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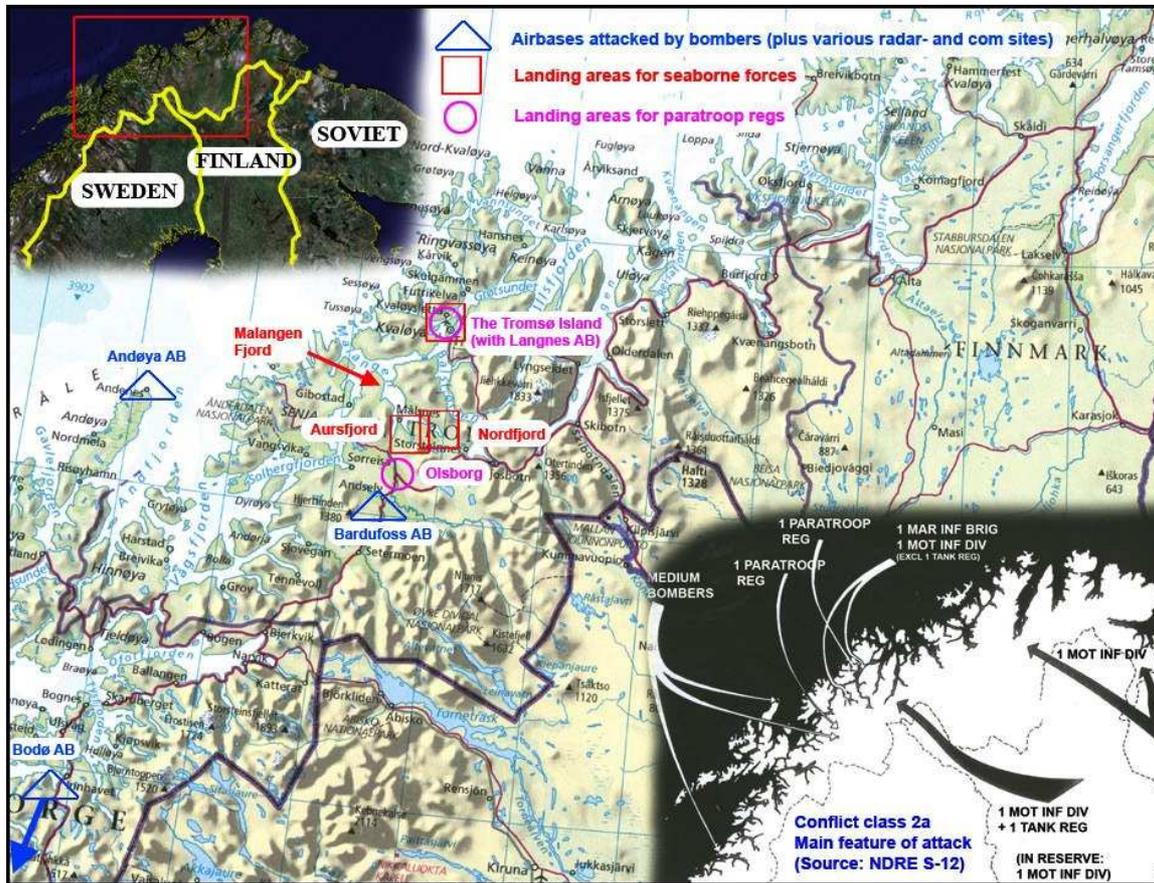
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The 1970-74 Combat Aircraft Analysis

Priority to Defensive Counter Air and Anti-Shipping Operations

How optimizing defence resources altered the use of RNoAF fighters



Hans Ole Sandnes

Master of Philosophy dissertation

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University of Glasgow

Department for Modern History

Centre for War Studies

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Abstract

This thesis explores why and how the Royal Norwegian Air Force (RNoAF) changed from having an offensive to a clearly defensively postured fighter fleet. The Combat Aircraft Analysis, carried out at the Norwegian Defence Research Establishment (NDRE) in 1970-74, was seemingly fundamental for this relatively sharp change in RNoAF fighter plans for wartime. The Analysis is therefore placed at the core of this thesis.

During the 1950s and 1960s the wartime use of RNoAF fighters was clearly offensively postured. SNOWCAT missions illustrate this quite well. These were wartime RNoAF fighter-bomber missions into Soviet and WP territory, aiming to pave the way for Western nuclear bombers. However the 1970-74 Combat Aircraft Analyses brought changes. The 2a scenario and the selection of 'holding time' as Measure of Effectiveness are crucial both for the basis and the prerequisite to the Analyses. The 2a scenario described a limited-size Soviet invasion in north Norway. 'Holding time' was the total time defending forces could prevent Soviet forces from reaching their invasion objectives; i.e. taking control over the Bardufoss region. The definition of a pre-determined budget-size seems to have played an almost equally important role. The overall aim of the Analyses was to find what effect various usage of combat aircraft, including the use of resources on associated support functions, would have on 'holding time' as a whole.

One of the primary roles of the NDRE was to provide advice and a basis for defence planning. It was therefore important to manage and carry out Analyses that would result in conclusions on which long term defence planning decisions could be made. The idea was simply to make new RNoAF fighters contribute to the overall defence of Norway in the best possible way. As Norway could not fight off a Soviet invasion alone, the 'best way' would be to prevent the Soviets from reaching their objectives before our Allies could get to Norway's assistance. The Analyses left no doubt as to how RNoAF fighters could contribute to the most 'holding time': This would be achieved through flying Defensive Counter Air and Anti-Shipping war-missions. The best candidate, given the amount of resources foreseen to be available, would be a fighter corresponding to the characteristics of Combat Aircraft Class nr 3; in short described as a simple fighter-bomber.

With that the focus was clearly changed from an offensive to a defensive use of RNoAF fighters. Instead of SNOWCAT missions into Soviet and WP territory, the RNoAF war time fighter missions would now be Combat Air Patrol and, to some extent, Anti-Shipping missions.

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1 Introduction

In 1969 Royal Norwegian Air Force (RNoAF) doctrine was revised. However, its closing remarks were identical to the previous edition: *An Air Force is by nature offensive. Offensive action is in line with RNoAF traditions; it shall mark our attitude and be held up on every occasion.*¹ In 1970 the ‘Analysis of alternative allocation of resources in the Combat Aircraft Sector for the period 1975-1990’ was initiated at the Norwegian Defence Research Establishment (NDRE).² Four years later the Analysis strongly recommended that priority be given to Defensive Counter Air (DCA) and, to some extent, Anti-Shipping operations for RNoAF fighters.³

It is quite a conventional view, as discussed in the Norwegian Defence History and in the Air Force History, that RNoAF fighters were, from the beginning of the 1980s and onward, intended for defensive purposes. The priority on DCA operations were in line with the overall national plans for defending Norway.⁴ It could be held that the 1970-74 Analysis *de facto* constituted a new doctrine for the RNoAF. Certainly both preparations as well as principles for the use of air power were discussed in the Analysis, and it has been argued that the *concept that underlay the F-16 deal heralded the end of a long doctrinal line.*⁵ The plans to use RNoAF fighters mainly in a defensive air-to-air role in case of a Soviet attack was well known and generally accepted as a sound idea.

The Analysis took a broad view on the resources available to the combat aircraft sector, considering also the relationship with Army and Navy assets, aiming to optimize the use of combat aircraft in the defence of Norway in case of a Soviet invasion. The Control and Warning (K & V) System was examined leading to recommendations on how fighter aircraft should be controlled and directed, and also identifying the need to initiate a project for recommending new radars. The Analysis studied the allocation of resources to the Maintenance Branch and Air Bases in general, opting to create a best possible balance between producing as many fighter sorties a possible and preserving the ability to operate

¹ Håndbok For Luftforsvaret 95-1, *Luftoperasjoner. Prinsipielle retningslinjer for bruk av luftstridsmidler*, (Oslo: Sjefen for Luftforsvaret, 27. juni 1969), chapter 15. Original text: [*Et luftvåpen er av natur offensivt. Offensiv handling er i pakt med Luftforsvarets tradisjoner; det skal prege vårt holdningsmønster og komme til uttrykk ved enhver anledning.*]

² Ragnvald H Solstrand, ‘Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990’, *NDRE Report S12* (1975), p.5.

³ I will from this point refer to the 1970-74 study as the “Analysis”.

⁴ Jacob Børresen, Gullow Gjeseth and Rolf Tamnes, *Norsk Forsvarshistorie Bind 5*, [the Norwegian Defence History] 5 vols (Bergen: Eide forlag, 2004); Svein Duvsete, *Luftforsvarets Historie*, [the Air Force History] 3 vols (Oslo: Aschehoug & Co, 2004).

⁵ Øistein Espenes and Nils Naastad, ‘The RNoAF – A Multipurpose Tool during the Cold War’, *Air Power History* 47 (2000), p. 49.

from the air bases after enemy attacks. The Analysis thus helped pave the way for the introduction of the Norwegian Adapted Hawk system (NOAH), a surface-to-air missile system mainly used for defending RNoAF air bases.

Given the focus on using RNoAF fighters in an offensive role in the 1950s and 1960s, it is my view that the conclusions of the 1970-74 Analysis were fundamental for the relatively sharp change in the planning of RNoAF fighter aircraft usage in times of war. Thus, rather than aiming to discuss doctrinal change as such, this thesis set out to explore *how and why* the shift from an offensive to a clearly defensively postured fighter fleet came about. In doing so the Analysis, with particular attention to a few vital aspects studied therein, is placed at the very core of the thesis.

Structure of the thesis

The thesis is mainly chronologically structured. However, due to the nature of the particular subjects, some parts have had to be thematically structured. The thesis is divided into six chapters, with chapter 1 providing a presentation of the subject of the thesis and a brief account of its sources.

In order to recognise and understand a change, it is often necessary to be familiar with what was altered. Hence, chapter 2 briefly describes the main events in the history of the Norwegian fighter fleet from World War II until 1970. It surveys American influence and weapons aid, NATO plans and doctrines, and relevant national policies, plans and priorities. The chapter describes the difficult first post-war years, the build-up and expansion in the 1950s, and the more temperate 1960s.

Chapter 3 explores aspects of the NDRE, and describes how the Analysis was carried out. The chapter starts with a description of the NDRE System Group and a brief explanation of the characteristics of operations and systems analyses. This is followed by an examination of the Soviet threat as it was contemporarily perceived, including NATO's assessment of the Soviet threat. Chapter 3 is aimed at elucidating the fundamental basis for the Analysis, with associated assumptions.

In chapter 4 the 1970 preparatory work for the Analysis is discussed in greater detail, with particular attention to the discussions on invasion scenario and measure of effectiveness (MoE). These elements were arguably the two most important components – as well as prerequisites – to the Analyses, and chapter 4 aims to shed light over the selection and establishment of these elements.

In chapter 5 the analysis of how to make best possible use of (new) RNoAF fighter aircraft is examined. The aim of the chapter is to describe how Defensive Counter Air (DCA) operations were found preferable to Offensive Counter Air (OCA) operations. Likewise the chapter examines the conclusion that fighters should be used for Anti-Shipping operations, and not in direct support of own army units fighting a much larger and stronger Soviet invading force.

In the final chapter selected aspects of the Analysis, viewed in retrospect, are commented upon and discussed. In summing up chapter 6, conclusions are presented about how and why the shift from an offensive to a clearly defensively postured RNoAF fighter fleet came about.

Literature

Given its implications, surprisingly little scholarly work has been written on the subject of the Analysis. However, a few works have touched upon it in a more general way, of which the ‘Arms Deal – The Selling of the F-16’ by Ingemar Dörfer examines the process of purchasing the F-16 in four European countries (Belgium, Holland, Denmark and Norway) on both political and military levels. Along with the process of developing the Light Weight Fighter Dörfer also looks into the US Air Force and Navy perspectives. However, Dörfer deals only sparsely with the Analysis.⁶ In the book *Århundrets Våpensalg* [‘Arms Deal of the Century’] Hans C Erlandsen focuses on the role of Norway in the four European countries’ purchase of the F-16. Still, also Erlandsen primarily discusses political, economical and industrial aspects.⁷

However, in volume 3 of *Luftforsvarets Historie* (the RNoAF History, published in 2004) by Svein Duvsete, the Analysis is dealt with over several pages. Likewise the Analysis, and implications thereof, are discussed and referred to in ‘Norsk Forsvarshistorie’ (the History of Norwegian Defence), both in volume 4⁸ and volume 5.⁹ In the book ‘Kunnskap som våpen’ (The History of the NDRE 1946-1975) by Olav Njølstad and Olav Wicken the Analysis is quite thoroughly examined, though mainly based on how it set the terms for later NDRE analyses.¹⁰ Scholarly work such as the ‘Encyclopedia of Operations Research and

⁶ Ingemar Dörfer, *Arms Deal – The Selling of the F-16*, (New York: Praeger Publishers, 1983)

⁷ Hans Christian Erlandsen, *Århundrets våpensalg*, (Oslo: Bedriftsøkonomens forlag, 1983). English title, translated by author: ‘*The Weapons Sale of the Century*’.

