Fixed-wing aircraft intended for maritime surface surveillance, which may possess an anti-surface or anti-submarine warfare capability.

Paramilitary
Variable: aircraft_paramilitary
Definition: Fixed-wing aircraft which may be used to support or replace regular military forces, and which may have primarily civil function.

Recon-surveil
Variable: aircraft_reconsurveil
Definition: Fixed-wing aircraft intended to provide radar, visible light, or infrared imagery, or a mix thereof. Their primary purpose is to gather intelligence.

Tanker
Variable: aircraft_tanker
Definition: Fixed-wing aircraft designed for air-to-air refuelling.

Transport
Variable: aircraft_transport
Definition: Fixed-wing aircraft intended for military airlift. In some years (2011-2019), these aircraft are further categorized according to the following payload ranges:

- Light transport aircraft have a maximum payload of up to 11,340kg.
- Medium transport aircraft have a maximum payload of up to 27,215kg.
- Heavy transport aircraft have a maximum payload of above 27,215kg.

Utility
Variable: aircraft_utility

Definition: General-purpose fixed-wing aircraft which are usually used for transport, but also serve as sufficient substitutes for specialized aircraft in the performance of other duties. Includes maintenance, training command, etc.

Amphibious

Vessels designed to transport personnel and/or equipment onto shore.

Landing craft
Variable: amphibious_landingcraft
Definition: Amphibious open vessels, smaller than landing ships, which are designed to transport personnel and equipment from a larger vessel to land or across small stretches of water.

Landing ship
Variable: amphibious_landingship
Definition: Amphibious vessels which are capable of ocean passage and have a hold, as opposed to being an open vessel. This also includes warships employed to support ground forces during an amphibious assault.

Anti-tank/anti-infrastructure

Guns and missiles designed to engage armoured fighting vehicles or other heavy military infrastructure.

Artillery
Variable: anti-tank/anti-infrastructure_artillery
Definition: Unguided “fire and forget” launchers. Long range, high power weapons with a calibre greater than 100mm capable of engaging hardened ground targets with indirect fire.

Missiles
Variable: anti-tank/anti-infrastructure_missiles
Definition: Guided missiles designed to destroy heavy assets, such as armoured vehicles or other ground targets.

Armoured fighting vehicles

Combat vehicles protected by armour.

Attack
Variable: armoured fighting vehicles_attack
Definition: Armoured, tracked fighting vehicles with a turret-mounted gun of at least 75mm calibre, designed to carry out offensive attacks on enemy defenses. In some years, vehicles in this category are categorized further by weight:

- Vehicles are considered main battle tanks if they weigh 25 metric tonnes unladen or more, while vehicles weighing less than this are considered light tanks (2014-2019).
- Vehicles are considered main battle tanks if they weigh 16.5 metric tonnes unladen or more (1990-2013).

Engineering and maintenance
Variable: armoured fighting vehicles_engineering and maintenance
Definition: Armoured fighting vehicles which fulfill a support role, namely in recovery, construction, or the dispensing of combat engineers.

Transport
Variable: armoured fighting vehicles_transport
Definition: Armoured fighting vehicles designed and equipped to transport infantry or carry out reconnaissance.

Ballistic missiles

Missiles designed to deliver one or more warheads to a specific target via a high, arching trajectory. They are initially guided, but then fall to their target through the force of gravity.

Intercontinental
Variable: ballistic missiles_intercontinental
Definition: Ballistic missiles with a range over 5,000 km. Note that all modern submarine-launched ballistic missiles fall into this category.

Medium-range
Variable: ballistic missiles_medium-range
Definition: Ballistic missiles with a range of 1,000–3,000 km.

Short-range
Variable: ballistic missiles_short-range
Definition: Ballistic missiles with a range less than 1,000 km.

Helicopters

Rotary-wing platforms.

Attack
Variable: helicopters_attack
Definition: Helicopters designed for delivery of air-to-surface weapons, and fitted with an integrated fire control system.

Electronic warfare (EW)
Variable: helicopters_ew
Definition: Helicopters intended for electronic countermeasures.

