How Carriers Fought - Carrier Operations in WWII

Indian Ocean Raid

by Lars Celander, updated September 19th 2019

About this text

This is a bonus chapter to my book How Carriers Fought - Carrier Operations in WWII. The book has accounts of all major carrier battles, using them as the basis for the combat model which is then used to evaluate different tactics and strategies. The Indian Ocean Raid did not make it into the book as no carrier battle actually occurred and no useful statistics was provided by it.

Nevertheless, this very first carrier encounter of the war is still of considerable interest to the history of carrier operations in WWII. As we shall see, it is actually one of the most interesting carrier encounters of the entire war, both tactically and strategically.

Special thanks to Rob Stuart, undoubtedly the foremost expert on this operation, for both raising my awareness of it and in helping me finding and correcting my mistakes.

Introduction

Before the war, Admiral Yamamoto said that "for the first six months, I will run wild!". This is exactly what the Japanese were doing in early '42. The question was where to go and how far. One alternative was to go west, cut the British off from India and the Middle East and link up with Nazi German forces coming down through the Caucasus. A more immediate plan was to capture Ceylon (today Sri Lanka) which would make it difficult for the British to maintain supply lines to the Middle East and Egypt.

The Japanese ultimately decided to settle for a more modest objective, to knock out any British naval forces in the Indian Ocean. To minimize the danger of being defeated in detail, all available fleet carriers were kept together and used as a single force. This would secure the western flank of the Japanese Empire without consuming too much time and

resources. The original reason for entering the war was to capture the oil fields of the Dutch East Indies and these now had to be defended against incursions.

Singapore surrendered on February 15th. Java fell on March 9th. The Andaman and Nicobar islands had been occupied and the situation in Burma was deteriorating. Now the British worried about Ceylon falling, including the port of Colombo and the main RN base at Trincomalee. This would seriously threaten Allied lines of communication with this part of the world. At a minimum, they expected a Pearl Harbor type raid on both of these bases. An additional worry, even worse, was that the Vichy French in Madagascar would hand over their port facilities to the Japanese, like they had done in French Indochina (today Cambodia, Laos and Vietnam). Basing submarines there, the Japanese could cut Britain off from both India and the Middle East. Madagascar could play a role similar to that of Malta in the Mediterranean. A huge area was threatened, with major geo-strategic implications.

Ceylon itself was an important source of rubber, not to mention tea. It should be noted that Middle Eastern oil was *not* a factor. At this time, Britain got most its oil from the US. The Middle East, including the large Abadan refinery complex, was not a major source of oil, mainly used to supply local forces and to a lesser extent, Russia.

Not much was available to defend the area. The German battleship Tirpitz was at this time tying down some major units of the RN, including carrier Victorious and fast battleships King George V, Duke of York and Renown. After the loss of Prince of Wales and Repulse, these were the only remaining fast battleships in the RN. Given the importance of both Atlantic and Russian convoys, they had to be guarded against attacks by the Tirpitz and other heavy units of the Kriegsmarine. The relatively short distances to the convoy routes, combined with the generally bad weather of the North Atlantic and Arctic Ocean, made the task resource-intensive.

The British had built an Eastern Fleet around fast battleships Prince of Wales and Repulse with nominal support provided by the small and slow carrier Hermes. The Prince of Wales and Repulse were sent in without proper air cover and were sunk by Japanese land-based bombers. As the Indomitable and later the Formidable arrived in Eastern waters, they were then left without suitable battleship escorts.

Unbeknownst to the Japanese, the RN had prepared a fallback base at Addu Atoll on the southern tip of the Maldives island chain. Its main function was to serve as an anchorage where to refuel from tankers. The British arrived there in August '41 and at this early stage of the war, it had a makeshift base for Catalina and Sunderland flying boats but not much else. Its isolation made it unpopular with sailors ("Scapa Flow with palm trees") but provided a degree of secrecy not possible at Trincomalee. Anti-colonial sentiments were running high in India and Ceylon. Some Sinhalese even hoped to be liberated by the Japanese, as shown by the mutiny on Cocos Island in May '42. It might matter that the Sinhalese are predominantly Buddhists, as are the Japanese. It was assumed that there were people willing to report to the Japanese what ships were at Trincomalee.

British commanders expected, through radio intelligence, a Japanese task force of two fleet carriers and associated escorts. They also knew from the raid on the Italian naval base of Taranto, that a night torpedo attack could be devastating.

Unbeknownst to the British however, a much more powerful Japanese task force, actually all the fleet carriers available, the entire Kido Butai, was now coming for them.

Forces Available and Logistics

The Japanese Striking Force had five fleet carriers, battleships Kongo, Haruna, Hiei and Kirishima, heavy cruisers Tone and Chikuma plus light cruiser Abukuma and nine destroyers. The carriers had the following air groups:

Zuikaku	18 Kate, 19 Val, 18 Zero
Shokaku	19 Kate, 19 Val, 18 Zero
Akagi	18 Kate, 17 Val, 19 Zero
Hiryu	18 Kate, 18 Val, 18 Zero
Soryu	18 Kate, 18 Val, 20 Zero

These numbers represent aircraft operational when the operation began based on primary sources. Most sources state higher numbers for the air groups, the above is what remained after losses during preceding operations. Kaga is missing, having struck a reef in March and forced to return to Japan for repairs.

Tone and Chikuma carried four or five floatplanes each, a mix of Jake monoplanes and slower Dave or Alf biplane floatplanes. These were used extensively for searches, augmented by floatplanes on the battleships (typically one or two Dave or Pete biplanes) and on Abukuma.

The Japanese Malaya Force had carrier Ryujo (with 12 Claude fighters and 14 Kate torpedo bombers), heavy cruisers Chokai, Kumano, Mikuma, Mogami, Suzuya, light cruiser Yura and eight destroyers.

The Japanese also had six submarines in the area (I-2, I-3, I-4, I-5, I-6 and I-7). They were a major concern for the British but mostly being used to watch known British bases, ended up having little influence on the battle.

The British Force A ("Fast Force") consisted of two modern armored fleet carriers, battleship Warspite, heavy cruisers Cornwall and Dorsetshire, light cruisers Emerald and Enterprise plus six destroyers. The Warspite had just arrived in the area after a major refit on the US West Coast. After the loss of Prince of Wales and Repulse a few months earlier, the Warspite would have to do, despite being old, slow and single. The two carriers had the following air groups:

Formidable	21 Albacore, 12 Martlet, 1 Swordfish
Indomitable	24 Albacore, 12 Fulmar, 11 Sea Hurricane, 1 Swordfish

These numbers represent aircraft operational when the operation began based on primary sources. The Fulmar is a two-seat long-range fighter. The Sea Hurricane is single-seat short-range fighter. The Martlet is a long-range single-seater but was in short supply. The Swordfishes were used for target towing as the Albacores present could not operate the available target towing gear.

