

Air War Guide v2.7

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Covers up to and including v28.

I'm no super expert. I've not re-written the manual, all I've done is collect various post together with the bare bones of how thing work giving references' to sections in the new manual. In many instances there's more than one appropriate section.

There's also stuff here that isn't in the manual but it's how it works. This has been worked out by observation and testing by many people.

To my knowledge the manual and post are up-to-date with the exception of the red text. I don't think that works.

IF YOU KNOW SOMETHING HERE THAT'S WRONG OR NEEDS CLARIFICATION TELL ME.

Table of Contents

Air War Interface.....	6
Airfields (9.4).....	6
Airfield size (9.4.1.).....	6
Seaplanes and AF (7.0.1.1.1).....	7
Airfield size restrictions.....	7
Enlarging Airfields (9.5).....	7
Manning Airfields or Ships (7.1, 7.2 and 15.4.1).....	7
Air Transfers (7.2.3).....	8
Overland by Rail (7.2).....	8
Transport by Ships (6.3.2.1 and 7.1).....	9
Airfield Capacity (9.4.1).....	10
Base Administration (Groups).....	10
Stack Level (Aircraft).....	10
Effects of Overstacking.....	10
Mitigating Overstacking.....	11
Airfield Damage (9.4.2).....	11
Repairing Damaged Airfields.....	11
Air Headquarters (7.2.1.5).....	11
Positive Effects of an Air HQ in Range.....	12
Negative Effects of an Air HQ NOT in Range.....	12
Air HQ Commanders.....	12
Command Headquarters (8.1.1).....	12
Aviation Support (AV) (9.4 and 15.4).....	12
Naval Air Operations (5.2.3 and 7.0.1.1.1).....	13
Ships Air Capacity (6.1.3).....	13
What type of Aircraft?.....	13
Carrier Based Aircraft (7.0.1.1.1).....	13
Carrier Capable.....	13
Non-carrier Capable.....	13
Carrier Trained.....	14
Float planes.....	14
Operating from Ships (15.4.1.2).....	14
Max Sorties (6.1.3, 7.2.1.10 and 9.3.3.2).....	14
Max Torpedoes (6.1.3, 7.2.1.10 and 9.3.3.2).....	15
Air Replenishment Unit (16.2).....	15
Effects of Ship Damage to Air Ops.....	15
Aircraft Tenders.....	15
Task Forces, Ships and Air Commanders.....	16
Air Units (7.0).....	16
Renaming Air Units.....	16
Resizing Air Units (7.3).....	16
Air Unit Restrictions (7.1.1).....	17
Air Missions (7.1 and 7.2).....	17
Mission Order.....	17
What is required?.....	18
Land Based Torpedo Support (7.2.1.10.2.2).....	18
Mission Effectiveness.....	19

Air Unit's Skill Set, Experience and Fatigue and Morale (7.1 and 7.4).....	19
Air Unit Leaders (7.1).....	19
Leader Qualities for Primary Role.....	19
Airfield size (9.4.1).....	20
Kamikaze (7.4.2.3).....	20
Range (7.2.1.6 and 7.4.2.5).....	21
Drop Tanks (7.2.1.6.4).....	21
Cost of Drop Tanks.....	21
Altitude (7.2.1.9, 7.4.2.4 and 19.3).....	22
Bombing Heights.....	22
Torpedo Height.....	23
Strafing (7.1).....	23
Fighter Heights.....	23
Search and ASW Heights.....	23
Defensive Fire (Flak) (5.4.1.3 and 7.2.1.9).....	23
Aircraft Capabilities (type and performance) (5.4.1).....	24
Weather (7.2.1.12 and 12.0).....	24
Raid Detection (7.4.1.1).....	24
Terrain (8.3.1), Forts and Fortifications (8.4.4).....	25
Night Operations (7.2.1.3).....	25
Air Superiority (7.0.1).....	25
Air Coordination (7.2.1.11).....	25
Air Coordination from Carriers.....	26
Examples Air Coordination.....	26
Tips on improving Mission Success.....	28
Searching and Arcs (7.1 and 7.5).....	28
Height.....	29
Range.....	29
Naval Search.....	29
ASW Searches.....	29
Displaying Search Arc.....	30
Offensive Missions (7.1, 7.2.1 and 7.2.1.7).....	30
Air Combat Resolution (7.4).....	30
Airfield Attack.....	30
Port Attack.....	31
Naval Attack.....	31
Kamikaze (7.4.2.3).....	31
Ground Attack (8.4.5).....	32
Sweep.....	32
Escort.....	32
Recon (10).....	33
City Attack.....	33
Defensive Mission (7.1, 7.2.1 and 7.2.1.8).....	33
CAP (7.4.1).....	34
LRCAP.....	34
Naval Search (7.5).....	35
ASW Patrol (7.5).....	35
Transport (7.2.4).....	36
Training (16.3.1.3).....	36
Stand Down/Rest.....	37

Viewing Air Missions and their Results.....	37
Combat Animations (F5 key)(7.4.2.1).....	37
Combat Summaries (F8 Key)(2.6.6 and 7.4).....	38
Combat Report (C Key)(2.5.1).....	38
Operational Report (O key)(5.6).....	38
Combat Events (7.0).....	38
Air Unit Management.....	38
Sub units and Detachments (7.1 p161).....	38
Aircraft Replacements (7.1 and 16.2).....	39
Replacement and Upgrade Supply Costs.....	40
Returning Aircraft to Pools (7.1).....	40
Upgrading Aircraft (7.1 and 6.2.3).....	40
Player Define Upgrades (PDU)(2.4.4).....	40
Turning on Upgrades.....	41
Automatic Upgrades.....	41
Manual Upgrades.....	41
No Upgrades Possible.....	41
Upgrade Screen.....	42
Rules for Upgrading.....	42
Air Unit Reinforcements (5.1.4.2)(16.0).....	43
Air Unit Withdrawals or Disbandments (5.1.4.3)(7.2.2).....	43
Unscheduled removal.....	44
Scheduled removal.....	44
Pilots (7.1 and 16.3).....	45
Pilot Pools (5.1.4.6, 5.1.4.6.1 and 16.3.1.2).....	46
Pilots Screen (16.3.1.2.5).....	46
Assigning Pilots (7.1 and 16.3).....	47
Auto Accept Pilots (Appears not to be working????).....	47
Manual Pilot Selection (16.3.1.2.3).....	47
Releasing Pilots (5.4.6.1).....	48
Top Pilots (Hotkey 4) (5.1.4.5).....	48
Pilot Skills.....	48
Pilot Training (16.3.1.3).....	49
Training Command (TRACOM) (5.1.4.6 and 16.3.1.1).....	49
Training Missions (7.1).....	49
Training Groups (16.3).....	52
On-the-job Training (7.1).....	52
Affects of the Air Unit on Pilot Training.....	52
Secondary Training.....	52
More Training Tips.....	52
Aircraft (7.0).....	53
Aircraft Types (7.0.1 and 5.4.1.1).....	53
Aircraft Ordnance (5.4.1.2 and 15.4).....	54
Aircraft Performance Parameters (5.4.1.1).....	55
Aircraft Production (5.1.4.4 and 5.3).....	55
Controlling Production (13.0).....	56
Damaging or Destroying Production (17.0).....	57
Repairing Production.....	57
Japanese Production (13.3.2.4 and 13.4).....	57
Research and Development (R&D).....	58

Japanese (R&D) (13.4.1.1).....58

Research Example.....60

Air War Interface

There are many ways to find or carry out stuff in the game. Where depends on what it is you are trying to do. This is a list of the most relevant screens, and hopefully, those with the most relevance at the top. To access them click or use the shortcut if there is one.

Air Unit Information (7.1). All the info and controls on the selected air unit. Allows you to assign missions etc. to the unit.

All Land Based Aircraft (a)(5.2.2). Lists critical info for all the land based aircraft currently in play. Selecting an air unit brings up the Air Unit Info screen. You can give global command and filter the info shown.

All Naval Air Units (n)(5.2.3). Lists critical info for all the naval based aircraft currently in play. Selecting an air unit brings up the Air Unit Info Screen. You can give global commands and filter the info shown.

All Air Units Based on an Airfield (9.1 p191). Similar to the All Land Base a/c screen but for that AF only. If there's only one air unit at the base goes directly to the Air Unit Info screen.

All Bases List (b)(5.2.1). Allow you view info on AV support, port and AF sizes, damage etc. for all bases. Selecting a base brings up the Base Info screen.

Base info (9.1). Similar to the All Bases List but with extra detail. Selecting an AF brings up the All Air Units Based on an Airfield

All Task Forces (t)(5.2.6) and TF Info (s)(6.1.2). Limited info but often vital nethertheless. Air capacities basically but the import bit is you can access the ship info screen, hence bring up Air Unit Info screen for air units stationed on it.

Active Ships (s)(5.2.5). Similar to All TF. Selecting a ship bring up the Ship Info screen.

Ship Info (6.1.3). For applicable TFs list all air units on the ship. Selecting an air unit bring up the Air Unit Info screen.

Intelligence (I)(5.0). List the current status of the air war including reinforcement, pilot training, loses and production.

Combat Report (c)(2.5.1). List all the battles that have taken place for both sides during the turn.

Operational Report (o)(5.6). List info on all non battle events that occurred during the turn. This is side specific.

Airfields (9.4)

Airfields and certain ship types accommodate, repair and resupply air units, and allow the player to carry out air missions. Individual aircraft do not carry out air missions but they do restrict which missions an air units can carry out.

There can be significant differences in how land based and sea based air units operate. These difference are mostly covered separately under Naval Air Operations.

Airfield size (9.4.1.)

Airfield size can range from 0 to 10. The larger the AF the fewer operational restrictions there are. In numbers, a zero (0) means no airfield (often called a dot base), while a 10 is unlimited in the number of air groups and aircraft it can manage without restrictions. Arguably the most common size is 4, which is the smallest size AF from which medium bombers (MB) can operate without restriction.

You can base any type of a/c on any sized field (except level 0) but the larger the a/c the more the restrictions there are. They can also operate as a transit base during air transfers.

Level 0 - No land based aircraft can use a level 0 AF. Float Planes (FP), Float Fighters (FF) or Patrol (PA) aircraft can but only IF the AF also has access to water. Please refer to the section on Seaplanes and AF below and under Naval Air Ops for more detail.

Level 1 - The smallest operational AF, suitable for defensive ops only. Fighters (F), fighter bombers (FB), dive bombers (DB), Torpedo Bombers (TB) and some Float Planes (FP) can carry out unrestricted defensive ops (7.2.1.13). Defensive ops include:

- CAP
- LRCAP
- ASW
- Search
- Escort

Level 2 - The smallest AF from which offensive (group) missions can be carried out. All small a/c including F, FB, DB, TB FP and light bombers (LB) can carry out any applicable offensive missions. Offensive ops include:

- Airfield Attack
- Port Attack
- Naval Attack
- Ground Attack
- Sweep (F or FB only)

Level 4 - The smallest AF from which medium bombers (MB) can operate without restriction. All types of offensive mission can be carried out.

Level 5 - The smallest AF from which heavy bombers (HB) can operate without restriction. All types of offensive mission can be carried out.

Level 7 - The smallest AF from which super heavy bombers (SHB) (B29) can operate without restriction. All types of offensive mission can be carried out. Air groups can upgrade their planes (16.2.3).

The formula for calculating the AF size from which level bombers can operate without restriction is:

airfield => size 4 + (bomb load / 6500) rounded down. Thus, an A-20A requires a minimum size 4 base, a B17-E requires a minimum size 5 base, and a B29 requires a minimum size 7 base to avoid penalties.

Seaplanes and AF (7.0.1.1.1)

Seaplanes (FP/FF/PA) cannot be based at or operate from an AF unless it also has access to water or the seaplane is classified as amphibious. The size of the AF is irrelevant, even dot bases.

FP/FF can always operate from appropriate ships or subs.

Airfield size restrictions

- It is easier to damage and destroy aircraft on the ground at smaller airfields (less dispersion) (9.4.2).
- It is more likely that planes will suffer operational losses when landing at smaller airfields. Very important when landing large aircraft on small AF (7.2.1.14).
- Increased operational losses on take off (7.2.1.14).
- A reduction in their range as air units cannot fly combat missions at greater than their normal range if the AF is too small (7.2.1.7).
- A diminished (extended range) bomb load (7.2.1.7).

Enlarging Airfields (9.5)

An AF can be enlarged in game by any unit(s) that have ready engineer squads (or equivalent) (7.0 and 8.1.3) in it's TOE, there's no limit. How large they can be built depends on their Standard Potential Size (SPS) (4.3). The following restrictions apply:

- Non ready engineers or units not in combat mode do not construct or repair anything.
- Supply is needed, one supply point being consumed every twelve hours for each engineering squad (or equivalent) that is involved in construction operations.
- The more engineering squads (or equivalent) there are the quicker the AF will be built.

Size 10 AF are special and can never be built in game.

In the bases list, AF being enlarged are indicated by a 'b' next to their size.

Manning Airfields or Ships (7.1, 7.2 and 15.4.1)

There are three ways to do this, air transfer, overland by rail, transport by sea. Each has it's own advantages and disadvantages and not all are applicable to both AF and ships.

All are initiated during the 'Orders' phase but can be completed during subsequent 'resolution' phases (3.0).

Static [S], Perm restricted [R] or temp Restricted (R) units can only change bases if the new base is also under the same command (7.1.1 and 8.1.1). There's one major exception to this, restricted air units can transferred to ships but they must be ship capable. Once transferred their restricted command attachment is change to Independent.

Note: Once independent on a ship, you can do anything you like with them as all command and resizing

restrictions are removed, mostly anyway.

Resizing in particular is a method of increasing your sides overall air capacity. This is more than useful for the Japanese and there many small FP units; FP being ideal for local search and ASW patrols (you never have enough). Some players think excessive use of this is gamey.

Air Transfers (7.2.3)

Any air unit that flies into a AF or ship has carried out an air transfer. This can be a deliberate act or forced in an emergency (7.0.1.1.1.1). Air transfers are limited to one per day per air unit and are initiated when 'Transfer to Base' or 'Transfer to Ship' is selected from the *Air Unit Info* screen.

- The advantage of an air transfer is the aircraft arrive in a 'ready' state and are immediately available for operations.
- The disadvantages are the transfer range is limited to the max range (7.2.1.6) of the aircraft and only 'ready' aircraft can transfer(7.2).

Stacking limits having no effect during air transfers but the effects of overstacking will be felt next turn. While picking the destination, an overstacked AF will have the number of groups shown in RED.

Any transfer to a ship that would cause its max capacity (115%) to be exceeded is indicated by the number of aircraft being shown in RED (see [Operating from Ships](#) (15.4.1.2)). This calculation is based on the max number of aircraft in the air unit being transferred and NOT on the current number of aircraft.

AF damage has no affect on air transfers other than for ops losses or when either base has 100% runway damage. Like overstacking, the effects will be felt on subsequent turns. While picking a destination any damaged AF will have its size shown in RED. For ships, the normal damage rules apply.

Air units can be flown to any base or ship provided:

- A base has an AF or it has access to water for seaplanes.
- Ships must be at sea (undocked) and have spare max capacity (see [Operating from Ships](#) (15.4.1.2)). If the transfer would cause this number to be exceeded a warning message pops up. No aborts it, yes limits the number of a/c being transferred with any excess a/c being lost. The air unit retains it's max a/c capacity.
- Air transfers to carriers require the air unit to either be 'carrier trained' or 'carrier capable'.
- It is within the max range of the aircraft. Only ready a/c move, any unserviceable a/c form a sub-unit and are either repaired and flown in later (manually or by the AI) or transferred overland by rail.
When picking the destination an * against the number of groups at a base indicates the location of the parent unit. This is useful when you want to re-combine fragments and sub-units.
- The air unit is not restricted.
- Neither base is 100% damaged.

Base Hopping

The normal reason for an air transfers is to keep the air unit operational after transfer. Although this limits the range you can transfer between bases you can do multiple hops over a number of turns increasing the overall transfer range. This can lead to some fragmentation at each base resulting in the AI getting confused during automatic transfers.

Automatic Air Unit Transfers (7.2.3.1)

Emergency transfers occur when a carrier is too damaged to land aircraft. Such aircraft will land on other carriers within the carriers ops capacity of 110% or land on the closest AF forming a fragment. The parent unit, including damaged and reserve a/c remain with the original carrier. If they are unable to do either they ditch and are destroyed. The pilot maybe rescued (7.0.1.1.1.1 and 15.4.1.2).

The AI will attempt to move any ready a/c from a sub-unit to the parent automatically during the 'resolution' phase provided it is within two transfer movements. You can move them yourself during the 'orders' phase.

Overland by Rail (7.2)

An air unit can be transported by rail between bases provided there's an AF and it's connected by rail. Such bases are marked with -r after their name. As it can take more than one day to complete, range is now in days. Transfer to off map bases can take many days. The units are removed from the playing area, appearing as reinforcements a number of days later at their new base.

Note: When either base is 100% damaged it prevents all flying from the base. It doesn't prevent rail transfers. A small game quirk here; if the current base is 100%, range to destination is still shown in

hexes.

Rail transfers are limited to one per day per air unit.

- The advantage is you can transport an air unit any distance provided there is a working rail link between it's current base and its destination.
- The disadvantages are the aircraft arrive at the destination in an '*unready*' state and have to be repaired before they can carry out any operations and it can take a number of days to complete.

Stacking limits having no effect during rail transfers but the effects of overstacking will be felt next turn. While picking the destination, an overstacked AF will have the number of groups shown in RED.

Damage to AFs has no effect on rail transfers. While picking the destination a damage AF will have its size shown in RED.

An air unit can be transported by rail provided:

- The base has an AF and it's connected by rail.
- The air unit is not restricted.

Transport by Ships (6.3.2.1 and 7.1)

If the air units can't fly or there's no rail link then your only option is transportation by sea.

Fragments and sub-units can be loaded but the load process itself only ever loads whole units, it never causes a unit to be fragmented or form a sub-unit [6.3.3.1.1].

Each air group has a load cost based on the type of the aircraft (Fighter, Bomber, etc.) and the number currently in the group [6.3.2.1].

There are two methods of sea transport based on the type of ship used.

Carrier Transport

In this method any carrier (CV, CVL, CVE) or seaplane capable ship (CS etc.) but normally a CVE, is loaded with aircraft.

- The advantage of carrier transport is you're not limited by range, it can be any distance, port to port and they arrive in a '*ready*' state. Distance makes it less vulnerable to attack.
- The disadvantages are it takes considerably longer to complete.

Once loaded, the ship is moved to within max range of the new base, flying the air unit off when it is. This allows air units to reach a new base without putting the carrying ship(s) into unnecessary danger, particularly since they may not be able to operate their own aircraft due to exceeding the carrier max capacity.

You can always unload the carrier while docked or in port via '*Transfer to Base*' option but they will be in an '*unready*' state.

Only '*carrier capable*', '*carrier trained*' air units or, if neither, any unit with single engine (1e) aircraft can be placed on a carrier (7.0.1.1.1). The 1e cannot operate from a carrier.

A carrier can be loaded up to twice its air capacity with the following provisos.

- When at sea you flying the units on via using '*Transfer to Ship*'. This maintains its operational capability but limits how many aircraft can be on the ship to its max capacity (115%). All will be in a '*ready*' state after transfer.
- If docked or in port any a/c capable of operating from it can be loaded using '*Transfer to ship*'. If it's a 1e aircraft then '*Transfer to Docked Ship*' is used.
- Any carrier loaded when docked or in port can load up to it's max limit, (twice its air capacity).
- All a/c loaded while docked or in port become '*unready*'.

Transported as Cargo (6.3.3)

This is what is generally meant by transporting by sea. Any ship capable of loading '*a commercial load*' (6.3.3.1.1) can load an air unit.

- The advantage of carrier transport is you're not limited by range, it can be any distance, port to port.
- The disadvantages are it takes considerably longer to complete and, they arrive in at their destination in an '*unready*' state (carrier transport excepted). The TF has to be docked to unload, making it vulnerable to attack.

Loading is carried out using the TF 'Load Troops' option and are loaded immediately. Each ship is restricted to one air unit and provided there's enough cargo space, any type of aircraft.

You unload using the TF 'Unload troops' option. They will be in an 'unready' state. There is one special exception to this rule when using an AKV transport (6.3.3.1.2). They were designed to carry uncrated aircraft and are always in a 'ready' state.

Airfield Capacity (9.4.1)

Airfield size governs AF capacity, the bigger the AF the larger the operational capacity of the AF.

There is no actual limit to the number of air units or aircraft that can be based on any AF. However, an AF with too many aircraft (physical space) or groups (administrative) present for its size is deemed overstacked and cannot operate efficiently.

Both base admin and aircraft stack levels are shown in the top right hand corner of any Base AF list as a #/## where # is the current level and ## is the max level. If the current level exceeds max level then the AF is overstacked. An overstacked AF is also indicated in a number of ways:

- by an '*' next to it level size in the All Base list.
- by an '*' next to the 'Airfield Capacity' in a Base screen.
- By numbers and text turning red in Base AF list.

Base Administration (Groups)

The maximum number of groups that can be based at an AF without restriction is AF size +1. Once you exceed this number you are overstacked. This maximum number can be increased by the command radius of an any Air HQ (7.2.1.5) or Command HQ (8.1.1) but only the best applies. Level 9+ AF have no operational restrictions.

E.g. A Level 1 AF can base 2 groups, a level 2 can have 3, while a level 4 AF in range of an HQ with a command radius of 5 can base 9 groups.

The minimum current level for any occupied AF is one. This current level is affected by the following ways:

- Each individual operational group adds one to the current level.
- Groups at rest or training don't count towards this total.
- Fragments, sections or flight groups also don't count towards the total.
- Spilt (*Divided* or *Detachment*) only count as individual groups if they are either located at a different based to their siblings or attached to different HQ.
- FP and patrol aircraft do not count if they have access to water.

Stack Level (Aircraft)

How many aircraft an AF can support without restriction is base on AF size x 50. This represents the number engines at the AF so a level 1 can support 50 single engine, 25 two engine, or even 12 four engine! Aircraft. The only way to increase this number is to enlarge the AF. Level 9+ AF have no stacking restrictions.

The current level calculated in the following ways:

- Each engine adds one to the current level. This applies to all aircraft (ready, damaged or reserve).
- Groups at rest or in training only count as 1/3.
- FP and patrol aircraft do not count if they have access to water.

Effects of Overstacking

An overstacked airfield affects:

- how many aircraft can be launched
- casualties from attacks
- aircraft repairs

Quite simply avoid overstacking and there will be no restrictions. If you see your AF are overstacked, just realize air units are not operating as efficiently as they might.

Notes on overstacking

- A 9+ AF does not suffer from overstacking.

- Just because you DON'T have an overstacking problem does not mean ALL aircraft will fly (see [LBA](#) missions).

Mitigating Overstacking

Although overstacking causes problems it's not a curse word, just a fact of life. The designers said 'they INTENDED for AF to be overstacked. It was part of the effort to slow things down, and de-fang air combat a bit.'

There are however ways to overcome the problem without moving air groups out.

By combining AF size with the command radius of an Air Headquarters (see [below](#)).