Maritime
Variable: helicopters_maritime
Definition: Helicopters intended for maritime function, particularly surveillance, anti-surface warfare, or anti-submarine warfare.

Observation
Variable: helicopters_observation
Definition: Helicopters used for aerial reconnaissance.

Search and rescue
Variable: helicopters_search and rescue
Definition: Helicopters used to recover military personnel or civilians.

Transport
Variable: helicopters_transport
Definition: Helicopters intended for military airlift. In some years, these helicopters are further categorized according to the following internal payloads:

- Light transport helicopters have an internal payload of up to 2,000kg (2018-2019).
- Medium transport helicopters have an internal payload of up to 4,535kg (2011-2019).
- Heavy transport helicopters have an internal payload of 4,535kg or more (2011-2019).

Utility
Variable: helicopters_utility
Definition: General-purpose helicopters which are usually used for transport, but also serve as sufficient substitutes for specialized platforms in the performance of other duties. They typically perform non-combat functions, including command and control, special operations, etc.

Land/Sea Defense

Forces designed to defend military assets from land and/or sea attacks.

Air-to-surface ordnance
Variable: land/sea defence_air to surface missiles
Definition: Missiles and unguided projectiles launched from aircraft which are designed to destroy ground or surface targets.

Surface-to-surface artillery
Variable: "land/sea defence_surface to surface artillery
Definition: Artillery mounted on ground or naval forces designed to launch munitions at ground or surface targets.

Surface-to-surface missiles
Variable: land/sea defence_surface to surface missiles

Definition: Missiles launched from ground or naval forces designed to destroy ground or surface targets.

Logistics and Support

Ocean-going surface vessels performing an auxiliary military role, supporting combat ships or operations.

Command and support
Variable: logistics and support_command and support
Definition: Ships which serve to implement and/or supplement the combative capability of other forces.

Logistics
Variable: logistics and support_logistics
Definition: Cargo ships, personnel housing/transportation, and sealift.

Maintenance
Variable: logistics and support_maintenance
Definition: Cable repair, tenders, tug, yard craft, and depots.

Replenishment
Variable: logistics and support_replenishment
Definition: Tankers, oilers, and ships which serve to resupply wares such as ammunition; distinct from the transportation of cargo in that replenishment vessels replenish the ship itself.

Research
Variable: logistics and support_research
Definition: Survey ships; ships with the purpose of conducting maritime naval investigations, often carrying out tasks such as submarine detection, sonar tests, or weapons trials.

Special purpose
Variable: logistics and support_special purpose
Definition: Vessels with a designated non-combat role, excluding tugs and surveillance/intelligence vessels. Includes hospitals, icebreakers, oil spill/fire response, search/rescue/salvage, royal yachts, etc.

Surveillance and intelligence
Variable: logistics and support_surveillance and intelligence
Definition: Ships dedicated to the gathering of information, often through intercepting signals; includes missile tracking ships.

Transport
Variable: logistics and support_transport
Definition: Vessels used for the transportation of troops or cargo.

Mine warfare

Ships designed either to dispense rigged explosive devices or respond to enemy explosive devices at sea.

Mine countermeasures
Variable: mine warfare_mine countermeasures
Definition: Minesweepers, which are designed to locate and destroy mines in an area, minehunters, which are designed to locate and destroy individual mines, and countermeasures vessels, which combine both roles.

Mine layers
Variable: mine warfare_mine layers
Definition: Surface vessels configured primarily for mine laying.