Albacore biplane torpedo bombers were well suited for night operations. Being slow is actually an advantage as the pilot has more of a safety margin. Training is everything for night operations. It was reported as adequate for night operations but not for night torpedo attacks. In fact, any night torpedo attack would have been their first (Woods, p159).

The RN faced mostly modern battleships with good deck armor, German or Italian, against which dive bombing was not very effective. No dedicated dive bombers were carried. The Fulmars could carry bombs but without dive brakes, they could not really dive bomb with any accuracy. Albacores could do some light dive bombing, using the high drag of their biplane wings as dive brakes.

The Formidable was of the same design as class leader Illustrious and her elevators were too small for Sea Hurricanes. The Indomitable was built to an improved design with an added half-length hangar below the main hangar allowing her to carry more planes. Her forward elevator was also larger and a Sea Hurricanes could fit on it despite not having folding wings (if turned sideways).

The British Force B ("Slow Force") had the four old battleships Resolution, Ramillies, Royal Sovereign and Revenge, light cruisers Caledon and Dragon, Dutch light cruiser Jacob Van Heemskerck plus eight destroyers. The R class battleships were in poor conditions and their crews were not well trained. Their maximum speed was only 17-18 knots and endurance was limited to about three days due to a shortage of fresh water for the boilers. The old and slow carrier Hermes was also assigned to this force but from the 4th she was berthed at Trincomalee for a refit and had disembarked her aircraft. At this point in the war she was being used to escort convoys and her twelve Swordfish mainly performed ASW duties.

Command and Control

The Striking Force was commanded by Vice Admiral Chuichi Nagumo. The Malaya Force was command by Vice Admiral Jisaburo Ozawa.

Force A was commanded by Vice Admiral Sir James Somerville flying his flag on the Warspite. Force B was commanded by Vice Admiral Sir Algernon Willis flying his flag on the Resolution. Somerville was in overall command. As it happened, he was promoted to full Admiral on the 6th.

RN carriers and battleships all had air warning radar. These were either Type 79, 279 or 281, all with a range of 60-110 miles if of quite different designs. Hermes was an exception, she was supposed to have the less powerful Type 286 air warning radar but this set appears to not have been fitted in time before her loss. Dorsetshire was one of very few ships fitted with the Type 290 air warning radar, a model originally intended for destroyers and other smaller ships. The Type 290 had serious problems with the reliability of the transmitter and was soon replaced in general use by the Type 291. Dorsetshire and Cornwall, had they survived, would have been fitted with the 281 as were Emerald and Enterprise in late '42 and '43 respectively.

ASV II radar sets were fitted to four (Mackenzie, p108) of the Albacores on the Formidable. None of the Albacores on Indomitable had any ASV fitted.

The ASV II had a detection range of 15-20 miles against medium-sized ships, 40-45 miles against major warships and 60-70 miles against a landmass. These ranges apply to typical installations on multi-engine patrol planes. On the Albacore, the transmitter used Yagi antennas on both sides of the fuselage, pointing roughly 45º outboard. The receiver used Yagi antennas on the wing struts, also angled about 45º to either side. With smaller and less powerful antennas, the range of the ASV II as installed on Albacore should be shorter. On the other hand, in this particular battle, the target was a whole formation of major warships which should be possible to detect at a relatively long range. An effective range of 40 miles to each side is estimated for purposes of ASV searches done during this battle.

Image 1: An Albacore on board Formidable in November 1942. The antennas for the all-important ASV II radar are clearly visible. The transmitter antenna is on the side of the fuselage and the receiver antenna is on the forward wing strut.

Little is known about the performance of the ASV II on the Albacore as well as the performance of the individual sets and the exact search techniques used in this particular battle. The only source found, with any possible direct insight into the matter, is from an

observer flying in one of the Albacores on the Indomitable during this battle. He gives the range of an ASV II as 40 or so miles against a sizable ship (Mackenzie, p108).

A standard fan-shaped search pattern consists of an outbound leg, a short dogleg and an inbound leg. Searching for a formation of major warships, flying out to 180 miles and with a dogleg of 80 miles, each ASV II set can then cover a sector of about 45º.

The path flown is not the same as the area covered. The area covered will actually stretch out to 220 miles (from the starting point) as a search to the side continues while flying the dogleg. The path actually flown was almost never a simple triangle as some allowance had to made for the movement of the carrier while the search mission was carried out.

The maximum speed of the Albacore is typically given as 161 mph and cruising speed as 116 mph. A search mission of 180+80+180=440 miles will then take about four hours.

Both RN carriers had capable fighter direction. This increases the usefulness of fighters but without any need to defend a point target here, the selection of aircraft carried showed an emphasis on torpedo attacks.

Japanese carriers did not have any air search radar and only the most primitive fighter direction. Nagumo most likely knew of the British use of ASV airborne search radar as the Germans at this time were starting to fit radar warning receivers to their U-boats (first operational installation of a Metox was in August '42). It was only much later that ships of the IJN would be fitted with these receivers. Japanese aircraft never had anything that could detect or track any British radar sets, shipborne or airborne.

Visibility and Wind

On April 5th 1942, at latitude 3ºN and longitude 80ºE, using the GMT+6 time zone, sunrise was at 0638 and sunset at 1848. Nautical twilight began at 0552 and ended at 1935. Moonrise was at 2238 and moonset at 0955. The moon was slightly less than full and waning. The moon would not be useful for landings after dusk but was close to ideal for operations deeper into the night.

The path of the moon was along the latitude of about 17ºS. For an observer at 3ºN the moon will be at an altitude of about 70º when at the longitude of the observer. At a time of a possible torpedo attack of about 0000, the moon had not yet reached that longitude, was still rising and to the southeast of the battle area. The rising moon would be at a height suitable for silhouetting the targets. To keep the targets 'up moon', attacking torpedo bombers should best come in from the northwest. This does not mean that carriers have to be northwest of their targets, the bombers could well attack from a different direction than they approached on. Still, if the carriers are northwest of their targets, the approach becomes simple and the enemy task force will be sighted against the moonlight. The obverse is also true. Coming in from southeast and searching for their targets, pilots would be peering into blackness while the target sees the incoming planes as small dots backlit against the moon.