Saipan has an SPS of 4. If you base an Air HQ in command range of the base, such as the XX US Bomber Cmd with its Command radius of 5, you will increase the effective AF size.

- If the best Air HQ is in the same command as the base then you get a level 9 AF. Over-stack to your hearts content.
- If the best Air HQ is not of the same command then only half the command radius is added and you only get a level 7 AF. Still enough to operate a B-29 without restriction but not enough to overcome overstacking.

By changing air groups missions.

With 6 groups based at level 4 AF, setting 3 to rest or training effectively reduces the groups to 4. ($1/3 + 1/3 + 1/3$ on rest/training + 3 groups on ops). Alternatively you could set them all to CAP or Naval attack and suffer a penalty, but all groups would fly some, but not ALL of their complement each phase. It might just be that even with the penalty you'll get more A/c airborne than standing down half your force!

Airfield Damage (9.4.2)

Airfields can suffer two types of damage: runway and service (both ranging from 0 to 100 percent). It is easier to damage smaller airfields than larger airfields, but once damaged larger airfields take longer to repair.

An airfield's runway damage will be shown in RED if it exceeds 49 or ORANGE if it exceeds 10. Service damage is not indicated by colour coding. When viewing the AF screen the percentage is shown, when viewing a list it is the AF size that is colour coded.

The effects of service damaged include:

- Reduced a/c repair speed
- Reduced number of ready a/c.
- Lower pilot morale

The effects of runway damage include:

- Reduced number of a/c being able to take off and land.
- Strike missions can only be launched if runway damage is less than $20 + (\text{Airfield Size} * 5)$.
- No patrol and CAP Missions if runway damage is more than $50 + (\text{Airfield Size} * 5)$
- 100% runway damage prevents all flights.
- Increase operational losses.
- Seaplanes do not suffer losses from runway damage (7.2.1.7).

The effects of combined damage include:

- No air replacements or upgrades if the combined damage is >59% (16.2).

Repairing Damaged Airfields

The presence of any ready engineering squad (or equivalent) at the base will result in repair following in the same way as they enlarge AF. Repair of existing facilities takes preference over **any** new construction.

Air Headquarters (7.2.1.5)

Air HQ help conduct air operations within their command radius. This command radius is shown in the top left corner of the HQ's info screen and can be any number typically between 1 and 5.

IMPORTANT NOTE: Unless mentioned specifically, command hierarchy plays no part. Any Air HQ will do.

Positive Effects of an Air HQ in Range

- The best Air HQ of the same command as the base adds its command radius to the number of groups that can be administered at a base. (9.4.1)
- If not in the same command, the nearest HQ will add $\frac{1}{2}$ its command radius (rounded down) to the number of groups (9.4.1). The minimum bonus is 1.
- If an Air HQ is within range of a base, the AF size required to upgrade aircraft is reduced by $\frac{1}{2}$ the command radius (rounded down) (16.2.3).
- Provides land based torpedo support (7.2.1.10.2.2).
- Increases the chance of air raid co-ordination.

Negative Effects of an Air HQ NOT in Range

- Level bombers have the number of planes flying reduced by 25% for Offensive Missions.
- All other air strike missions have the number of planes flying reduced by 10%. *This also seems to apply to patrol missions but is not mentioned in the manual.*

Air HQ Commanders

First a beef. There's nothing in the manual about how Air HQ leaders affect the game other than this. *'The bonuses are impacted by the leaderships rating of the commander of the HQ' (8.1.1).* A general comment about all HQ commanders which, in my opinion is not and never has been helpful.

Players have deduced the following.

- The *Air Skill* rating of an Air Commander helps improve the number of aircraft that fly
- No other leader skills have any influence or bearing on air operations. *Some say aggression plays a part but I do not think this is the case?*

The larger the *Air Skill* value the better. The *Air skill* rating obviously affects group die rolls but exactly how is not known as the formula has never been published.

In task forces the TF commander is also the Air commander so for carrier TFs choose wisely.

Command Headquarters (8.1.1)

A Command HQ can use its command radius to increase the number of groups an AF can support. This is not cumulative with the Air HQ and only the best of either is used. For this to happen a Command HQ must be within 2 x command radius of the base. This command radius is shown in the top left corner of the HQ's info screen and can be any number typically between 1 and 9.

- The command radius of a base's Command HQ is added to the number of groups that can be administered at a base if the base is within its command radius.
- If a base is greater than this radius but not more than twice the command radius then $\frac{1}{2}$ the command radius (rounded down) is added to the number of groups that can be administered at a base.
- If a base is within within 2 x command radius of any other Command HQ then $\frac{1}{2}$ the command radius (rounded down) of that HQ is added to the number of groups that can be administered at a base.

It is possible one Command HQ to be subordinate to another Command HQ. If this happens then the game routines seem to get a little confused only ever adding $\frac{1}{2}$ the command radius (rounded down).

Note: *Beware of bases attached to none command HQs such as the Combined Fleet. For instance, in Guadalcanal scenarios Truk is attached to the Combined fleet and not being a command HQ will not give group admin support.*

Aviation Support (AV) (9.4 and 15.4)

Aviation support is required at all AF to service and repair aircraft based there. The more aircraft there are the more AV required. An airfield level 8 and above has its AV doubled. One AV point is required for each a/c operating from the AF.

This AV is provided by engineer units referred to as base units of which they are a number of types or by certain HQs. AV can also be provided by various types seaplane tenders but as the name suggest they only provides it for seaplanes.

Failure to provide enough AV results in:

- Ready a/c may become damaged
- Damaged a/c may repair more slowly or not at all.
- Reserve a/c may not be available
- Level bomber offensive missions are reduced by 25%.
- No automatic upgrades if AV is less than ½ that required

In the base list, if the aviation support is red it's short of AV in that base (5.2.1). On the map mouse over, aviation support is indicated by a V=## (4.5.2).

Naval Air Operations (5.2.3 and 7.0.1.1.1)

This implies aircraft operating from ships and not naval aircraft operating from land.

Unless specified, supply plays no part in naval air operations. Various aspects of rearming ship does.

Ships Air Capacity (6.1.3)

Some ships have an 'Aircraft Capacity' which allows them to base and hence operate aircraft from their decks at sea, how many depends on ship type and purpose. The number of aircraft a ship is currently carrying compared its air capacity determines its operational air capabilities. Effectively the ship equivalent of overstacking an AF.

What type of Aircraft?

The type of aircraft that can be on a ship or sub is mainly restricted to single engine although they are a few twins that can. The following apply:

- 'Carrier capable' and/or 'carrier trained' air units can always operate from carriers.
- The aircraft types that can operate from a carrier include fighters (F), fighter bombers (FB), night fighters (NF), dive bombers (DB), torpedo bombers (TB) and recon (RC).
- Certain twin engine aircraft can be based on a carrier. These are mainly fighters (F), fighter bombers (FB) and recon (RC) although not all.
- The type of aircraft that can operate from a non-carrier (e.g. CA, BB, AV, Sub etc) include float planes (FP), float Fighters (FF).
- Level bombers (BM) cannot be based on a carrier (5.2.3). The manual does not include light bombers (LB) here but I've never been able to put any light bombers on a carrier.
- Float planes (FP), float Fighters (FF) aircraft cannot be based on a carriers.
- Patrol (PA) aircraft cannot be based on any type of ship.

Carrier Based Aircraft (7.0.1.1.1)

Remember it's not the aircraft but the air units that carries out air missions. For instance the *Air Unit Information* screen could say the unit is 'carrier capable' meaning the air unit can operate from carriers. This comes from the type of aircraft it has so changing the aircraft to something else may result in this capability being lost. E.g. The Japanese switching the CV capable A6M2 zero to the A6M3 which is not CV capable.

Carrier Capable

Being on a carrier does not mean an aircraft can operate from one. To operate (i.e. carry out missions) from it, it needs to be able to take off and land back on it. Aircraft that can LAND on a carrier are referred to as 'carrier capable' aircraft (5.1.4.1.1).

Non-carrier Capable

Aircraft that can't land on a carrier are 'non-carrier capable' aircraft. Some 'non-carrier capable' types can be put on a carrier but the only thing they can do is take off for an air transfer (7.2.3) but you cannot fly them onto the carrier. You put 'non-carrier capable' aircraft on a carrier by transferring them to it while the ship is docked or at anchor. They will all be in an 'unready' state but will repair quickly over time allowing they transfer when in range of their destination.

Not being designed to operate from carriers, 'non-carrier capable' aircraft occupy four times the space than 'carrier capable' aircraft. Exceeding a ship's air capacity can have dire consequence on its air operations and it is easy to miss, so be careful.

Carrier Trained

As well as an air unit being 'carry capable' it can also be 'carrier trained'. This means the pilots have been trained to operate from a carrier, reducing the chance of suffering operational losses during take-offs and landings.

Most carriers come into the game with air units that are already 'carry capable' and 'carrier trained' but for those that don't you can train them to operate from a carrier. It takes approx. 90 days to train an air unit in carrier ops but once achieved this ability is never lost by the air unit even if the pilots changed or if it changes to a 'non-carrier capable' aircraft. There is some small random element and the days do not have to be consecutive.

To train Just place the air unit on a carrier and leave it there training. Actually any mission will do but you will suffer more ops losses if you do.

The two things, 'carry capable' and 'carrier trained' are different, the first applies to the aircraft, the second to the pilots but both are applied through the air unit.

Note: There's a bug in the game where being 'carrier trained' let you put any a/c on a carrier, even 4e. Obviously nonsense. In practice this is very difficult, nigh impossible to carrier train a 4e air unit as you can't put them on a carrier unless they are and you can't train unless they are on one. But it exists and could be edited.

Float planes

FP/FF can always be based and operate from any appropriate ships or subs with air capacity. In WW2 this was mostly, but not all naval ships over destroyer size. There's also various aircraft tenders (AV, AVD, AVP), few sundry ships and some Japanese subs with air capacity.

An AV 'Seaplane support' is the number of 'seaplanes' that can be supported by a ship before it needs to start looking for supply (on tender or in base). This rule does not apply to CS type ships, just tenders.

Note: If an AV has an air capacity value, then the AV can operate planes while underway [7.0.1.1.1]. For example, the U.S. Curtiss Class AV has a zero air capacity, but the U.S. Wright Class AV has a 4 air capacity; thus, the Wright Class AV can operate planes while underway and the Curtiss Class AV cannot.

Operating from Ships (15.4.1.2)

Aircraft on ships are assumed to have sufficient aviation (AV) support and supplies to carry out their missions.

A ship's aircraft (air) capacity represents normality i.e. peacetime. But ships were more often than not operated at extremes during the war. A ship's air capacity is different to its operational (op) capacity which in turn is different to its max capacity, the latter two represents the ability to operate more a/c than normal. These capacities are set at 110% and 115% of air capacity. Anything above 110% the carrier starts to suffer various operational restrictions. A carrier's op capacity is affected by the number of air units (not fragments) and by number of aircraft on board:

- Carriers can never have more than 5 air units on board at a time (7.0.1.1.1).
- Carriers can operate without any restrictions up to 110% air capacity. Over this and they start to suffer ops losses.
- Planes won't make an emergency landing (refer to 7.0.1.1.1.1) on another carrier in such a way as to cause it to exceed its op capacity of 110%.
- The Max Operational Capacity is 115%. Anything above this and only *Air Transfer Missions* can be flown.
- A ship may never have more aircraft on board than twice its air capacity (200%). Its maximum limit.
- If a carrier is in a base, CAP or strike missions are limited to 50% of its aircraft. If CAP is reinforced only 50% of the remaining aircraft will be used to reinforce CAP (7.2.1.13.2). This does not apply to CVE or seaplanes.

Notes: There's no mention in the manual about CVE or seaplanes not being affected by this rule, although I think it was true. Currently there's a bug where this is not happening at all.

[https://www.matrixgames.com/forums/viewtopic.php?](https://www.matrixgames.com/forums/viewtopic.php?f=10683&t=377907&sid=43154079c7373798e7727c08d93ac67e&start=20)

[f=10683&t=377907&sid=43154079c7373798e7727c08d93ac67e&start=20](https://www.matrixgames.com/forums/viewtopic.php?f=10683&t=377907&sid=43154079c7373798e7727c08d93ac67e&start=20)

Max Sorties (6.1.3, 7.2.1.10 and 9.3.3.2)

This is a measure of a ship's ability to carry out offensive missions, basically how much ordnance the ship can carry. Once the max sortie count reaches zero the ship needs to rearm from a port or via a replenishment at sea. Max sortie count does not restrict defensive ops, critically CAP.

The rearm level of a port, AK/AKE or combination of these needs to be ≥ 500 . For example, Darwin at game start is

only a level 3 port and level 3 ports only has a rearm level of 40 so on it's own can't rearm your sorties. It would need to be a level 6 port (rearm level 700). This is where AK/AKE come in. Any one with a cargo capacity >500, and most of the US AKE are, will do. Park one in Darwin and keep in supplied and you can rearm carriers to your heart's content.

Max Torpedoes (6.1.3, 7.2.1.10 and 9.3.3.2)

There is a separate max torpedo count that works in exactly the same way as max sortie except they are fewer in number and rearming is much more restricted. Rearming the torpedo count is based on torpedoes *load cost*.

Air Replenishment Unit (16.2)

These are special air units (VRF) stationed on CVEs and used as a source of replacement aircraft and pilots for other carriers. They are predominantly USN units and easily recognised but in stock there are also five FAA units (Nos 706, 722, 723, 742, 757, 797 Sqns) used as VRF units. The Japanese had no such equivalent.

These VRF units can have any type of CV capable aircraft but to function as intended need to be in a *replenishment TF* which in turn needs to be within normal range for the a/c being replaced (see [Aircraft Replacements](#)).

VRF units are not meant to be combat units. They are oversized and crammed onto the CVE to its max capacity (200%). Once the capacity falls to 115% then you can use them in a combat role.

The pilots situation is more confusing. For auto replacements the pilots go with the a/c even if the pilots are not needed, possibly exceeding the roster numbers. For manual replacements only the a/c appear to go if the receiving unit has spare pilots although how an a/c can get the receiving unit without a pilot is another thing.

These units are also a very good place to train pilots. Don't ignore this secondary role.

Note: *These units are ahistorical in the form used in the game. VRF units did exist but were land based ferry units. IRL CVEs were used as sources of replacement aircraft but from what I can gather these aircraft were not in organised air units, just aircraft crammed onto a CVE? (If you know different...). The game uses the VRF units in this way to make it work.*

Effects of Ship Damage to Air Ops

Aircraft on a ship may not fly if the ship's combined System Damage and Flootation Damage are greater than 50. They may transfer off the ship if docked or at anchor at a base with an airfield (15.4.1.2).

Air groups on carriers with more than 50 system or flood damage cannot receive replacements (16.2)

Note: *Fires affecting air ops is not mentioned in the manual. I tested it and even with 99% fires on board and no other damage, air ops were still carried out. How effective I did not test.*

Aircraft Repair on Ships

Repair facilities on ships are based on the ship's system damage as a percentage. Anything more than zero slows repair speeds down. E.g. 20 sys damage means 80% repair speed. If system damage reaches 60% then no aircraft can be repaired onboard.

There is no special 'in port' a/c repair bonus, it's all down to the ship's current system damage. In some instances it will be quicker to transfer the air units to a base rather than leave them on a ship.

Standing down the group will also increase repair chance.

Aircraft Tenders

All ships with air capacity have sufficient 'Aviation Support' (AV) to maintain their own aircraft.

Some ships may have 'Seaplane Support'. This does exactly the same thing as 'Aviation Support' (AV) does but for seaplanes ONLY. These ships are collectively called aircraft tenders (Aircraft Tender (AV), Aircraft Tender, Destroyer (AVD) and Aircraft Tender, Patrol (AVP)) (20.1.2).

This means a base with access to the water does not need AV to maintain seaplanes if the base has an aircraft tender in situ.

Both AV and aircraft tenders can be present at the same base. If so, the tenders will service any seaplanes leaving the AV free to service anything else.

Note: *While all aircraft tenders have 'Seaplane Support' only a few types have 'Aircraft Capacity' as well.*

Task Forces, Ships and Air Commanders

For task forces, the TF's commander serves as the Air Commander hence his *air skill* is used to determine how many a/c fly strike missions. Vital for carrier ops but does also influence search and ASW ops using FP from ships.

The *air skill* rating of leaders commanding ships, say a carrier, is unimportant unless that leader is also the TF commander.

Apart from a carrier TF commander's *Air Skill* requirement you should have:

- **Aggression** to improve reaction moves toward an enemy. Beware, being too aggressive could result in getting too close with disastrous consequences.
- **Surface skill** to help evade naval attacks.

Air Units (7.0)

Air units are based on airfields (AF) or ships, how many depends upon the size of the individual AF or ship type. Each air unit consists of one aircraft model only (*the manual says type. This is incorrect*) (7.0.1).

Individual aircraft don't fight, air units do but unit size can be anything between 0 - ## a/c. How many there are at any one time depends on:

- the historic size of the group, Squadrons and Groups for the Allied player and Chutai's, Sentai's, Buntai's and Hikotai's for the Japanese player. The normal range is 9-72 planes.
- Any operational or combat losses (5.1.1).
- If the unit has been divided into small units (7.1)

It is also vital to realise that just because a group has X number of a/c that does not mean all will fly in any one instance. This reduction in the number of aircraft can be caused:

- *involuntarily* through losses and damage (5.1.1), poor AF support (9.4 and 15.4), lack of pilots (16.3), low morale (7.2.1.4), poor leaders (7.2.1.4) and other factors.
- *voluntarily* through patrol setting, training or rest (stood down) (7.1).

Renaming Air Units

Historically and for whatever reason many air groups were renamed during the war. This is reflected in the game and happens automatically on the date scheduled. You have no input but it can cause some confusion if you miss the message when your favourite group apparently disappears from the list.

You cannot rename them.

Resizing Air Units (7.3)

Some air units can be resized during the game. You can tell if an air unit can resize by observing the yellow 'resize toggle' in the 'Air Unit Info' screen (7.1).

Other than historical resizing, which can affect any air unit, resizing is only carried out on ship based air units i.e. FP/FF.

To resize you need a level 1 AF or a ship with free air capacity and enough supply at the base for either method. You cannot resize fragments or detachments unless the scenario allows.

There are a number of possible options:

No resize allowed - Doesn't mean it will never resize, just that it's not set to resize.

Resize to fit ship - Resizes the air unit to the max possible size without exceeding the ship's air capacity. E.g. A CS (24 air cap) with 3 Jakes and 12 Petes could increase the Jakes to 12 or the Petes to 21 but not both.

Resize to fit ship (a second time) - Allows you to select the number of aircraft you want to resize too. Again up to the air capacity of the ship.

Changing to # on date - The historical date when an air unit resized. There may be more than one date but you cannot manually resize until this date has passed. Generally once the date has passed no manual resize is possible the toggle changing to 'No resize remaining'.

No resize remaining - Somewhat misleading. Although it can mean just that what it generally means is there's no

resize remaining where it is based. For instance a FP on an AF could say this but if you transfer it to a ship with enough capacity then the option will change to 'Resize to fit ship'.

Air Unit Restrictions (7.1.1)

Air Units assigned to a restricted HQ may not be:

- *Loaded onto ships.* 'Loaded on ships' implies loaded into cargo space using TF load routines making them unavailable for air operations until unloaded.
- *Transferred* to a base that does not report to its restricted HQ. Restricted HQs are usually shown with a [R] after their name when displayed but could just show [S] when viewing an air unit list.

Note: Any ship capable aircraft can nearly always be transferred to a ship irrespective of any HQ restrictions. Once on the ship they become 'independent' and can be moved anywhere capable of basing them.

Air Missions (7.1 and 7.2)

Air missions are the heart of the air war. Some missions may not be available dependant upon the political situation (8.6 Russia and Manchukuo Garrison).

Air missions are carried out during one of the four air phases:

Night Air Operations - All night air missions are flown and air combat is resolved.

Daytime Air Operations - All daytime air missions are flown and air combat is resolved. It is divided into three pulses, morning, afternoon and transport, like this.

- Naval Attack mission may attack in both the morning and afternoon.
- Other attack missions and sweeps take place in either the morning or afternoon.
- Air units given any other attack mission will only attack in one of the two pulses.
- Recon, search and ASW missions are flown in both pulses.
- Air units transport supplies and troops during the transport pulse.

Air missions are all set up and controlled through the *Air Unit Information* screen and fall into three distinct types:

- **Group Mission:** The primary mission for the air unit. These can be sub-divided into offensive or defensive missions.
- **Secondary Mission:** An offensive mission type only available if the primary mission is set to naval. It is only carried out in the naval doesn't go in and restricted to Airfield Attack, Port Attack, Recon and Rest. There is no secondary mission at night.
- **Patrol Mission:** Optional and defensive in nature. A number (as a percentage) of aircraft from an air unit are set aside to perform the patrol, hence will no longer be available for the primary or secondary missions. Air units can have more than one patrol type, each one reducing the number of aircraft available for the primary mission. If a unit has more than one set an "*" appears next to the primary mission in all air unit lists.

Which mission are available to any particular air unit depends greatly on the a/c type in the unit. Mostly the missions fall into two categories. Offensive, used to attack the enemy and are often referred to as attack or strike missions. Defensive, basically anything else such as CAP, training, rest etc. The following should be noted:

- With exception of stand down (rest) all need a range and height. Height is set via the *Current Altitude* buttons, Range is set via the *Maximum Range* buttons.
- Offensive mission (except naval) require a target 7.2.1.7). This can be set by you or left to the AI (Commander Discretion) to select. (7.2.1.7.1).
- Defensive missions don't need a target specifically, but for CAP you can if you wish. They do need to know how many to fly and is set through patrol level (percentage).
- Night missions are less effective than day missions.

Mission Order

I do not fully know how the AI determines the order in which missions are carried out. In truth I don't care provide co-ordination rules work and they do. What appears to happen is missions are carried out by area, probably based on command areas but that's a part guess. I'm open to suggestions.

The order is NOT based on...

- group ID #. It may appear that way at the beginning of any scenario but the further into the scenario you go the more mixed up they will be. Much more obvious in full map scenarios. I can supply prove if you want it but you can check yourself by noting the ID # of groups from the combat report.
- raid creation order.
- air HQ or leader.
- anything else that I can see.

Raids on a specific target are based on group ID # however the rules of co-ordination are followed. The main one being sweeps do not co-ordinate with bombing raids.

What is required?

To carry out any air mission four things are required:

- **Functioning Airfield.** Both size and damage can prevent missions taking place. (See the [AF Size](#) and [Damage](#) sections for details).
- **Serviceable/ready aircraft capable of carrying out the mission.** Damaged, those under maintenance or reserve a/c will not fly missions (15.4). Not all types of aircraft are capable of carrying out every mission type. E.g. Level bombers can't perform CAP but aircraft capable of flying CAP maybe able to carry out level bombing (FB and some F) (7.2.1).
- **Ready pilots to fly the a/c.** Every a/c that flies a mission requires a pilot. Note that all air units have a designated leader. If you don't pick one, one is chosen for you from the air unit list of pilots (7.1 and 16.3).
- **Supply to to arm and fuel the a/c.** All land based missions use supply for their ordnance and aviation fuel requirements. The cost varies dependant upon the type of mission flown and type of a/c used (15.4). Land based torpedo missions have special rules (see below). Ships have special rules for air missions (see [Naval Air Operation](#)).