Patrol and Coastal Combatants

Ships and craft whose primary role is protecting a state's sea approaches and coastline. Patrol and coastal combatants are considered "fast" if they have a top speed greater than 35 knots (2011-2019) or greater than 30 knots (2000-2010) ***Figure 3*** *depicts the various types of patrol and coastal combatants coded in IISS and how they vary based on tonnage and armament (corvettes are armed).*

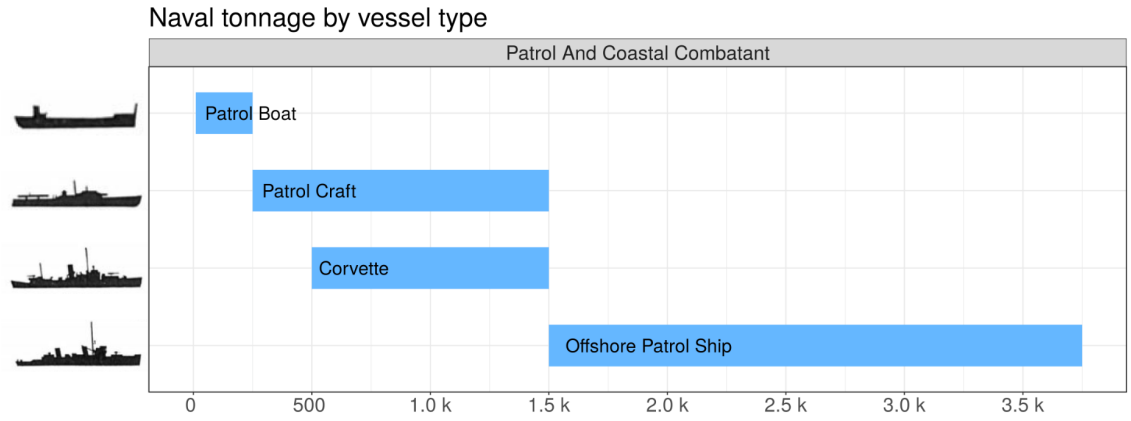

Figure 3: naval tonnage of the various patrol and coastal combatant types.

Coastal
Variable: patrol and coastal combatants_coastal
Definition: Patrol boats and patrol craft designed primarily for coastal or riverine operations; If a patrol craft does not specify that it is offshore or a corvette, it is considered coastal.

Corvette
Variable: patrol and coastal combatants_corvette

Definition: Surface vessels which are distinguished from other patrol vessels by their heavier armaments and have an FLD satisfying:

- Between 500 and 1,500 tonnes (2000-2019).
- Between 600 and 1,000 tonnes (1988-1999).
- Nationally designated as a corvette (1970-1987).

Offshore
Variable: patrol and coastal combatants_offshore
Definition: Surface vessels used for offshore operations; offshore patrol ships have an FLD satisfying:

- Greater than 1,500 tonnes (2011-2019).
- Greater than 500 tonnes (2000-2010).

Other
Variable: patrol and coastal combatants_other
Definition: Patrol vessels with a designated miscellaneous function. Includes support, training, ice patrol, etc.

Principal surface combatants

*Surface ships designed for combat operations on the high seas. **Figure 4** depicts the various types of principal surface combatants coded in IISS and how they vary based on tonnage.*

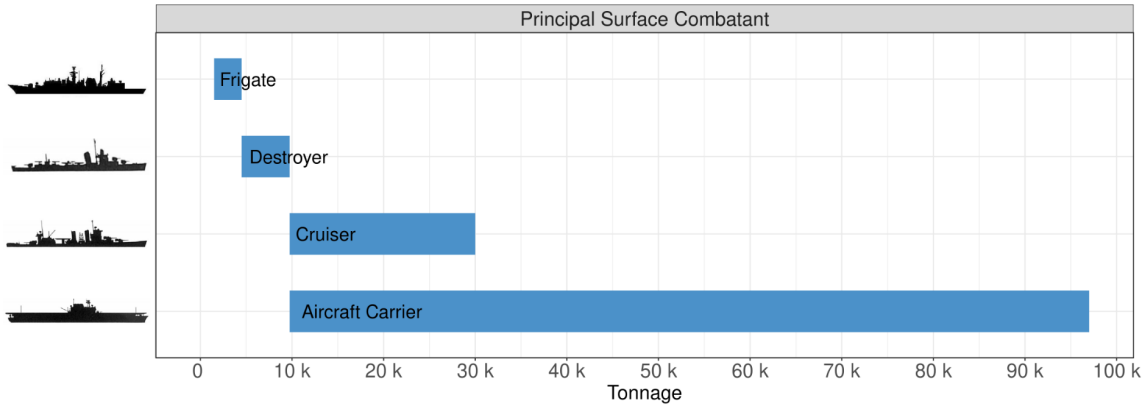

Figure 4: naval tonnage based on the type of principal surface combatant.