⁸ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004)

⁹ Jacob Børresen, Gullow Gjeseth and Rolf Tamnes, *Norsk Forsvarshistorie Bind 5*, 5 vols (Bergen: Eide forlag, 2004)

¹⁰ Olav Njølstad and Olav Wicken, *Kunnskap som våpen* (Oslo: Tano Aschehoug, 1997)

Management Science’, edited by Saul I Gass and Carl M Harris,¹¹ ‘The United States and the Cold War in the High North’ by Rolf Tamnes¹² and the Fryktens Likevekt [‘Balance through Fear’] by Kjetil Skogrand and Rolf Tamnes,¹³ are representative for the type of secondary sources consulted in writing this thesis.

The Combat Aircraft Analysis’ main results and conclusions were presented in NDRE Report S-12.¹⁴ The material supporting the S-12 was relatively massive, consisting of 36 classified NDRE reports.¹⁵ These reports, in addition to several other relevant documents at the NDRE Archives, have up to now been inaccessible due to their classification. In fact most of these reports were exempt from automatic declassification, which is often the case once 30 years have elapsed. However, in spring 2007 they were de-classified in the course of the research for this thesis, thus making them available as primary sources for my work.

The nature of the NDRE reports and documents is predominantly ‘scientific’; typically covering a well defined part of a larger and more complex problem, and containing tables, calculations, graphs and so on. Making assumptions, however, are also a common feature of these reports. Such assumptions are openly stated and, as far as found herein, well explained and accounted for. The NDRE documents, together with Parliamentary and Governmental papers, national defence plans, air force doctrine, and NATO doctrines and documents, serve as the primary sources for my thesis. As such the amount and access to primary sources has been very satisfactory. However, it has nevertheless proved difficult to gain access to national intelligence archive sources. The Armed Forces HQ Intelligence Staff provided the NDRE Analysis with intelligence material regarding location, numbers and amount of Soviet military forces and equipment. Although correspondence between recently declassified NDRE and NATO documents indicate that the on-hand information about scenarios and on assessments of Soviet capabilities are adequate, access to contemporary national intelligence evaluations could nonetheless have been beneficial to my work.

¹¹ Saul I Gass, Carl M Harris (ed), *Encyclopedia of Operations Research and Management Science*, (Norwell: Kluwer Academic Publishers, 1996)

¹² Rolf Tamnes, *The United States and the Cold War in the High North* (Cambridge: University Press, 1990)

¹³ Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001)

¹⁴ Ragnvald H Solstrand, ‘Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990’, *NDRE Report S12* (1975)

¹⁵ FFI Saksarkivet 161, ‘Jobb-Sluttmelding 242-S/161 – ”Analyse av alternative anvendelser av ressurser innen Kampflysektoren for prioden 1975-1990”, attachment ”Resultater”.

2 The pre-1970 RNoAF fighter fleet

In April 1940 Hitler launched his offensive towards Denmark and Norway; operation Weserübung. Norway had no independent air force as such, but both the Navy and the Army had an air arm. A handful Norwegian Gloster Gladiators took off from Fornebu airport near Oslo early on 9 April, but was severely outnumbered and could do little harm to the invading German forces. According to Olav Riste the German attack on Norway was both strategically and tactically unexpected; *a classic example of a successful strategic attack*¹⁶.

From November 1940, Norwegian pilots were trained at the base “Little Norway” near Toronto, Canada. Upon completion of training the pilots were sent to operational squadrons in the UK. Throughout the war Norwegian fighter squadrons were mainly based in England, and to some extent the Low Countries following the Normandy invasion. The Royal Norwegian Air Force was formed on 10 November 1944, by joining the air arms of the Navy and the Army.

The first post-war years

RNoAF fighter squadrons operated more or less as an integrated part of the Royal Air Force (RAF) during the war. In essence the post-war RNoAF consisted of two fighter squadrons; 331 and 332 squadrons, with their roots in the Army Air Arm, and three maritime squadrons stemming from the Navy Air Arm¹⁷. The very close relationship to the RAF dominated the RNoAF during the first few post-war years. For a while the RNoAF fighter squadrons would keep their British aircraft, and three main tasks: air defence, tactical support of surface operations, and reconnaissance.

Towards the end of the war the British had offered some defence equipment and material to Norway with the condition that Norway participate in the occupation of Germany. Norway accepted the British offer in March 1945.¹⁸ The Norwegian forces were positioned in the British sector, cooperating with British forces. Thus the relationship with the British would be strengthened, and at the same time this would not annoy the Soviet Union. It was in any case not the view of the government that Norway could defend herself alone.

¹⁶ Olav Riste, 'Weserübung: Det perfekte strategiske overfall?', *Forsvarsstudier* 4 (1990), p. 22

¹⁷ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), p. 13 and 51.

¹⁸ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), p.158.

The first three-year plan for the re-building of Norway's armed forces, based on plans from the Army, Navy and Air Force respectively, was issued by the Department of Defence on 13 September 1946. The plan stated that the Norwegian Armed Forces had to be able “*to stand our ground until we get help from those who will be our allies*”¹⁹. The Air Force plan was written by a group led by Adolf B Øen, later to be General Major and Chief of the RNoAF²⁰. Øen was very familiar with both theories on air power and practical lessons from the war, and at the same time well aware of national political priorities. Unlike the Army and the Navy the young RNoAF had few old home-bases or traditions to return to. In the rather modest three-year plan for the Air Force it was stated that it would be necessary to consolidate the position of the RNoAF, and gradually build an air force able to handle contemporary developments. Øen recognized the effectiveness strategic bombing could have in reducing enemy capabilities. However, Øen also realized the political situation and the restricted resources that would be available - the RNoAF would not be able to operate heavy bombers. Øen thus set aside the idea of extended use of Norwegian fighters for offensive operations; the primary task in war for the RNoAF would be to fight enemy air attacks²¹. The RNoAF plan was not very detailed; it merely outlined goals for the build-up of an air force: By 1949 the RNoAF should have three Spitfire fighter squadrons, two fighter-bomber squadrons, one maritime squadron, and one transport squadron. The two main tasks would be air defence and the support of army and navy operations²².

For a short period Norway had the ambition of becoming a bridge-builder in the international arena. However, the European crises in 1948 led to a strengthened Norwegian conviction that the country needed to improve its chances of obtaining help in a crisis or war. In January 1949 the attempt to establish a Scandinavian Defence Union was found to be unrealistic, and on 4 April 1949 Norway signed the North Atlantic Treaty. The treaty was seen as a traditional military pact; joining it *first and foremost marked Norway's intent and position*²³. In line with a traditional small state perspective Norway was sceptical about establishing an allied staff or

¹⁹ Stortingsmelding nr 32 (1945-46), *Plan for en første gjenreisning av Norges Forsvar*, (Oslo: FD, 13. september 1946), p. 3. Original text: [.. *holde ut alene inntil vi får effektiv hjelp av dem som måtte bli våre allierte*].

²⁰ General Major Bjarne Øen was Chief of the RNoAF in the period March 15th 1946 – December 1st 1951. He became General and was Chief of Defence in the period January 10th 1957 - December 31st 1963.

²¹ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), pp. 36-39.

²² Stortingsmelding nr 32 (1945-46), *Plan for en første gjenreisning av Norges Forsvar*, (Oslo: FD, 13. september 1946), pp. 47-48. See also Svein Duvsete, 'Fra luftforsvar til strategisk angrep', *Forsvarsstudier 2* (1998), pp. 46-48.

²³ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), p.165. Original text: [*først og fremst markerte intensjon og tilhørighet*].

an allied supreme commander in peacetime. Such institutions were expected to be dominated by the great powers.

The 1950s – expansion and build-up

The post-war reconstruction of the country demanded a significant amount of resources, and the rebuilding of the armed forces was just one of many tasks. However, the Korean War brought changes to this undertaking. It was soon decided to make NATO a closely integrated organization, with its own command system. Also, steps were taken to coordinate the development of the member states' military forces. In autumn 1950 NATO adopted the principle of forward defence. Adding substance to forward defence required a build-up of national armed forces in Europe, as well as support from the USA (soldiers, arms and equipment).²⁴ In 1951 NATO established several commands under the Supreme Allied Commander Europe (SACEUR), US General Dwight D Eisenhower. NATO was no longer just a traditional military pact; it had become an integrated military defence organisation.²⁵

Although the Korean War led to a strong increase in Norwegian defence budgets, NATO and American programmes still covered much of Norway's defence expenditures.²⁶ In February 1950 the Norwegian Parliament approved the Mutual Defence Assistance Program (MDAP), which was a bilateral agreement with the USA.²⁷ For years to come Norway would receive a substantial amount of aircraft²⁸ and other defence equipment from the USA through the MDAP, and the RNoAF has for this reason operated several types of US fighters and fighter-bombers.²⁹ From 1951 and onward NATO's infrastructure programmes had, to a great degree, helped finance the construction of airfields, command-, control- and communication installations, as well as radar sites.³⁰

²⁴ Rolf Tamnes, *The United States and the Cold War in the High North* (Cambridge: University Press, 1990), p. 64-65

²⁵ Knut E. Eriksen and Helge Ø. Pharo, *Norsk utenrikspolitikk historie*, 6 vols (Oslo: Universitetsforlaget, 1997), pp. 31-40.

²⁶ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), pp. 255-56. For 1949/50 the Defence Budget was 322 millions NOK For 1952/53 this had increased to 1.295 millions NOK.

²⁷ Stortingsproposisjon nr 23 (1950), *Om (1) Samtykke til å ratifisere avtale med Amerikas forente stater om gjensidig hjelp på forsvarets område (Våpenhjelpavtalen. (2) Fullmakt til å motta materiell under denne avtale. (3) Dekning av utgifter i forbindelse med våpenhjelpen.* (Oslo: FD, 3. februar 1950).

²⁸ Jonn Bekkevold, 'Våpenhjelpen fra USA', *Luftled - Luftmilitært Tidsskrift* 2 (1996), pp. 36-39. Norway received more than 600 aircraft under the programme, of which some 400 fighter-bombers and fighters.

²⁹ Tom Arheim and others, *Fra Spitfire til F-16* (Oslo: Sem & Stenersen AS, 1994), pp. 256-57. The RNoAF operated 200 F-84G (1952-60), 64 F-86K (1955-67), 115 F-86F (1957-67), 19 F-104G (1963-83), 22 CF104 (1973-83), and 92 F-5 A/B from 1966 and onward.

³⁰ Rolf Tamnes, *Norsk utenrikspolitikk historie*, 6 vols (Oslo: Universitetsforlaget, 1997), pp. 63-64. Norway received about NOK 33 billions (1995 value) via NATO infrastructure programmes during the cold war.

NATO issued DC 6/1, its first Strategic Concept for the Defense of the North Atlantic Area, in December 1949. DC 6/1 stated that *the over-all defense plans must provide [...] the ability to carry out strategic bombing promptly by all means possible with all types of weapons, without exception.*³¹ The phrase *all types of weapons* makes it clear that nuclear weapons were included in this concept. Still, during the first half of the decade NATO planned on stopping a Soviet invasion in Western Europe using large conventional forces. Following the NATO meeting in Lisbon in February 1952 NATO issued MC 14/1,³² in which it was assessed that *the enemy would have a preponderant advantage in ground warfare.*³³ The use of nuclear weapons was by no means ruled out, but in an attempt to stop a Soviet invasion – with the protection and preservation of Western European territory and peoples in mind – the use of nuclear weapons would clearly not be a natural first choice.