The month of April is in the period of changeover from the winter monsoon, with winds out of the northeast, to the summer monsoon with winds out of the southwest. The weather

is hot and humid. Most days are clear and sunny with scattered cumulus clouds, as shown in the photos from the battle. Underneath the cloud base, visibility is excellent, as reported from the battle. The altitude of the cloud base is not in any of the reports. It might have varied but appears to have been high enough to not interfere with scouting, which is quite normal. Pilots generally stay below cumulus clouds as the convection inside them can make flying uncomfortable, not to mention the lack of visibility. They are useful to hide in however and this happened frequently during the battle, an often life-saving tactic. These cumulus clouds can grow to cumulonimbus with showers or even thunderstorms. This happened during the battle but had only minor influence on it. With all the humidity in the air, there can be some haze or light stratus or altostratus cloud cover at night. Visibility is still fair to good and the effect on scouting should be minor. These layer clouds typically dissolve in the morning.

Wind was calm or very light and mainly out of the southwest. The flat sea meant optimal conditions for an ASV radar to detect ships at long range as returns from waves ("clutter") did not mask returns from ships.

Air Operations

From March 31st to April 2nd, when the moon was full, Somerville had maintained an ambush position south of Ceylon but no enemy force appeared. He then retreated to Addu for refueling. He sent Dorsetshire and Cornwall to Colombo. Dorsetshire had machinery problems that needed work and Cornwall was scheduled to escort a convoy to Australia.

At 1630 on April 4th, Somerville received a report that a Catalina at 1605 had spotted the Japanese carriers about 360 miles south of Ceylon, heading for what appeared to be a flying off position. The Catalina ventured close enough for accurate identification and paid for it by being shot down by Zeros but not before it had radioed a sighting report. The survivors from the Catalina were picked up by the Japanese and taken prisoners. What was not in the sighting report, was the size of the enemy fleet. Somerville would continue to believe that he was facing a two carrier raiding force.

When the sighting report arrived, Somerville was refueling at Addu. Force A had arrived at 1200 and was halfway through refueling. Force B had arrived at 1500 and would not be ready to sortie until early the next day. The ambush was on again but Somerville had been caught badly out of position. It would take a full day to reassemble his force and get back into position.

Somerville sortied with Force A at 0015. He could have sortied immediately but that meant without Emerald and Enterprise. He decided to wait until they too had finished refueling. Dorsetshire and Cornwall were ordered to rejoin Force A, leaving Colombo at 2200. Force B sortied at 0710 and would catch up as best they could.

The Japanese knew they had been spotted but not where Somerville was. As a precaution against a possible ambush, the Kate torpedo bombers were temporarily re-armed with torpedoes. When the danger had passed, they were again armed with bombs for use against land targets.

At 0600 on April 5th the strike against Colombo started launching. The strike consisted of 53 Kates, 38 Vals and 36 Zeros, 127 planes in total.

At 0650 the Indomitable launched four Albacores to search eastward. He was still too far west and nothing was found. One of the Albacores did spot an enemy floatplane, flying its own search pattern.

Nagumo also sent out a morning search. He used floatplanes to search to southwest and northwest. Two Daves from Kongo and Haruna searched out to 170 miles and three Alfs from Tone, Chikuma and Abukuma searched out to 250 miles.

At 0715 Colombo was attacked. It was a nice quiet Sunday morning, just as at Pearl Harbor. Having been alerted by the sighting report the previous day, the defenses were mostly ready. The harbor had been emptied and AA batteries were manned and ready. However, the local air warning radar installation failed to detect the incoming attackers and the defending fighters were caught on the ground, or at an altitude disadvantage, suffering heavy losses.

At 1000, Nagumo's search found the Dorsetshire and Cornwall as they were heading south to rejoin Somerville, having hurriedly left Colombo the night before. Nagumo knew from the morning strike that the enemy fleet was not at Colombo. He also knew that his attack had not been a surprise. He had a second strike ready in the hangars. It was initially armed for use against ships but not seeing anything of the enemy, at 0853 he had ordered the bombers to be rearmed for land targets. Having sighted the cruisers, at 1023 Nagumo gave the order to again rearm his bombers for use against ships.

At 1145 a strike of 53 Vals took off from Hiryu, Soryu and Akagi.

At 1340 the attack began. Using available cloud cover, they had worked they way into a good attack position and were not spotted until they started their dives. Attacking was in threes with about seven seconds between them. Both Dorsetshire and Cornwall were hit by upwards of 80% of the bombs, either as direct hits or very near misses, in what was probably the best dive bombing of the war. The attack was over by 1350. At 1355, the order was given to abandon the Cornwall. The Dorsetshire was already gone. The attackers appears to have not been picked up by the Type 290 radar on Dorsetshire. Both ships were sunk without being able to successfully radio a warning.

The progress of the attack was seen on the radar sets of Indomitable and Warspite, 84 miles the the southwest. Something was clearly out there. Somerville had serious misgivings about what had happened. Without hearing anything from either Dorsetshire or Cornwall, it was hoped that they were fine and just maintaining radio silence. As they never showed up for the rendezvous, it was gradually realized that they had been sunk.

Nagumo did no attempt to search for other British ships in the area. Had a search been done in the direction the cruisers were heading, as dive bomber pilot McClusky did at Midway, they would have quickly found Somerville's carriers. On the other hand, McClusky knew something was out there while Nagumo did not. He also did not know they had a base at Addu so there was little reason to suspect anything interesting coming from that direction. Madagascar was in Vichy French hands so the nearest RN base in that direction would be South Africa or maybe Kenya, both too far away to have any immediate role. He assumed the British fleet would be, if not at Colombo, then at Trincomalee or perhaps at Bombay, if at all in the area. After all, cruisers like Dorsetshire and Cornwall

were often used to patrol British trade routes against commerce raiders. As an example, the cruiser HMAS Sydney had recently been sunk by the raider Kormoran west of Australia.

At 1411 the Indomitable launched four Albacores to search to the north and east out to 200 miles.