Aircraft carriers
Variable: principal surface combatants_aircraft carrier
Definition: Principal surface combatants, powered by nuclear or non-nuclear means, with a flat deck primarily designed to carry fixed- and/or rotary-wing aircraft.

Cruisers
Variable: principal surface combatants_cruisers

Definition: Principal surface combatants with an FLD satisfying:

- Above 9,750 tonnes (2011-2019).
- Above 8,000 tonnes (1988-2010).
- Nationally designated as a cruiser (1970-1988).

Destroyers

Variable: principal surface combatants_destroyers

Definition: Principal surface combatants with an FLD satisfying:

- Above 4,500 tonnes (2011-2019).
- Less than 8,000 tonnes and generally having an anti-air role but also potentially having an anti-submarine capability (1988-2010).
- Nationally designated as a destroyer (1970-1988).

Frigates

Variable: principal surface combatants_frigates

Definition: Principal surface combatants with an FLD satisfying:

- Above 1,500 tonnes (2011-2019).
- Less than 8,000 tonnes, and generally having an anti-submarine role (1988-2010).
- Nationally designated as a frigate (1970-1988).

Other

Variable: principal surface combatants_other

Definition: Miscellaneous surface combatants, including battleships, training, ASW, etc.

Radars

A system, either land-based or space-based (satellites), used for detecting information about objects or areas at a distance by releasing and then detecting the reflection of high-frequency electromagnetic waves.

Air defense/Early warning

Variable: radars_air defense/early warning

Definition: surveillance sensors designed to detect incoming air attacks across a geographic area. Can be land-based and includes fixed, mobile, and transportable systems used for air defense. Includes ballistic missile detection and defense. Radars are categorized here by function, and there can be both land- and space-based radars in the same category.

Communications

Variable: radars_communications

Definition: satellite systems that relay radio or microwave signals between a transmitter and a receiver.

Navigation

Variable: radars_navigation

Definition: ship-borne surface search and air search radars and land-based coastal surveillance radars. land and ship-based air traffic control radar systems to help with aircraft landing and test ranges. Includes instrumentation and ranging radars. Includes air traffic control

Fire control
Variable: radars_fire control
Definition: Radar designed to locate targets and collect information in order to direct weapons. Includes target acquisition.

ISR and battlefield surveillance
Variable: radars_ISR/battlefield surveil
Definition: intelligence, surveillance and reconnaissance. Used for battlefield surveillance, tracking, and weapons-locating radar systems. Space-borne radar that do intelligence, surveillance, and recon missions.

Environmental monitoring
Variable: radars_environmental
Definition: weather observations, geological surveys, and earth observations. Note that some military radars also collect environmental data, and such dual use systems are included in ISR instead of in this category.

Submarines

Submersible vessels designed to operate primarily underwater.

Attack
Variable: submarines_attack
Definition: Submarines which are designed to attack other submarines, ships, or land forces.

Ballistic
Variable: submarines_ballistic
Definition: Submarines which deploy submarine-launched ballistic missiles.

Coastal
Variable: submarines_coastal
Definition: Submarines which have a dived displacement below 500 tonnes.

Other
Variable: submarines_other
Definition: Submarines which have a designated miscellaneous function. Includes support, training, communications, and unmanned undersea vehicles.

Unmanned aerial vehicles

Remotely controlled unmanned fixed- or rotary-wing systems. Note that this only includes aerial vehicles, not undersea UAVs.

Combat
Variable: unmanned aerial vehicles_combat
Definition: UAVs which carry offensive aircraft ordnance.

Recon-surveillance
Variable: unmanned aerial vehicles_recon-surveil
Definition: UAVs used for battlefield surveillance, operational reconnaissance, and/or target acquisition.

Transport
Variable: unmanned aerial vehicles_transport
Definition: UAVs with the primary purpose of delivering cargo.

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