Land Based Torpedo Support (7.2.1.10.2.2)

On land, torpedoes can only be supplied from any Air HQ. Unlike in earlier versions there is no need for the 'Torpedo Ordnance' device to be carried, torpedoes are now always available to the Air HQ. Air HQs can provide this support up to their command range with each torpedo costing 10 supply points but they do need to be stored with the HQ.

Important Note: The game implies that torpedoes can be supplied by Command HQ or certain Base Forces by adding device 196 Torpedo Ordnance to it's weapons list. This is incorrect.

There are two ways to store torpedoes.

- **Manually the 'Torpedo Ordnance' device**

To manually add torpedoes click the 'Get torpedo' button immediately to the right of the 'Torpedo Ordnance' device. This allows up to 20 torpedoes to be immediately supplied at each request but you can repeat this request any number of times and is only limited by the base supply. These torpedoes remain with the HQ until used by an air unit.

The disadvantage is you do have to keep track of their use or you might find a critical attack going in with bombs instead. The advantage is you decide when to use them, hence not wasting supply

- **Semi-automatically through the TOE**

You can automatic keep the unit supplied through the TOE. By selecting 'Show unit TOE' the 'Torpedo Ordnance' device will turn yellow. Clicking it allows you to add any number of torpedoed to the TOE, which in turn keeps the HQ's 'Torpedo Ordnance' count at that level, supply permitting. This resupply is carried out during the next supply phase so there is no immediate effect in setting the TOE figure, but like manual supply, once drawn it cannot be returned.

The advantage is you don't have to keep constant check on use, limiting the stock to smaller numbers. The disadvantage is you might have torpedoes stocked you don't need them

Note: You don't have to have the exact same number of torpedoes as there are a/c. An air unit set to use torpedoes will use whatever is available, the others using bombs in a separate mission if there are not enough.

Mission Effectiveness

Success or failure of an air missions depends on many things. These include the following with details below:

Air unit skills	Weather
Leadership	Raid Detection
AF Size	Terrain, forts or fortifications
Range, altitude	Day or night ops
Defensive fire (flak)	Air superiority
Aircraft capabilities	Mission co-ordination

Air Unit's Skill Set, Experience and Fatigue and Morale (7.1 and 7.4)

These values are based on the average values of all the pilots in the unit. There are 12 skills, each having an affect on at least one mission type and three attributes that affect all mission types. All air units have them. With the exception of fatigue and morale all skills a trainable (see *Pilot Training* for details).

When viewing the *Air Unit Info* screen only fatigue (fat), morale (mor) and experience (exp) are visible as these affect all types of mission. The other skills are only visible when you view the list of pilots the unit has. This lists the individual skills all pilots have and are shown with the average at the top of each column.

For convenience, you can also view the top three major skill a unit has but there maybe more than three. Anything over 50 is classified as a major skill, with the best shown first.

Experience

The overall ability of the air unit. A unit can gains **Exp** in two ways, by flying mission or by training the pilots. Flying missions is quickest but inexperienced units are more vulnerable. **Exp** affects every aspect of any air mission. E.g. operational losses, combat losses, kills, finding and targetting, training and others.

Fatigue

The more missions a unit carries out the more tired the pilots gets, the more tired pilots gets the more mistakes they make resulting in more ops losses and less combat effectiveness. Zero is good anything greater 50 is bad. Rest is the only cure.

Morale

Low morale does not prevent air missions only how effective they are. Basically a check to see how war weary the air unit is. The more they are, the less likely the unit is to fly effectively. This is particularly important for level bombers carrying out offensive missions but does affect all missions (7.2.1.4).

Zero is very, very bad, 50 is mediocre and anything over 75 good. If you can rest and/or transfer units from the front line when morale is around 50, it's only going to get worse from there. Many things affect morale but the but rest is best.

Skills

Are covered in more detail in the [Pilot Training](#) section below.

Air Unit Leaders (7.1)

Selecting leaders for air units is a fairly complex task. Most aircraft can perform multiple roles so choosing a leader for it's primary role is vital to it's overall success. E.g. A patrol aircraft can also bomb stuff but it's primary purpose is search so select a leaders that purpose. You never know you might find one suitable for both.

Air leaders with a * after their rank are also be pilots and can fly and in the case of detachments, fragments and divided unit this is the more than likely. Flying leaders can be shot at and killed. If this happens the most experience pilot still active in the units replaces him. Note he also flies.

Note: *If they are a good leader and also a pilot it is always best to replace them as a leader. Pilots get killed in combat.*

Leader Qualities for Primary Role

Aggression seem to play a part in all missions. The high it is the more likely that the air unit will continue to the target in face of adverse conditions, including enemy CAP. *It's possible it may also affect a unit's morale but I'm unsure of*

this?

The qualities for each role are, arguably, in preference order.

CAP and Escort - This includes any F, FB, NF, or FF.

1. **Inspiration** - Influences the number of CAP aircraft that will fly. Influences air group morale recovery.
2. **Air Skill** - Influences the air-to-air combat results.
3. **Leadership** - Influences the air group's experience gain.

Offensive Missions (except Level Bombers) - This includes airfield, port, naval, or ground attack, as well as sweep, and recon missions carried out by any F, FB, NF, DB, RC, FP, FF, or TB.

1. **Inspiration** - Influences the number of strike and patrol aircraft that will fly. Influences air group morale recovery.
2. **Leadership** - Influences the air group's experience gain.
3. **Air Skill** - Influences results in air-to-air combat.

Offensive Missions (Level Bombers) - This includes airfield, port, naval, ground attack or recon missions carried out by any level bomber.

1. **Inspiration** - Influences the number of strike aircraft that will fly. Influences air group morale recovery.
2. **Air Skill** - Influences results in air-to-air combat.
3. **Leadership** - Influences the air group's experience gain.

Patrol Missions - Includes naval search and ASW patrol missions carried out by any DB, BM, RC, PA, FP, or TB aircraft.

1. **Inspiration** - Influences the number of patrol aircraft that will fly. Influences air group morale recovery.
2. **Leadership** - Influences the air group's experience gain.
3. **Air Skill** - Influences results in air-to-air combat. Minor influence only.

Transport Missions - Includes supply or troop Transport mission carried out by BM, TR, or PA aircraft.

1. **Inspiration** - Influences air group morale recovery.
2. **Leadership** - Influences the air group's experience gain.
3. **Air Skill** - Influences results in air-to-air combat. Minor influence only.

Training Missions - Any air unit.

1. **Leadership** - Influences the air group's experience gain.
2. **Inspiration** - Influences air group morale recovery.
3. **Air Skill** - Influences results in air-to-air combat. Minor influence only.

Airfield size (9.4.1)

AF size matters, the larger it is the better the runway and servicing capabilities it has. This impacts on a/c size, it's load out and range and how quickly damaged aircraft can be repaired (see [Airfields](#) for details).

Kamikaze (7.4.2.3)

A kamikaze attack is a form of naval attack. It's a one way attack, one from which no aircraft or pilot will survive the mission.

According to Alfred's guide there are a number of unpublished restrictions and limitation imposed on the game. I have also carried out some test which seem to impose more. Some of these things are very important for Kamikaze operations.

Kamikazes activate on or after 1 Jan 1944 provided there's an Allied base within 15 hexes (the guide says 20?) of Tokyo, Takao, or Saigon. Once per day you can convert one normal air unit into a Kamikaze. You cannot convert the unit back. There are two important limitations on what qualifies as a triggering Allied base. To qualify the Allied base must:

- not be located in China or Tibet (nationality codes 70 and 71 respectively)
- contain an air field which is sized level 1 or greater

Once activated the Japanese player can convert standard air group into Kamikaze. For eligibility the standard units must:

- have an experience level of less than 50
- have a morale level above 70

- not be flying transport type aircraft
- not be a fragment

Unlike what the manual says there appears to be a limit as to how many of these converted Kamikaze groups you have at any one time. That limit is seven. This means if you convert seven standard units immediately they are triggered but you can convert no more until one is destroyed. This rule does not affect Kamikaze units entering play as reinforcements.

I have used Alfred's excellent detailed Kamikaze 101 Guide for most thing Kamikaze and tested them. This means manual is incorrect in a number of ways and really should be updated.

<https://www.matrixgames.com/forums/viewtopic.php?p=4627326#p4627326>.

Range (7.2.1.6 and 7.4.2.5)

Mission range is set via the *Maximum Range* buttons found on the *Air Unit Info* screen. It is limited to the maximum range of the aircraft model taking into consideration drop tanks and mission type. Mission range is displayed on map as a blue circle.

The basic concepts is, 'the further an air unit flies the less ordnance they can carry'. Additionally there's more wear and tear on a/c and pilots, more fatigue, more disruption, more ops losses, more chance of turning back due to fuel shortage, fewer a/c intercepting etc. (7.2.1.7).

Air units can have up to four set ranges dependant upon a/c type and date. These ranges are normal, extended, normal drop and extended drop tank. They are displayed on map as by toggling the F3 key, black, red, grey and pink in that order of range.

Normal and extended are available to all air units but there maybe little to no difference between them.

Note: *In the early days of the war, Japanese air units generally held a significant advantage over Allied air units with their much longer ranges. Even with drop tanks the allied a/c were often out ranged by the Japanese, particularly fighter a/c. This advantage gradually reversed so by war end the opposite was true.*

Drop Tanks (7.2.1.6.4)

Not all aircraft can carry drop tanks and for some they are only available after a certain date. This date can be confusing as nearly all the DTs in the game are available for use from the start. What's crucial is the date the DT became available for the airframe. This info is not available in game but is available through the editors 'Date DT Active' box when viewing the aircraft tab. Here's the list for scenario #1.

Br Catalina I	Jun 44	USN F4F-3 Wildcat	Oct 42
Dut PBV-5 Catalina	Jun 44	USN F4F-3P Wildcat	Oct 42
Aus Catalina I	Jun 44	USN F4F-4 Wildcat	Oct 42
Aus Catalina IIIA	Jun 44	USN F4U-1 Corsair	Oct 43
Can Canso A	Jun 44	USN PBV-5 Catalina	Jan 44
NZ PBV-5 Catalina	Jun 44	USN PBV-5A Catalina	Jan 44
USA P-38E Lightning	May 42	USN TBF-1 Avenger	Nov 43
USA P-47D2 Thunderbolt	Jul 43	IJA Ki-44 Tojo	Jan 42

For those a/c that can carry DTs, there are three possible states the air unit can be in. This status is shown in centre of the Air Unit Info screen:

Drop Tanks unavailable - Greyed out, It can mean two thing, not enough supply at the base or it's before the date available for the air frame.

Not using drop tanks - In yellow. Mean what it says, click to toggle on.

Using drop tanks - In yellow. Mean what it says, click to toggle on.

Cost of Drop Tanks

Using drop tanks is not free, equipping an a/c with a DT cost twice the amount of supply. There's also an added AV support requirement. It does not matter what range is set for the air unit, if it's equipped with *Drop Tanks* and flies this supply and support is used.

The exception to this is their use on ships. Supply plays no part in Naval Air Ops instead sorties are used for all offensive missions and they are not affected by *Drop Tanks*. Defensive missions (E.g. CAP) are free anyway.

Note - The use of centreline drop tanks will replace any centreline ordnance.

Altitude (7.2.1.9, 7.4.2.4 and 19.3)

The only height restraints placed on any mission are the max altitude for the airframe and the likelihood of success at the chosen height. E.g. don't expect to find a sub at 30K, try or fighters to perform well above their critical mvr.

All aircraft are affected by altitude. For bombers it's all to do with accuracy, for fighters it's to do with manoeuvrability and possibly 'bounce' advantage (7.4.1.1).

Mission height is set via the *Current Altitude* buttons found on the *Air Unit Info* screen. Due to the way the game works, altitude can only be increased/decreased in 1000' steps with one very important exception, 100'. It is limited to the maximum altitude of the aircraft.

The cut off point for low altitude attacks is 2000'. Attacks above that height are considered 'normal', below that height there low level. Importantly, because of how the game works, there are only two heights below 2000', hence at low level, that can be set, 100' and 1000'.

Flying constantly at very low or very high altitudes will also affect your fatigue and possible morale, particularly very low.

Bombing Heights

Generally the lower the release point the more accurate the bombing will be. The other major contributing factor to accuracy is the weight of the bomb, light bombs drift more. Other factors, such as experience, weather, aircraft type and model and attack profile, DB were more accurate than level bomber for instance, all affect accuracy. To offset this advantage the lower the a/c release point is the greater the chance of being shot down or damaged by flak. Aircraft durability plays huge part in reducing losses at low level.

There are three attack profiles in the game, dive, skip and level arguable with DB being the most accurate and level the least.

- **Dive Bombing** only occurs when DB are set to an altitude between 10-15K inclusive, with a release point between 1-3K. Any altitude set outside of this results in level bombing.
- **Skip bombing** occurs when attack bombers (AB) are set to an altitude 5K and below, the release point being 100'. ABs at altitudes above 5K are level bombing. Sometimes normal level bombers will also skip bomb if set to altitudes <2K and they pass a random check as the raid goes in (see below).
- **Level bombing** can occur at any height by any aircraft type or model capable of carrying bombs, excluding DB and skip bombing above.

Skip Bombing

In game, any bomber can bomb from a low level, irrespective of type or model or their LowN or lowG skills. LowN and lowG skills just help reduce losses and improve accuracy 2K and below. This low level bombing is not generally skip bombing but there does appear to be a random possibility that some normal LBs will skip if below 2K. The reason I say this is I've observed them attacking in flights of 1-2, as AB do.

The game does not specifically tell you when a unit is skip bombing or not, but you can see it in operation via the *Combat Animations* and the result in the *Combat Report*.

- The combat animation normally shows level bombing being carried out by flights consisting of 3-4 a/c. If aircraft skip bombing these flight consist of 1-2 a/c, usually 1.
- If you see a large number of hits then its a sure bet some if not all of the aircraft in the raid skip bombed.
- In the combat report, attacking aircraft skip bombing are indicated by '*bombing from low level*' whereas for level bombing it just says '*bombing from xxxx feet*'. E.g. 20 x B-25J11 Mitchell bombing and strafing from low level or 6 x B-25J11 Mitchell bombing from 100 feet.

For LBA only these attacks are carried out with half the normal bomb load. Note that this helps to stop low level ship killers.

Note: Although any bomber could skip bomb, historically it was carried out by medium attack bombers although at least one B-17 group also had success. It was in fact the pioneer.

Torpedo Height

The approach height is whatever you set the unit's height to, the release point is 200'.

Strafing (7.1)

Strafing is any attack by guns at an altitude of 100'. There's no separate strafe mission. Any air unit with an attack mission or sweep may also strafe dependant upon height and a random factor.

- At 100' all aircraft with an attack mission can strafe.
- At 1000' only fighters (F, FB, FF) and attack bombers (AB) with an attack mission can strafe, dropping to 100' to do so.
- Between 2000' - 5000' only attack bombers (AB) can strafe, dropping to 100' to do so.
- At 5000' or above no strafing is possible.

***Note:** There's a difference in strafe reporting. If it's a land target by any bomber other than attack bombers you have to watch the animation to see if the a/c fires it's guns. For naval targets and attacks by attack bombers (AB) the guns don't fire, instead a targetting messages appears. Also you can see the shell hit on naval targets.*

Fighter Heights

To successfully defend bombers or their targets you need fighters with escort or CAP missions respectively. How successful there are depends on any number of factors but altitude is vital.

- Fighters have five altitude bands each of which can affect their manoeuvrability (mvr). The altitude at which mrv starts to drop off is critical, it not only affects their ability against other aircraft but against flak as well.
- The chance of interception or intercepting. Two wildly differing altitudes might mean they miss each other. Good for the strike, bad for the target.

These factors should play an important part of planning any mission, be it offensive (strike) or defensive (CAP).

Search and ASW Heights

Another heavily discussed subject with varying opinions. These are mine.

For **Naval Search** you don't want to be too high but it does need to be >5K. Flying at or below 5K has poor detection rates. I use 6K normally, not too high for or cloud may obscure your search, too low leaves you more vulnerable to flak.

For **ASW Patrol** a height between 1-2K is best. The higher you go the poorer the detection rates are changes are not large even at high altitudes. Ideally you want to surprise a sub so in theory flying higher gives the sub more chance of spotting you.

Defensive Fire (Flak) (5.4.1.3 and 7.2.1.9)

You should expect any ground unit or ship to be capable of defensive fire against an aircraft. This fire can take place at any time during a turn resolution against any type of air mission, not just against offensive air missions. E.g. ships and bases can fire against search, ASW, recon, CAP etc. or even training mission if your unlucky.

The game uses the terms AAMG, Flak guns and AAA/DP guns inter-changeably. DP guns are dual purpose weapons mainly fitted to ships. You should note that most of the Japanese 5" guns are not true DP mounts and not very effective.

Two things help against flak, flying above it and a/c manoeuvrability.

All flak has a maximum ceiling above which it is ineffective, however there is some little leeway so these figures are not absolute. (*I read somewhere it's 1%!*). The approximate ceilings for each type are:

AAMG	Low	<5K
Flak (20-40mm) gun	Medium	<10K
AAA/DP gun	High	<35K

For attacks against bases and ground units the only criteria for effective firing is height.

Flak can be suppressed by using ground attack missions, but some other offensive mission will also help suppress it, such as AF attack. Attack bombers(7.0.1) and strafing will also suppress flak.

Individual ships are never targetted directly as a mission, only TFs. When a raid attacks, one ship is randomly selected

as a target from the TF. This leads to three separate flak phases.

1. All the guns in the TF can fire at the raid using the flak guns height criteria and raid approach height.
2. The targetted ship only dependent on the direction of the attack and mission profile. I.e. If it's coming from port the starboard guns, if it's a torpedo or DB attack. Because of the lower height its the lighter guns doing most of it.
3. When the raid egresses all ships can again fire.

Task forces that consist of more than 15 ships suffer diminishing returns in effectiveness defending against air attack and fighting in surface battles. (6.2) This does not mean their flak gets less, just that the additional ship don't contribute all their flak.

Under no circumstances will another TF in the same hex ever use its flak to assist another TF.

Aircraft Capabilities (type and performance) (5.4.1)

Some performance related issues have already been discussed, range, altitude and manoeuvrability. But there's a lot, lot more to the games combat modelling, way beyond my knowledge.

Performance is a difficult subject and not one I'm going to get heavily into it here, even if I did know. It has caused many a friendly discussion on the forum. What I will say is that pound for pound (e.g. speed for speed) the bigger the number the better. The problem comes when, say speed is higher for one model but it's manoeuvrer rating (mvr) is lower.

The basic generalisations are these:

- Allied a/c suck at the start. Particularly true for fighters were Japanese a/c were faster and more manoeuvrable.
- By the end of the war the reverse is generally true.
- The larger the bomb load the more effective the bombing.
- The more guns the better the chance of shooting down the enemy.
- The more modern the a/c the better.

Please see the sections on [Offensive](#) and [Defensive](#) Air Missions and [Aircraft Types](#) for more details.

Weather (7.2.1.12 and 12.0)

Weather can play a huge part in the success or otherwise to a strike mission. All bases check their local weather every air phase. The results are relative to the prevailing weather in the base's quadrant set at the start of the turn and the games climate zones. E.g. There's more chance of a clear local forecast if the quadrant has a partly cloudy forecast then if it had an overcast one.

Bad weather can:

- reduce the number of a/c flying.
- cancel a strikes completely.
- cause the strike to partly or entire miss it's target.
- Reduce raid detection ranges
- reduce CAP interception effectiveness

Raid Detection (7.4.1.1)

There are two means of detecting air missions, line-of-sight using the mark one eye ball and radar with radar having the greater detection range, increasing as the war progresses.

Essential, the earlier a raid is detected the higher and more successful the chance of an interception will be. At low detection ranges only airborne a/c are likely to intercept successfully. The further away it's detected the more likely it is for ready CAP to scramble and intercept, with a high possibility of bouncing the escorts. At really long detection ranges even unready aircraft can launch.

It is highly unlikely that the raid will be completely undetected on it's approach but the closer the raid gets to the target before detection the better. It also gives any escorts the advantage over CAP, including a chance to bounce.

The size of the raid, the weather in the form of clouds etc. and height of the will all help avoid early detection.

You can't do much about the weather, but height is a different matter. Both line-of-sight and radar especially are

affected by the curvature of the earth with both detecting in a straight line. So lower the height, lower the chance of detection.

Terrain (8.3.1), Forts and Fortifications (8.4.4)

All have a defensive multiplier with the terrain modifier being cumulative with either of the other two. Terrain is a very big factor. Bombing can be very effective in plains. In Jungle its next to useless.

Units that are moving lose any fort modifier. For terrain it depends on how they are moving. It's lost if they moving via road or rail.

Air attacks cannot destroy or damage a defensive modifier, all they can do is slow their build or repair rate through a reduction in supply or damage to a unit.

Night Operations (7.2.1.3)

There is only one night phase. Only a/c set to night ops will fly at night and vice versa. The day/night toggle will be in blue if set to night.

Offensive night missions require at least 6 ready aircraft with at least 50 morale.

Night ops are less complicated to set, there's fewer possible missions (no escorts to start with) and have little co-ordination. In general they are less effective all round, bombers less accurate, fighter intercepts harder. To add to this the combat reports carry little info on the results, your in the dark, literally.

Night fighters and a/c radar help improve things but don't expect miracles.

Air Superiority (7.0.1)

There's little in the manual about this other than fighter are used to gain air superiority but the effects are noticeable.

Unescorted bombers can be reluctant to carry out raids unescorted and the further the range the worse it gets. It can even affect escorted missions. Not much else to say here. Just think about it when raids are not carried out.

Air Coordination (7.2.1.11)

The effectiveness of any air raid depends greatly on how well the various air units coordinate together. If they arrive piecemeal or even fail to arrive at all could lead to poor results and/or heavy losses. Good coordination is achieved when all the air units arrive within 30 mins of each other overwhelming flak and fighter defences.

This is not easy to achieve. You can improve the chances of raid coordination in many ways but arguably the most important is altitude. Logically you would think target selection; it's not, height is.

Another question that pops up, should you base fighters and bombers on the same AF? Good question and not one I can answer as they both have there advantages. If in the same base then you get better chance of coordination on the other hand fighters, with their shorter range, generally need to be closer to the target!

Sweeps, recon, search and ASW missions do not use coordination however sweeps and recons can accompany other raids but do not affect them. If you time it right based mainly on cruise speed and range and then you can get a sweep to arrive before the raid and recon to arrive after. Other factors do apply such as climb rate and altitude.

Here's a list of all the factors that affect raid coordination. Its starting the most important at the top:

Height - All air units on the raid (bombers and escorts) must me set to the same height. Multiple raids from a base to different targets should be separated by height to prevent the game getting confused, 1-3k works.

Setting a target - A manual target is not essential if all units are from one base, the AI will pick one for you. If they are not from the **same base** then it is essential. Escorts targeted to same target as bombers have a better chance than un-target escorts.