With the Soviets in a position to *provide a manpower pool for military purposes in excess of that which can be provided by the western powers* the use of NATO air power would be vital in stopping the Soviet aggression, in two ways:³⁴ Directly by the (immediate) use of tactical air support of own surface forces, and indirectly by a *strategic air offensive against the enemy* [as the] *effect of this offensive on the defensive battle will be cumulative and may be decisive.*³⁵ The particularly large number of F-84 fighter-bombers given by the US (more than 200 to the RNoAF and a total of some 2000 to European allies) can easily be seen to support this concept.³⁶

Based on the Lisbon meeting, national plans indicated that the RNoAF backbone would consist of 200 fighter aircraft; of which 150 would be fighter-bombers. By 1954 the RNoAF operated 150 F-84G fighter-bombers, divided into six squadrons. The Military Assistance Advisory Group (MAAG),³⁷ an American group at the US Embassy in Oslo, described five of

³¹ NATO: *DC 6/1 Strategic Concept for the Defense of the North Atlantic Area*, (December 1, 1949), see paragraphs 7 and 7a.

³² NATO: *MC 14/1, A report on Strategic Guidance* (December 9, 1952). MC 14/1 reflects NATO's intent to continue the build-up of conventional forces, in order to deter or if necessary to defend against a Soviet Union attack. See for instance page 12, where it is stated that [... *as the conventional NATO forces at present in being fall far short of requirements, no relaxation can be allowed in their planned expansion ...*].

³³ *Ibid* p. 11.

³⁴ *Ibid* pp. 10-11.

³⁵ *Ibid* p. 13.

³⁶ Kjetil Sogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), p. 204..

³⁷ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), pp. 94-95.

these RNoAF squadrons as effective and *ready to go*.³⁸ Half way into the 1950s one can see the definite shape emerging for an offensive role for RNoAF fighters, compared to both the three year plan from 1946 and also to the FK 46 report (completed in 1949).³⁹ The latter recommended 8 squadrons of fighter aircraft in an air defence role, and prioritised much less fighter-bombers – only 2 squadrons. Thus the prioritisation of an offensive use of the fighter fleet seemingly stems more from NATO doctrine and plans and the type and amount of aircraft provided by the US through the MDAP rather than being the result of decision on Norway's part.

A conventional force able to support the ambitions from the Lisbon meetings was however never fully built up. Instead NATO took to the strategy of Massive Retaliation, implemented in late 1954.⁴⁰ Initially Norway supported Massive Retaliation as it was seen to strengthen NATO's ability to deter aggression, and thus increase the importance and position of the alliance.⁴¹

SACEUR anticipated that in a major conflict the first phase – the air war – would be decisive. The air war would consist of nuclear weapon deliveries by parties in the conflict, and with parallel fighting over air superiority.⁴² In order to maximize the effect of strategic bombing, it would be necessary to do reconnaissance both pre- and post-strike, and to use fighter-bombers in support of the strategic nuclear missions. The Norwegian DoD established a committee, led by Jens Boyesen, to evaluate what the new strategy would mean for Norway. One of the committee conclusions was that the best way to deal with the enemy would be to attack his bases. It is noteworthy that regarding combat effectiveness the committee prioritised quality before quantity. Consequently the committee did not support the proposal from the military leadership for setting up two more fighter squadrons. According to the Boyesen Committee the RNoAF should be equipped with better aircraft and better weapon systems. Simply buying more aircraft was not necessarily the best solution. Although advocating modernisation of the armed forces, the Boyesen Committee avoided addressing the question of nuclear weapons for

³⁸ Ibid p. 113. Duvsete refers to a report from MAAG, Oslo to JAMAAG in London, titled 'Activity Report, Air Force Section, MAAG, Norway, December 1954'.

³⁹ Ibid pp. 81-83. In 1949 the Defence Study Group of 1946 [*Forsvarskommissjonen av 1946 (FK 46)*], led by Trygve Bratteli (later Prime Minister, Labour), presented its plan for the build-up of the Norwegian Armed Forces in the period 1949-55.

⁴⁰ NATO: *MC 48, A report on the most pattern of NATO strength for the next few years military* (November 22, 1954). See for instance p. 3, where it is stated that the Soviets must be convinced that *they cannot quickly overrun Europe and that in the event of aggression they will be subjected immediately to devastating counter-attack employing atomic weapons*.

⁴¹ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), pp. 167-71.

⁴² Svein Duvsete, *Luftforsvarets Historie, 3 vols* (Oslo: Aschehoug & Co, 2004), p. 85

Norway.⁴³ The Joint Chiefs of Staff,⁴⁴ established as the top leadership of the Armed Forces along with the removal of the position of Chief of Defence in 1946, had a quite different view and stated that *in our current situation, with regard to conventional forces and small chances of getting help directly, tactical nuclear weapons are a necessity for Norwegian Armed Forces.*⁴⁵

These issues were naturally also discussed within and among the Air Force, the Army and the Navy. Should one conduct offensive operations on enemy territory, or should the RNoAF prioritise more defensive tasks, for instance operations in (more or less direct) support of its own Army and Navy forces? Lieutenant General Lambrechts, Chief of the RNoAF 1951-55, viewed defence against enemy air attacks as the most important task. In February 1955 Lambrechts expressed his view on the best way to achieve such a defence, and stated that Norwegian fighters should conduct offensive operations against targets in the Soviet Union and *hit the enemy at his bases before he can release his full attack potential.*⁴⁶ This would contribute to keeping Norwegian airfields open for 1-2 weeks; which was considered to be sufficient window of opportunity for allied air forces to arrive. Lambrechts's successor as Chief of the RNoAF, Lieutenant General Motzfeldt, shared Lambrechts's view. Not surprisingly the Chief of the Army argued the need for direct air support of the Army's operations, claiming that the RNoAF put too much weight on offensive operations. Neither the Chief of the Navy was pleased with air force priorities, and argued that the fleet of maritime patrol aircraft not only needed modernization; it should also be increased from 6 to 18 aircraft.⁴⁷ Nevertheless, the Air Force generals maintained their position on the matter.

Parallel with the introduction of Massive Retaliation, Prime Minister Torp (Labour) and his government planned for a change in Norwegian policy which would forbid foreign bases in Norway in peacetime, a policy declared in February 1949. However, the government's plan was never realized.⁴⁸ The US presented the so-called Nash-offer, an arrangement involving

⁴³ Ibid p. 86.

⁴⁴ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 300. Original text: [*Den sentrale sjefsnemd*]

⁴⁵ Wilhelm Mohr (referent): *Referat fra møte i Den sentrale sjefsnemd 23. November 1956* (Oslo, 26 November 1956), pp. 1-2. Document available at Magasinet, RNoAF Academy Library. Original text: [*i den situasjon vi befinner oss i med hensyn til konvensjonelle styrker og med våre små muligheter for å få direkte hjelp, vil taktiske atomvåpen være en nødvendighet i norske styrker*].

⁴⁶ E. Monstad (referent): *Referat fra møte i Den sentrale sjefsnemd 18. Februar 1955* (Oslo, 12 Mars 1955), p. 5. Document available at Magasinet, RNoAF Academy Library. Original text: [*...ramme fienden i hans utgangsbaser før han får utløst sitt fulle angrepspotensial*].

⁴⁷ Svein Duvsete, *Luftforsvarets Historie, 3 vols* (Oslo: Aschehoug & Co, 2004), pp. 88-89.

⁴⁸ Ibid p. 109.

the stationing of 20-25 US fighter aircraft in Norway, but on regular rotation. As another option the US could also offer more aircraft to the RNoAF through the weapon aid programme, provided that the RNoAF would establish three extra fighter squadrons. In 1954 RNoAF generals Lambrechts and Tufte Johnsen, wanting all-weather capable (AWX) fighters (the F-86K) instead of day-only fighters, presented an altered plan to the DoD, which partially agreed to the proposal.⁴⁹ However, it was soon clear that the Nash-offer did not include AWX fighters. Norway thus received 50 F-86Fs, and in addition one squadron of RF-84F reconnaissance aircraft. In 1955 the defence budgets were reduced by the new government, and the expansion plans put on hold. The new aircraft received from the US therefore became a straight forward replacement of the old ones; F-86Fs replaced F-84Gs. Although the new reconnaissance squadron arguably represented an expansion, the RNoAF fighter fleet was in reality modernised rather than enlarged.

The NATO document MC 70 indicated a force goal of a minimum 193 fighter aircraft for the RNoAF in the period 1958-63.⁵⁰ In March 1958 the MAAG in Oslo signalled that they were considering making a delivery of some 140 aircraft to the RNoAF in 1962.⁵¹ As it turned out the actual delivery of fighter aircraft counted 115. In the same period Norway took to a more reserved view of Massive Retaliation, as well as nuclear weapons. Regarding Massive Retaliation the Joint Chiefs of Staff already in 1956 argued that the risk of local and limited attacks, or smaller scale conflict or war, was not properly addressed in the doctrine.⁵² In 1959 Chief of Staff General Øen again pointed out that the NATO plans took into consideration little else than the possibility of an all-out war, and voiced the need for plans that addressed alternatives. On the issue of nuclear weapons Norway took an even more rigorous stance. At the NATO meeting in Paris in 1957 Prime Minister Einar Gerhardsen (Labour) announced the Norwegian policy was not to allow nuclear weapons on Norwegian soil in peacetime, a policy that was reaffirmed in Parliament four years later.⁵³

⁴⁹ Ibid pp. 108-11.

⁵⁰ NATO: *MC 70, A report on Minimum Essential Force Requirements 1958-63* (January 29, 1958), p. 107.

⁵¹ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), pp. 114-15.

⁵² Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), p. 170.

⁵³ Stortingsmelding nr. 28 (1960-61), *Gjennomføringen av målsettingen i St.prp. nr. 23 for 1957 Om hovedretningslinjer for Forsvaret i årene framover* (Oslo: Forsvarsdepartementet, 9. desember 1960), p. 43, and the Innst. S. nr 155 (1960-61) *Innstilling fra militærkomiteen* (Oslo: Militærkomiteen, 18. april 1961), p.6.

The 1960s – rising need for modernisation

NATO strategy gradually changed from the early 1960s. Several factors contributed to this. In the USA critics claimed that Massive Retaliation no longer served US interests, and in Europe scepticism increased about whether the USA would go to an all-out war in response to a Soviet attack on any of the European NATO members. On 20 April 1961 the US National Security Council issued the National Security Action Memorandum (NSAM) 40, which set forth US policy toward NATO. NSAM 40 stated that the US should urge that *first priority be given, in NATO programs for the European area, to preparing for the more likely contingencies, i.e., those short of nuclear or massive nonnuclear attack.*⁵⁴ After the French withdrawal from the integrated command structure of the alliance in 1966 a doctrinal change could finally be agreed upon, and Flexible Response was adopted by NATO in December 1967.⁵⁵ With MC 14/3 (1968)⁵⁶ and MC 48/3 (1969)⁵⁷ the time of Massive Retaliation was over, and the key feature of the new NATO strategy *was not just flexibility [...] but [also] the idea of escalation.*⁵⁸

However, NATO's plans for how Europe would actually be defended had gradually become more and more flexible since the beginning of the 1960s. Already in 1962 SACEUR introduced alternative plans for dealing with *aggression short of all-out war.*⁵⁹ When Flexible Response was formally adopted by NATO in 1967, this merely brought the overall doctrine in line with the plans on how to defend Europe, rather than the opposite.

Norway was in favour of the change to Flexible Response, as it gave more room for planning and preparations aimed at dealing with tense situations and conflict short of all-out (nuclear) war. However, the RNoAF was in need of modernisation going into the 1960s, and so were the Army and the Navy. Much of the equipment received through the MDAP was now both worn out and obsolete. The new Minister of Defence as of February 1961, Gudmund Harlem, quickly made changes in order to meet the upcoming challenges.⁶⁰ The Chief of Staff was given increased responsibilities; for one he was put in charge of coordinating all defence plans (thus far submitted "un-coordinated" directly from the Chief of the Army, Navy and Air

⁵⁴ Gregory W. Pedlow, 'NATO Strategy Documents 1949-1969', (NATO: October, 1997), p. XXI. <http://www.nato.int/docu/stratdoc/eng/intro.pdf>, March 2007.

⁵⁵ NATO: MC 14/3, *A report on the Overall Strategic Concept for the Defense of the North Atlantic Treaty Organization Area* (January 16, 1968). The new concept was adopted on 12th of December 1967.

⁵⁶ Ibid pp. 10-11.

⁵⁷ NATO: MC 48/3, *Measures to Implement the Strategic Concept for the Defence of the NATO Area*, (December 8, 1969).

⁵⁸ Gregory W. Pedlow, 'NATO Strategy Documents 1949-1969', (NATO: October, 1997), p. XXIV.

⁵⁹ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 172. Original text: [aggresjon mindre enn allmenn krig].

⁶⁰ Ibid p. 306. Harlem was Minister of Defence in the period 1961-65.