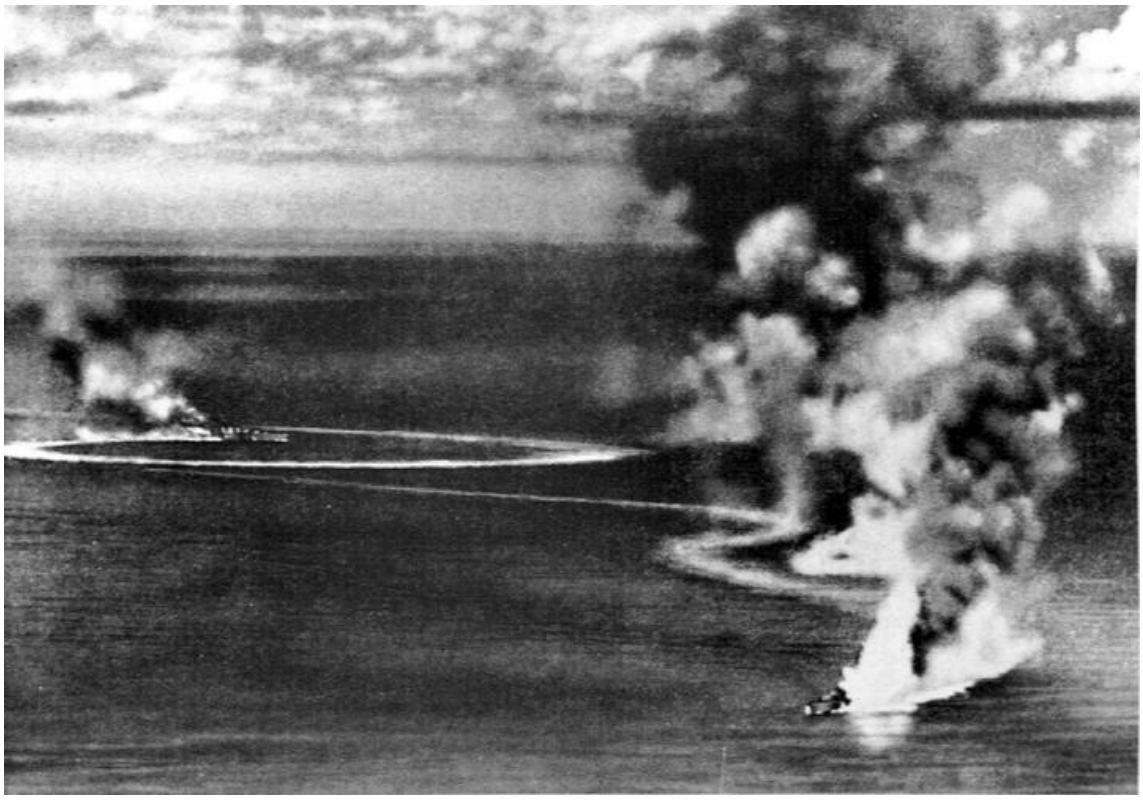

Image 2: HMS Cornwall (left) and HMS Dorsetshire (right) under attack and sinking. When attacked, they were both heading 185º at 27.5 knots with Dorsetshire leading. The attacking dive bombers set up their attack to be downwind. Attacking without a crosswind, bomb drops will be more accurate. With the wind out of 230º, the attack was then done on a heading of 50º. Both ships reacted by turning hard to starboard, into the attackers, steepening their dives and possibly forcing an overshoot. As they turned, the attackers were now coming in from directly ahead, simplifying accurate bombing. The sun was at 282º, at an altitude of 75º, for some defenders it then appeared that the attackers were coming out of the sun. As can be seen from the wakes, Cornwall tried to turn full circles which is an effective defensive maneuver against dive bombers. Dorsetshire began doing the same but likely had to avoid a collision with Cornwall.

At 1530 the Japanese main formation changed course. The strike against Cornwall and Dorsetshire had finished recovering. Nagumo had been steaming southwest for most of the day but he now turned southeast to withdraw and refuel. After having done a major attack, Nagumo could expect to be located and counterattacked. A suitably timed major course

change followed by a disappearance into the night was a good exit strategy. He did not miss the opportunity to allow his opponent to make a mistake.

At 1522 one of the Albacores reported that it had found the wreckage of the cruisers. At 1620, this Albacore was spotted by the Japanese and was shot down at 1628 without having time to send a report. Another Albacore sighted two Japanese carriers at around 1600, was attacked and damaged at 1604 but managed to send a report that Somerville received at 1655, given the location of those two carriers but no speed or heading. The carrier forces were now only around 120 miles apart, well within striking distance.

Nagumo was soon informed that a carrier type aircraft had been shot down. It was known that this type of aircraft was also operated from land bases, but at 350 miles from the nearest land base, it was suspected to have come from an enemy carrier. Either way, it did not really matter as it was now simply too late to launch a search that could be recovered before nightfall. The moon would not be up until later that night. Should a search be launched, it should have been done at around 1330-1400, as Somerville did. The very short range search that could have been warmed up and launched would not have found Somerville. Had anything been found, nothing could be done anyway. Business was closing for the day. Unless you ran a shop that was open at night.

At 1700 Somerville received a warning from radio signal intelligence at Colombo that an enemy force, of unknown position, might be heading southwest. If this was the force located at 1600, it was now heading directly in his direction. At 1726, Somerville changed course to south. He had been steaming east most of the day but did not want to bump into anything. This course change had not been planned. He broke radio silence and sent a message to Force B behind him, and to the Dorsetshire, still hoping they were afloat somewhere, to also change southward, with the intention that they should support Force A at daylight.

At 1815 a damaged Albacore landed on the Indomitable, having found its way back to the task force despite it having done an unplanned course change. This was shortly before sunset. The crew was quickly debriefed.

At 1800, with more details arriving at 1817, Somerville on board Warspite received reports from the Indomitable. He was again informed of the location of the enemy fleet (at 1600) and that it included two carriers but now also that they were heading northwest, not southwest as indicated by the 1700 radio intelligence report. At 1817, he changed course to northwest, intending to steam parallel to the enemy and maintaining a suitable strike distance. Force B was radioed the new coordinates for the dawn rendezvous. A night torpedo attack was prepared.

When the Albacore sighted the enemy carrier formation, they were indeed heading northwest. What the crew of the Albacore did not know was that they they had spotted the Hiryu and Soryu just as they were making a series of small detours, away from the rest of the task force. The reason for these detours remains unknown but it might have been to recover the strike that sank Dorsetshire and Cornwall or to launch/recover CAP or perhaps both. Either way, by 2200 the Hiryu and Soryu had caught up with the main force. Somerville quite naturally assumed that Nagumo would stay on the northwesterly course reported.

The information Somerville received was entirely trustworthy. The problem was that the direction reported was utterly wrong. The delay in delivering the information meant that he had limited opportunity to act on it with another search before the information became outdated.

It appears that Somerville at this point still did not know that he was facing five fleet carriers and not just two. The attack on Colombo was reported to involve 75 aircraft (it actually involved 127 aircraft) which is a bit on the high side for two carriers but these numbers are often wrong. It was yet known what exactly had attacked Cornwall and Dorsetshire but the sinkings could well have been done by just two carriers. The sighting of Hiryu and Soryu, and not much else, appeared to confirm a two carrier force. Signal intelligence was feeding him reports of a larger force but signal intelligence had been wrong before, such as on the timing of the raid. The night torpedo attack was still on. Somerville knew that a night torpedo attack was the RN forte, perhaps its only advantage against the Japanese, and he wanted to use it. Had he known what he was actually playing with, he might well have decided that the attack was too risky for him as the sole guardian of the Indian Ocean.