Same base - Raids from the base/ships have a better chance of coordination. The further apart AF are lessens the chance.

Same mission type - Attack missions, except for *Naval Attack*, will coordinate raids to the same hex.

Same bomber type - Using only one bomber types in the raid increases chance of coordination. E.g. MB an HB, or LB and DB. This doesn't affect DB and TB.

Range - All aircraft in the raid should be able to reach the target from their base. Raids from different bases/ships have a better chance of coordination if the distance to the target is the same.

Air unit speed - Air units need to be within 20% of the raid's speed or time to target for the raid and group within 30 minutes to participate in raid.

Same command - Air units belonging to same command have an increased chance of coordination. IJA and IJN groups have a lesser chance to co-ordinate than most.

Air HQ - Air units within range of their Air HQ have an increased chance of coordination.

Air Unit Experience - The higher it is the greater the chance of achieving coordination.

Leader's Air Skill - The higher it is the greater the chance of achieving coordination.

Luck - I.e. a random die roll. You can plan all you like but....

Air Coordination from Carriers

The coordination of air strikes from Aircraft carriers is affected by how many Carrier aircraft are based in the TF launching a strike. The chance of in-coordination is doubled under the following circumstances:

- Allied TF in 1942 and the number of aircraft in the TF is greater than 100 + rnd (100).
- Allied TF in 1943 and the number of aircraft in the TF is greater than 150 + rnd (150).
- Allied TF in 1944 or later or a Japanese TF at any time and the number of aircraft in the TF is greater than 200 + rnd (200).

Examples Air Coordination

(Taken from Air Coordination Guide By LoBaron 2/2/2010)

What the game tries to do is to coordinate missions based on altitude, range and target. Here are some examples:

1. Attacker has 1 fighter and 1 bomber squad at base A and wants to fly a coordinated attack on base B.

That's the simple scenario that everyone should have guessed how to best coordinate: simply by setting the fighters to the same altitude as the bombers (additionally but not mandatory the fighter squad could be set to target B). The game engine recognizes this and tries to coordinate the attack.

Leadership, pilot experience and weather and a bad dice roll still can prevent coordination but chances are high that the strike arrives on target at the same time as the escorting fighters.

2. Attacker has 2 fighter and 2 bomber squads at A and wants to attack B.

Now the player has a choice:

He could set all squads to the same altitude the game engine makes the same check as in 1) and tries to coordinate the strike. The chance of success is probably a bit reduced because there are more squads (more leadership checks and other dice rolls involved) but most probably the 4 squads arrive at the same time over target.

On the other hand the player could do something different:

He can set 1 fighter and 1 bomber squad to, say, 10k alt and the other two to 11k.

What's the result? The game engine makes the usual check on altitude and tries to plan 2 coordinated strikes, one with the first pair and one with the second. Chances are high that the first bomber pack arrives with first escort and the second bomber pack with the second escort. But the engine makes a second check: if all 4 squads have the same target selected there is a (reduced) chance that all 4 squadrons arrive on target but it has a significantly lower chance than in the example above.

What is the advantage of the second choice?

Well, plain and simple the second way of doing things has a higher chance of coordination per strike, because the strike packages are smaller. So there is less chance that somewhere in the resolution phase a lonely bomber squad arrives on target completely without escort. Its easier to coordinate 2 40 planes strikes than 1 80 plane strike!

3. Now we add a 3rd base, C, another enemy base. Lets say the distance to the bases is the same, so range doesn't matter.

The attacker wants to attack base B with an escorted strike and base C without escorts because he knows this base has no fighter cover.

Solution: He sets bomber squad 1 to 10k and targets base B, both fighter squadrons are set to without target selection 10k. The second bomber squadron is set to 11k and base C as a target.

The game engine makes the altitude check and recognizes that bomber squadron 1 and both fighter squads want to get coordinated. So chances are high that the result is an escorted attack on B and an unescorted on C.

4. *This is the last one and the most complicated but I just want to show what you can accomplish with strike coordination if used wisely:*

The attacker has 3 Bases. A, B and C

The defender has 2 Bases, D and E

Base A and B are pure bomber bases, base C is a fighter base, closer to the front line.

Lets say you want to make a coordinated strike on base D, which is heavily guarded, and E which is lightly guarded but needs the higher success rate (for whatever reason) Number of squadrons is not of importance but please do not forget that the higher the number of squadrons/planes involved, the lower the chances that every single strike gets coordinated.

First you could select with which bombers to attack which target base. You select all bombers on base A to attack base E and want some from base B to join the fun because the strike on E needs to hit home. The rest attacks base D

So:

Base A: select target E, select 10k for all base A bombers.

Base B: select 50% of the bombers to target base E and set them to 10k. Set the rest of the bombers to target base D and set them to 12k.

Why?

Because now comes the fighters. and you want them to escort exactly what you tell them to and leave no chances (or at least as few as possible). As said before, base D is better guarded. Because of this set e.g. 70% of the fighters to 12k, split between sweep and escort mission however you desire (and target base D but, again, you don't have to because the coordination based on altitude could be enough) Set the rest to 10k and also either escort or sweep.

What does the game engine do now?

It again checks for alt coordination. It recognizes you want to coordinate a strike on base D with 50% of base B bombers and 70% of base C fighters and tries to accomplish it. It also recognizes you want to coordinate 100% base A bombers and 50% of base B bombers with 30% of base C fighters to attack base E and tries to accomplish it.

If everything else goes well you get two beautifully coordinated strikes. There are many things that can go wrong but this way you minimize the chances.

Do's and don'ts:

- Select different altitudes for your strikes in one area. This is important. You are unnecessarily confusing the game engine if you don't.
- Other missions that take place in the same area that do not need coordination for whatever reason should also be set to unique altitudes
- Smaller strikers have much higher chances of coordination than a 250 plane I-want-to-dim-out-the-sun whacker. If you can accomplish something with low numbers or expect high resistance its sometimes better to plan several smaller strikes on different altitude bands than a single big one which simply is to large to get proper coordination and could lead to completely unescorted raids.
- Don't forget that there's more factors involved: range to target, a/c type, weather over origin and target bases, leadership value, pilot experience. Adapt to those factors!
- Trying to attack a heavily guarded base from 4 directions, with 10 different plane types, without training, wrong leaders during a thunderstorm and other missions set to the same altitude is the best way to improve the mood of your opponent.
- HQ's have an important part in the Air war, not only for total planes participating but also on better raid coordination
- When trying to coordinate an attack, don't miss the fact that plane types and their respective cruise speeds

- have a huge impact on whether the raid is cohesive or not.
- If you want fighters from another base to escort your strike, make sure that the base they are based on is closer to the target hex than the bombers.
- When planning long/extended range strikes assume that this increases the chance of uncoordinated attacks and plan accordingly.
- Plan your strikes as if they could go wrong, and not as if they must succeed in order to avoid a catastrophe. So, basically I am suggesting that you plan low risk, as long as the outcome is in doubt. This naturally does not apply to situations where you have to be creative because you are hopelessly outgunned or outnumbered or when you own the skies anyway.

Tips on improving Mission Success

(Taken from Air Coordination Guide By LoBaron 2/2/2010)

There are no limits on maximum mission altitude except the one governed by the airframe.

If you experience severe losses due to an opponent flying at higher altitudes than you are able to, the reason is that you are doing one or a combination of the below wrong:

- Defending with too few numbers (its a numbers game, always)
- Competing against a (historically) superior airframe without other qualitative or quantitative advantages to compensate
- Neglecting the def skill for fighter pilots (big boo, guess what a pilot has to do when he loses the initiative)
- Not using layered CAP (different altitude settings for different squadrons)
- Using planes at altitudes they were not designed for

Simply take a step back, re-evaluate the situation and change accordingly.

Fight an air war on these very basic principles and get absolutely plausible and realistic results based on the odds.

Searching and Arcs (7.1 and 7.5)

The object of a search is to find stuff at sea (e.g. TFs). Once found there can be attacked with bombs either by the search aircraft themselves (*Naval Search* or *ASW*) or more likely by other air units set to Naval Attack. Torpedoes are never used by search aircraft.

I've carried out many, many tests, parking a TF in or next to an enemy base or TF and there's was no automatic detection with the exception of TFs in the same hex.

With the exception of *Recon missions*, there are only two mission types or patrol options that will find a task force, Nav or ASW search. Recon mission can detect a TF if it is in the same hex as it's target.

If you set up a search and don't set *Search Arcs* then the AI will randomly search 360° in 10° steps. This is the default method. Not entirely useful if searching from San Francisco! But could be at Midway.

The alternative method is to use *Search Arcs*. These are set from the 'Air Unit Info' screen. *Search arcs* determine the direction of your search in 10° steps with 0° being north. You can start anywhere, setting as many arcs as you wish in either a clockwise or anti-clockwise direction but each arc requires at least one aircraft.

Whatever method you use, allocating too few aircraft and searches may not be successful, too many and they may search twice. You should try and avoid the first but the second is often desirable. However desirable this maybe setting a group's patrol level to high will result in many unserviceable a/c. (e.g. Setting a 100% search can cripple a unit within 6-7 turns).

There is some debate over which is more effective, arcs or not. My answer is arcs but not by much but number and situation matter and it's hard to keep arcs constant.

Some general tips on *navS* and *ASW* searches

- *Patrol Aircraft (PA)* aircraft seem better at searching than FPs which in turn are better than any other aircraft type that can fly search (particularly *ASW*). For PA this is probably down to endurance (more time in the search area).
- The larger the TF the better the DR.
- Strange things can happen on the first turn.
- An already spotted TF is easier to keep spotted.
- A moving TF is harder to find and harder to keep spotted.

- If you're looking at the map and in the right place during execution phases you can see detected TF flash up on the screen. They might not stay for the orders phase.
- Enemy flying activity does not improve your DR. Any form of combat they take part in however, can and mostly does.

Height

Height matters. At heights above 5K a/c visibility appears to be 2 hexes, below it's only 1 hex. This is inline with real life when LOS at 6K is roughly 80 miles (2 hexes). This results in better *navS* **Detection Rates (DR)** above 5K.

Not obvious when using a general search but it is when using arcs. This was shown in testing over and over again when TFs were detected out of arc (often in the complete opposite direction) and particularly noticeable close to the point of take off.

ASW is more effective than *NavS* at finding surface TF at altitudes $\leq 5K$.

Range

Range matters. Both types of searches find nothing beyond the *max range set* and the greater the distance searched the poorer the **DR** will be. *ASW* search range is always half *max range set* (rounded down).

Some tips on range.

- Patrol ranges are independent from mission ranges. E.g. A mission set at 10 hexes results in an *ASW* patrol range of 5 and a *NavS* range of 10.
- Search ranges less than 2/3 an aircraft's normal range seems to work the best for long range patrol a/c (Emily, Cats etc), less for other a/c. The further you push it the more DR fall off.
- Search range appear to be a little inconsistent. For a general searches the detection range is always one less than the *max range set*. (E.g. Set to 10 it only search out to 9). Mostly one but at longer ranges, Emily at 18 for instance, it was two. (A bug?)
- Arcs searches as set, going to the *max range set* as it should be.
- The 'visibility' thing resulted in detections up to two hexes from an aircraft's base no matter what range was set.

Naval Search

Used for spotting surface TFs (including subs). Any TF found is subject to attack by the searching aircraft but don't expect a Cat to attack the Kido Butai.

During the day there are two naval search phases, morning (AM) and afternoon (PM). Searches can take place in either or both dependant upon a/c numbers available. If the search is during the morning any arcs will be blue, in the afternoon they are green and for both, black. At night there is only one search phase so all arcs are black. Only air units set to night will search at night and vice versa.

The more a/c you use the better the detection rate (DR) will be. The effective minimum size for a search is three aircraft but the more the merrier but beware unserviceability. Losses or damage occurring during the morning could reduce the number of available aircraft for afternoon searches.

Search example: If you want to search between 0-40° and you have 4 a/c, then those a/c will search in both phases (black arcs). If you have only 2 a/c then you'll have two blue arcs (0-20°) and two green arcs (30-40°)

Some tips on *navS*.

- Any search is better than none. If you can't find it you can't attack it.
- There is no difference between a *NavS* mission and *NavS* patrol.
- Auto detection does not exist between a base and TF no matter how big the base is or how many units are stationed there. The only way to detect a TF is to fly a *NavS* or *ASW* or to bump into it with another TF.
- The minimum effective size is three for an all round search, while for arcs it's one per sector.

ASW Searches

Used for finding and attacking subs with bombs. Surface TF may also be found but never attacked by the *ASW* aircraft.

The rest is almost identical to *Naval Search*, except there's no night phase, they operate at half the max range (rounded down) and the colours are a light blue, light green and white (light grey?) respectively.

Some tips on *ASW*

- A height <=5K is best although subs can be found flying higher but I think these are surfaced subs?
- ASW *missions* and ASW *patrols* seem to behave exactly the same.
- ASW DR are much more varied than *navS* DRs.
- Only ASW find subs.

Displaying Search Arc

There's also the rest a 'Show arcs' button that displays the arcs being searched on the map.

As well as the 'Show arcs' button for the unit, all the search arcs can be displayed on the map by toggling the z key. These arcs are only visible if there's enough a/c to do the search. There's some interaction between this key and the F3 'Display range circle' key so make sure it is on (7.5.2).

Offensive Missions (7.1, 7.2.1 and 7.2.1.7)

All are primary group missions and are often referred to as attack missions. *Strafing* may also occur during the mission depending on mission altitude and fighters may 'bounce' the mission or be bounced depending upon detection.

Players often ask 'why is my bombing not doing anything?' Well it probably is, your not just seeing the results due to fog of war. There could also be a cumulative effects, again your not seeing it it happen because the effects are "ironed out" during supply phase at the end of the replay.

Bombing units makes their AAA shoot and use their supply that way. Bombing also forces a unit into "Combat Stance".

Other than how they are supplied, there is no difference between how a land based air mission or a naval based air missions is carried out.

Any offensive mission on a hex can cause a TF to undock, that's Naval, Port, AF, Ground, Recon, or search. Whether it does or not is random. <https://www.matrixgames.com/forums/viewtopic.php?f=10683&t=217557&start=40>.

Level Bomber Restrictions (7.2.1.4)

Before Level Bombers fly an Offensive Mission, they must pass 3 tests in order to fly all of their ready aircraft:

1. An experience test
2. A leadership test
3. A morale test in order to fly all of their planes

For each test failed, the number of bombers that fly the Mission will be reduced by 25%.

You can tell in the Combat Summary/Report when a unit has used a reduced load it's is highlighted by an *. E.g.

*12 x B-24D1 Liberator bombing from 25000 feet **
Airfield Attack: 5 x 500 lb GP Bomb

Why are level bombers so roughly treated? According to the devs it's because they didn't operate from forward AFs that were just captured. Generally they operated from rear area bases that had natural or man-made buffers between them and the enemy. Generally we are trying to limit the pace of Air operations. Somewhat restrictive rules for LBA was a key ingredient.

Air Combat Resolution (7.4)

Missions are resolved as raids, with each raid consisting of the bombers and escorts assign to a single target. How effective these raids are is determined by the air coordination rules. Lack of coordination can result in the target being attacked multiple times but with smaller numbers but the effects are cumulative.

Once coordination has been determined the raids go in with the aircraft attacking in flights ranging between 1-4 aircraft, each group facing AA and CAP. You can see this taking place in the combat animation.

Coordination plays a huge part of any raid.

Airfield Attack

Objective: To damage or destroy an enemy air base and any a/c based on it through the use of bombs.

Requires: Minimum of 3 ready a/c. Height and range to be set. An AF target is required, manually or by AI.

Restrictions: Day or night from size 2 AF and above.

Aircraft: Any a/c capable of carrying bombs. Some a/c will strafe if low enough. Escorts for protection.

Primary Results: AF services, runways, aircraft, supply (9.4.2).

Secondary Results: AF support troops and, just occasionally, leaders.

Notes:

- A single supply hit reduces supply in the base by 1%!
- Bombing AF makes their AAA shoot and using up their supply.
- Aircraft may strafe if their altitude is set 1000' or less.

Port Attack

Objective: To damage or destroy an enemy port and any ships anchored in it through the use of bombs.

Requires: Minimum of 3 ready a/c. Height and range to be set. A port target is required, manually or by AI.

Restrictions: Day or night from size 2 AF and above but restricted to one attack per day.

Aircraft: Any a/c capable of carrying bombs. Some a/c will strafe if low enough. Escorts for protection.

Primary Results: Port, repair yards, ships at anchor (50% of the time), supply, fuel (9.3.1).

Secondary Results: Port support troops, cities (stray bombing?) and, just occasionally, leaders.

Notes:

- TF in port (docked or not) are always spotted but never attacked by TFs but they will help defend the base.
- A single supply hit reduces supply in the base by 1%!
- Bombing ports makes their AAA shoot and using up their supply.
- Aircraft may strafe if their altitude is set 1000' or less.
- The use of torpedoes is very rare. The major exception to this rule is the first turn.
- Bases are always known so searches are irrelevant. What gets hit is pure random.

Naval Attack

Objective: To damage or destroy enemy ships and any thing on them through the use of bombs or torpedoes. Ports are never attacked.

Requires: Minimum of 3 ready a/c. Height and range to be set, load out selected (bombs or torpedoes). Targetting is always carried out by the AI. Ships can't be targetted directly, it's the TF that is the target with ships being selected when the attack goes in.

Restrictions: Day or night from size 2 AF and above. F, FB and FF cannot fly this mission at night.

Aircraft: Any a/c capable of carrying bombs or torpedoes. Some a/c will strafe if low enough. Escorts for protection.

Primary Results: System, flotation, engine, weapons and fire damage. Ships may suffer critical Results which cause more damage than normal (6.5). Ship that sink can lose leaders.

Secondary Results: Ships with flotation damage or fires can suffer additional damage (6.5).

Notes:

- Any found TF can be targetted. Bases will help defend a TF if it's in the same hex but other TF will not.
- Units with a naval attack mission may select a secondary mission type; AF, port, recon or rest. These secondary missions are identical to a primary mission but are only carried if the unit doesn't carry out it's naval attack.
- Aircraft may strafe if their altitude is set 100' or less.
- Any TF attacked when docked can become undocked (i.e. It puts to sea).

Kamikaze (7.4.2.3)

A kamikaze attack is a form of naval attack. It's a one way attack, one from which no aircraft or pilot will survive the mission. Kamikazes activate on or after 1 Jan 1944 provided there's an Allied base within 15 hexes (the guide says 20?) of Tokyo, Takao, or Saigon. Once per day you can convert one normal air unit into a Kamikaze. You cannot convert the unit back.

I have used Alfred's excellent detailed Kamikaze 101 Guide for all thing Kamikaze. This means manual is incorrect in a number of ways. <https://www.matrixgames.com/forums/viewtopic.php?p=4627326#p4627326>.

Objective: To damage or destroy enemy ships and any thing on them.

Requires: Japan only. Height and range to be set. Targetting is always carried out by the AI. Ships are not targetted directly, it's the TF that is the target with ships being selected when the attack goes in.

Restrictions: Day only from size 2 AF and above.

Aircraft: Any a/c except for transports. The air must have converted to a Kamikaze. Escorts for protection.

Primary Results: System, flotation, engine, weapons and fire damage. Ships may suffer critical Results which cause more damage than normal (6.5). Ship that sink can lose leaders.

Secondary Results: Ships with flotation damage or fires can suffer additional damage (6.5).

Notes:

- Any TF can be targetted. Bases will help defend a TF if it's in the same hex but other TF will not.

Ground Attack (8.4.5)

Objective: To destroy or disrupt an enemy ground unit (LCU) in preparation to infantry attack through the use of bombs.

Requires: Minimum of 3 ready a/c. Height and range to be set. A target hex is required, manually or by AI. One LCU in the hex is then selected as the primary target. Other LCU in the hex may also be hit. This is the only type of attack that can be made on non-base hexes.

Restrictions: Day only from size 2 AF and above.

Aircraft: Any a/c capable of carrying bombs. Some a/c will strafe if low enough. Escorts for protection.

Primary Results: Squads, guns, and vehicles (8.4.2.2).

Secondary Results: Squads, guns, and vehicles to other LCUs in the hex (8.4.2.2).

Notes:

- Fighters on Gnd Attack mission will load bombs 100% of the time **IF** they are set at 6000 feet, ranges of 1000-5000 feet are a lottery, and you may end up with a fighter with no bombs loaded who will drop to 100 feet to strafe instead.
- Terrain plays a very big factor. Bombing can be very effective in the clear, in Jungle it's next to useless.
- Bombing for four or five turns creates large amounts of disruption that significantly improve your infantry attacks.
- Few permanent casualties are inflicted, someone estimated it would take years to significantly reduce an infantry target that is dug in in heavy terrain. Tanks in the open are something else.
- If you want to reduce supply use an airfield attack.
- Bombing can also force a unit into 'Combat Mode'. A particular irritant if the unit was moving by rail, it'll now have to walk the rest. Units in reserve will not be affected.
- Bombing units makes their AAA shoot and using up their supply.
- You don't gain more victory points than you lose through lost aircraft.
- Aircraft may strafe if their altitude is set 1000' or less.

Sweep

Objective: To engage, destroy or damage enemy CAP or LRCAP in air-to-air combat.

Requires: Height and range to be set. A target is required, manually (highly recommended) or by AI selection.

Restrictions: Day or night from size 2 AF and above. Air units may only fly one sweep mission a day.

Aircraft: Any a/c capable of engaging in air-to-air combat. These include F, FB, NF, FF, and some FP.

Primary Results: Drive away, damage or destroy enemy a/c flying CAP or LRCAP.

Secondary Results: Pilots injured, killed or shot down. Pilots not killed may recuperate or be rescued.

Notes:

- The game does not use the fighter tactic of 'high cover', only 'close cover' via escort missions. Sweeps can simulate 'high cover' (7.4.2.4).
- You should never assume a sweep will arrive before a strike mission just because it has the same target or even height. They are not escorting the bombers, it's a mission in its own right.
- Aircraft may strafe if their altitude is set 1000' or less. But strafing is NOT their job.

Escort

Objective: 'Close air cover' for attack missions protecting against enemy CAP/LRCAP.

Requires: Range to be set. Height should be the same as the attack mission. A target is required, manually or by AI selection although manual selection is HIGHLY recommended for mission co-ordination reasons.

Restrictions: Day only.

Aircraft: Any a/c capable of engaging in air-to-air combat. These include F, FB, NF and FF.

Primary Results: Drive away, damage or destroy enemy a/c flying CAP or LRCAP.

Secondary Results: Pilots injured, killed or shot down. Pilots not killed may recuperate or be rescued.

Notes:

- The manual and nearly all advice says height has to be the same as the strike mission. This is not strictly true, but BIG however, it improves the odds of achieving co-ordination. By how much? No idea but I work on 99%! It does become essential if you plan more than one raid from a base or your targets are close together.
- I read, but can't find it, a separation of at least 2K is recommended in raid heights!

- Height is often enough to enable mission co-ordination IF there are based together but that may not be the case. It is therefore HIGHLY recommended you always set a target manually for air co-ordination reasons.