Force) before presenting them to the DoD. As of August 1961 the Chief of Staff was given full operational command over all national forces in peace and war, and on 1 January 1963 the title Chief of Defence (CoD) was formally reinstated. Harlem also directed an increased effort in getting standardized material and simplified routines across the Services.⁶¹ Finally, in January 1962, Harlem requested a new five-year plan for the Armed Forces. Harlem acted in full understanding with the Americans. During a meeting between Harlem and the US Secretary of Defence Robert McNamara in March 1962, *the Americans expressed that they supported the development of a purely conventional defence, which would have an increased focus on national tasks, especially on fighting enemy invasion in north Norway.*⁶² The new five-year plan, Stortingsmelding 84, was presented to Parliament in June 1963. The three main tasks of the Armed Forces were defined as (1) *To conduct efficient surveillance and early-warning, (2) To provide the strongest possible resistance against invasion, and (3) To secure the best possible conditions for receiving allied help.*⁶³

In an RNoAF modernization plan presented in 1959 it had been suggested that the RNoAF should acquire 144 new fighter aircraft by 1961; all of them F-104Gs. However at the beginning of the 1960s the Americans believed several European countries were now able to finance much of their defence spending themselves. The MDAP would soon come to an end, and a modernization of the RNoAF fighter fleet could not be expected to be financed by the USA. The modernization plan thus seemed unrealistic as it was not likely that several squadrons of sophisticated F-104Gs would be delivered to the RNoAF.

However, the Americans considered it to be in their own interest to continue to deliver defence equipment to Norway through the MDAP. The reasons were twofold: Norway was viewed as important to US security because Soviet air attacks against the USA would most likely pass through Norwegian air space. In addition it was perceived, based on American analyses, that with ice-free Norwegian harbours in Soviet hands, the effectiveness of the Soviet fleet of submarines could increase by as much as 40%. In a meeting between McNamara and Harlem in Athens, May 1962, it was implied that Norway would receive defence material worth approximately 40 million dollars in the period 1962-67, on two

⁶¹ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), pp. 174-77.

⁶² Ibid p. 177. Original text: *[fikk Amerikanernes støtte for oppbyggingen av et rent konvensjonelt Forsvar som i større grad skulle rette fokus mot nasjonale oppgaver, særlig invasjonforsvaret i Nord-Norge].*

⁶³ Stortingsmelding nr 84 (1962-63), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1964-1968*, (Oslo: Forsvarsdepartementet, 14. juni 1963), p. 3. Original text: *[(1) Å gjennomføre en effektiv overvåknings- og varslings-tjeneste, (2) Å kunne yte sterkest mulig motstand mot invasjon, og (3) Å legge forholdene best mulig til rette for alliert hjelp].*

conditions: Increased Norwegian defence budgets, and Norwegian acquirement of American fighter aircraft.⁶⁴

The modernization of the Air Force was indeed a question of economy. The MC 70 had set an RNoAF goal of 193 fighter aircraft for the period 1958-63. However, most modern aircraft were complex and thus expensive to run. For instance, if all of these new fighters were to be F-104Gs the annual RNoAF budget would have to be increased by 120% - just to run the fleet. Even if the aircraft had been received at no cost, the RNoAF could not afford to fly them.⁶⁵ The RNoAF was originally offered 36 F-104Gs, enough to set up two squadrons. However, the Norwegian DoD had an alternative plan, and proposed that the RNoAF should receive only one squadron of F-104Gs. The value of the second squadron – some NOK 210 million - could instead be spent on less expensive fighter-bombers. Harlem discussed the matter with McNamara in March 1963, who agreed.⁶⁶ The same issue was on the agenda in a meeting between Harlem and RNoAF Lieutenant General Wilhelm Mohr later in the spring of 1963.⁶⁷ Mohr was well aware of the budgetary situation, as well as the Norwegian policy on nuclear weapons. The F-104G was an AWX capable fighter able to carry both conventional and nuclear weapons, and it was also viewed as a state-of-the art interceptor. Mohr regarded the F-104G as an excellent nuclear deterrent, but not cost effective if this potential would not be exploited.⁶⁸ Mohr therefore wanted to look into the possibilities of acquiring more aircraft of a less sophisticated type. From a military standpoint a minimum of 100 fighter-bombers were required, and these would – in lieu of the low numbers of AWX capable fighters – have to be capable as day-only fighters / interceptors. However, the political view was that 60 fighter-bombers would do, partially based on financial aspects, but also on an anticipation that allied air forces would quickly come to Norway's aid if need be. As chief of the RNoAF, Mohr never acknowledged the latter to be an appropriate input to the planning of the structure of national forces.⁶⁹

⁶⁴ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), pp. 177-79. On page 179 Duvsete refers to the *NATO Ministerial Meeting, Athens, May 4-6, 1962, Position Paper Norway*.

⁶⁵ Ibid p. 182.

⁶⁶ Ibid p. 184.

⁶⁷ General Lieutenant Wilhelm Mohr was Chief of the RNoAF from June 1st 1964 to June 30th 1969.

⁶⁸ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), p. 182. Duvsete refers to a letter from Mohr, at the time Deputy Chief of Staff at the RNoAF HQ, to the Department of Defence, dated September 30th 1961. Mohr questions the spending of limited resources on acquiring aircraft with qualities that the RNoAF will not be allowed to use, and states that *this [the F-104G] is too expensive if only a conventional role is intended*. Original text: [*..denne egenskap er for kostbar hvis kun konvensjonell rolle er påtenkt*].

⁶⁹ Ibid p. 189. Duvsete refers to a letter from Chief of the RNoAF Gen.Lt Mohr to the Chief of Defence, dated April 12 1966.

As it turned out the national long term plan for the period 1964-68 stated that the RNoAF would get 3 new squadrons with a total of 60 fighter-bombers, with possibly a fourth squadron added later in the period. The number of F-104Gs would be limited.⁷⁰ Eventually the RNoAF came to operate a total of 19 F-104Gs from 1963 and on, initially replacing the F-86F. In the first years of its service the main wartime role of the F-104Gs was thus to fly as fighter-bombers.

All weather capable fighters for north Norway

Towards the end of the 1950s plans had been made to establish an AWX capable fighter squadron in north Norway. The reason for this was increased Soviet air activity; of which approximately one third was all-weather operations. The lack of an AWX capability was of concern on a national level as well as in NATO.⁷¹ Late in 1960 the F-86Fs at Bodø Airbase were replaced by F-86Ks. The K model had radar, and the primary mission was to fly as an AWX air defence fighter. In addition, for the purpose of air policing, the F-86K squadron was also responsible for maintaining Ground Alert with two (and in periods four) aircraft. The F-86K had limited range and endurance, and the typical sortie length would be 45-60 minutes. The sortie could however be considerably shorter, even halved, depending on the need for low level flying or use of the afterburner. The lack of speed in dry power in many cases forced use of the afterburner, significantly reducing endurance and severely hampering the successful completion of interceptions.⁷²

The F-104Gs were delivered under the MDAP, and the Americans were consulted before the role of the aircraft was changed. After a meeting between Harlem and McNamara in the fall of 1967 it was clear that the 331 squadron and the F-104Gs in Bodø would be used as AWX fighters in wartime, and the change to the new role came into effect as of October.⁷³ In peacetime the main role for the squadron would be Air Policing. The squadron was placed under the command of Commander-in-Chief Allied Forces Northern Europe (CINCNORTH), and as of 1 November the squadron had two aircraft on Ground Alert day and night, ready to air police on scramble orders.

⁷⁰ Stortingsmelding nr 84 (1962-63), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1964-1968*, (Oslo: Forsvarsdepartementet, 14. juni 1963), p. 11.

⁷¹ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), p. 144.

⁷² *Ibid* p. 143-47.

⁷³ *Ibid* p. 217.

The purchase of the F-5 and the NDRE

In 1962 it had become clear that the F-86 fighter-bombers were not only outdated, they were also in poor condition. Temporary technical modifications for parts of the fleet helped to some degree, but in the long term new fighter-bombers would have to be acquired. This would be the first national purchase of fighter-bombers since the Vampire in 1948; then based on technical analyses, cost assessments and test flying performed by the RNoAF alone. The method selected in 1962 was quite similar, but in addition the RNoAF also wanted a scientific approach.⁷⁴ The job would go to the NDRE.

Norway had no own defence research establishment prior to WW II. However during the war Norwegian civilian scientists and engineers were engaged in British military research activity.⁷⁵ When the NDRE was formally established 11 April 1946, the core of the new organisation consisted of scientists and engineers with British experience. Although the NDRE took on the task of giving advice on defence related science and technology from the start, the efforts in this field were modest during the first years. But towards the end of the 1950s changes were made in order to organize and improve the field. In the book “Kunnskap som våpen” Olav Njølstad and Olav Wicken describe the establishment of the System Group in 1959 as a turning point for the better.⁷⁶ One year later Parliament put the NDRE in charge of all defence related operations research and system analyses.⁷⁷

The RNoAF contacted the NDRE System Group in fall 1962. The System Group spent half a year on the analysis ‘*A limited Effectiveness/Cost study of Fighter-bombers*’, with the intention of assisting the RNoAF in the evaluation of fighter aircraft in missions involving attack on surface targets.⁷⁸ The effectiveness of seven different aircraft was studied, with two main types of missions taken into consideration. One was the penetration of enemy territory and attack on radar installations in support of allied nuclear strike missions; i.e. SNOWCAT missions. The other was attack against invading enemy sea and ground forces, with both sides using only conventional weapons. These two main mission types were combined with different types of targets and ranges from the home base, resulting in a number of specific

⁷⁴ Ibid p. 237.

⁷⁵ Olav Njølstad and Olav Wicken, *Kunnskap som våpen* (Oslo: Tano Aschehoug, 1997), pp 21-30. For instance, Norwegian scientists and engineers worked at the Admiralty Signal Establishment, National Physical Laboratory, Air Defence Research and Development Establishment, Anti-Submarine Experimental Establishment, Armament research Department and others.

⁷⁶ Ibid pp. 294-301.

⁷⁷ Stortingsmelding nr 5 (1960-61), *Om Forsvarets Forskningsinstitutt, dets organisasjon og retningslinjer for dets fremtidige arbeid og utbygging*, (Oslo: Forsvarsdepartementet, 5. august 1960), pp. 4-6.

⁷⁸ Kjell Roderburg and others., ‘A limited effectiveness/cost study of fighter-bombers’, *FFI Intern rapport S18* (1963), p.3.

missions. The MoE used for each type was simply set to be *the average number of targets destroyed by a squadron*.⁷⁹ No doubt was left regarding the necessity of the fighter-bomber in case of an invasion, as it was stated in the study's introduction that *in an initial invasion defence of Norwegian territory short term reduction of enemy tactical fighting strength on land must have high priority. Wherever possible enemy ground forces should be engaged by fighter-bombers before they reach the battle area and are able to inflict losses on our army units*⁸⁰. Average annual costs figures per squadron were established so that the effectiveness/cost calculations could be made. The cost figures included all initial investments as well as operating costs, varying with the number of squadrons. One squadron was set up with 21 pilots and 18 aircraft. Life expectancy for one aircraft was set to ten years with 240 flying hours per year.

The F-86F and F-84F were both excluded early *due to the age of these aircraft [...]*.⁸¹ Of the remaining five aircraft the F-104G was ranked last. It was the most expensive candidate, and was also restricted in its ability to carry conventional stores due to few stations for external weapons and fuel tanks. The Fiat G-91 was ranked as number four. It was the cheapest of the candidates, but rather limited in range and weapon carriage capability.⁸² The three top candidates were from first to third place the Douglas A4D-5, the Northrop F-5A and the Lockheed F-104 -17 (or just F-104H). The latter was basically the same aircraft as the F-104G, but without the more complex electronic systems, such as radar and inertial navigation system. The F-104H would therefore be cheaper than the F-104G. However, both the A4D-5 and the F-5A were preferred over the F-104H in the fighter-bomber role, with the A4D-5 ranked highest.

American analyses gave similar results. But in fall 1963 a new and important aspect emerged. As the RNoAF would receive only one squadron of F-104Gs, it was decided that the new fighter-bomber would be assigned the secondary role of air policing, air defence and reconnaissance. The chief of the RNoAF decided that the F-104H was to be part of the final evaluation and test flight programme. The NDRE findings were verified, as the A4D-5 performed best in the fighter-bomber role. However, the F-104H was by far the best air defence candidate. Although the F-5A was found inferior to the A4D-5 and the F-104H in roles of fighter-bomber and air defence respectively, it delivered decent results in both roles. Overall the Norwegian team considered the F-5A to be the best candidate. General Major

⁷⁹ Ibid p.5.