At 1930 a single (Wallace, p86) ASV-equipped Albacore was launched from Formidable to search between 345° and 030° out to 180 miles. This search protected against bumping into enemy surface forces as well as tracking Nagumo as long as he did not make a major course change. Unfortunately for Somerville, that is exactly what Nagumo did after having been sighted earlier in the day. He was now steaming at 24 knots in a southeasterly direction, the exact opposite of what Somerville assumed. Nagumo avoided the search pattern.

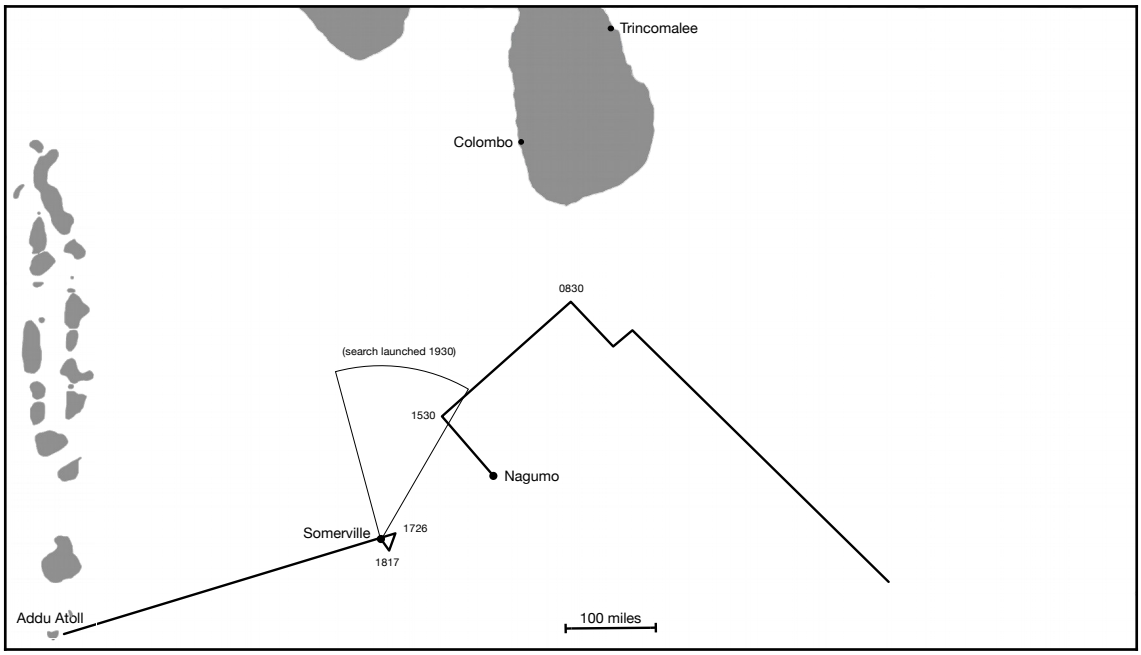

Illustration 1: Situation at 1930 on the 5th, showing search launched.

The search was launched more than an hour after Somerville received the report. This is somewhat late but is still a reasonable delay given the need to analyze the situation, decide on a search, design a search pattern, ready the planes and warm up the engines. With more urgency it might be possible to reduce this time by half an hour. On the other hand, if Nagumo was moving at the typical cruising speed of 18 knots, it would only have meant a difference of 9 nautical miles. It should also be remembered that moonrise was at about 2238 and it was easier for a plane to land back on the carrier when moonlight was available.

Somerville continued northwest during the night. Further ASV-equipped searches were sent out from 2100 to 0600, covering a sector between 20° to 80° out to 200 miles. The 9+ hours it took to search this sector points to available ASV-equipped Albacores flying more than one search mission during the night. This makes sense given the very limited number of ASV sets available. Furthermore, it has to be assumed that one ASV-equipped Albacore had to be on hand to act as a guide in case a strike was launched, either on deck or in the form of a soon to return search plane.

Despite these efforts, nothing was found. Nagumo had slipped away to the southeast, slowing to a more pedestrian 12 knots after midnight. Nagumo never knew how close he was to finding and most likely sinking the British carriers. He also never knew how close he was to be the target of a surprise night torpedo attack. He might have suspected things but since he was withdrawing, he was leaving it all behind anyway.

On the 6th, at 0720 Somerville had rendezvoused with his Force B as planned. There was security in company. The usual morning search found nothing. At 1300, he detached cruiser Enterprise and destroyers Paladin and Panther to search for survivors from Dorsetshire and Cornwall. These were finally picked up late in the afternoon, some thirty hours after the sinking.

Nagumo continued on a loop to the southeast to rendezvous with his tankers. Now being well off to the southeast, his morning search found nothing.

Ozawa's Malaya Force entered the Bay of Bengal and sank twenty merchant ships. The Kate torpedo bombers on Ryujo were used for scouting and bombing/torpedoing when something had been found. The mayhem created did not elicit any response in the form of an RN sortie from Trincomalee. which one perhaps could have expected, but then only Hermes and her escorting destroyer HMAS Vampire were actually there.

On the 7th, Somerville was retreating towards Addu. He did it in a roundabout way, approaching Addu carefully and from the northwest. He did not know where Nagumo was or if he knew or suspected anything about Addu. Nagumo could have learned from radio intelligence, sightings by submarines or from interrogation of captured aircrew. Somerville knew that two Ceylon-based Catalinas and one of his own Albacores had been shot down by Nagumo, with the fate of the aircrews unknown. During the 5th, Nagumo had been observed steering a southwesterly course that if continued on, would have taken him close to Addu. The ambushers could well be ambushed themselves, either by Nagumo himself or by his submarines. As it was, Nagumo spent the day refueling and his submarines were more hunted than being hunters. Ozawa's Malaya Force regrouped and with plenty of victims in the bag, retreated back towards their freshly captured base of Singapore.

At 0700 on the 8th, as he was approaching Addu, Somerville launched a morning search covering 360° degrees out to 175 miles. Nothing was found and Addu appeared safe to approach. At 1100, both British forces arrived at Addu and started entering. A conference decided that the Japanese forces were too strong to engage. It is not clear exactly when the British realized this. It appears to have been a gradual process. The size of the attack against Colombo was now better understood. Survivors from Cornwall and Dorsetshire told of being attacked by about fifty dive bombers, a powerful strike. The appearance of Ozawa's force added to it. A larger force was also what radio intelligence had been telling them all along. With this in mind, neither Addu nor Ceylon could any longer be considered safe to use as bases.

Force B was seen as just a liability and was sent to Kilindini (the port of Mombasa, Kenya) for training exercises in preparation for the upcoming operations against Madagascar.