Recon (10)

Recon planes are fast, long legged aircraft with minimum, often no, weapons using speed to escape. Some have cameras improving the quality of their recon by up to 3 times.

To be successful Recon! recon! Recon!

Objective: To gather intelligence on enemy units thus improving their '*detection level*' (DL).

Requires: Height and range to be set. A target is required, manually (recommended) or by AI.

Restrictions: Day only.

Aircraft: Any recon, patrol, bomber or FP aircraft. It should go without saying recon aircraft are by far the best.

Primary Results: To gather intel. No primary weapons.

Secondary Results: Defensive only, possibly causing problems to the enemy but highly unlikely.

Notes:

- You're gathering intelligence, the AI isn't very good at intelligence so manual targetting is the way to go, especially when you are planning a major operation.
- Reports of recon flights can be found in the '*Ops Report*' (5.6).
- You cannot manually target a TF but TFs in targetted bases can be spotted.
- All aircraft except fighter types will gather some intel when engaged in combat, particularly bombers but it is limited.
- There are some other aircraft types that have a cameras, such as the Sonia, Wildcat 3P etc. These are not recon a/c. They perform '*tac recon*' when accompanying a raid (7.0.1).
- Recon missions can also be used in conjunction with TF bombardment. Set the aircraft to fly at night with or without a manual target, although it seems to work better without. This will improve bombardment result.

City Attack

Objective: Strategic bombing to damage (or destroy?) the enemies industrial capacity through the use of bombs.

Requires: Day or night. Minimum of 3 ready a/c. Height and range to be set and a city's industrial target selected. It is also possible through '*commanders choice*' to select an industrial type. E.g. Selecting aircraft factory results in the air unit bombing any a/c factory in range.

Restrictions: D/limited N from size 2 AF and above. F, FB and FF cannot fly escort mission at night.

Aircraft: Any level bomber (BM). Some a/c will strafe if low enough. Escorts for protection.

Primary Results: Damage to targeted industry only.

Secondary Results: If *Manpower* is targetted fire(storms) may start, possibly damaging (or even destroying?) any industry in the city.

Notes:

- Only *Manpower* attacks start fires.
- According to the manual only fire(storms) or A-Bombs can destroy industry but I've only ever seen A-bombs do it (17.0)?
- Bombing cities makes their AAA shoot, using up their supply.
- Aircraft may strafe if their altitude is set 1000' or less.

A-bomb Attack (7.2.1.13.3)

This is a special type of *City Attack*. One target is selected but all industry in the hex can suffer damage or be destroyed. In the main official full campaign scenarios only the 509th CG/393rd BS can use the A-Bomb. Using the A-bomb can affect the Allies victory score.

Defensive Mission (7.1, 7.2.1 and 7.2.1.8)

Strictly speaking these are not all defensive mission, what they are is NOT offensive missions as defined by the game.

Some are solely primary group missions, while others are patrols dependant upon the primary mission and/or a/c type.

Patrols are always optional. Whatever level you set (as a percentage of aircraft) are allocated to the patrol and are therefore no longer available for any other mission. Air units can have more than one patrol type, each one reducing the number of aircraft available for other mission or patrols.

CAP (7.4.1)

There's no separate group mission for CAP. This *patrol* is available when a CAP capable air unit is assign to any attack, sweep or escort mission.

Objective: A *patrol* to protect friendly assets against any enemy air activity.

Requires: Height, range and a patrol level to be set. A target is required, manually (recommended) or by AI. Patrol radius is between 0-3 hexes from the target (or own hex) and defines the patrol area.

Restrictions: Day or night.

Aircraft: Any a/c capable of engaging in air-to-air combat. These include F, FB, NF, FF, and some FP.

Primary Results: Drive away, damage or destroy enemy a/c.

Secondary Results: Pilots injured, killed or shot down. Pilots not killed may recuperate or be be rescued..

Notes:

- *Maximum Range* setting controls two things, target range and patrol radius. It is restricted to 3 hexes irrespective of the max combat range of the aircraft (See [Ranges and drop tanks](#) above).
- Target range is the standard distance from base to target and can be anything between 0-3. Selecting a target automatically sets max range to this distance if it's currently less. Not selecting a target automatically sets the target to it's own base but although the *Air Unit Info* screen will not say this.
- Patrol radius is between 0-3 hexes from the target. Any range over 3 hexes is automatically limited to 3 hexes. If you want a smaller patrol radius, hence patrol area, you need to adjust the max range after the target has been selected. E.g. Set to 0 to protect just the target hex.
- CAP tries to maintain 1/3 of the patrol level, round up, on patrol at all times. Losses, damage, but most of all combat will reduce this number. Each raid into a patrol area, per phase or turn, will result in fewer a/c being available each raid. It can get down to zilch.
- Any enemy air activity inside the patrol area is subject to interception. Sometimes patrol areas overlap resulting in the chance of more than one CAP intercepting.
- The further CAP has to fly to intercept the less likely it will.
- Aircraft currently on patrol intercept first, followed by those on standby scrambling once the raid is detected. Later still, other CAP capable aircraft not at rest can also scramble but a scrambled aircraft is no guarantee of engagement. Detection range improves the chances.
- CAP can be engaged by enemy escorts, sweeps and possible even enemy CAP/LRCAP although I think might be rare.
- CAP can engage a raid twice, as it approaches and as it leaves.

LRCAP

There's no separate group mission for LRCAP. This *patrol* is available when a LRCAP capable air unit is assign to any attack, sweep or escort mission.

Objective: A *long range patrol* to protect friendly assets against any enemy air activity, usually at longer ranges than CAP.

Requires: Height, range and a patrol level to be set. Manual target is required. Patrol radius is between 0-3 hexes from the target and defines the patrol area. If you don't set a target LRCAP behaves like CAP.

Restrictions: Day or night.

Aircraft: Any a/c capable of engaging in air-to-air combat. These include F, FB, NF, FF, and some FP.

Primary Results: Drive away, damage or destroy enemy a/c.

Secondary Results: Pilots injured, killed or shot down. Pilots not killed may recuperate or be be rescued.

Notes:

- *Maximum Range* setting controls two things, target range and patrol radius. It is restricted to the max combat range of the aircraft (See [Ranges and drop tanks](#) above).
- Target range is the standard distance from base to target and can be anything between 0 - max range of the a/c. Selecting a target automatically sets max range to this distance if it's currently less.
- Patrol radius is between 0-3 hexes from the target. Any range over 3 hexes is automatically limited to 3 hexes. If you want a smaller patrol radius, hence patrol area, you need to adjust the max range after the target has been selected. E.g. Set to 0 to protect just the target hex.
- The further the patrol area is from the unit's base the less time the unit has over target and the few aircraft over the target at one time. *This appears to range between all to 1/3, with 1/3 being at the aircraft max range!* Aircraft endurance play a huge part in this.
- The further LRCAP has to fly to intercept the less likely it will.
- Any enemy air activity inside the patrol area is subject to interception. Sometimes patrol areas overlap

resulting in the chance of more than one LRCAP intercepting. This can lead to some odd looking interception numbers as patrols closer to their base have more a/c on patrol.

- If an overlapping LRCAP does intercept, it's area will no longer be protected for that phase.
- Only a/c currently on patrol ever intercept. Unlike CAP, there are never any a/c on stby and none ever scramble. I'm assuming they spend most of their none patrol time flying to and from the patrol area. This is why LRCAP produces substantially more fatigue than CAP.
- LRCAP can be engage by enemy escorts, sweeps and possible by enemy CAP/LRCAP although I think might be rare.
- LRCAP can engage a raid twice, as it approaches and as it leaves.

Naval Search (7.5)

Available as a *group mission* or as a *patrol* when a search capable air unit is assign to another group mission.

Objective: To find and improve 'detection level' (DL) of enemy TFs. Individual ships or subs are reported but it is the TF that is plotted. It will also report and attack subs but it is less effective, however a spotted sub is less likely to launch an attack. The minimum effective size is three aircraft.

Requires: Height (5-6K), range and a patrol level to be set. There is no target but a search area is optional using *search Arcs*. *Search Arcs* are in 10° steps (see [Arcs](#) above).

Restrictions: Day or night.

Aircraft: Any patrol, FP, bomber or recon aircraft. Except for recon a/c, all carry an extended bomb load and may attack lightly defended targets, particularly subs.

Primary Results: To find and report enemy TF sightings.

Secondary Results: System, flotation, engine, weapons and fire damage. Ships may suffer critical Results which cause more damage then normal (6.5). Ship that sink can lose leaders.

Notes:

- Like recon you are gathering intelligence but on ships and TFs. Unlike detection of ground units and bases, ships and TF are not automatically detected if adjacent or in the same hex as one of your units.
- Each aircraft flies from it's base along the centre of it's assigned arc to the max range set for the air unit, turning back when it reaches it. If max range is set too far the a/c may not have enough time to get back for an afternoon search.
- If a TF is spotted it is reported in the '*Ops Report*' (5.6) with an estimate of what it contains before possibly turning back.
- The smaller the search area the greater the chance of spotting something. This can be done in three ways:
 - Reducing the range:** The further a search flies from it's base the least likely it will find anything. The manual specifies 300 miles (7-8 hexes) but I work with 400 (10 hexes) (10.0). On the other hand, searches within 5 hexes are much more likely to succeed.
 - Reducing the search 'Arc'** (see *Arcs* above).
 - Increasing the number of search a/c.**
- Search areas are always one less than the range set (A bug?).
- If the search is not given an 'Arc' the AI will randomly search 360° in 10° steps.
- Height plays a large part of a successful search. The consensus is naval search work well at 5-6K. Too high and cloud may obscure the search, too low and your more vulnerable to Flak.
- Primarily search in the direction you think the enemy will approach from. There's no point in searching over a land mass. E.g. You don't get TFs in the centre of Aus.
- Night searches are not as effective but you should not ignore them.

ASW Patrol (7.5)

Almost identical to *Naval Search*. Available as a *group mission* or as a *patrol* when an ASW capable air unit is assign to another group mission.

Objective: To engage, find and improve 'detection level' (DL) of enemy submarines. Individual subs are reported but it is the TF that is plotted (most sub TF only consist one sub anyway). It will also report on ships but it is less effective?

Requires: Height (1-2K), range (half max range) and a patrol level to be set. There is no target but a search area is optional using *search Arcs*. *Search Arcs* are in 10° steps (see [Arcs](#) above).

Restrictions: Day only.

Aircraft: Any patrol, FP, or bomber aircraft. All carry an extended bomb load and will attack any subs found.

Primary Results: Spotted subs are less likely to launch an attack. System, flotation, engine, weapons and fire damage. Subs may suffer critical hits which cause more damage then normal (6.5). Subs that sink can lose leaders.

Secondary Results: Ship sightings.

Notes:

- Like search you are gathering intelligence but on subs and TFs. Unlike detection of ground units and bases, sub and TF are not automatically detected if adjacent or in the same hex as one of your units.
- Each aircraft flies from it's base along the centre of it's assigned arc to half it's max range set, turning back when it reaches it. The premise here is they spend more time search an area. If max range is set too far the a/c may not have enough time to get back for an afternoon search.
- If a sub is spotted and/or attacked it is reported in the '*Ops Report*' (5.6) with an estimate of what it contains and the result of any engagements.
- The smaller the ASW patrol area the greater the chance of spotting something. This can be done in three ways:
Reducing the range: The further ASW flies from it's base the least likely it will find anything.
Reducing the search 'Arc' (see *Arcs* above).
Increasing the number of search a/c.
- ASW patrol range is always one less than the range set (A bug?).
- If the ASW patrol is not given an '*Arc*' the AI will randomly search 360° in 10° steps.
- Height plays a large part of a successful ASW patrol. The consensus is ASW patrols work well at 1K but some say 100', others 2K.
- Primarily search in locations you think the enemy will be, narrows, approach to ports etc. Keep ASW patrols sea areas.

Transport (7.2.4)

Objective: A primary *group mission* to transport supply or ground troops by air. Either can be dropped (by parachute) or moved between AF.

Requires: Height, range and a patrol level to be set. A manual destination (target) is required. Drop range is up to the normal range of the a/c, while AF to AF is half max range of a/c.

Restrictions: Day only, carried out during the transport phase.

Aircraft: Any transport, patrol or level bomber can carry supply. Only transports and patrol a/c can carry troops.

Primary Results: Successful transport.

Secondary Results: None

Notes:

- Even today, transporting by air is not really cost effective. In WW2 it was less so. In the game, transport aircraft are heavily restricted as to what and how much they can carry.
- Perm restricted [R] or temp Restricted (R) units cannot be transported by air. All other ground units can, either in part or as a whole. If the whole cannot be moved by air the remainder is left behind and must find an alternative method of travel. Sea, train or road.
- Each device making up a ground unit has a '*load cost*'. If the *load cost* is >9 then that device cannot be transported by air. Also, non-squad devices >7 cannot be air dropped. In both case they are deemed to be too large for the aircraft.
- To transport one supply point by air requires the aircraft to have a max load capacity of between 1-2000. An a/c with a capacity between 2001-4000 can transport 2 supply points, etc.
- When a destination is selected you have the option to '*pick up*' from the base. A single air unit cannot pick up and drop off in the same turn.
- Para dropping occurs when there's no functioning AF and only then for those ground unit marked with a '*p*' after their name.

Training (16.3.1.3)

Available as a *group mission* or as a *patrol* option but they do the same thing. Selecting *Training* as the primary *group mission* automatically sets general pilot training to 20%.

[Pilot training](#) will be covered in more detail later.

Objective: A primary *group mission* to train pilots for combat. When selected, a secondary *training mission* becomes available, which is optional. What these are depends on the air unit's role and plays a huge part in how pilots are trained.

Requires: Height, range and a patrol level to be set. No Target is needed.

Restrictions: Day or night.

Aircraft: Any air unit.

Primary Results: Improve pilot skills.

Secondary Results: Rest units.

Notes:

- Training flights suffer operational losses like any other mission. You can keep these to a minimum if you set range to zero and keep height at some medium altitude.
- Training flights can also suffer combat losses if their base comes under attack.
- Combat missions are the best way to train any unit.
- Training also a way to rest some or all of your air units.
- Air units training only count 1/3 for counting aircraft at base and don't count at all for admin purposes (9.4.1).

Stand Down/Rest

Stand down is a *group mission*, *rest* is a *patrol* option but they essentially do the same thing. Selecting *Stand down* automatically highlights the *Training* group mission but sets it to zero (0) training. *Rest* sets a % level of pilots to stand down (no missions and no training), the remainder carry on as before.

Objective: Rest pilots from combat

Requires: None for *Stand down*, while *Rest* requires a patrol level. Height, range or target have no effect.

Restrictions: Day or night.

Aircraft: Any air unit.

Primary Results: Pilots recover morale and fatigue. Aircraft are repaired faster and recover from fatigue.

Secondary Results: Carry out [Pilot Training](#).

Notes:

- Any or all of the above primary results can occur at any time but it happens quicker when resting.
- Units regularly given the patrol option will help keep operational efficiency longer, if not indefinitely. Most players use between 10-30% rest but that does depend on how busy the unit is and the tactical situation at a base.
- Any aircraft on the ground when it's AF is attacked is vulnerable, particularly those at rest. You should try and avoid standing unit down where attacks can take place.
- Air units with a primary *Naval Attack* mission can have a secondary *Rest* mission. This is the equivalent of the primary *Stand down* mission except it only occurs when there's no naval attack.
- Air units at rest only count 1/3 for counting aircraft at base and don't count at all for admin purposes (9.4.1).
- If an aircraft and/or pilot is not used in any combat during a turn it is at rest irrespective of any other setting.

Viewing Air Missions and their Results

Only battles are reported as they happen. A **battle** is any form of *offensive mission* with the exception of *recon*.

Reports are generated by all air missions and air related events mostly written reports stored as text files stored in the **save** folder. They can be viewed using any text reader (E.g. Notepad).

Note that these all these things contain other stuff not related to air missions or event, such as surface and land combats.

Combat Animations (F5 key)(7.4.2.1)

Often overlooked but they convey vital information not always available anywhere else. Combat animations appear whenever a battle occurs.

You can turn them off at anytime through the *Preferences* screen or be toggled on/off using the **F5 key**. You can skip running animations using the **Esc key**.

Some of the things shown include:

- Flak burst show a miss, if there's lots of bursts it's heavy flak.
- Flight numbers can indicate the type of attack being carried out. 1-2 aircraft for skip, 1-4 level bombing with 3-4 being the norm.
- Bomb splashes indicating misses
- Bomb hits.
- a/c firing guns during a bombing run indicates it was strafing.
- Fighters not catching fast bombers due to fighters inferior speed (i.e. Claude vs B-17s).
- Fighters driven away by defensive fire from bombers (turrets on bombers acting as force multipliers; no defensive fire from flying patrol boats - probably a bug).

Combat Summaries (F8 Key)(2.6.6 and 7.4)

This is a text report that appears after a battle. You can turn them off at anytime through the *Preferences* screen or be toggled on/off using the **F8 key**.

It contain important info on battle location, combatants (air, sea or ground), CAP effectiveness, altitudes, ordnance, weather, detection level, losses, damage, hits and probably other stuff I've forgotten. It is heavily affected by FOW and is the same for both sides.

Combat Report (C Key)(2.5.1)

Every *Combat Summary* is written to a *Combat Report* text file. It contains all the battles carried out that turn and can be viewed in game (**C Key**), via a **Menu Bar** button or read externally using any text reader (E.g. Notepad). It is stored in the **save** folder along with all the other written reports generated by the game.

You can turn it off through the **Game Options** screen but you are ill advised to do so.

Operational Report (O key)(5.6)

Each side has their own *Operational Report* text file. The manual says it is essentially a written copy of all those messages that flash up at the bottom of the screen. I disagree, it's more to do with info generated by air missions exclusive of battles.

They contain a lot of info on searches, recons, mine laying, pilot info, leader changes and oodles of other stuff.

You can viewed your *Ops Report* in game (**O Key**), via a **Menu Bar** button or read externally using any text reader (E.g. Notepad). They are stored in the **save** folder along with all the other written reports generated by the game and you can't turn them off.

Combat Events (7.0)

A little used text report which is more like the messages that flash up at the bottom of the screen. It cannot be viewed in game, other than watching the messages, and cannot be turned off. Just sometimes there are things in it that you might find useful such as a sudden inexplicable loss of a ship. You might find it blew in harbour for some reason.

Air Unit Management

Together with the pilots, the aircraft are what makes an air unit. Many units enter the game in a depleted state, lacking aircraft, pilots and in some cases leaders. They can also be lost in combat, to accidents or for, pilots and leaders, deliberately moved elsewhere. Pilots require training, leader may not be suitable for their roll and aircraft models might change altering they combat rolls.

All of these things are part of air unit management.

Air Unit Pop Up

You can find thing out about the air unit by hovering over the yellow unit name (5.1.4.2). This brings up the *Air Unit Pop up* with the following info:

- If the unit is scheduled to be withdrawn and the withdrawal date.
- If the withdrawn unit returns and date of return.
- The next scheduled aircraft model upgrade and earliest date for upgrade.
- The date for unit resizing and new size.

The name in the pop up can have one or more of the following bracketed letters after it's name

- [S] unit cannot be reassigned to a different Headquarters.
- [D] use the disband button on the air unit screen to affect the disbandment.
- [W] use the withdraw button on the air unit screen to affect the withdrawal.

Sub units and Detachments (7.1 p161)

Air units can enter the game with one or more detachments. To reattach them the detachment must be in the same

base as the parent. Some special detachments cannot be reattached. Any detachment is in effective a small air group and as such are treated in exactly the same way as their big bothers.

Many units can be divided into smaller component parts during the game. These sub-units are identified as (/A, /B and /C) with the leader going with /A and two temp leaders chosen from the pilots for /B and /C. To rebuild a unit they must all be in the same base. The only restriction placed on sub-units is they cannot resize.

Any air unit divided in any way will have a Unit OOB button showing where all the constituent parts are.

Aircraft Replacements (7.1 and 16.2)

The best place to see and control all things related to air unit management is via the *Air Unit Info* screen although limited info is available elsewhere, such as the *All Land Based Air Unit (A)* and *All Naval Air Unit (N)* lists.

Many air units arrive understrength or lose planes during the game and these must be replaced. The normal source of these replacements is from the *Aircraft Replacement Pool (I)*. *Naval Air Units* at sea can also draw from *Air Replenishment Units*. Obviously these sources have to have replacement a/c in them.

You can manually 'Draw a/c from the pool' singly or take the max number of planes allowed from the *Aircraft Replacement Pool (I)* (Hotkey 3) (5.1.4.4). Alternatively you can set the air unit to automatically receive replacements during the next supply phase via the 'Replacement on' toggle. In this case the AI will attempt to replace as many a/c as it can from those available.

On the turn following any replacement the 'replacement on' toggle changes to 'Replacements delayed'. Hovering over it will tell you how long for. Further, on any air unit the 'Ready' and 'N/Ready' numbers turn grey.

Accept replacements can be globally turned on at the beginning of a scenario via *Game Options* and the *Accept Air and Ground Replacement* toggle but I'd recommend not doing this, you might forget its on, resulting in unnecessary/unwanted replacements at the games start (2.5.6). They can also be turned on via one of the air units lists (e.g. List all land based air units (a)). Filters apply (5.2.2)

Generally a/c received as replacements are 'unready' but they usually repair quickly, but how quickly depends on the number of engines it has, air support and A/F service damage. Many single engine a/c can take a day, 4 engine monsters can take days.

You can also manually choose to send a maximum of 4 a/c to the unit's group reserve. This is done in the top left of the screen where it says 'In reserve'. Reserve planes will automatically be used to replace damaged or destroyed planes.

This is all done with the following provisos:

- There's enough aircraft in the pool (5.1.4.4).
- No more than 12 aircraft can be drawn at any one time.
- A unit can only take replacements once every 7 days.

For **Land Based** air units one of the following conditions must also apply, the first one true taking effect. Note that an airfield must have less than 59% service or runway damage to be eligible.

- The unit is at an AF with more than 20K supplies (No airfield is needed for seaplanes).
- The HQ (most likely an Air HQ) of the unit is within transfer range of the aircraft model and the HQ's AF has more than 20K supplies.
- The Command HQ of the unit is within transfer range of the aircraft model and the HQ's AF has more than 20K supplies.

For **Ships Based** air units one of the following two conditions must also be met, the first one true taking effect. The ship may not have more than 50 flooding or systems damage.

- The air unit is located on a ship and an *Air Replenishment Unit* is within normal range of the a/c being replaced. A/c received in this way are 'ready' immediately, they fly in, and there's no limit to how many can be received in one turn. However, there is a limit to how many can be drawn by one request, 22 for auto and 12 for manual so multiple request attempts maybe needed.

Note: I believe there is a bug to do with the pilots in the *Air Replenishment Units*. If you transfer manually then only the a/c are received. How does a/c fly somewhere without a pilot?

- The air unit is located on a ship in the same hex as a base with more than 20K supplies.

If none apply the AI has one last chance at providing the unit with replacements. This attempt is automatic but entails creating a sub-unit which would then have to be flown to the parent (or vice versa) and merged.