⁸⁰ Ibid p.4.

⁸¹ Ibid p.100.

⁸² Ibid p. 22, Table 3.5 Average Total Annual Cost per Squadron

Mohr, at the time leading the RNoAF Staff, also preferred the F-5A.⁸³ The F-5A was recommended by the RNoAF as the new fighter-bomber aircraft, and in February 1964 the government decided to purchase 64 F-5s.⁸⁴ The RNoAF came to operate a total of 108 F-5 aircraft.⁸⁵

The RNoAF was quite pleased with the cooperation with the NDRE. The scientific analysis and report complemented the RNoAF analysis. In addition the NDRE was considered by political decision makers to be an independent research institution. The RNoAF therefore found the NDRE to be a very important partner. In an interview in May 2000 General Major Mohr stated that *we saw the NDRE as very useful to us...they said it all so much better, and had access to circles we could not reach.*⁸⁶

SNOWCAT - typical offensive tasks

The most illustrative offensive tasks of the RNoAF fighter fleet in the 1950s and 1960s were the SNOWCAT (Support of Nuclear Operations with Conventional Attacks) missions. RNoAF fighter-bombers would attack pre-planned targets with conventional weapons, and reconnaissance fighters would carry out both pre- and post-attack reconnaissance. The aim of these operations was twofold. The foremost goal was to destroy Soviet radar antenna and communication nodes, and thereby deny the enemy early warning and reduce his ability to control and direct forces against NATO operations. Secondly, the aim was to contribute to an overload in the Soviet command and control systems, thereby preventing the enemy from figuring out which of the many incoming NATO aircraft were carrying nuclear weapons and thus unable to stop NATO nuclear bombers from striking their targets. The latter has been seen as perhaps the most important effect of the SNOWCAT missions.⁸⁷

The SNOWCAT missions were introduced in 1956. The mission targets, picked by CINCNORTH, were located in the Soviet Union, East-Germany, Poland and the Baltic states. In addition plans were made for attacking targets in Finland, but these missions were not to be carried out until it was clear that enemy forces were preparing to make use of Finnish bases.

⁸³ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), p. 238-42.

⁸⁴ Stortingsproposisjon nr 91 (1963-64), *Om anskaffelse av jager-bombefly til Luftforsvaret* (Oslo: Forsvarsdepartementet, 28. februar 1964).

⁸⁵ Tom Arheim and others, *Fra Spitfire til F-16* (Oslo: Sem & Stenersen AS, 1994), p. 256.

⁸⁶ Svein Duvsete, *Luftforsvarets Historie*, 3 vols (Oslo: Aschehoug & Co, 2004), p. 243. Original text: [vi grep FFI som en nyttig ting for oss selv...for de sa det bedre, og de hadde tilgang til miljø der vi ikke rakk frem]

⁸⁷ Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001), p. 198.

The practical planning of the missions, including the routing, was done by Norwegian personnel. The SNOWCAT missions involved the use of F-84Gs, F-86Fs and F-5As. Limitations in combat range was an important planning issue. The limited amount of fuel would rule out deviation from planned routing as well as aerial engagement with enemy forces. SNOWCAT missions were thus in some cases seen as one-way missions, with an anticipation that several units might end their mission with an emergency landing on (or ejection over) foreign territory.

SNOWCAT missions would primarily support SACEUR's nuclear strike plans. However, in the event of a broad offensive air campaign the SNOWCAT missions would function as a door-opener not only for strike forces under NATO command, but all air forces (for instance the US Strategic Air Command or the RAF Bomber Command) with strike missions in the same area. From 1959 NATO plans for the Norwegian air forces in north Norway showed that support of CINCNORTH's Atomic Strike Plan (ASP) was prioritised higher than the defence of Norwegian territory against Soviet invasion. This triggered discussions on a national military level. Should one suggest a change to the NATO prioritisation of the tasks; or should one call for a transfer of the authority to alter the prioritisation to a Norwegian General? In 1959 the Commander of Northern Norway (ØKN), Skule Storheil, suggested that such an authority should be delegated to him. But the plans for 1960 reflected the same priorities. No changes were made, and *it was with great ambivalence Norwegian military commanders accepted that support of the ASP would have higher priority than the defence against an invasion, and that the authority to re-allocate the Norwegian forces would be in the hands of CINCNORTH.*⁸⁸

Norwegian political authorities were not enthusiastic about the SNOWCAT missions. In March 1956 Prime Minister Gerhardsen expressed his aversion to the use of Norwegian aircraft in offensive missions over Soviet territory.⁸⁹ His comments were based on principle; the RNoAF should primarily be used for the direct defence of Norwegian territory and people. However; despite the scepticism towards the SNOWCAT missions, Norwegian political authorities never put a stop to it. In fact, the use of Norwegian aircraft for offensive missions inside another country's airspace was in an indirect manner approved by Parliament in Stortingsmelding 77, the five-year plan for the structuring and tasks of the RNoAF in the

⁸⁸ Ibid pp. 202-03. Original text:[*det var med en betydelig ambivalens at de norske militære sjefer godtok at støtteoppgavene til atomoffensiven skulle gå foran invasjonforsvaret og at retten til omdisponering av styrkene skulle ligge i CINCNORTHs hender*].

⁸⁹ Knut E. Eriksen and Helge Ø. Pharo, *Norsk utenrikspolitikk historie*, 6 vols (Oslo: Universitetsforlaget, 1997), p. 264. See also Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001), p. 201.

period 1964-68, presented in April 1964.⁹⁰ On page 2 it is stated that in conducting offensive operations with fighter-bombers *the primary goal is to attack enemy forces before they force their way into our own areas.*⁹¹ Possible targets are listed, including airports and installations at airports, aircraft on the ground, radar sites and communication nodes. To attack such targets, before the enemy could get to *our own areas*, would have required offensive missions into Soviet territory.

SNOWCAT missions had first priority for assigned squadrons until the end of the 60s. In 1970 the concept was discussed among CINCNORTHs Air Commanders. Going into the 1970s the use of the fighter aircraft in exercises changed; direct support of anti-invasion would now have priority over SNOWCAT missions. SNOWCAT missions slowly disappeared from the plans, and by the middle of the 1970s the last plans were gone.⁹²

Chapter 2 in perspective

The three-year plan for the rebuilding of Norway's armed forces, issued by the DoD in 1946, stated that Norwegian Armed Forces had to be able *'to stand our ground until we get help from those who will be our allies'*. Norway joined NATO in 1949, but announced the same year the policy of not allowing foreign forces bases in Norway in peacetime.

Although national defence budgets were increased in the early 50s, huge defence investments in the period 1950-1965 were financed by the USA and NATO. Through the 1950s and well into the 1960s the RNoAF operated a fighter fleet of nearly four hundred F-84s and F-86s. These aircraft were true workhorses of their day; primarily intended for use as fighter-bombers carrying out offensive missions. SNOWCAT missions, supporting nuclear strike missions on Soviet and WP territory, are the most illustrative offensive missions for RNoAF fighter-bombers in the period. These missions had first priority for assigned squadrons until the end of the 60s. In 1955 Air Force General Lambrechts stated that conducting offensive fighter missions against targets on enemy territory, thus hitting *'the enemy at his bases before he can release his full attack potential'*, would contribute to keeping Norwegian airfields open for 1-2 weeks. Such was considered to be sufficient window of opportunity for allied air

⁹⁰ Stortingsmelding nr 77 (1963-64), *Luftforsvarets styrkemålsetting i perioden 1964-1968*, (Oslo: FD, 24. april 1964). See also Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001), p. 204.

⁹¹ Stortingsmelding nr 77 (1963-64), *Luftforsvarets styrkemålsetting i perioden 1964-1968*, (Oslo: FD, 24. april 1964), p.2. Original text: [*Det primære mål er å kunne angripe fiendens styrker før disse har trengt inn i våre egne forsvarsområder*].

⁹² Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001), p. 205. Squadrons 336 and 338 were the last two squadrons with plans for SNOWCAT.

forces to arrive. However, in 1956 the Joint Chiefs argued that the risk of limited attacks, or smaller scale conflict or war, was not properly addressed in the doctrine of Massive Retaliation. Nonetheless, the same year the Joint Chiefs stated that *'in our current situation, with regard to conventional forces and small chances of getting help directly, tactical nuclear weapons are a necessity for Norwegian Armed Forces'*. However, shortly thereafter Prime Minister Gerhardsen (Labour) announced the Norwegian policy not to allow nuclear weapons on Norwegian soil in peacetime.

In 1959 Chief of Staff General Øen again pointed out that the NATO plans took into consideration little else than the possibility of an all-out war, and voiced the need for plans that addressed alternatives. It seems clear that going into the 1960s both political and military levels increasingly favoured Flexible Response. It was at the same time evident that the weapons aid programmes were coming to an end. However, in the case of Norway the Americans considered it to be in their own interest to continue to deliver defence equipment a while longer, based on the view that Soviet air attacks against the US would most likely pass through Norwegian air space. This combined well with Norwegian ambitions to acquire a certain air defence capability; a capability that in fact was viewed to be important throughout the period. It was the Boyesen Committee that had voiced the strongest preferences with regard to air defence fighter squadrons, but also the RNoAF saw the need for a certain air defence capability. From 1960 onwards, increasing Soviet air activity caused concern both on the national level and in NATO, resulting in more focus on using fighters in an air defence role in north Norway. This seems to have helped pave the way for getting AWX Air Policing fighters stationed in Bodø; first the F-86Ks in 1960, and three years later the F-104 Starfighter (also delivered under the MDAP).

Continued US weapon aid was given under the conditions that Norway increase her defence budgets, and purchase US fighters. In 1963 a new five-year plan, Stortingsmelding 84, was presented. The three main tasks of the Armed Forces were to conduct efficient surveillance and early-warning, to provide the strongest possible resistance against invasion, and to secure the best possible conditions for receiving allied help. At the same time the NDRE System Group, after having been contacted by the RNoAF, carried out the analysis *'A limited Effectiveness/Cost study of Fighter-bombers'*. The aim was to assist the RNoAF in evaluating fighter aircraft in missions involving attack on surface targets. The study's introduction stated that *'in an initial invasion defence of Norwegian territory short term reduction of enemy tactical fighting strength on land must have high priority. Wherever possible enemy ground forces should be engaged by fighter-bombers before they reach the battle area and are able to*

inflict losses on our army units'. The MoE for each of the two main mission types, SNOWCAT missions and attack against invading enemy sea and ground forces respectively, were set to be *'the average number of targets destroyed by a squadron'*. Not only did the NDRE analysis complement the RNoAF analysis, the NDRE was also well regarded as an independent research institution by political authorities, and was therefore viewed as an important ally.

Summed up it is clear that throughout this period national defence planning was heavily based on the idea that Norway would not be able to defend herself. Strong allies were therefore of great importance. Norway joined NATO, and was initially in support of Massive Retaliation. Nevertheless, at the same time political authorities did not permit foreign forces permanent basing in Norway or nuclear weapons on Norwegian soil in peacetime. Into the 1960s Norway increasingly favoured Flexible Response, and looked more to the Soviet threat in the north and the need for certain air defence capabilities. Nonetheless; the prioritisation of an offensive use of the fighter fleet was upheld; even though it seemingly stemmed more from NATO doctrine and plans, and the type and amount of aircraft received through the MDAP, rather than being the result of decision on Norway's part. In addition the 1964 decision (supported by the NDRE F-5 study) to buy fighter-bombers, the priority to SNOWCAT missions throughout the 1960s and the renewed RNoAF doctrine of 1969 all underpin the same picture: An RNoAF fighter fleet being in an offensive posture through the 1950s and the 1960s.

3 The NDRE System Group, The threat, and the Conflict Scenario

The NDRE, the NDRE System Group, and Operations Research & System Analysis

The NDRE, led by a civilian Director General and located at Kjeller near Oslo, was organised directly under the DoD from its inception in 1946. Over the years the NDRE experienced considerable growth, both in budgets and manning. In 1946 the institution employed approximately 50 people, with a budget equivalent to 0.5 % of the defence budget. By the end of the 1960s the budget was 1.1 %, and total manning more than 500.⁹³ The primary task of the NDRE was to carry out defence related research, and to advise on defence related science and technology.