Force A would stay in the area to guard against enemy light forces venturing too far west but first going to Bombay for a brief period of rest and recovery. One can imagine that after several days of extremely hazardous and difficult duty, the (surviving) aircrews of the Albacores, especially those that flew ASV missions during the nights, could well use a stiff drink or two.

At 1536 a report came through that a Catalina had sighed a force of battleships and carriers about 475 miles southeast of Trincomalee. It was quickly concluded that the Japanese were coming back and that Trincomalee would be the target for an attack the next morning. Nagumo knew that the British force needed to refuel and that Trincomalee was their main base in the area. He hoped to catch them there. He still did not know about Addu.

At 1728 the order was given to raise steam and the harbor was then cleared of most shipping. Hermes and Vampire were ordered to go south along the coast, to a position at least 40 miles away. They would stay there during the attack and then return to the harbor that afternoon, after the attack was over. If they stayed at Trincomalee, they would surely be sunk. Better to run away and hide, it was felt.

At 0600 Nagumo launched seven floatplanes to do a search through the western semi-circle out to 200 miles. At around the same time, the strike against Trincomalee started launching. It consisted of 91 Kates, escorted by 41 Zeros. Unusually, no dive bombers were used.

At 0706 on the 9th, the radar at Trincomalee picked up a large incoming force at 91 miles out. Thanks to the report of the Catalina the previous day, defenses had been alerted and the harbor was largely empty. Having received proper warning from the local radar installation, the Hurricane fighters were waiting at altitude. Still, the defenders were outnumbered by the Zeros and the attack proceeded against ships, airfields and the dockyards. Trincomalee had a massive RN tank farm, twice the size of the tank farm at Pearl Harbor, but it was not targeted. Only one tank was destroyed by a crashing Kate. By 0800 the attack was over.

At 0755 a floatplane from Haruna reported that it had found the carrier Hermes and three destroyers. It was actually Hermes, Vampire, the Flower class corvette HMS Hollyhock and the tanker British Sergeant. Again, Nagumo found himself in the awkward

situation of having unexpectedly sighted an enemy force while busy attacking a land target. The reserve strike was readied. There was time to do this because the initial strike on Trincomalee had not yet begun returning.

At 0843 a strike consisting of 85 Vals and nine Zeros started launching.

At 1035 the reserve strike had found the Hermes and started the attack. They were surprised to find no fighters defending the Hermes. AA fire was light. There was no wind to compensate for when aiming the bomb. With a target the size of the Hermes, it was almost impossible to miss. It was target practice. The Vals attacked in threes and released their bombs at very low altitudes. Almost all bombs either hit or were very near misses. Torpedoes are normally the most effective way of to sink a large ship but in this case it was not needed. The old lady was soon sinking and at 1055 she took her final plunge. A few land-based Fulmars had tried to intervene but where too late to stop any sinkings.

With the Hermes gone, those dive bombers that had not yet made their attack runs, now shifted their attention to the other ships. Vampire sank at 1105, Hollyhock at 1218 and British Sergeant at 1300. Two merchants in the area, tanker Athelstane and the Norwegian freighter Norviken, were also sunk.

At 1047 nine Blenheim bombers based on Ceylon started attacking the Japanese carriers, doing level bombing runs at 11,000 feet. No hits were scored. These bombers were not sighted or possibly taken for some late returning Kates (these had been landing just before). Either way, CAP did not immediately attack them but they were soon jumped by Zeros and five of the Blenheims were shot down.

The strike against Trincomalee had been recovered by 1100. The last of the dive bombers had landed by 1330. There was no second wave attack. The work was done and Nagumo withdrew.

Analysis

Using Addu Atoll as their base was a risky move by the British, given its weak defenses against both air and submarine attack. Using it depended on secrecy. The British were largely forced into using something like Addu as both Colombo and Trincomalee were too exposed. Bombay was an alternative but was too far away for a timely intercepts of any attacks against Ceylon as well as an easy target for Japanese intelligence efforts.

Nagumo did a westward sweep and attacked both known RN bases. As always when attacking a land target, this meant exposing himself to being ambushed by the enemy fleet. He handled it by raiding each base in turn. Each raid consisted of an approach under cover of darkness, a single strike in the morning and then a rapid withdrawal to well out of range, changing course as he withdrew to throw off any attacker. Nagumo never stayed and tried to dominate an area, not even staying long enough for a second attack wave (as he did at Pearl Harbor). He maintained the initiative but never exposed himself more than he had to. He was raiding, not only in the strategic sense but also in the tactical sense. This reflects the realities of carrier warfare in '42, without large numbers of fighters and effective fighter direction, carriers were eggshells armed with hammers, at least those without armored flight decks.

In both attacks, his spotters did indeed inform him of the presence of an enemy carrier force while the attack was under way, the worst case scenario. In both attacks, the situation was handled without any major dramas. This should be kept in mind when looking at how Nagumo handled this same situation when it arose at Midway.

Nagumo attacked the base farthest away first. Had he attacked the closest base first, the attack on the farthest away would have been expected by the enemy and also the easiest to defend which would have been a high risk at the same time as Nagumo was the most exposed, the farthest away from his own bases. Nagumo took the most difficult target first, when he had the best chance of surprise.

The Japanese split their forces into a carrier force, escorted by battleships, and a smaller force consisting of cruisers. This smaller force was placed in a relatively less exposed position and was to a degree covered by the main force. There is always a risk in splitting forces but in this case it enabled both more attacks and more confusing attacks, again probably the correct disposition given the superiority in strength. There was no scouting force, no advance force and no attempt at baiting. It was a raid, pure and simple, not a fight over some island.

The British had a clear intelligence advantage provided by radio intelligence, by the Catalinas and by the air warning radar sets available. Nagumo failed in achieving surprise which is understandable. He also failed in finding the British carrier force which is less understandable. Nagumo must have understood that his opponent would have an intelligence advantage and would try to ambush him, that his only defense against an ambush would be aggressive vigilance. His searches were simply not frequent enough and when he did launch a search, the search pattern often used too few planes which left holes in it.

Nagumo used mainly his floatplanes to do searches and he only had a limited number of floatplanes on his battleships and cruisers. On his carriers, he had plenty of Kate torpedo bombers, perfectly capable of doing long range searches, but he wanted to retain them all for use in strikes. Another explanation can be that Japanese carriers did not have dedicated homing beacons. If a returning plane had trouble finding its way back to the task force, it would have to break radio silence to enable the pilot to find the right direction. The problem here is that enemy could find the direction as well, particularly when the enemy could be assumed to have listening stations in the area. Inaccurate navigation is not the only problem here, while a search mission is ongoing, the task force has to stick to the planned itinerary or the returning planes will not find it.

Somerville had similar problems. He could use either his Fulmars or Albacores for searching. The Fulmars were faster and could thus cover an area faster, as well as having a better chance of evading defending fighters. However, he only had a very limited number of Fulmars and needed those for fighter duties.