- The unit is within twice the transfer range of its Air HQ or Command HQ and the HQs base has twice its 'supplies required' + the supply cost of the aircraft AND there are 10 + (a/c build rate/2) aircraft in the pool. For the Japanese build rate becomes production rate when production is on.

Failure means no replacements for that turn.

Replacement and Upgrade Supply Costs

Replacement and upgrade cost aren't free. Supply cost are incurred for each a/c is dependent on type.

- 12: Fighter, Fighter-Bomber
- 15: Sea planes (FP/FF), Dive, Torpedo Bomber,
- 18: Night Fighter, Recon
- 30: Light, Medium, Heavy Bomber, Patrol, Transport

Where the cost is incurred depends on which of the conditions was satisfied to allow planes to be added. So if supplies are short in the groups own base, but planes were added due to a well-supplied base with an HQ, then the base with the HQ will provide the supplies.

Returning Aircraft to Pools (7.1)

You can only return individual aircraft back to the pool if they are in a unit's group reserve. A unit's reserve normally consists of up to 4 a/c but on arrival or game start can have more.

Do not confuse this with disbanding or withdrawal of air units.

Upgrading Aircraft (7.1 and 6.2.3)

Historically designers continually fiddled with aircraft models, a tweak here, a different engine there all produced a number of variants or marks of the model. Mostly beneficial, improving speed, performance, weapons, reliability or even use. This is what is meant by an aircraft family.

Sometimes no amount of tweaking will improve the model further a new design being required.

Generally older models need to be replaced with the newer, more effective machines. There's also the possibility that losses may exceed build/production rates, draining pools or the air unit changes its primary role (e.g. F to NF or F to MB). Whatever the reason an upgrade may be needed.

Be warned that a change in aircraft type and often model will result in a decrease in the units experience but not skills. Appears to be between 0-5 but the norm is 3. This represents unfamiliarity with the aircraft.

Note: One exception to this is a switch between F/FB?

Essentially an upgrade is really just a replacement exercise with a change of aircraft model. The supply costs are identical to both but with stricter upgrade conditions applying to upgrades.

Nearly ever air unit (not fragment or sub-unit created in play) and many aircraft models have an 'upgrade path'. The extent of these paths depends on the scenario designer and how you wish to play E.g. PDU on/off).

Air units are not restricted to just one upgrade, there may be many throughout the game, further, when upgrading manually, you can do multiple upgrades during a turn provide if there's aircraft to do so.

Some models were exported but not necessarily all variants so nationalities are important when considering upgrades.

You can view scheduled upgrades in four ways.

- The *Air Unit Pop Up* (5.1.4.2).
- Via the *Aircraft Replacement Pool* and the 'Upgrade to' column (5.1.4.4).
- When upgrades are turned on the *Air Unit Info* screen's upgrade toggle name displays *Upgrade - "aircraft name"* (E.g. 5.2.2).
- This same link name takes you to the *Upgrade* screen that has full info on all possible upgrades for that unit. It is here where you can choose which aircraft to upgrade to when manually upgrading.

Player Define Upgrades (PDU)(2.4.4)

One of the most important decisions players have to agree on at the start of any scenario is whether to turn on *Player Defined Upgrades* (PDU)(18.1.4). This is a realism choice and is crucial, affecting both players but the Japanese in particular. Once the game has started it cannot be changed.

- With **PDU off** the game is played historically using upgrade paths describe below. These paths are usually restricted to the same aircraft type (e.g. Any recon etc), family and nationality.
- With **PDU on** the player is free to upgrade any way he chooses. If the player chooses to follow the upgrade paths described below it costs nothing. If the player deviates it costs PPs. These costs can be heavy.

The Upgrade Paths

There are two standard paths an air unit can follow:

Air Unit Upgrade Paths. These takes president over *Aircraft Upgrade Paths* and follows the historical upgrades used by air units. For example, some air units did not upgrade their aircraft past a certain variant, others changed their the model or even type of aircraft flown (E.g. F to BM, F to NF etc.). There are many reasons for change but it is all factored into the game.

Aircraft Upgrade Paths. Some air unit do not have an *Air Unit Upgrade Path*, instead they upgrade along **family** lines. E.g. A6M3 to A6M3a to A6M5 etc.

Once ether of these two paths come to and end, no more upgrades can occur unless you are playing with PDU on.

IMPORTANT NOTE: *The concept of Aircraft Upgrade Paths or **families** is very important to both sides but for the Japanese one of the most important aspect of the game. It not only affects **aircraft upgrading** but **factory production** and **aircraft research**.*

Turning on Upgrades

For any air upgrade to take place it needs to be on. There are four ways to turn upgrades on:

- At the start of any scenario a game option gives you the choice of turning *Automatic Upgrades for Ships and Aircraft* (2.5.6) on/off. Fortunately you can also turn upgrades on/off during the game but I'd recommend turning it off at the start. Why? Well you might forget its on and automatically upgrade stuff that you don't want upgrading for various reason. (2.5.6)
- Globally, by turning upgrades on/off in any *Air Unit* list. Filters apply.
- Individually via the 'Upgrade' toggle on the *Air Unit Info* screen (7.1)
- Toggling the 'Do not Upgrade/Upgrade Allowed' option in the *Upgrade* screen.

Automatic Upgrades

The AI will automatically upgrade air unit if upgrades are turned on (see *No Upgrades Possible* below).

The AI follows the 'upgrade paths' set by the scenario designer with upgrades taking place during the supply phase provided there's enough a/c in the pool to replace all the unit's 'max ready a/c'. If not, it will on that or some subsequent turn when there is. For this reason automatic upgrades could happen anywhere, at anytime provided all the criteria are met. Aircraft received will be in an 'unready' state.

Automatic upgrades will not happen in a base where the total AV support is less than ½ the AV support required. However, manual upgrades can occur.

Auto upgrades are not available for the first 7 days but you can still manually upgrade.?

Manual Upgrades

Manually upgrades are just an extension of auto upgrades. Upgrades still need to be on. All you need is one (1) new a/c in the pool. (see *No Upgrades Possible*).

The difference is you get to select which aircraft to upgrade to via the 'Upgrade' screen then manually clicking the *Upgrade Now* button on the *Air Unit Info* screen.

Like auto upgrades, a/c received will be in an 'unready' state but because you might not have upgraded all the 'max ready a/c' in one go you'll have to get replacements on that or subsequent turns.

No Upgrades Possible

Even though you may have turned upgrades on there maybe a number of reasons preventing it happening. If the upgrade is not possible the 'Upgrade now' button will not be displayed, instead a greyed out message saying, "No upgrade possible". Hovering over it displays the possible reasons why.

Upgrade Screen

Note: Here I should point out there's nothing in the manual about this screen, or at least I can't find it. What happens depends on PDU, aircraft numbers and auto/manual updates settings. And just to confuse the issue, what the designer decided to do.

You access it from the *Air Unit Info* screen and the *Upgrade* toggle. This link is always there even if there's currently no possible upgrade available. The *Upgrade* screen looks like this:

Name	In pool	J Navy	Availability
G3M2 Nell	46	J Navy	41/12
G3M3 Nell	54	J Navy	42/05
G4M1 Betty	34	J Navy	41/12
G4M2 Betty	53	J Navy	44/01
G4M2a Betty	21	J Navy	44/06
G4M2e Betty	14	J Navy	44/11
G4M3a Betty	15	J Navy	44/11
K11W1 Shiragiku	0	J Navy	45/02
K5Y1 Willow	0	J Navy	45/05
Kikka	0	J Navy	46/01
P1Y1 Frances	42	J Navy	43/11
P1Y2 Frances	65	J Navy	44/11
P1Y3 Frances	56	J Navy	46/01
Q1W1 Lorna	24	J Navy	44/04
Toka	0	J Navy	45/12

Future upgrades
1. G4M2a Betty
2. G4M2e Betty

Upgrade Allowed Done Exit

On the screen you have:

- In the top left the units name, a/c complement, what the next scheduled upgrade would be if any followed by the number of *Political Points* (PPs) you have.
- Under this, on the left is a list of all possible aircraft the air unit can upgrade too with name, numbers, nationality and availability date. If a '+' sign appears after models name to signify that this is the next official upgrade model. This list is always selectable normally displaying *Aircraft Data* screen except when '*Upgrades Allowed*' is on. In this instance a L-click manually selects the new aircraft model.
- For the Japanese only, the dates can change dependant upon their research priorities (see [Japanese \(R&D\)](#)).
- To the right is a '*future upgrades*' list, this time showing the *Air Unit Upgrade Path*. These are not selectable.
- At the bottom are '*Do not Upgrade/Upgrade Allowed*', *Done* and *exit*.

The left hand list will always have at least one aircraft in it but could have many more dependant upon the upgrade path being used and *PDU* setting. If *Aircraft Upgrade Path* is being used there will only one more, with *Air Unit Upgrade Path* there could be many.

If the paths have reached their end there will only be one a/c in it, the current model. The a/c names are colour coded for ease, yellow indicates you can select it and green for currently selected a/c you want to upgrade too. If the model's data is greyed out the a/c is not being produced (e.g. Obsolete or under research).

To upgrade first make make sure '*Upgrades are allowed*' is on, then select any aircraft from the list. It will turn green with a '+' next to the official upgrade. Clicking '*Done*' will take you back to the '*Air Unit Info*' screen were you can either '*Upgrade now*' or leave it to update during the next supply phase as it does with auto upgrade.

'*Exit*' cancels the upgrade process.

If you choose manually choose to '*Upgrade now*' there's one further decision to make, to retain the original path or start a new *aircraft* path one based on the model chosen. Either selection immediately upgrades to the new aircraft with 'yes' resetting the next scheduled a/c upgrade back to the model with the '+', and 'no' selecting the next upgrade due dependant upon the new path being used.

Auto updates always uses the *Future Upgrades* list. If this list is empty then auto updates will stop.

Rules for Upgrading

Air units will upgrade if one of the following conditions are met, with the first one true will taking effect. Note that an airfield must have less than 59% service or runway damage to be eligible.

- The unit is located on a 7+ AF and the base has more than 20K supplies.
- The Air HQ of the unit is within transfer range of the aircraft model and the HQ's base has a 7+ AF with more

than 20K supplies.

- The Command HQ of the unit is within transfer range of the aircraft model and the HQ's base has a 7+ AF with more than 20K supplies
- The air unit is located on a ship in the same hex as a 7+ AF and the base has more than 20K supplies.

The minimum AF size required to upgrade can be reduced by the presence of an HQ. The minimum AF size is one.

- If the Base's Command HQ is within range, the AF size is reduced by the HQ command radius. (E.g. A command radius of 5 would result on only 2+ AF being required)
- Else if an Air HQ is within range of the base, the AF size is reduced by ½ the command radius rounded up. (E.g. An air HQ radius of 5 would result on only 4+ AF being required).

A group may always upgrade in their national home base, subject to the above conditions. It acts as a Command HQ base.

Note: *Can't emphasise enough how important PDU is on how the game plays. It not only gives both side more choice on what aircraft to use when and where but for the Japanese it strongly affects your production and research choices. If you know a particular aircraft is not good, why use it if you have a choice. Some players do not like to use PDU as it is ahistorical but this is a game after all. I use it and always will but it's up to you.*

Air Unit Reinforcements (5.1.4.2)(16.0)

Throughout the game new air units arrive. All info on what, when and where can be in the *Group Reinforcement Schedule (I)(Hotkey 2)* (5.1.4.2). Apart from the new units the list may also contain:

- Air units transferred by rail (7.2)
- Air units that disband or withdraw then return (7.2.2).
- Destroyed air units purchased back by expending political points (16.2).

The only control you have over reinforcements is the ability to vary them at the start of the scenario (18.1.10).

Air Unit Withdrawals or Disbandments (5.1.4.3)(7.2.2)

Collectively all are removals from the game.

The basic idea was a disbanded unit leaves the game, a withdrawn unit comes back later. Wish it was as simple as that as many units can do both!

Some are scheduled by historical circumstances, others by choice due to the game situation, some return, some don't, some remove pilots, some don't, some are affected by removing early, some not. Sometimes you can withdraw when you should be disbanding and vice versa. It can get confusing, hopefully this helps.

Generally:

- You can voluntarily withdraw or disband most air units at any time.
- Air units (apart from fragments) assigned to ships at the start of any scenario are not allowed to disband even if transferred to land. This does not affect fragment nor any air unit assigned to operate on land that is transferred to a ship. They can still withdraw.
- You cannot disband a unit if it has an active detachment. Note: Detachment are only present at the start of any scenario, you cannot create them during game play.
- If the base has less than 20K supply all aircraft are lost indicated by the red withdraw and disband button.
- Air units returning as reinforcements come back in their *National Home Base* with what it left with in terms of aircraft and pilots.
- Returning air units lose any *Perm restricted [R]* status they may have had when leaving unless the scenario specifically keeps them. If this did not happen all returning air units would be stuck in their *National Home Base* and any location attached to it.

Note: *You can't do anything about the loss of aircraft when you withdraw or disband but you can prevent the loss of pilots by transferring them to the reserve prior to disbanding. These a/c losses are not due to combat so no VPs are lost.*

When Carriers Withdraw

When carriers withdraw their aircraft go to the pools, the pilots remain with the air unit on the Carrier. If they come back the a/c they left with have to be replaced.

No Unit Withdrawals (18.1.9)

At the start of a scenario you can toggle on, 'No units will be withdrawn' from the game. This prevents all scheduled withdrawal. Unscheduled removal still applies.

Unscheduled removal

Unscheduled removal is entirely voluntary and is used to reorganisation air units.

Withdrawal temporarily removes air units from play, with the option to return 60 days later. Particularly useful when units are short of their full complement and cannot draw replacement a/c from the pool. There are two ways to withdraw voluntarily:

- If there's another unit at the base of the same type and with fewer a/c than it's full complement (*max Ready a/c + reserve*) then it will 'merge' with it, your choice if more than one. All aircraft join the other unit. The pilots leave with the air unit coming back as reinforcements.
- Else the air unit is removed from the game, returning as reinforcements. Ready a/c are sent to the pool, damage a/c are lost. The pilots stay with the air unit.

***Note:** Air units withdrawn in this fashion AND were originally assigned to a ship return to that ship but the ship must be in a base with at least 20K supply. It does not matter where the air unit was when withdrawn. The unit will remain in the reinforcement queue stuck on 2 until it does. I think that if it returns and would result in the ship exceeding its air capacity the excess is lost?*

Disbanding permanently removes air units from play, with the option to return 120 days later. Particularly useful when dealing with fragments from carriers that have lost their ship. These fragments could be scattered far and wide, out of air transfer range but could be merged with another unit at the base. There are two ways to disband voluntarily:

- Merges with another unit. All aircraft and pilots join the other unit. The air unit is removed from the game with the option to return.
- If it cannot merge, ready aircraft and all pilots are returned to the pools, unready a/c are lost. The air unit is removed from the game with the option to return.

Scheduled removal

Scheduled removals are based on what the air units did historically.

A complete list of scheduled withdrawals or disbandments can be seen in the *Group Withdrawal Schedule (I)* (Hotkey A) (5.1.4.3). The *Air Unit Pop Up*, *Air Unit Info* screen or any *Air Unit list* also shows withdrawal info for that unit.

- *Group Withdrawal Schedule (I)* (Hotkey A) (5.1.4.3). Contains a complete list all air units due to be removed from the game. This list does not show how a unit it will be removed, e.g. a withdrawal [W] or disbandment [D]. You can find that out by bringing up one the *Air Unit Pop Up* or *Air Unit Info* screen.
- The *Air Unit Pop Up* is extremely useful. It tells you all you need to know about removal method (**W**) or (**D**), date, return if any, name change and possible other stuff as well.
- The *Air Unit Info* screen is where you carry out the removal through the *Disband Group* or *Withdraw Group* buttons. Hovering over either brings another pop up tell you what will happen to the unit, aircraft and pilots. If the test is red then all aircraft will be lost.

In the top left corner you will see a message telling you the removal date, a '*' to indicate it's later return and, if it's permanent, a 'P'. If it's in red you have less than 30 days to remove it. You can get further pop up messages, such as 'reform (in a certain number)' of days. Please read all pop up, it helps.

- In any *Air Unit List* a '#' after the units name indicates it is scheduled to be removed.

Failure to remove a unit by its due date results in a PP penalty for each day you fail to do so. On the other hand, remove a unit early and you could gain PPs.

***Note:** A unit can have both an '*' and 'P' after they name. Apparently conflicting info! How can a permanently removed unit return? It's timing. Most disbandments represent the unit moving out of theatre which is permanent. Once that theatre ended that restriction ended so it could return.*

Scheduled (W)ithdrawal represents the temporary removal of the unit from the Pacific, usually to rest and recover losses. You will find this happens regularly to USN patrol units for instance.

Scheduled withdrawal is essentially a standard withdrawal with a date limitations. There are three possible effects:

- Withdrawal late results in lose of PPs.
- Withdrawal early, within 120 days of due date, gains you PPs. The closer you are to the due date the fewer PPs you get.
- Withdrawal in excess of 120 days of due date, gains you no PPs. When they come back the original scheduled withdrawal date still stand.

There are a few units that do not come back when withdrawn, usually detachments but not always.

If the unit is scheduled to withdraw do not disband it if that option is available. It'll take 120 days to come back and you will still need to withdraw it.

Scheduled (D)isbanding represents the unit being transferred out of the Pacific Theatre of Operation e.g. to Europe. The effect are:

- Disbanding late results in lose of PPs.
- All aircraft and pilots are lost and the unit is removed from the map.
- The removal is classified as permanent!

This is where it gets complicated and confusing. As sated above some units return as denoted by a (*) after their name. It's name and when it returns are also displayed in blue, (or is it purple), in the middle of the screen.

If this is the case you can also choose to use an early withdrawal but this **does not** remove the need to disband the unit.

It is entirely possible that the return date after withdrawal could be later than the original disband date. If this happens you must immediately disband it on return or you lose PPs.

***Note:** I don't disagree with the ability to withdraw an air unit scheduled for disbandment, just when. Being able to withdraw a scheduled disbandment based on some scheduled return date makes no sense.*

What you need to do is prevent air units scheduled to disband withdrawing within 60 days of it's disband date, and not base it on the scheduled return date. Remember you can voluntarily withdraw any air unit at any time.

Pilots (7.1 and 16.3)

All ready aircraft need a pilot to fly. Likewise all pilots need a plane. In a group's list of pilots, pilots names are colour code indicating their status as follows:

- **White** - Assigned aircraft
- **Black** - Temp removed from flying.
- **Red** - From the manual. Not enough ready aircraft, so won't fly unless there are any reserve aircraft. This is probably wrong?
- **Red** - Pilot is set to be retained and cannot be transferred. Flying leaders are always retained.
- **Yellow** - *exp*>80 so eligible for TRACOM

Ideally you need the same number of pilots as there are aircraft in the air unit's full complement (*Max Ready a/c + 4 reserve*). A situation that the major Allies can easily maintain, not so much the Japanese in the later stages or even some Allied nations. Manual page 154 covers most

Air units can have more pilots than aircraft, up to a 1/3 more (rounded down). This allows for pilot rotation. For most nationalities it is not easy or even practical to maintain this level, some small nations will even struggle to maintain one pilot per aircraft (or the other way round).

You can get overall view of pilot numbers, *experience*, *fatigue* and *morale* from the *Air Unit Info* screen (7.1). From here you can assign pilots, drawing them into the air unit from one of the five pilot pools. These assigned pilots can be viewed via the *Pilot* screen where you can also release them from active duty.

The *assigning* or *releasing* of pilots is primarily based on pilot **Exp** hence it greatly affects an air units average experience.

New Pilots are added at the beginning of the month based on a nations current pilot replacement rate. The Allies get their pilots for free, the Japanese do not, it cost both manpower and HI points. If there's not enough of either to cover the cost then they are lost.

Apart from a few named pilots, all pilots work their way through training but various aspects of the game can change this. E.g. TRACOM and Japanese early *trainee* release to combat.

Pilot Pools (5.1.4.6, 5.1.4.6.1 and 16.3.1.2)

All nations and, in some instances their services (i.e. IJA and IJN), have pilot pools. Each nation has five pools, some of which are sub-divided into specialties. There pools are:

- **Trainees** - These are unnamed pilots undergoing 12 months of training (*TRACOM*) arranged in four classes. Not normally used as replacements but can be assigned by the Japanese (NOT Allies) if needed.
- **Replacements** - The national replacement pool containing all fully trained but operationally raw pilots. These pilots have not yet been assigned to air units and therefore have no speciality nor name. This pool is not used when *requesting a veteran*.
- **General Reserve** - Operationally trained pilots. Being in the *General Reserve* is no indication as to how good the pilots are. These pilots have already been assign to an air unit and therefore have a name and specialization. Specialization is based on what type of air unit the pilot is assigned to. E.g. fighter, bomber, recon etc.
- **Group Reserve** - Pilots already in an air unit that are currently inactive or in the process of being transferred to it. They appear greyed out with a delay. Once assigned, they specialize in the type of aircraft that group uses. These pilots are only available to other units when you *'request a veteran'*.
- **TRACOM** - Training Command were the most experienced (>80) pilots are sent as instructors. These pilots, like the *'general reserve'*, are separated into specializations. Drawing on them will slow the speed at which your trainee's train. For the US and Japan in particular, investing in 10 or more instructors in each specialization is worthwhile but be warned, instructors specialize, and the predominant one you will get are fighter jocks.

Trainees and replacements have no names or specializations, only the bottom three pools do (5.1.4.6.1).

Specializations

I repeat, other than *'request a veteran'* pilots are not selected based on their *skill* level but on **Exp** within their specialization. Rightly or wrongly fighter pilots gain **Exp** far more quickly than any other pilot so you can have a glut.

Whenever a pilot joins a group he always takes on that groups specialization no matter where the pilot came from. If you do this deliberately it's cross training and can be useful. If you do it through necessity or accident then it's detrimental as the pilot will lose not only experience but lack the needed skills for that group.

To cross trained use *'request a veteran'* and selected a pilot who does not specialize in that units aircraft type.

Note: *I find this useful when selecting pilots for FB. Japan has no FB until mid late 42 and as the pool FB pilots are selected from is 'Fighter' they will predominantly have fighter skills (Air, Def) unless they have also trained for or carried out bombing missions. FB do both and how you initially want to use them should determine the skills they need. If it's bombing then 'request a veteran' with high GrdB. Any with a high Air is a bonus.*

If you select a pilot from 'out of spec' The five specializations and the types of aircraft used.

- Fighter - F, FB, NF, FF
- Bomber - DB, HB, MB, LB, AB, TB
- Patrol - Pa, FP
- Transported - Tr
- Recon - R

Delayed Pilots

Pilots do not instantaneously arrive at their destination, be that unit or pool.

There's a random delay of up to 15 days when transferring to the general *Reserves* or *TRACOM*. Until they arrive you can do nothing with them.

The delay going the other way appears to be between 1-7 days but I'm unsure of this, it might be that I have not noticed longer delays up to 15 days. Pilots transferred in to a unit appear greyed out in the list (i.e. inactive). A delay of one means he's is immediately ready for action. You cannot do anything with delayed pilots until they arrive.

Note that delays also affect air unit leaders.

Pilots Screen (16.3.1.2.5).