In the late 1950s a reorganisation of the NDRE was initiated. The main aim was to strengthen the Director General and his ability to direct research activities.⁹⁴ Thus, the System Group was established in 1959. The NDRE's efforts in providing advice on defence related science and technology had been modest during the first years. With the System Group, organised directly under the Director General, this was now to change. NDRE Director General Finn Lied had *ambitions for the new Systems Group beyond Operations Research limited to the field of weapon systems, and more in the direction of broad Systems Analysis aimed at finding optimum use of resources on various levels in the Armed Forces.*⁹⁵

Lied selected Erik Klippenberg as the first leader for the NDRE System Group, a position he held until 1984. Klippenberg had experience with Operations Research (OR) and Systems Analysis (SA) from the SHAPE Air Defence Technical Centre (SADTC) in the Hague. From its establishment the System Group used OR and SA as tools to provide *a basis for planning and decisions on different levels within the Armed Forces.*⁹⁶ The System Group was central in strengthening the position of the NDRE as chief adviser to the DoD and the Armed Forces on defence related matters, and also in underpinning the NDRE as a vital contributor in defence planning.

⁹³ Olav Njølstad and Olav Wicken, *Kunnskap som våpen* (Oslo: Tano Aschehoug, 1997), Attachments 2 and 4, pp. 502-04.

⁹⁴ Ibid pp. 242-51.

⁹⁵ Ibid p. 300. Original text: [*Lieds ambisjoner for det nye stabselementet pekte utover de snevre operasjonsanalyser av våpensystemer og gikk mer i retning av bredt anlagte systemanalyser med henblikk på finne frem til den optimale ressursanvendelse på ulike nivåer i Forsvaret*].

⁹⁶ Ibid pp. 295. Original text: [*som grunnlag for planlegging og beslutninger på ulike nivåer i Forsvaret*].

According to the Canadian scientist Omond Solandt⁹⁷ OR started as a more or less formal British concern early in WWII, with the different services covering different subjects. For instance in the Air Force, the first of the services to use OR, quantitative analysis was applied to solve the problem of how to use the radar. In the book ‘Methods of Operations Research’ OR is defined as *a scientific method of providing executive departments with a quantitative basis for decisions regarding the operations under their control*.⁹⁸ Clayton J Thomas has stated that the general methods of OR apply in particular to many aspects of military operations, and thus defines Military Operations Research (MOR) as *the application to military operations of the methods of operations research*.⁹⁹ MOR became a highly valued method of analyzing a wide range of military activities in order to promote greater efficiency during WWII. After the war, scientific study of military operations such as MOR became widespread and institutionalized. As the Cold War emerged, there was a general recognition that it would be necessary to increase the use of MOR, devoted not only to combat operations, but also in the fields of supply, logistics, training and more.

Even in the Cold War climate there were limits on national expenditures for armed forces. Problems soon involved more than that of merely maximizing the effect of individual weapon systems. In Thomas’ words governments needed to decide “how much is enough”, and MOR sought to support this decision. Application of operations research at this level – termed Systems Analysis (SA) – involves difficulties much greater than difficulties of, for instance, MOR in WWII. For a quick look into what SA is, the article ‘An Appreciation of Systems Analysis’ by Charles Hitch, RAND Cooperation is very helpful. It states that *military systems analysis is an extension of operations research techniques of WWII to problems of broader context and longer range – e.g. force composition and development [...]*.¹⁰⁰ Hitch points out that composition and development decisions concern a military force ten to fifteen years in the future, and maintains that this alone causes a substantial increase in the number of interdependent variables which have to be considered. Hitch, who in a later article examined more in depth what he considered to be the most intractable problems of OR,¹⁰¹ illustrates his

⁹⁷ Omond Solandt, ‘Observation, Experiment, and Measurement in Operations Research’, *Journal of the Operations Research Society of America* 3, 1 (1955), p. 1.

⁹⁸ P.M. Morse and G.E Kimball, *Methods of Operations Research*, (Cambridge: Massachusetts Institute of Technology Press, 1951), p.1

⁹⁹ Clayton J Thomas, ‘Military Operations Research’, in *Encyclopedia of Operations Research and Management Science*, ed. by Saul I Gass and Carl M Harris, (Norwell: Kluwer Academic Publishers, 1996), p. 394.

¹⁰⁰ Charles Hitch, ‘An Appreciation of Systems Analysis’, *Journal of the Operations Research Society of America* 3, 4 (1955), p. 466.

¹⁰¹ Charles Hitch, ‘Uncertainties in Operations Research’, *Operations Research* 8, 4 (1960).

point by comparing the WWII problem of improving bomber accuracy with the post-war problems of weapon system development and force composition. In the short run [i.e. the WWII problem], Hitch argues, much would be given, but in the longer run the situation would be different: *The planes were B-17's, their number was given, the targets were given, the bombs were given, the enemy defenses were given [...]. In the longer run these are not given. They are unknown. They become variables.*¹⁰² However, in Thomas' words, *despite these difficulties, governments must make decisions, and Systems Analysis, with all of its limitations, has much to offer.*¹⁰³

In 1960 the Norwegian Parliament decided that the NDRE would be the leading institution for defence planning decisions.¹⁰⁴ The Army and the Air Force were content with this, but there had been disagreements on the matter between the NDRE and the Navy. In 1957 the Chief of the Navy Statistic Unit stated that his unit from now on would conduct all Navy related OR. Though the Navy and the NDRE eventually found a middle ground,¹⁰⁵ the Navy kept on educating officers in OR at the US Naval Postgraduate School.

In 1967 Klippenberg clarified what OR and SA meant at the NDRE.¹⁰⁶ OR were analyses of operations involving existing material, weapon systems and/or military personnel. The goal would primarily be to evaluate either alternative products, or to find an optimum way of using already implemented material or weapon systems. Also the term SA was used to describe defined studies. SA primarily aimed at finding an optimum configuration of a defence system intended for one or more of the Services; carefully observing the amount of defence resources available for implementing and running the system in question. Moreover, to the extent the use of simulations and OR allowed, SA was also aimed at recommending guidelines for the most effective use of the system(s) in question.¹⁰⁷

OR, SA and quantitative methods were the main tools for the NDRE in providing a foundation for its decisions in defence planning. As the 1960s went by the demand for this

¹⁰² Charles Hitch, 'An Appreciation of Systems Analysis', *Journal of the Operations Research Society of America* 3, 4 (1955), p. 468.

¹⁰³ Clayton J Thomas, 'Military Operations Research', in *Encyclopedia of Operations Research and Management Science*, ed. by Saul Gass and Carl Harris, (Norwell: Kluwer Academic Publishers, 1996), p. 396.

¹⁰⁴ Stortingsmelding nr 5 (1960-61), *Om Forsvarets Forskningsinstitutt, dets organisasjon og retningslinjer for dets fremtidige arbeid og utbygging*, (Oslo: Forsvarsdepartementet, 5. august 1960)

¹⁰⁵ Olav Njølstad and Olav Wicken, *Kunnskap som våpen* (Oslo: Tano Aschehoug, 1997), pp. 296-99.

¹⁰⁶ Ibid p. 306. Njølstad and Wicken refers to a letter from Klippenberg dated April 26th 1967.

¹⁰⁷ For an in-depth examination of the use of quantitative methods in defence planning in the period, see also Thesis for the Dr. Ing Degree at the Norwegian Institute of Technology, Trondheim: Ragnvald Solstrand, *'Quantitative Methods in Long-Term Defence Planning – Towards Structural Planning, Volume I & II* (Trondheim: Norges Tekniske Høgskole, 1982)

increased. There were several reasons for this.¹⁰⁸ The US weapon aid programme was coming to an end, whilst several of the Norwegian Services' weapon systems were becoming obsolete. In addition prices on defence related material and systems had been increasing drastically. In 1967 Director General Lied reported to the DoD *that while true-value growth in the defence budgets has been some 30 – 50 % in the past decade, the prices for new and sophisticated weapon systems has increased much more sharply; for example the prices for new fighters have increased with some 300%.*¹⁰⁹ It would be essential to make the coming defence investments as cost effective as possible. Authors of the NDRE History (1997) Njølstad and Wicken commend Lied and Klippenberg *for having realized at such an early stage that the changes to the economical situation would create an almost inexhaustible need, both on political and military levels, for quantitative cost-effectiveness calculations as basis for decisions regarding future defence investments and disposition of forces.*¹¹⁰

National threat assessments

From 1947-48 and onward, national authorities viewed the Soviet Union as the primary threat to Norway. Some vital lessons had been drawn from WWII.¹¹¹ In particular one feared being attacked the same way as in 1940; a surprise attack aimed at paralyzing the authorities, preventing mobilisation and an organised defence from being mounted. Unlike the interwar period it was no longer thought that Norway could avoid being involved in case of war between the great powers, and it was assumed that the goal of an attacking enemy would be to invade and occupy Norway (or at least part of it). Above all it was generally acknowledged that Norway would not be able to defend herself alone.

For some time it was thought that a Soviet attack could be launched against both southern and northern Norway. But, based on the general development and strengthening of NATO's atomic strike capabilities, and the build-up of West German conventional forces, focus on the northern region gradually became more dominant. A Soviet attack on southern Norway without first gaining control of West Germany and Denmark was considered unlikely. The densely populated parts of Norway were thus considered to be better off. It has been argued

¹⁰⁸ Olav Njølstad and Olav Wicken, *Kunnskap som våpen* (Oslo: Tano Aschehoug, 1997), pp. 302-05.

¹⁰⁹ Ibid pp. 305-06. Original text: *[mens forsvarsbudsjettene trolig hadde hatt en realvekst på 30 – 50 % det siste tiåret, hadde prisen på nye avanserte våpensystemer steget langt kraftigere, for kampfly ca 300 %].*

¹¹⁰ Ibid p. 306. Original text: *[Lied og Klippenberg må berømmes for at de så tidlig og så klart innså hvordan de endrede økonomiske rammevilkårene måtte skape et nesten uuttømmelig behov, både hos den politiske og militære ledelse i Forsvaret, for kvantitative kostnads- og effektivitetsberegninger som grunnlag for beslutninger vedrørende Forsvarets fremtidige materiellinvesteringer og styrkedisposisjoner].*

¹¹¹ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 33.

that such a view was underpinned by the fact that West Germany asked to establish bases and hospitals in southern Norway.¹¹²

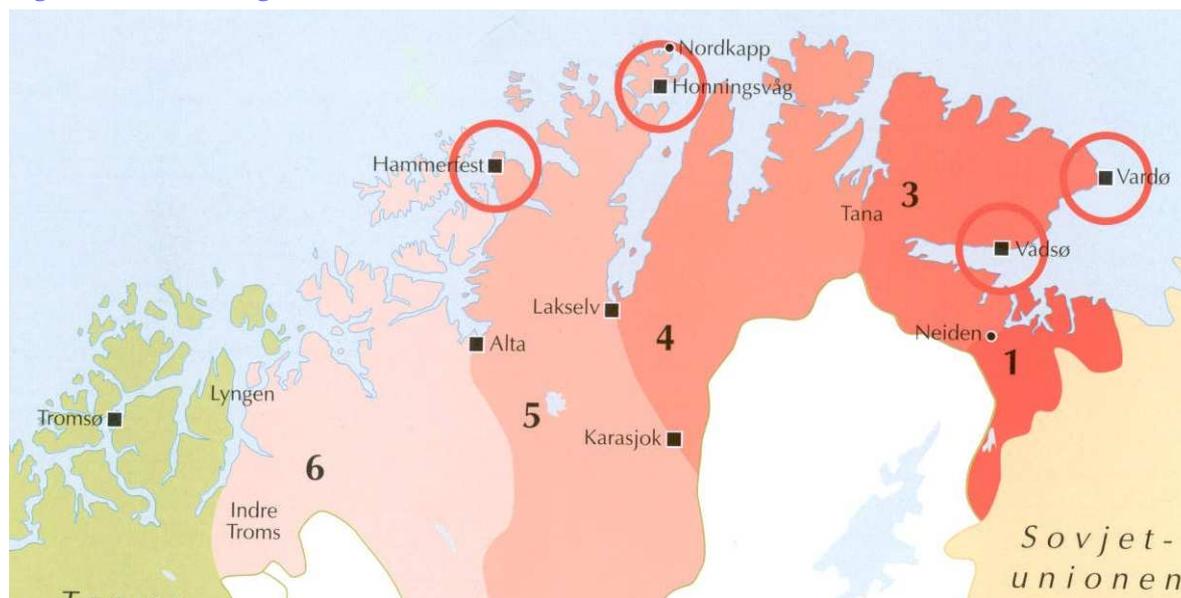
A Soviet attack on the northernmost parts of Norway, the counties of Finnmark and Troms, was not an entirely new scenario. In the Medium Term Defence Plan, as part of adopting the principle of forward defence, NATO had set forth the plan that in the north the alliance would aim to stop a Soviet attack in the Lyngen area in Troms.¹¹³ In addition, as both the geographic area and the enemy were the same, one could also look to the experiences of German forces during WWII. Finnmark, bordering the Soviet Union and Finland, is relatively flat and presents few natural difficulties for an advancing mechanised force. Thus the Lyngen area, based on its topography, was considered to be the first line of defence that would favour an inferior defending force trying to halt an invading enemy from the east. Parallel with the military land-based focus on the area of inner Troms, Bodø in Nordland (south of Troms) was given a similar focus regarding air forces. During the 1950s Bodø Airbase was designated as a main airbase and set up with two fighter squadrons, partly because Bardufoss Airbase (some 30 nm west of Lyngen) would be exposed to enemy air attacks, and partly because Bodø probably would be a suitable area for receiving allied reinforcements. In the 1960s several scenarios involving somewhat limited Soviet attacks against north Norway were developed. Figure 1 shows a map with six different scenarios, all of them involving occupation of Norwegian territory.¹¹⁴

¹¹² Ibid p. 38.