Both sides were unwilling to commit enough resources for effective scouting and as a result, they both failed to find each other. This was the first carrier vs carrier encounter of the war and the balance between scouting and striking was still being worked out.

Somerville's plan was to do a night torpedo attack. He knew that the Japanese had no air warning radar and no ability to do night intercepts of his bombers. He also knew that Japanese bombers did not do night attacks (the Japanese began doing night torpedo attacks

only in '43). This would allow to him to do what every carrier commander dreamed of, an unanswered attack against the enemy fleet. He planned to stay out of range by day, close in for an attack at night, then to retreat out of range before daylight. This required accurate knowledge of the movements of the enemy task force. This in turn depended on the few Catalinas available and on a the very few ASV radar sets available on the Albacores. Anything short of perfect timing and he would be caught. It was an aggressive plan but then aggressiveness had paid off against both the Germans and the Italians, if not with Repulse and Prince of Wales. He never had any plan for a daylight strike or a surface action, day or night. That would have crossed the line into the foolhardy. His force was a critical asset and must not be wasted.

At night, the targets would have to be found using ASV radar. Targeting would still have to be done visually using available moonlight. The attack would have to wait until the moon was at least over the horizon or some time after about 2300. There would then be at best about six hours of darkness to be used for the getaway.

The need to wait for the moon could have been avoided by using flares. The Albacores carried flares but only an ASV-equipped Albacore would know where to drop them. Using flares out on open water and in complete darkness probably required a degree of teamwork that just was not there. Somerville never considered a night attack that did not use available moonlight.

Surprise would also be largely lost as the flares would warn the Japanese of the impending attack. Other possible warning sign would include being spotted against the night sky or simply being heard as they approached. The steam turbine machineries of the ships of the day are surprisingly quiet, enabling external noises to be heard. Achieving full surprise, exploding torpedoes might still be the first sign of an air attack. However, as formation flying and attack coordination is difficult at night, the attack will likely be done by disjointed formations trickling in one after the other. The first formation might well have a good attack run but after that things will become much more difficult.

The strike would probably have to be in split into two waves with up to an hour between the waves, allowing for movement and engine warm-up. The Albacores where heavily loaded, there was only a light wind available and it was hot. These conditions all points to longer take off runs being required for safe operations leaving less room for spotting planes. Sources do not specify exactly how many Albacores were ranged on the flight deck in preparation for the strike. In the Taranto raid, the 21 Swordfish used were launched from the Illustrious in two waves with about an hour between them. Two waves from two separate carriers will involve significant problems in attack coordination. That only a handful of the Albacores carried ASV radar also complicates matters.

Defending AA would likely be confused and ineffective. At least ineffective in term of shooting down attackers, it might still be useful in distracting pilots on their attack runs. That the bombers can see the targets silhouetted against moonlight does not mean that the gunners can see the bombers. Star shells might be used in an attempt to see the attackers. The odd bomber might get caught in a searchlight beam but then both searchlights and gun flashes might as well serve as aiming points for the bombers. The overall scene would be one of spectacular fireworks and mass confusion.

The hit rate for airborne torpedoes launched against warships in daylight was around 10%, with great variations. For attacks at night, for example against Italian convoys, the hit percentage was somewhere around 5-10%. These percentages depend heavily on pilot training, light conditions and on whether or not the targets were able to do evasive maneuvering. If they are, and given how hard it can be to estimate the angle of ship at night, the percentage might well be lower than 5%. According to IJN doctrine, evasive maneuvering was the main defense against torpedo attacks. However, after midnight Nagumo cruised at a relatively leisurely 12 knots and this is not enough for radical evasive maneuvering. Despite knowing very well about Taranto, Nagumo did not expect a night air attack. If the targets have been largely surprised and with limited maneuvering, the 5-10% estimate might still be reasonable. Assuming an attack by some thirty odd Albacores, we then get 1-4 torpedo hits. Presumably most of them will be against the carriers, the intended targets. This could be effective against two carriers but against five, most of them will not be hit.

Somerville only planned to make one strike. A second strike during the night was possible but not planned. It would not be a surprise attack and it might not even find the target. A second strike would reduce the time for the getaway. Attacking Nagumo's carriers just before dawn, when they presumably had armed and fueled aircraft on the decks ready to take off, had the same problem of not leaving enough time for the getaway.

Dive bombing is effective against carriers without armored flight decks, particularly with armed and fueled planes on the decks. However, dive bombing at night is normally not feasible given the difficulties in spotting, targeting and in not crashing into the sea.

Should a surface action develop during the night, the almost full moon and generally clear visibility would reduce the British advantage in radar. As had already been demonstrated in the battles of the Java Sea, the Japanese were well trained in night surface actions. On the other hand, the British were well trained in the use of radar.

Somerville came very close to succeeding with his plan. He was probably lucky in not succeeding. The big unknown here is what Nagumo would do after having suffered a night attack. One can argue that after suffering damaging hits to one or more of his carriers, that Nagumo would become disheartened and retire. That is not what happened at Midway. Having lost all but one of his carriers, he still stayed in contact and fought back. Nagumo can be criticized for being a bit lackadaisical in not searching to westward on the 5th but then again he had no obvious reason to do so. Having just been taken by surprise however, he now had every reason to be extremely intense about doing what he came for, finding and destroying any RN forces in the area. Somerville's hope was that Nagumo would allow him to escape by moving in the wrong direction and/or searching in the wrong direction.

Nagumo knew he had superior forces. Nagumo knew he could, and should, sink the enemy carriers. The problem was finding them. Nagumo must have understood that Somerville would attempt to run away after the attack. Nagumo therefore needed to guess where Somerville was and in what direction he would run away. He would then move to have Somerville within search range at dawn.

He does not necessarily need to move at full speed in exactly the right direction, normal cruising speed in roughly the right direction might well suffice. No need to rush things and take unnecessary risks. With a difference in speed made good in the direction Somerville

was heading of 6-10 knots, six hours of darkness would yield a range extension of 36-60 nautical miles. If Somerville struck at a range of for example 140 miles, he should then be about 200 miles away at daybreak, within both search and strike range.

Nagumo should have some clues as to where the attack came from. One was that the area he just came from had proven empty, hence not a likely source of the attack. To the west or southwest would then be a natural conclusion. He could blame himself for not having searched more in that direction but that was now history. The direction from which the torpedo bombers attacked could give an indication of where they came from but then again the attack would more likely come in from a direction dictated by available moonlight. Which way they retreated might be a better indication. Which way they retreat can be observed either visually or by sound, both with the caveat that they are short range.