All pilots in the air unit are listed. It lists current pilots and those scheduled to arrive within 15 days. The list is also sortable by selecting a column heading. A pilots is either active (white names) or inactive (grey). All pilot names are

clickable.

An* after a pilot's rank indicates he is also the leader of the group. This generally happens when you divide a unit but it could happen at any time. Apart from divided units, using a good leaders as pilots is not a good idea.

From this screen you can:

- View all the individual pilot attributes and skills. *Fat* and *Mor* fluctuate with flying, *kills* and the 13 pilot skills can only improve overtime through flying or training.
- Monitor their training. You can see at a glance which skills have improved, they will be green for the last turn, orange for monthly changes (16.3.1.3) (see [Training](#) below).
- Delayed pilots. You cannot do anything with them until they do arrive.
- Make pilots inactive by sending them to the *Group* reserve (16.3.1.2.6). Inactive pilots are resting and cannot training or carry out combat missions.
- Release pilots to the general *Reserve* or *TRACOM*.

Assigning Pilots (7.1 and 16.3)

There are two main ways to assign pilots, manually or automatically. I never use the latter and I suspect most players don't either. You can toggle between the two in one of the three ways listed below:

- Globally at the beginning of the scenario via the *Game Options* and the *Accept Air and Ground Replacement* toggle. This is the same toggle that allows for auto a/c replacements (2.5.6).
- Globally from any *Air Unit* lists (e.g. List all land based air units (a)). Filters apply (5.2.2).
- Individually from any *Air Unit Info* screen (16.3.1.2).

There's also third way that most player's don't realise and that's through [Air Replenishment Units](#). These pilot replacements are however tied to the replacement a/c and cannot be individually chosen in any fashion.

Auto Accept Pilots (Appears not to be working????)

In auto mode the AI tries to maintain the same number of pilots as there are ready a/c. I don't think it's particularly good at doing it in a timely manner, you're often left short of pilots fortunately you can still select pilots manually even with auto accept on.

The one other single control available to auto accept is the ability to change the experience level of the pilots. The options are 50+, 60+, 70+, 80+ and 90+, Trained through to elite.

For convenience the sources are colour coded,

- **Green:** Enough pilots with **Exp** level.
- **Yellow:** Some pilots with **Exp** level. (Whatever some means?)
- **Red:** No pilots with **Exp** level.

Manual Pilot Selection (16.3.1.2.3)

You assign pilots from the *Air Unit Info* screen singly or in groups. The first group fills to *Max Ready a/c*, the second up to pilot max (1/3 more). How good these pilots are depends upon where they come from.

The pilots can come 'from' any of the five pools using the following criteria (16.3.1.2.3):

- *Trainee* Pool. Only used by the Japanese and then as a final resort. You cannot select directly from this pool.
- *Replacement* Pool. Once assigned they are given a name and specialization. If the Japanese *Repl* pool is empty pilots will be drawn from the *Trainee* pool starting with the most experienced.
- *General Reserve* based on pilot specialization. No other pool is used but selecting out of spec happens if you run out of specialized pilot.
- *TRACOM* based on pilot specialization.
- *Any* pool. Selected by pool, specialization then experience. It uses the *Replacement* pool first, then the general *Reserve* and finally, for the Japanese, *Trainees*. *TRACOM* are never used. The number in parenthesis after pool is the average **exp** for the pilots in that pool.
- In addition you can also request a *Veteran*. A veteran is considered to be any inactive pilot assigned to a unit's *Group Reserve* (16.3.1.2.4) or one in the *General Reserve*. Pilot specialization plays NO part here, all pilots in any reserve pool is available but it is possible to filter and sort the *Veteran* table.

For convenience the sources are colour coded.

- **Green:** Enough pilots in the pool.

- **Yellow:** Some pilots in the pool (Whatever some means?)
- **Red:** No pilots in the pool.

Releasing Pilots (5.4.6.1)

Turning the *Retain* button On prevents a pilots from being transferred out of the group. Pilots set to be retained will be in red. This is always on for flying leaders.

You cannot send pilots back to the *Trainee* or *Replacement* pools. You can send pilots back to the other three.

There are a number of reasons for releasing pilots from their unit or perhaps from combat is more accurate. These include:

- Resting them
- More pilots than aircraft
- You need instructors in TRACOM
- Pilots needed elsewhere
- And others

There are two ways to release pilots:

- Individual selection by L or R clicking on they names. This is the only way you can send a pilot to *TRACOM*. Hovering over a name displays 'pop-up' that will guide you (16.3.1.2.5). Use it.
- Semi automatically using the group release buttons at the bottom of the *Pilot* screen. You can send 1, 5 or 10 pilots to the *Group* reserve (inactive), general *Reserve* or make them *Active* again using the 'To Pool' setting. Who is released depends upon how the pilot list is sorted. You can also set a pilot to be *Retained*

Pilots *Wounded in Action* (WIA) are automatically set to the general *Reserves* returning to their *Group* reserve between 10-60 days later.

Top Pilots (Hotkey 4) (5.1.4.5)

Lists pilots who have shot down enemy aircraft so this primarily show fighter pilots. It also shows they fate.

You can't do a great deal with this screen but you can use it to find high experience pilots for *TRACOM*.

Pilot Skills

Just having the numbers is a small part of an effective air unit. By far the most important factor is the various skills a pilots can have, each one greatly affecting some mission or another. Strictly speaking **Exp** is not skill but a separate trainable attribute.

Whether the various skills are more important than **Exp** is arguable as both play a huge roll. Skills are for a specific mission types while **Exp** is used by all missions and is always trained, but not to same level. Sort of 'Jake of all trades master of none'. **Exp** is also what the game use to assign pilots.

The list shows the skill, mission type that trains it with a brief explanation of what it does.

Exp: The overall ability of the pilot - All air missions. This is not the average of all the other skills a pilot has but a separate trainable attribute. It affects every aspect of any air mission. E.g. operational losses, combat losses, finding, targetting and others, including training. **Exp** can also fall if his plane is damaged or lost due to ops losses. Note that an air unit's overall **Exp** can also fall due to a change of aircraft type but soon picks up.

Air: Air to Air Combat - Attacking aircraft. Offensive air-to-air governing the extent of a pilots airmanship and aircraft knowledge.

NavB: Naval Bombing - Attacking Ships using bombs at or above 2000'. The type of bombing attacking, level, skip or dive doesn't matter.

NavT: Naval Torpedo - Attacking ships using torpedoes from any altitude. The attack profile will make the bomber drop to 200' to release the torpedo and then return it to the set altitude.

NavS: Naval Search - Spotting enemy TFs, the higher the skill the better the details. There's also a chance of an attack being made on one of the spotted vessels, including subs but with less effect.

Recn: Reconnaissance - Recon of enemy bases and ground units, the higher skill the better the details.

ASW: Anti Submarine Warfare - Spotting and attacking enemy subs, the higher the skill the better the details. A spotted sub is an ineffective sub. There's also a chance of an attack being made on a sub. Ships can also be spotted.

Tran: Air Transport - Air transport of supplies and troops.

GrdB: Ground Bombing - Any attack on AFs, ports, ground units or cities using bombs on or above 2000'.

LowN: Low Altitude Naval attack - For naval attacks, including Kamikaze, taking place at 1000' or lower. For non Kamikaze this is also the altitude they will use to fly to the target.

LowG: Low Altitude Ground attack - Any attack other than naval attacks that take place at 1000' or lower. This is also the altitude they will use to fly to the target.

Straf: Strafing - Any attack at 100' using guns. Neither the lowN or lowG skills are used at 100'

Defn: Defending - Self-defence for all aircraft and affects all air missions. Represents dodging flak or defending attack by fighters.

Pilot Training (16.3.1.3)

Stood down (Resting), replacements, reserves and TRACOM pilots, don't train. All other pilots will train with the following observed behaviour,

- Any unit with a group mission other than stand down or with a training level above zero (0) will train.
- Training is best carried out with the same number of aircraft as pilots.
- An Air unit has zero a/c will still train but it's slower than normal.
- Fighter's seem to train slower than bombers, particularly with zero a/c?
- Training occurs on a CV disbanded in port.
- Training on a CVs seems to be slower than land. (Might be because it was disbanded and/or it's also carrier training)?
- Air units being transported as cargo do train (even with a zero training level set) but very, very slowly.

There are three main ways to train pilots, Training Command, a Training Mission and On-the-job training (flying Missions). There's also random chance a skill will improve but this is rare and can be ignored. A Training Mission is the most important method of training it is here that the player has the greatest control.

Having said that, none of it may be possible due to the state of the war, the later it is the more limitations you will face (particularly the Japanese).

Training Command (TRACOM) (5.1.4.6 and 16.3.1.1)

Initially, pilot training is carried out in the Training Command (TRACOM) where new pilots are trained up to their nation's average acceptable experience level deemed suitable for operations (16.2.2). If you do nothing this initial training takes 12 months and is split into the four stages of experience.

When a scenario starts the total number of pilots in training is based on a nation's current replacement rate, times 12. It is then roughly divided into 4 training periods based on experience.

At the beginning of every month a number of pilots roughly equal to the replacement rate leave training (p10-12) and enter the *replacement* pool as fully trained pilots. Roughly the same number advance through the training periods with the exact number of new replacements entering into training p1-3.

You can speed up the training by allocating named pilot with **Exp**>80 to a nation's TRACOM as instructors. I do not know how much effect each instructor has but it manifests itself by pilots skipping a training stage. If anyone does let me know. What you can't do is increase the national pilot experience threshold, it's an average up to that level.

Training Missions (7.1)

Training missions are subject to pilot fatigue, morale loss, operational losses and can stumble into combat situations. For these reasons training is best carried at lower altitudes (5-10K) and have a range of zero. Some skills are height critical and must be trained at those heights (E.g. LowN must be 1K). Both of these settings will keep fatigue at a bare minimum, reducing ops and morale losses. If the base is also out of range of the enemy then combat is also avoided.

There are two types of training mission but both need a '*training level*' set as a patrol percentage.

- A dedicated group '*training mission*' of which one is '*General Training*'. Best employed behind the front lines.
- A *Patrol* option where the '*training level*' trains in whatever the air unit's '*mission type*' is. The rest carry out the mission. Other *patrol* options are available (e.g. CAP, rest etc).

Note: If you don't set a training level an air group is classified as stood down and no training occurs.

Most players seem to agree that 70 is the optimum experience level for fighter pilots. It is slightly lower for bombers (60 maybe) and lower still for other aircraft types but overall the higher it is the better. In practice it can take 3-4

months to train experience to these levels and possibly much longer. (*Catch 22 here, **Exp** is best train operational*).

This level of training may not be possible for any number of reasons so a decent compromise would be **Exp** 50 taking much less time at 1-2 months. HOWEVER, if possible you should make sure their *skills* are at least 60, pushing 70.

The lower a pilot's **Exp** is the faster his skills train overall. All skills train much faster than **Exp**, at least twice as fast (or more) but do slow down the closer you get to 70. It is extremely difficult to train anything above 70, only combat (on-the-job) can really do that, not just assigning mission, but combat.

Conversely, **Exp** trains fastest when skills are lower and as skills slow down the closer they get to 70 the slower **Exp** increases. Use of *General Training* overcomes this it always tends to train in the lowest skills first.

The game tries to prevent **Exp** from outstripping skills. If **Exp** is higher than the best skill by more than 5, then a skill, based on the group's mission, might gain the accumulated points instead.

Changes to skills are highlighted, green for the last turn, orange for monthly changes.

Air units can fly training missions in the AM and PM air phases, gaining both skill and experience points.

***Note:** As an example of training suppose you have a bomber unit and want to train it full time. First look at the list of pilot skills you can see that **GrdB** (Ground Bombing) skill affects any attack mission on an AF, port, ground unit or city using bombs at or above 2000' height. Therefore a training mission set to any one of these mission at 100% training with a height $\geq 2K$ will work.*

What's Trained (16.3.1.3)

Which pilots train is governed by the AI. It picks the lowest skilled pilots for the training missions using fatigue to rotate pilots. You do have some control over which pilots are trained as pilots resting/inactive do not train. The AI does just fine if you set the training at 100% and let it do its thing.

Don't expect a pilot to train in a skill not applicable to his roll. E.g. A Bomber pilot training in **air**-to-air or a fighter pilot to training in **transport**. It won't happen.

Exp is always trained. Which one of the 12 skills is trained depends on the 'training mission' or 'mission type'. A pilot's **Defense** is the only other skill trained no matter the type of training. As it's a skill it trains faster than **Exp**.

Below is a table with all the possible training missions available and what skills are trained dependant upon aircraft type and height.

General training is different. It does what it says on the tin and trains everything but there are limits based on height. Which skill is trained is random because the AI will train each pilot in their poorest skill irrespective of aircraft type. Why do that? Well if the primary skills are already up to 70 but the **Exp** remains low (below 50), the fastest way to train **Exp** (without sending them on combat missions like CAP) is to do 'General Training'.

Skill Training Table

x - means it can't fly that mission type

* - depends on weapon load (torp/bomb)

N - Either naval skill.

Type	Alt	AF	Port	Naval	Ground	Sweep	Escort	Recon	Search	ASW	Trans	General
F	100'	S,D	S,D	S,D	S,D	S,D	A,D	x	x	x	x	A,S,D
F	1k	LG,D	LG,D	LN,D	LG,D	A,D	A,D	x	x	x	x	All Ex N,G,S
F	2k+	G,D	G,D	NB,D	G,D	A,D	A,D	x	x	x	x	All Ex NT,LG,S
FB,	100'	S,D	S,D	S,D	S,D	S,D	A,D	x	x	x	x	A,S,D
FB,	1k	LG,D	LG,D	LN,D	LG,D	A,D	A,D	x	x	x	x	All Ex N,G,S
FB,	2k+	G,D	G,D	NB,D	G,D	A,D	A,D	x	x	x	x	All Ex NT,LG,S
DB	100'	S,D	S,D	S,D	S,D	x	x	S,D	S,D	S,D	x	A,S,D
DB	1k	LG,D	LG,D	LN,D	LG,D	x	x	R,D	NS,D	ASW,D	x	All Ex NT,G,S
DB	2k+	G,D	G,D	NB,D	G,D	x	x	R,D	NS,D	ASW,D	x	All Ex NT,LG,S
MB	100'	S,D	S,D	NT/S*,D	S,D	x	x	S,D	S,D	S,D	S,D	A,NT/S*,D
MB	1k	LG,D	LG,D	NT/LN*,D	LG,D	x	x	R,D	NS,D	ASW,D	T,D	All Ex N/NB*,G,S
MB	2k+	G,D	G,D	N*,D	G,D	x	x	R,D	NS,D	ASW,D	T,D	All Ex N*,LG,S
LB	100'	S,D	S,D	S,D	S,D	x	x	S,D	S,D	S,D	S,D	A,S,D
LB	1k	LG,D	LG,D	LN,D	LN,D	x	x	R,D	NS,D	ASW,D	T,D	All Ex NB,NT,S
LB	2k+	G,D	G,D	NB,D	G,D	x	x	R,D	NS,D	ASW,D	T,D	All Ex NT,LG,S
Rec	100'	x	x	x	x	x	x	S,D	S,D	x	x	S,D
Rec	1k	x	x	x	x	x	x	R,D	NS,D	x	x	All Ex N,G,S
Rec	2k+	x	x	x	x	x	x	R,D	NS,D	x	x	All Ex N,LG,S
Tr	100'	x	x	x	x	x	x	x	x	x	S,D	S,D
Tr	1k	x	x	x	x	x	x	x	x	x	T,D	All Ex NT,G,S
Tr	2k+	x	x	x	x	x	x	x	x	x	T,D	All Ex NT,LG,S
Pa	100'	S,D	S,D	NT/S*,D	x	x	x	S,D	S,D	S,D	S,D	A,N*,S,D
Pa	1k	LG,D	LG,D	NT/LN*,D	x	x	x	R,D	NS,D	ASW,D	T,D	All Ex N*,G,S
Pa	2k+	G,D	G,D	N*,D	x	x	x	R,D	NS,D	ASW,D	T,D	All Ex N*,LG,S
FP	100'	S,D	S,D	S,D	S,D	S,D	x	S,D	S,D	S,D	x	A,S,D
FP	1k	LG,D	LN,D	LN,D	LG,D	A,D	x	R,D	NS,D	ASW,D	x	All Ex N,G,S
FP	2k+	G,D	GD	NB,D	G,D	A,D	x	R,D	NS,D	ASW,D	x	All Ex NT,LG,S
FF	100'	x	x	x	x	S,D	S,D	S,D	S,D	ASW,D	x	A,S,D
FF	1k	x	x	x	x	A,D	A,D	R,D	NS,D	ASW,D	x	All Ex N,G,S
FF	2k+	x	x	x	x	A,D	A,D	R,D	NS,D	ASW,D	x	All Ex NT,LG,S
TB	100'	S,D	S,D	NT,D	S,D	x	x	S,D	S,D	S,D	x	S,D
TB	1k	LG,D	LG,D	NT,D	LG,D	x	x	R,D	NS,D	ASW,D	x	All Ex NB,G,S
TB	2k+	G,D	G,D	NT,D	G,D	x	x	R,D	NS,D	ASW,D	x	All Ex NB,LG,S

Some observations.

- The lower the skill the faster it trains.
- Experience, **Defence** are always trained, with **D** training much faster than Exp. Compared to skills, exp is slow. Better obtained through combat missions.
- There are only three height ranges, 100', 1K and >=2K.
- There is no difference between AF, port or ground training. With the exception of PAs; if one of the three is available for a mission they all are. PA can't fly ground.
- 100' is the only altitude available for **Strafe** training.
- 1K is the only altitude for **Low Ground** training.
- Naval is the only mission available for **Naval Torpedo** training.
- For Kamikaze air group the skill required is **Low Naval**.
- Night training follows the same rules as day training. Bear in mind that not all day missions are available at night. This is reflected by the training.

Tip: Don't train under the night setting.

- Weapon load (torp/bomb) affects trained skills. Don't expect a MB carrying torps (available or not) to train in ground bombing and vice versa.
- General training is the tricky one.

Training Groups (16.3)

Some groups can be defined as '*Training Groups*'. Not to be confused with groups on a training mission. These '*Training Groups*' are dedicated solely for the purpose of training pilots and cannot fly any other mission, except rest. However, the Japanese can convert these units to Kamikaze.

A '*Training Groups*' can be loaded with up to 3x the normal pilots complement. If instructors are also present (any pilot with more experience than the trainees) training speeds will increase.

On-the-job Training (7.1)

On-the-job training is carried out whenever an air unit flies any air mission and is the fastest but not the safest way to train as it nearly always involves combat. On-the-job training doesn't apply to pilots set to rest.

Generally **Exp**, **Def** and an applicable mission skill are trained but not all missions are equal as supply, transport and training missions yield less experience. **Def** is only ever increased when the unit is actively engaged in combat, not just flying.

Here's what's important but there is some randomness involved in on-the-job training. I'd ignore the vagaries, look at them as a bonus.

- Hitting something boosts training speed, killing something even more so.
- Only active pilots train. Inactive or those at rest don't train.
- Experience gain is possible on any mission.
- Only primary skill relevant to the mission are trained.
- A mission has to be flown and not just set. No fly, no training.
- Don't expect patrol levels to affect training. They can but the affects vary.
- Setting a *Training* patrol trains for the primary mission.

Affects of the Air Unit on Pilot Training

The overall experience and skill of a unit, its leader and other pilots in the unit can '*rub off*' on other pilots. Hence there is a random chance at the end of every day that pilot exp and skill will improve.

Secondary Training

I stated above not to 'expect a pilot to train in a skill not applicable to his roll'. There are many occasions where an air unit, hence the pilots can have more than one roll. Some of these situations are listed here:

- Any bomber can naval search. Training them to search is almost essential for DB and TB on ships but also very useful for land based a/c.
- Same as above for ASW but not as critical?
- Bombers used as transports
- Fighters used as FB
- And other.

Do not neglect this secondary training requirement.

More Training Tips

It is best to use the restricted, obsolete and air units in quite sectors, e.g. Japan in the early days, Manchuria, USA, India etc, as dedicated training groups. Set them to 100% full time training, height between 5-10K, range to zero.

- Most players seem to agree that 70 is the optimum experience level for fighter pilots. It is slightly lower for bombers and lower still for other a/c type but overall the high it is the better. In practice it can take 3-4 months
- A typical training regime for a fighter unit could be something like this. First select *escort training* until you get the **air** rating up between to 65-70. Then move it to *sweep training* at 100 ft until you get **def** to between 65-70. Lastly, put them on an escort mission with cap at 100% until you get **exp** to 70.
- Be careful that units under full training they kept away from a front line.
- It takes about four months to get a squadron fully trained.

- Once a pilot gets into the 70's across the board take him out of a training squadron and put him on the line.
- Training past 70 is very, very, slow so don't try and do it. Combat will do it for you.
- Use soft targets for training. I.e. Those were losses will be minimal. Ideal for improving bombing skills.
- Don't let **fatigue** build up, rotate pilots to the group reserve for a rest.
- Training with a full complement of aircraft is best.
- Adding more pilots than planes does take a little longer to train all of the pilots, usually about a 1/3 more time.
- Put an experienced pilot in with any unit with a training mission. It will help increase training speed.
- Try and keep a *general Reserve* of at least 2 months.
- Although you should not train pilots in a roll their air unit or aircraft type is not suitable for, you can retrain them. Just reassign them via the '*Request Veteran*' option
- A good source of trained pilots are the *Air Replacement Units (VRF)*.

Aircraft (7.0)

Aircraft are assign to air units, one aircraft model per air unit. The game does not allow a unit to have more than one aircraft model. To fly an aircraft needs a pilot.

When aircraft fly or through lack of maintenance (AV support) (7.4.2.7.1) there suffer fatigue. Too much fatigue and they are grounded until repaired. The only place to see a/c fatigue is the *Air Unit Info* screen.

a/c can also be damaged (7.4.2.7) and destroyed due to combat (7.4) or accidents (Ops losses) (7.4.1.14).

Standing down (resting) a/c or air units is the quickest way to repair them, the larger the a/c the longer repair takes.

New aircraft are received as replacement throughout the game, replacing those lost (16.2).

Aircraft Types (7.0.1 and 5.4.1.1)

All told there are 14 aircraft types in the game each with their own attributes suitable for the roll they play. Probably teaching gran to suck eggs here but these types are:

Fighters - Employed to shoot down or damage other aircraft. Speed and manoeuvrability are their main assets but don't ignore firepower for sheer killing power and climb rate when scrambling and interception. Ideal for CAP, LRCAP, sweep and escort missions.

As most can also carry a limited bomb load they can perform most bombing missions and strafe if height allows. Although many fighters, especially late war models, are good at this their main job is air-to-air combat.

Fighter Bomber - Same as fighters but slightly worse at air-to-air, better at bombing. For FBs durability is also important.

Night Fighter - Not as most think the night time equivalent of a fighter although they can be used as such. Their job is to combat night bombing. Nearly all NF have radar to find targets with large firepower (mostly cannon) to damage or destroy them.

Any F or FB can be used at night but generally lack radar and have less firepower. In the early days that's all you've got. Don't ignore them.