¹¹³ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4*, 5 vols (Bergen: Eide forlag, 2004), p. 38

¹¹⁴ Ibid p. 43

Figure 1. Source: Skogrand/Forsvarshistorien bind 4.



Alternative 1 represents Soviet seizure of a limited area east of Neiden, while alternative 2 is a mere take-over of one or more towns and/or islands along the coast. Alternatives 3 through 6 represent progressively more ambitious Soviet attacks and the occupation of increasingly more territory in Finnmark and Troms. In time it was thought, both on national levels and in NATO, that a limited Soviet attack would at least be aimed at occupying both sides of the Varangerfjord, and thus advance to Tana (alternative 3). According to Skogrand the NATO view was that the Soviet Union would see this as an acceptable balance between achieving the goals of their attack and associated risks. An attack further towards the west would be perceived by the Soviets as too risky. In the words of Skogrand, a limited Soviet attack, with a quick and successful occupation of limited areas in Finnmark only, could in the worst case be a *fait accompli*.¹¹⁵ This would have to be avoided, and the way to do this was to engage an invading force immediately after border violation, thus making it clear that a NATO member had been attacked. To ensure a capacity to do so it would be required to have a certain amount of forces fielded permanently in the region. In March 1968 the government issued Stortingsmelding nr 37 (1967-68); 'Main guidelines for the organisation and activities of the Armed Forces in the period 1969-1973'. As it was presented in the spring, Stortingsmelding 37 did not reflect three important events, shortly to be discussed, that took place later in 1968. Nevertheless, Stortingsmelding 37 stated that *this paper is based on the view that as all-out war has become less likely, it has become necessary to increase the focus on the possibility of smaller conflicts and their potential for escalation. This premise does not only apply to the*

¹¹⁵ Ibid p. 42.

*military, but also to overall defence related measures [...] An attack against our territory will, even if it appears to be aimed only towards a limited part of our country, implies that we will have to fight for our existence. When planning our defence efforts it is vital that this is recognized.*¹¹⁶ In an attachment the Chief of Defence (CoD) called for a general strengthening of the Army, with priority in Northern Norway.¹¹⁷

Moreover, Stortingsmelding 37 settled that *the ability to mount the strongest possible resistance to any kind of attack, and to prepare in the best possible way for allied assistance, continue to be the cornerstones of our defence efforts.*¹¹⁸ These ambitions were in line with the preceding long term plan. But, on the financial side there was a call for reductions. The real budgetary growth in the period 1964-68 turned out to be 4 % pr year. For the period 1969-73 the plan was for 2.5 % annual growth.¹¹⁹ The CoD recommended a substantial growth in several areas, and referring to operational demands left no doubt that he highly prioritised the purchase of new aircraft: *With the aerial threat at hand, the tasks of the Armed Forces, the aim of the defence of the various parts of the country, the financial framework, the possibility of allied assistance and the prioritisation in-between the various elements of the Armed Forces, it appears that our fighter-bomber force should be increased considerably.*¹²⁰ In the concluding remarks of the CoD's five-year plan, regarding the financial side of the 1969-73 plan, it is stated that *the long term plan expresses how to achieve the best possible defence within a given [financial] framework. It is not an expression of a defence mass and volume that meet the operational needs.*¹²¹

¹¹⁶ Stortingsmelding nr 37 (1967-68), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1969 - 1973*, (Oslo: FD, 8. mars 1968), p. 7. Original text: [*i denne melding er det syn lagt til grunn, at fordi storkrigsalternativet anses som mindre sannsynlig enn før, må en i større grad rette oppmerksomheten mot muligheten for begrensede konflikter og opptrapping av slike. Denne forutsetning bør bli retningsgivende ikke bare for det militære element, men for de ulike totalforsvarsmessige tiltak [...] Et væpnet angrep mot vårt land vil, selv om det framstår som geografisk begrenset, bety kamp for vår eksistens. Ved planleggingen av vår forsvarsinnsats er det viktig at vi har klart for oss hva dette innebærer.*]

¹¹⁷ Ibid. Vedlegg: 'Forsvarssjefens uttalelse til de foreslåtte hovedretningslinjer for forsvaret i tiden 1969-1973', pp. 54-55.

¹¹⁸ Ibid p. 31. Original text: [*å kunne yte sterkest mulig motstand mot enhver form for angrep og å legge forholdene best mulig til rette for alliert hjelp må derfor fortsatt utgjøre hjørnesteinene i vår forsvarsinnsats*].

¹¹⁹ Ibid p. 33.

¹²⁰ Ibid. Vedlegg: 'Forsvarssjefens uttalelse til de foreslåtte hovedretningslinjer for forsvaret i tiden 1969-1973', p. 58. Original text: [*ved å sammenholde lufttrusselen, Forsvarets oppgaver, målsetting for forsvarsstriden i de enkelte landsdeler, den økonomiske ramme, muligheten for alliert hjelp og forsvarselementenes innbyrdes prioritering, synes det å fremgå at vår jagerbombestyrke bør økes vesentlig*].

¹²¹ Ibid. Vedlegg: 'Forsvarssjefens uttalelse til de foreslåtte hovedretningslinjer for forsvaret i tiden 1969-1973', p. 62. Original text: [*Langtidsplanen er derfor et uttrykk for det beste forsvar man kan oppnå innen visse grenser. Den er ikke et uttrykk for et forsvar som i størrelse dekker de operative behov*].

The 1968 events

Three events in mid-1968 were viewed as particularly important at the time, both in general terms regarding the Soviet threat and more particularly for the situation in the north. First, as allied forces were arriving in north Norway to take part in exercise Polar Express in June, the Soviet 45th Motorized Infantry Division moved into positions along the Soviet-Norwegian border. A few weeks later, in July 1968, the Soviets carried out exercise 'Sever'. This was by then the largest Soviet naval exercise ever observed in the north, involving more than a hundred vessels and supported by air forces. Finally, when Soviet troops marched into Czechoslovakia in August, this was also somewhat of a surprise to western analysts.¹²²

Lt. Col Aune, Chief of the Border Guard, had not received any advance information of possible increased Soviet activities. He was therefore taken by surprise as he got up in the morning with a Soviet division in position just across the border. Aune got no response to his reports on the matter. He therefore telephoned the Minister of Defence Otto Tidemand during the evening of 6 June, and asked what to do if the Soviets crossed the border. Tidemand simply referred to the Royal Decree of 10 June 1949, a well known decree that states that in case of an attack on Norway all officers, regardless of mobilisation status or whether war has been declared, are obliged to ensure that the enemy is engaged immediately and by all means available.¹²³ Aune pointed out that this would mean war, to which the Minister plainly replied 'yes, it does'.¹²⁴ Tidemand later explained that he feared that his telephone might be bugged, and that he wanted to leave no doubt what the consequences would be in case of invasion. The Soviet division withdrew after four days.

Exercise 'Sever' was conducted in the North Atlantic, the Norwegian Sea and the Barents Sea, and was seen to demonstrate the capabilities of the North Fleet in intercepting western lines of communication across the Atlantic. However, the exercise also demonstrated Soviet capability in conducting amphibious operations, causing concern for the Norwegians. In 'Sever' a group of Soviet amphibious vessels and destroyers sailed from the Baltic Sea all the

¹²² Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 44.

¹²³ Kongelig Resolusjon 10. juni 1949, *Direktiver for militære befalingsmenn og militære sjefers ved væpnet angrep på Norge*

¹²⁴ Tønne Huitfeldt and Arild Hjerde, 'Sør-Varanger juni 1968 – Den Sovjetiske styrkedemonstrasjonen', *Forsvarsstudier* 3 (2003), p. 27

way up along the Norwegian coast. After joining up with more vessels north of Finnmark they launched an amphibious assault on the Kola Peninsula.¹²⁵

The Soviet invasion of Czechoslovakia was yet another small surprise to western analysts. The Soviet troops used for the march into Czechoslovakian territory had for some time been participating in an exercise in the region. It had thus far been assessed improbable that a Soviet exercise could be turned into a live attack.

In sum the events in the summer of 1968 led to an increased concern that Soviet exercises might serve as a pretext for preparing live operations. The recently observed Soviet military activities were in themselves a challenge: By sailing an amphibious group close to the Norwegian coastline the Soviets set up a precedent for viewing this as a normal part of naval exercises. This would make it even more complicated to decide in the future whether an exercise was about to be transformed into a live operation. The Soviet deployment of a motorized infantry division of eleven thousand men to the Norwegian border showed how exercises could be exploited for political pressure. Even announced exercises, as was the case with 'Sever', could cause concern. On the one hand announcements could clear away the possibility for misunderstandings. On the other hand they could also be used for a variety of other purposes, ranging from exerting political pressure to concealing preparations for an attack. Also the NATO exercise Polar Express-68 was announced beforehand, and had been strongly criticized in the Soviet press.¹²⁶ In October 1967, as the first NATO Minister of Defence, Otto Tidemand had visited Moscow. On the issue of allied exercises in north Norway his Soviet counterpart, Andrej Gretsjo, said that *you are running a considerable risk [...]*.¹²⁷ However, with ten thousand NATO troops in Troms, the deployment of a division to the Soviet-Norwegian border was seen as a demonstration of strength, and of disappointment with Norway for hosting large NATO exercises. An attack was not perceived likely. Nevertheless, shortly after the 1968 events CoD Admiral Hauger Johannessen underlined the capability of the Soviet forces based on the Kola Peninsula to carry out a surprise attack on Norway, and stressed the need for immediately establishing a clear situation of ongoing war fighting upon enemy invasion, as well as the ability to delay enemy advances.

¹²⁵ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 44. See also Tønne Huitfeldt and Arild Hjerde, 'Sør-Varanger juni 1968 – Den Sovjetiske styrkedemonstrasjonen', *Forsvarsstudier* 3 (2003), pp. 8 and 43-4.

¹²⁶ Tønne Huitfeldt and Arild Hjerde, 'Sør-Varanger juni 1968 – Den Sovjetiske styrkedemonstrasjonen', *Forsvarsstudier* 3 (2003), p. 8.

¹²⁷ Ibid p. 10. Original text: [*jeg vil åpent og rett frem si at dere løper en stor risiko der*].

In fall 1968, in lieu of the events of the summer, it was decided to improve the mobility of the Air Force and the Navy, and to improve the ability to reinforce Finnmark in case of a Soviet surprise attack. In addition already existing units were strengthened.¹²⁸ These improvements, estimated to cost some NOK 100 million, were however to be covered within the ordinary defence budgets by altering a few already planned expenditures. In hindsight Kjetil Skogrand has held that the *national forces were to be the trip wire which set off an allied reaction*.¹²⁹

NATO's assessment of the Soviet threat

In 1970 NATO's Military Committee issued MC 161/70, a three hundred page Cosmic Top Secret report on 'The Soviet Bloc Strength and Capabilities'. The document was declassified in 2006. It covered the period of 1970-74, and aimed to provide *NATO Commanders with intelligence guidance on which to base their defense plans and force requirements; [and] NATO nations with the military intelligence which is used as a basis for NATO plans*.¹³⁰ MC 161/70 examined a broad variety of topics related to the Soviet Union, including campaigns against the Scandinavian Peninsula.