Nagumo could launch the first search well before dawn with the intention to be somewhere over Somerville at daybreak. If he had elected to use some of his Kates for scouting, Nagumo could have searched out to long range and in all directions, albeit at a cost in striking power.

If found by Nagumo, the survival of Somerville's carriers is doubtful. The fighters on the British carriers would likely make good use of fighter direction but would be badly outnumbered. AA alone would not be an effective defense, as shown by the sinkings of Repulse, Prince of Wales, Cornwall, Dorsetshire and Hermes. The British carriers did have armored flight decks designed to withstand the 550 pound bombs the Vals were using. On the other hand, that armor did not cover the entire ship nor protect against near misses. Applying the same 10% rule of thumb to the (initially) 91 torpedo bombers Nagumo had, would yield 9 hits. Nagumo did not have to sink the two carriers outright, simply slowing them down would suffice. He also had time to make more than one attack before nightfall.

Having superior surface forces, Nagumo could certainly engage in a stern chase hoping to catch a retreating Somerville. In this pursuit his carriers would not need to change course for flight operations as there was hardly any wind anyway. Even allowing for the slow speed of the Warspite, it is still unlikely it would amount to more than catching cripples before Nagumo would have to turn back. His destroyers would need refueling and he too might have cripples that needed protection as they limped home.

Somerville could try to hide behind the R class battleships of Force B. A rendezvous was scheduled for the morning after the night torpedo attack. Against a modest raiding force, the R:s would have worked well as a blocking force. Against what Nagumo actually had available, they would just slow down Somerville and increase the chances of Nagumo catching up to him. Using his speed advantage, Nagumo could then just ignore the R:s while attacking Somerville's carriers with his aircraft. In such a scenario, the main function of the R:s would probably be to draw some attackers away from Somerville's carriers by offering themselves up as additional targets.

Much of this analysis is of course only speculation. We know what happened. From the perspective of the art of carrier operations, it is still interesting to assess capabilities and risks. A night torpedo attack is clearly a lethal capability to have, as well as difficult to defend against. The Kido Butai faced real risks at the hands of the RN. On the other hand, the RN took serious risks in closing with a superior foe.

Aftermath

Nagumo did the Grand Tour of the Indian Ocean in some style, demonstrating superior strength and putting the British on a defensive footing. He had not knocked out any major units but then he had not suffered any major losses himself. He had executed a well crafted plan that achieved his main objective while minimizing the risks to the Kido Butai.

Somerville played an aggressive game but was neither rewarded nor punished for it. He did not succeed in defending the Indian Ocean but then he did not really have to since it was only a raid. The British continued to use the Indian Ocean, including the Bay of Bengal and the ports of Colombo and Trincomalee. At the end of the day, both sides had achieved their main objectives. It would be some time before this situation changed.

The Dolittle raid was only a week later, on April 18th. That raid caused a rethink of Japanese priorities. The main enemy was now clearly the US. The western flank was now also secure. Hiryu, Soryu and Akagi were sent back to Japan to rejoin Kaga. Zuikaku and Shokaku were detached to support a landing in the Coral Sea area.

This rethink was not known to Allied commanders at the time. For them the defense of the Indian Ocean remained a priority. To further secure the hold on the area, Madagascar was invaded in May. The Illustrious had now joined the Eastern Fleet. The Vichy French forces there were replaced by Free French. While at Diego Suarez (now Antsiranana), the Ramillies was hit by a torpedo from one of the midget submarines launched by Japanese submarines I-16 and I-20.

After Midway the pressure was off. Japan was now on the defensive. It was also clear that German progress through Ukraine was too slow to threaten the Caucasus. After the disastrous fall of Tobruk in June '42, the Indomitable was shifted to the Mediterranean to help with the situation there, joining Victorious for Operation Pedestal. Illustrious and Formidable stayed on a while longer as part of the Eastern Fleet but after Madagascar had been secured, were soon needed elsewhere. From January '43 to October '43, not a single carrier was based in the Indian Ocean. With D-Day completed, the last of a series of major amphibious operations in Europe, followed by the sinking of Tirpitz in November '44, the RN was finally free to focus on the Eastern Fleet but by now the IJN had already been crushed by the USN.

As the war went on, to what extent could the RN support the USN by threatening the western flank of the Japanese possessions? It is interesting to compare to how Tirpitz for a long time successfully tied down large RN forces. However, she could not get into a threatening position in northern Norway without the British discovering it, given the geography of the area. Once in place, being a "fleet in being" was a full time job for her. In the Indian Ocean, the geography was different. The RN could make a rapid approach towards the Straits of Malacca and Singapore and not be discovered until quite close. The RN was also capable of assembling a very powerful strike force. The RN had to be considered a serious threat to the Dutch East Indies even if no major units were actually in the area. This is the "fleet in being" concept, or to paraphrase, a "fleet in might be". The RN could have done more to support the USN but in a larger context, the best use of available resources was probably to do just like was done, to employ them elsewhere. One

alternative was of course to join USN operations as Victorious did for a while (as USS Robin). Even if the RN was employed elsewhere, the threat against the Dutch East Indies was still there. The IJN kept significant forces in the area up until the final stages of the war.

Final Thoughts

This is one complex raid. No major carrier battle was actually fought but for nothing much happening, a lot was going on. Both sides took substantial risks. Either side could have faced a disaster.

Unusually, there was no fixed point target involved, no landing site or convoy, which would have limited options on both sides. Much like Trafalgar or Jutland, it was a case of two fleets meeting to determine who was the strongest. It was an open-ended encounter with tactics mainly revolving about getting an advantage by controlling the circumstances for it. The two opposing forces had very different ideas on when the battle should be fought, by day or by night, which added to the tension.

It is also fascinating to see how this raid ties together the European and Pacific theaters of operation. They are almost always discussed in separation. Here we can see how they interacted with each other, involving the Grand Strategy of all major combatants.

The ASV II radar was in widespread use by April '42, just not on Albacores. The reason for this was that on the Albacore, the alternator of the radar set interfered with the compass. It took a while to sort this out which is why so few Albacores had been fitted with ASV sets at the time of these events. It can the be argued that the fates of countries and oceans hinged on the proper application of a few grounding strips costing pennies each. The author once spent more than a year debugging a new radar design that also had persistent interference issues. That an earlier generation faced the same pesky issues, and that it had consequences of historical proportions, carefully studied by historians many decades later, is for the author a deeply zen-like moment.

Which brings us to the confidence displayed by Somerville. He was under orders to use his carriers with caution, as a fleet in being. Yet he went into action relying on a new type of device built using a few vacuum tubes and carried by obsolete biplanes. In this duel of two minds, Chuichi Nagumo certainly played a good game but one must admire the sheer fighting spirit of James Somerville.

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