Dive Bomber - A small bomber designed to dive straight at their target. The DB height is between 10-15K, outside of these heights the level bombing profile is used. They usually carry a single, medium sized bomb mounted on the centre line. Naval attack is their main mission but can be used for any bombing mission and they are well suited in naval search and ASW rolls.

Using them for any mission other than naval attack it is wise to put them at a height were the level bombing profile is used or you will suffer unacceptable losses.

Level Bombers (BM) - Not a specific type of a/c but a class designed to operate in formation attacking at a level altitude. This altitude can be any height dependent upon model but players often restrict the heights at which the various aircraft types can operate. This is mainly because the game does not model the historical attack results accurately enough for their liking. The heights I've used here reflect what I think, but it's up to you and you PBEM partner to discuss. The higher they fly the fewer losses occur but accuracy suffers and vice versa.

Heavy Bomber - A level bomber used for any type of attack mission but generally deployed against bases, night or day. They are the biggest bombers available with the largest payloads and range, usually attacking at altitudes above 10K although earlier HB could fly lower. HB can operate at any height. You can also use them as supply transports and in the naval search an ASW roles.

The game allows you to fly HBs at any height which makes them good ship killers at low altitudes in the game. HBs were not designed for this purpose and for that reason players restrict their height to above, say 5K. Others think banding their use in naval attacks altogether is the way to go. I disagree, why! Well the USN did use HB as patrol a/c so banding them would prevent their use.

Medium Bomber - Smaller, faster and with less payload than HB otherwise they operate like HBs but at altitudes between 2-10K.

Light Bomber - The smallest of the level bombers with the least payload. They are not necessarily faster than MBs but can operate without penalty from airfields as small as level 2. The majority of LBs are Japanese; the Allies tended to use FBs in this role.

Attack Bombers - A special type of medium bomber designed to fly at altitudes at or below 5K. When flying at this height their attack profile allows them to skip bomb and strafe using their forward facing guns. They can be used at any height like all bombers.

Recon - The eyes in the sky. Designed to gather intelligence on enemy units thus improving their 'detection level' (DL). Recon planes are fast, long legged aircraft with minimum, often no, weapons using speed to escape. Some have cameras improving the quality of their recon by up to 3 times. Recon a/c are by far the best a/c to use for recon missions. Recon a/c can also carry out naval search missions. It is also appears they can find TF in targeted bases.

Note: *The manual states (7.0.1) '...it is possible to order specialized Allied Fighter units to perform "Tac Recon"'. There is no such thing as a 'Tac Recon', just recon missions. It should read something like 'Aircraft with cameras will carry out 'Tac recon' during any other mission type they take part in.'*

Transport - Dedicated a/c designed to transport troops and supplies. Load capacity limits how much they can carry but no transport can carry any device >9 in size. It won't fit in the a/c.

Patrol - A versatile a/c primarily designed for maritime operations, (naval search and ASW). All are sea planes, some amphibious with mostly exceptional endurance (even the older types had relative to their age). As well as maritime ops they can also carry out Recon, AF, port and naval attack missions plus transport missions. You will often find yourself using them as transports to remote locations with access to water. They have longer legs than standard transport a/c.

Float Plane - The most versatile a/c in the game. Apart from transport they can do most things, but being able to doesn't mean they are particularly good at it, more of a hindrance really but pilot training helps here. Their primary purpose is ASW and naval search, probably in that order. Range is much shorter than patrol a/c but they are equally as effective in their primary roles.

Float Fighter - Fighters with floats. Not as good as LBA due to the massive float stuck on the bottom but they are versatile. Only the Japanese use them.

Torpedo Bomber - Designed to carry torpedoes, releasing at 200' and at a close range. They tend to be bigger and slower than DBs but a torpedo that hits often does far more damage than a bomb. When not carrying torpedoes they carry bombs and can therefore carry out most bombing missions. Naval search and ASW are their other roles. If you throw in recon it makes them an extremely versatile a/c.

The basic generalisations are these:

- The faster and more manoeuvrable the better, particularly fighters.
- The larger the bomb load the more effective the bombing.
- The more guns the better the chance of shooting down the enemy.
- The more modern the a/c the better it will be.

Aircraft Ordnance (5.4.1.2 and 15.4)

The ordnance aircraft carry varies tremendously depending on type, role and mission. Some carry nothing more than a camera, some nothing, others are arm to the teeth.

While guns are a constant for a particular a/c model, anything else that they can carry, such as bombs, torpedoes, drop tanks etc isn't. The reasons for change are:

- Lack of supply
- Lack of facilities/support
- Type of target/mission
- Range - Essentially the further you fly the lighter the load out and but the more fuel you need, this includes the use of drop tanks.

The detailed affects of all these things has been covered early.

You can see these load outs, including the effects of range in two places. The *Aircraft Database (5.4.1)(Hotkey D)* and the *Air Unit Info* screen.

Aircraft Performance Parameters (5.4.1.1)

The basic performance parameters for each aircraft can be found in the database and consists of:

Max Speed - Essential for all good fighter types but is also good for aircraft in general. Helps catch or escape from the bad guy etc.

Cruise Speed - The most economical speed for an a/c. Along with an a/c fuel tanks it determines endurance. Any form of combat usually entails an increase above cruise, reducing endurance.

Max Altitude - How high it can get. Higher than the bad guy is usually good for fighter types but high bombing is less accurate.

Climb - How quickly it can get to a set altitude. Good for scrambling a/c.

Manoeuvrer rating - Another essential for all good fighter types but is also good for aircraft in general. It helps a/c avoid or inflict hits on other a/c. Some a/c types, those that can engage in air-to-air combat, have more than one Mvr rating depending upon height.

Durability - Indicates how good the a/c is at taking damage without being destroyed. It's also an indicator as to how much maintenance an a/c is likely to need.

Armour - The ability of the a/c to absorb hits without damage.

Endurance - A measure of the length of time an a/c can stay in the air on one full internal tank of fuel flying at cruise.

The game does not use this value to calculate any aircraft model ranges. It is used under the hood for stuff you have no control over so for game play purposes it can be ignored. <https://www.matrixgames.com/forums/viewtopic.php?p=3944347#p3944347>.

You need to be careful here as the database gives this measure in minutes, while *Aircraft data* accessed through *Air Unit Info* screen gives it in hours and minutes for a round trip and, for fighter capable a/c, allows for time over target.

Load - A measure of how much the aircraft can carry in terms of normal fuel and ordnance. In game, if you bother to calculate the weight of all the devices (weapons and bombs etc) say on a bomber, it never comes to the stated load capacity of that a/c. (For a B-26 this difference is 600lbs). I'm assuming the difference represents fuel as adding drop tanks or flying at extended range reduces the ordnance carried, usually stuff in bomb bays and cargo holds.

Gun Value - A measure on how effective the weapons are based on calibre and number.

There are also six more important aircraft data parameters used in the game (5.1.4.1.1).

Max Range - The max possible distance the a/c can fly at cruise. a/c carry no ordnance at this range.

Normal Radius - The range at which an a/c can fly carrying max ordnance and engage in combat before returning to it's base.

Extended Radius - Further than normal range but comes at price with reduced load out. Fuel replacing the ordnance.

Engines - How many engines it has. Three type, are single (1e), twin (2e) and four engined (4e) a/c. The number of engines is a direct indicator on how large an aircraft is thus where it can be operated from. It's also a direct indicator on it's service rating. For the allies these engines are generic to the a/c, for the Japanese they are modelled and have to be researched and produced.

Service Rating - Along the durability an indicator on how much maintenance an a/c requires. The larger the number the more it needs. This is directly related to the number of engines but also reflects reliability and how difficult it was to fly. A 1e service rating can never be less than 1, a 2e's less than 2 and 4e's less than 4 but all can be more to a max of 5.

Availability Date - The historical date the a/c entered service. This is fixed for the Allies but can change for the Japanese dependant upon how much research they put into each model. Allied a/c can also have an availability end date. This does not apply to the Japanese due to their ability to produce any researched a/c at anytime.

Aircraft Production (5.1.4.4 and 5.3)

The Allies have fixed historical aircraft production. It comes in two forms, those produced by *Aircraft* factories in the Pacific Theatre and those being imported from elsewhere as replacements. The imported rate is fixed by the scenario. All aircraft received go to pools of reserve a/c. You cannot change Allied aircraft production in anyway but you can stop factories producing.

The Japanese have much more flexibility in what and how much they produce but all are produced through on map factories. There are two parts to any Japanese aircraft, its airframe and an engine(s). *Engine* factories build the engines, *Aircraft* factories builds the airframe and then *assemble* the finished aircraft. While you can have a pool of aircraft and engines there is no such thing as an airframe pool. If you do not have enough engines for the number of airframes being built then the aircraft is not assembled (e.g. built). All aircraft built go to pool of reserve a/c. Japanese production rates can change.

Production Factories (13.3.2.4 and 13.3.2.5)

Factories have a maximum monthly production capacity. For factories to actively build anything they need have some *undamaged* capacity and have access to enough *Heavy Industry (HI)*.

If these two criteria are met and it passes a random check, a factory has a chance of producing at least one a/c per day. The formula for building is (fractions are rounded down):

(Number Of Undamaged Aircraft Factories + random number between 1 and 30) divided by 30

30 factories therefore gives you best chance of building one a/c per day although there is some very small chance that these numbers are rounded up or down. E.g. Producing 29 or 31 a/c per month but 30 is the norm.

The HI costs depend on how many engines there are. Each engines cost 18 HI while each airframes cost 18 x the number of engines each. So, for example the HI cost in build a 4e aircraft is:

$4 \times 18 = 54 \text{ HI (for the four engines)} + 4 \times 18 \text{ (for the 4e airframe)} = 108 \text{ HI.}$

As you can see HI costs are large. It's not something the Allies need worry about but it's a huge consideration for the Japanese.

Controlling Production (13.0)

For both sides it is possible to turn off factory production, cease repairing it or prevent a factory upgrading to a new model. The Japanese can also expand capacity and change what is being produced. All these things can be controlled via the base *Production* buttons (13.1) or through the global *Industry Management* screen (*J key*)(13.2).

Industry Management screen (Hotkey J)(13.2) is a vital screen for the Japanese, just useful for the Allies. The overall status of your sides industry is shown. It has various filters including *Engines*, *Air* and *R&D Air*.

Production Buttons (13.1) are visible at the bottom of the screen when any base with an industry is selected. These buttons control production at that base only. There is no engine button for the Allies.

Industry Management screen (J key)(13.2)

Factory names can have three colours:

- **Yellow** - Production factories
- **Grey** - R&D factories. Japanese only.
- **Blue** - R&D factories close to (within 30 days) production or are ready now (if **Prod** is off). These factories also have a percentage in brackets indicating research progression towards the due date.

Hovering over any factory name show either pool numbers or research progression.

All factories show their size as (damaged)/undamaged with an extra due date for R&D factories. There's also three production control toggles. These toggles are:

- **Upgrd** - Prevents a factory automatically upgrading to a new model when one becomes available. Only works for production factories.
- **Repair** - Allows factories to automatically repair. You can't manually repair anyway, so off is the same as saying no repairs will take place.
- **Prod** - Allows production factories to build stuff. For R&D factories in prevents their conversion to production factories BUT only if all the R&D factories of the same model have it set to off.

There maybe a second list on the right showing all the possible model changes available to you. This is only relevant when you click on a factory name.

For the Japanese only, all factories are clickable allowing production changes.

Production Buttons (13.0)

Applicable to that base only. They have less info and are laid out differently but essentially they function in the same way as the **J key**.

Damaging or Destroying Production (17.0)

Factories are located in bases so any attack on the base has a remote chance of damaging them. The real damage is done through *City Attack* missions against the factory, reducing production rates.

Heavy fires can rage out of hand, becoming a firestorm but the only way to start a fire is to bomb the manpower (the city itself). A firestorm can cause damage to any industry in the same base.

The manual says only a firestorms and A-bombs can destroy a factory, players say only A-bombs. I've tested it and seen nothing that suggest a firestorm destroys industry????

Destroyed industry cannot be repaired, instead you have to re-expand production. Victory points can be awarded for damage and destruction of a factory.

Damaged industry can be repaired given enough supply.

A captured *Aircraft* factories convert into *Vehicle* factories (13.6). I believe a capture engine factory just shuts down?

Repairing Production

Each damage factory point needs to be repaired before it produces anything. This is the same for both sides but it will affect the Japanese far more than the Allies as they have far more controllable industry and less overall supply.

Each base needs a minimum of 10K present before repairs can begin with each repair point costing 1K.

Japanese Production (13.3.2.4 and 13.4)

The Japanese can expanded capacity and/or change what a/c or engine model is being produced by a factory. Availability dates can also change dependant upon research. You are advised to save the game before making any changes.

Realistic R&D (2.4.8 and 18.1.8)

Normal play only allows production factories to build current models. Similarly, R&D factory can only research future models. **Realistic R&D** is a game realism option available at the start of a scenario that allows production factories to revert to R&D factories or vice versa. This can have a big impact on the game but most players leave this on I think.

Expanding Production (13.2)

When you expanded capacity it is initially damaged and requires repair before it starts producing. To expand you can:

- Use a base *Production* button then click *Expand*. This will double the current size.
- Use the **J key** to access *Industry Management* screen. Clicking on a factory brings up a set of expansion buttons in the top right corner. These buttons give you far more control over how many factories are expanded on each click. It's depends on how many factories there are to start with but basically the buttons are: an increase by 1, 10 or double.

It is not free to expand. It cost 100 supply, 10 HI and 10 manpower per expansion point. Supply comes from the base, HI and manpower come from the pools. If you cannot expand the factory the most likely reason will be lack of supply at the base.

In addition to the expansion costs there are also repair costs.

Example: The overall supply costs to expand a factory by 10 is 10×100 (for the expansion) + 10×1000 (for the repair) = 11K. Plus 100 HI and 100 manpower. As the Japanese play you need to expand but you need to aware of the costs.

Changing Production Model (13.2.2.4)

If **Upgrade** are turned on factories will automatically upgrade along family lines when a new variant becomes available. It might not happen immediately, but it will.

You can manually upgrade at anytime. Mostly done along **family** lines but there's little to stop you changing to any a/c or engine model other than a supply and repair cost after the change.

The process is the same for either method, *Production* button or **J key**. First click a factory name then, from the list on the right select the new model. This list will only display models the factory can be changed to. There is no cost to change model. Its a simple process but there are two thing you need to be aware off:

- The effects are instantaneous. You cannot cancel it or go back so beware.

- Changing to any model other than that next model scheduled by the *Aircraft Upgrade Path* results in an approx. 1/3 loss of factory capacity (rounded up) and ALL the remaining capacity becoming damaged.

This loss of production plus the need to repair it is one of the constraints placed on the Japanese player to prevent the willy-nilly changes to production. Supply in particular being critical.

Example: In Scen #1 the A6M2 is scheduled to upgrade to the A6M5. If its available selecting it from the list results in no loss of production. If you decide to change to any other aircraft model, even one in the same family, all production stops until repaired plus the factory's capacity is reduced by a 1/3. E.g. a (0) x 30 factory becomes a (21) x 0 factory.

Engines

Engine factories work in exactly the same way as a/c factories with these important points:

- Engines are tied to an aircraft model and cannot be changed.
- An engine model can be used on more than one a/c model.
- You need to produce enough engines of the type required for all the produce a/c models that use it. If you don't then the aircraft is not built.

Scrapping Aircraft (13.8)

There's an automatic process where excess aircraft are scrapped for resources. Basically there is a threshold for each aircraft that is 10 x the required number of aircraft needed to fill out air units using the a/c.

Research and Development (R&D)

Both sides get new aircraft models throughout the war, the Japanese also get new engines. If you don't do anything these new models always arrive on the first of each month according to their due date. For the Allies R&D is fixed, only the Japanese have any control over R&D.

Japanese (R&D) (13.4.1.1)

First and foremost, you do not need to research anything, I repeat all new aircraft and engines automatically arrive on their scheduled due date. All Research and Development (R&D) does is speed up research.

Once the due date arrives the new aircraft or engine model can be produced. You now have to make a decision to either turn the R&D factory into a production factory or to carry on using it to research something else.

All this is part of your R&D plan and is one of the most vital things the Japanese player needs to do at the start if they want to keep anywhere close to parity with the Allies.

I have no intentions of telling you what to research, there's enough discussion on this subject in the forum. I will repeat what I've said twice already about the basic generalisations of new models.

- The faster and more manoeuvrable the better, particularly fighters.
- The larger the bomb load the more effective the bombing.
- The more guns the better the chance of shooting down the enemy.
- The more modern the a/c and engine the better it will be.
- plus
- The concept of aircraft **families**.

There's a very good explanation of what's going on here. <https://www.matrixgames.com/forums/viewtopic.php?p=4184332>

R&D Factories

The basic concepts of an *R&D factory* is the same as a *Production factory* except it produces *research points* that go towards developing new aircraft or engines and there's no HI point cost involved. There's still the same random factor which means the ideal size of each factory is 30 which virtually guarantees 1 research point per day per factory.

(Number Of Fully Repaired R&D Factories + random number between 1 and 30) divided by 30

Only **FULLY** repaired *R&D factories* produce *research points* and it takes 100 research pts to advance a models due date one month. Any excess is carried over.

Note 1: A very basic rule of thumb. 3x30 factories will approx advance the due day every month. This effectively halves the period until due. E.g. 6 months turns into 3.

Note 2: *It's been stated that having more than a size 30 R&D factory, particularly those with multiples of 30 (60, 90 etc) increases the chance of generating a research point for each multiple. I've test this using v26b and did not see any increase.*

Once research gets to within one month of a due date the factory's name turns blue and remains blue for a very short period after the due date. Further, the number of research points towards the due date is shown in brackets after the aircraft's name. Prior to due date its highlighting the model is due and will start producing once the research points are >100. After the due date it's giving you some grace time (1 or 2 days usually) for any changes you wish to make as an R&D factory.

Note 3: *I originally thought the grace time was 1 day but it appears not. It's appears to be the number of research point over 100 that triggers the switch. I'm unsure of the exact numbers but I can say that with 2 R&D points generated per day it's 1 days grace, with 4 it's none, it switches to production immediately.*

Conversion to Production Factory

OK you've researched it now you want to build it. This is the tricky part and I'm assuming **Realistic R&D** is on.

Unless you intervene the R&D factory will convert to a production factory and once it does, it cannot be converted back. You may wish to research something else so you need to stop this conversion. This is done by turning off **Production** toggle via the *Production button* or **J key**.

With it on the factory moves from R&D to production on it's due date, it's name stays blue and remain like that for one days, thus giving you one days grace to decide, production or research. If you leave as it is it goes into production and turns yellow.

If conversion is stopped it's name remains blue and that one days grace turns into an eternity. It produces nothing because production is off and no new research as it's not been changed. You can now choose what you wan to do with it at you leisure! Convert it to production by turning **Prod** on, change its research model or even change it's production model. What ever you do the factory becomes active again and it's name changes from blue to yellow.

Warning: *All R&D factories researching a model need to have the **Prod** toggle set to off for this to work. Leaving one on will result in all those R&D factories converting to production.*

Expanding R&D (13.2)

The process of expanding an *R&D factory* is the same as for expanding a *Production factory*.

Changing R&D Model (13.2.2.4)

The process of changing an *R&D model* is the same as for changing a *Production model*. The effects of not choosing wisely can be much more severe however. Three thing combine here:

- It's the concept of upgrading along **family** line again.
- Only **fully** repaired *R&D factories* generate research points.
- Repairing an *R&D factory* now has a random element to it and it is this that causes the problems. For be this simulates the uncertainty of research.

This random factor only applies to aircraft R&D factories. If there's enough supply engine R&D factories always repair one per day.

I do not know what the formula is for this I can old relay the approx. effects. The further away the due date is the longer it takes to repair an R&D factory.

For instance *repairing a size 30 factory where the due date is 6 months away takes approx 1-2 months to repair, for one due 18-24 months away it could take up to a year. Go beyond this, say 4 years and your likely to be looking at 2-2½ years or more*

None of this matters if you upgrade through the **family** lines.

Personally I never expand a factory with a due date greater than two years. I don't think there's much benefit plus your not using supply up to expand it until you need to. It's your choice but do it wisely.

Engines R&D Bonus

Engine R&D work in exactly the same way as it does for production models with one very important addition.

Having more than 500 engines in a pool boosts aircraft R&D for those models that use it. This bonus adds 1 research point to each **fully** repaired aircraft factory. It does come a cost however, one engine is used for each bonus point

added. The overall effect is to double your research speed.

Research Example

What to research?

Using scen #1 and the family tree for the 'Zero'. It starts with the A6M2 (already being produced) then to A6M2 Sen Baku (2/44), A6M5b (6/44), A6M5c (10/44), and finally the A6M8 (8/45). All are good aircraft but the last A6M8 is best of all and that should be your aim, to get to it as soon as possible.

The Sen Baku has the same performance values as the Zero but is not due until early 44 years, 2 and bit years after start of the war. The difference between them is the Sen Baku is a FB carrying bigger bombs but with a small drop tank. Ranges are the same.

Here's the problem, if you examine the R&D factories currently available at the start none of these aircraft are being research. So what are your options, should you change some R&D factories to research the Sen Baku, go directly for the A6M8 or any of the other a/c in the chain? I say no to all, there's a much better option that will get all the available aircraft early.

There are other variants in another leg of the family tree. This leg starts with the A6M3 (6/42) then to A6M3a (12/42), A6M5 (8/43), A6Mb (6/44) before it merges with the other chain at the A6Mc (10/44). Like the other leg, all the aircraft are better than the A6M2. The A6M3 being marginally better, it's faster with less range. The main problem with this model is it cannot operate from a carrier.

Looking at the current R&D factories you will notice there are already two factories researching a/c from this leg, the A6M3 and the A6M5.

The A6M3 (6/42) is due in 6 months and as it ultimately ends with the A6M8. I'd put all my Zero research into this a/c even though it's not carrier capable. That actually doesn't matter much as all the following a/c are.

How long does it take?

I'd invest in the very minimum of 6 x 30 factories. If your die rolls go well they should all be fully repaired in about 2 months leaving 4 months until due date. These 6 factories will approx advance the due date every 15 days (twice a month or a quarter of the time) resulting in the A6M3 arriving sometime in March, 3 months early. At the very most you should have get it April.

Lets assume it's the worst case and it arrives in Apr. The next a/c (A6M3a) in the chain is schedule for Dec, 8 months time. All your factories are repaired so they go straight into research. Doing the maths (8/4) results it in the A6M3a arriving in June, 6 months early.

Going further, the A6M5 (8/43) is now 14 months away. Using the same research it should arrive $14/4 = 3\frac{1}{2}$ month time, Oct/Nov 42. You do the maths for the rest.

The Alternative

Lets assume you invested your research in A6M5. I will probably take until Sep 42 before all the factories are repaired and although you'll still get it early it won't be until Dec or even Jan until you do.

Other Considerations

This is the bast case scenario and I've not even considered the engine bonus but that's not likely to have much affect on the M3 or M3a as you've got to build the engines, engines that are also required for production.

I've also not taken in account the need to possibly convert some of the research factories to production.