In 1970 the Soviet air forces, including naval aviation, were assessed to have a total strength of 10,600 aircraft. Non-Soviet Warsaw Pact (WP) air forces numbered 2,500 aircraft, adding up to a grand total of about 13,000 aircraft.¹³¹ Some 8,500 of these were fighter aircraft: 2,930 Tactical Aviation, 2,200 non-Soviet and 3,310 IAPVO fighters.¹³² The latter would defend Soviet homeland only.

The mission of Soviet Tactical Aviation (STA), by the Soviets referred to as *aviation of the front*, was to support the theatre (front) commander.¹³³ This included air superiority operations, close air support, interdiction in combination with ground force operations, strikes against targets of importance to the front, and air defence in the theatre of operations. STA aircraft were organised into Tactical Air Armies (TAAs), vested with Military Districts (MD) in peacetime, and in wartime with theatre commanders. TAA quality was expected to increase

¹²⁸ Ibid p. 44.

¹²⁹ Kjetil Skogrand, *Norsk Forsvarshistorie Bind 4, 5 vols* (Bergen: Eide forlag, 2004), p. 46. Original text: [*de norske styrkene skulle være snubletråden som utløste en alliert reaksjon*].

¹³⁰ NATO: MC 161/70, *A report by the Military Committee on The Soviet Bloc Strength and Capabilities*, (September 24, 1970), p. -i-.

¹³¹ Ibid pp. 148-49. Soviet air forces consisted of Fighter Aviation Air Defence (IAPVO), Tactical Aviation, Long Range Aviation (LRA), Military Transport Aviation (VTA) and Naval Aviation.

¹³² Ibid p. 174.

¹³³ Ibid p. 153.

as new aircraft (the Flogger, the Flagon B and the Foxbat) were introduced. Within the decade no change was expected to the total number of STA aircraft.¹³⁴

Soviet Long Range Aviation (LRA) consisted of three Air Armies, sub-divided into divisions and regiments. Some 900 LRA aircraft were based in European USSR.¹³⁵ One of the LRA missions was to *provide support to the fronts by attacking selected high priority targets in areas beyond the range of Tactical Aviation.*¹³⁶ In addition Soviet Naval Aviation was estimated to have 900 aircraft.¹³⁷ The Northern Fleet Air Force had 125 heavy and medium bombers, 20 tankers, and 80 ASW aircraft.¹³⁸ Regarding amphibious capabilities Soviet Naval Infantry consisted of six brigades, of which the Northern Fleet had one. One brigade with support functions and service companies contained approximately 2,000 men.¹³⁹

In campaigns against the Scandinavian Peninsula Soviet objectives would be to *establish advanced bases on the coast of Norway [...], deny the Allies the use of bases and facilities in the area [...], and to extend their early warning and air defense system.*¹⁴⁰ The Northern Fleet, with its air force and amphibious capacity, would be able to provide direct support to operations in the northern area, as well as indirect support via their engagement in offensive operations at sea. Leningrad MD in north-western USSR had 10 divisions, of which 7 were ready for early commitment.¹⁴¹ About 115 combat aircraft, most of them designated for the role of ground attack, were routinely based with the 13th TAA in Leningrad MD and, according to MC 161/70, considered to be *available for use in operations against the Scandinavian Peninsula. These, however, might be considered insufficient; and additional tactical aviation required for the Scandinavian campaign would, in that event, have to be drawn from other areas.*¹⁴² Adjacent MDs, as for instance the Baltic and the Moscow MDs (both western USSR), were estimated to have a total of 215 and 190 Tactical Aviation combat aircraft respectively. It is my assessment that many of these could probably have been flown into Leningrad MD in a matter of hours, and that such a deployment of tactical combat

¹³⁴ Ibid p. 157.

¹³⁵ Ibid pp. 150-51, and Table A4, p. 215.

¹³⁶ Ibid p. 151.

¹³⁷ Ibid p. 121. Naval Aviation operated medium bombers, long-range reconnaissance- and heavy bombers, light jet bombers, long-range ASW aircraft, ASW flying boats and amphibians, and helicopters and transporters.

¹³⁸ Ibid p. 201, Table N4 Estimated Strength and Disposition of Warsaw Pact Naval Aviation. The other three Naval Aviation air forces were those of the Baltic-, the Pacific- and the Black Sea Fleet.

¹³⁹ Ibid p. 125.

¹⁴⁰ Ibid p. 258.

¹⁴¹ Ibid p. 259. See also Table G1 Distribution of Soviet Line Divisions by Categories and Types, p. 193.

¹⁴² Ibid p. 259.

aircraft would have left little time to assess (let alone react to) the situation. In addition to the 13th TAA the Leningrad MD also had about 245 IAPVO fighters.¹⁴³

Soviet use of military power was known to range from mere threats to large-scale intervention. In discussing Surprise Attack MC 161/70 stated that *Soviet military doctrine [...] holds that a general war could begin with minimal military preparations and with little or no warning [...] and asserts that an enormous advantage accrues to the side striking the first blow.*¹⁴⁴ It was further stated that *a surprise attack, however unlikely, remains a possibility and would be the most disadvantageous situation for the West.*¹⁴⁵

In case of a Soviet invasion it was assessed that *the initial campaign, and the only one which could begin early in the setting of surprise, is that into north Norway. A surprise attack in this direction could be initiated in the form of a direct attack across the USSR-Norwegian border, supported by airborne assault and amphibious landings. Forces moving through Finland could arrive at the Norwegian border within a short period [...] Finland would probably be forced to allow the movement of Soviet forces across her territory for an attack on Norway.*¹⁴⁶

At the time the Soviet Bloc was no doubt seen as a powerful adversary, possessing huge military capabilities, and having a general objective of *world communism under Soviet leadership.*¹⁴⁷ It was expected that the Soviet Union would *continue to build up its economic and military power,*¹⁴⁸ and it was assessed that *in the case of a surprise attack, the Soviets would try to achieve an optimum balance of surprise and weight of attack.*¹⁴⁹ In addition, as earlier discussed, concern was, in the MC 161/70, also expressed about the Soviet ability to shape military activities into a pattern of routine behaviour, which could come to be accepted by Western observers as normal. The discussion of surprise attack concludes that *in sum, the Soviets would attempt to conceal their preparation to the extent that the only warning to the West would be that given by early warning systems after the attack had been launched.*¹⁵⁰

¹⁴³ Ibid p. 213, Table A2 Estimated Strength and Disposition of Soviet Fighter Aviation of Air Defense

¹⁴⁴ Ibid p. 38.

¹⁴⁵ Ibid pp. 45-46.

¹⁴⁶ Ibid p. 260.

¹⁴⁷ Ibid p. 14.

¹⁴⁸ Ibid p. 15.

¹⁴⁹ Ibid p. 48

¹⁵⁰ Ibid p. 48.

Chapter 3 in perspective

Entering the 1960s the US weapon aid programme was coming to an end, whilst several of the Services' weapon systems were becoming obsolete. Moreover, costs of defence related material and systems were increasing drastically. For instance the prices for new fighters had increased by 300% in just one decade. This was precisely when Norway was planning for large defence investments. These would have to be based on a reliable and re-examinable basis. The main tools for the NDRE in providing a basis for decisions in defence planning was OR, SA and quantitative methods, i.e. exactly the right kind of decision basis. In addition the NDRE was well regarded as a trustworthy and neutral institution. There can be little doubt that the NDRE was well aware of its position.

The Soviet Union was the primary threat, and vital lessons had been drawn from WWII. It was generally acknowledged that Norway would not be able to defend herself alone, and one feared in particular a paralyzing surprise attack preventing an organised defence from being mounted. Several scenarios involving primarily limited Soviet attacks against north Norway were developed, and NATO had in its Medium Term Defence Plan set forth that a Soviet attack would be stopped in the Lyngen area.

In spring 1968 the Norwegian Parliament issued Stortingsmelding 37, 'Main guidelines for the organisation and activities of the Armed Forces in the period 1969-1973'. It stated that *the ability to mount the strongest possible resistance to any kind of attack, and to prepare in the best possible way for allied assistance, continue to be the cornerstones of our defence efforts.* These ambitions were very much in line with preceding long term plans, starting with the first three-year plan in 1946, and up to Stortingsmelding 84 of 1963 (covering the 1964-68 period). The CoD called for a general strengthening of the Army, with priority to north Norway, and he explicitly called for more fighter-bombers.

In the recently declassified NATO intelligence report for the 1970-74 period, the MC 161/70, it is stated that in a campaign against Norway, Soviet objectives would be to seize bases on the coast, prevent NATO forces from using bases in the area, and widen Soviet early warning and air defence system. Soviet forces were assessed to be huge. According to MC 161/70 the Leningrad MD had 7 divisions ready for early commitment, 115 ground-attack combat aircraft, and 245 IAPVO fighters. The Northern Fleet had amphibious capacity and it also had 125 bomber aircraft. There were 900 LRA aircraft positioned in the north western Soviet, and Leningrad's neighbouring MDs had more than 400 STA combat aircraft. Within the scope of this thesis it has unfortunately not been possible to compare the NATO assessments to

contemporary intelligence reports developed at the FO/E. However, based on available sources, and assuming that Norwegian services provided NATO with information on the situation in the northern region; there may be expected little or no differences between national and NATO views in these matters.

A Soviet invasion was expected to be initiated as a surprise attack. The enemy would conceal his intentions as long as possible, including by conducting 'fake' exercises, as was the case prior to the invasion of Czechoslovakia. For the same reasons it was not expected that other forces than those already based in north western Soviet would take part in a surprise attack. If such an assumption were to prove correct this would on the one hand limit the amount of involved Soviet forces. On the other it would also be more difficult to detect that an attack was imminent. Moreover, the Soviets could have started to bring in more forces, for instance fighter-bombers from nearby MDs, the very minute the attack was in progress without any worry of compromising their intentions. Being counterfactual the effect of such a Soviet reinforcement is difficult to evaluate, but most likely this would have been beneficial to the Soviet side. It is in any case clear that the Soviet forces by far outnumbered Norwegian forces. The events of 1968 contributed to a generally more complicated and unclear picture and it was into this situation that a well reputed NDRE was to be utilized.

4 The 1970-74 combat aircraft project

Initiating the combat aircraft project – the NDRE pre-study

The NDRE was mentioned on several occasions in Stortingsmelding nr 37 (1967-68). Keeping track of technological developments was important to the Armed Forces. In addition the NDRE was seen as a key player in involving national industries in defence related investments, and the political expectations could hardly have been clearer: *In the next five-year period it is necessary to make the most of the NDRE's ability to, by analytic methods, contribute to long term planning [...]*.¹⁵¹ The RNoAF request in 1969 to conduct an analysis on the roles and capabilities of future fighter aircraft fitted very well into this ambition. By March 1970 the NDRE finalised its pre-study 'An analysis of the tasks of the combat aircraft in the Armed Forces'.¹⁵² The aim of the pre-study was to prepare for a research project on new combat aircraft by *charting the possibilities and scope of such an analysis, and illuminating possible courses of action and particularly complicated problem areas*.¹⁵³ A month later, referring to the RNoAF request for a combat aircraft analysis, the Armed Forces Staff (FST) called for the analysis to be carried out as soon as possible.¹⁵⁴ A research project on the matter was laid before the NDRE Research Chiefs Council in September 1970. The project proposal was a summary of the work done so far; mainly consisting of the pre-study, the work on 'A Scenario for phase one of the Analysis of Combat aircraft for the 1975-1990 Period',¹⁵⁵ and several meetings between the NDRE, RNoAF and FST.¹⁵⁶ The formal go-ahead for the new project, referred to as job nr 242-S/161, was given on 15 October.¹⁵⁷

¹⁵¹ Stortingsmelding nr 37 (1967-68), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1969 - 1973*, (Oslo: FD, 8. mars 1968), p. 34. Original text: *[Det synes i den neste femårsperiode nødvendig å legge særlig vekt på FFIs evne til ved analytisk teknikk å bidra til langtidsplanleggingen]*.

¹⁵² Ragnvald Solstrand, 'Analyse av kampflyenes oppgaver i Forsvaret - Forstudie', *FFI Notat S-211* (1970). English title [An analysis of the tasks of the combat aircraft in the Armed Forces] translated by author.

¹⁵³ Ibid p. 4. Original text: *[for å klarlegge mulighetene for og omfanget av en slik analyse, og for å belyse mulige angrepsmåter og spesielt vanskelige problemområder]*.

¹⁵⁴ The NDRE Archive, Forskningssjefenes Råd/Utvidet, 1267R – 1319R. Letter to the NDRE from FST, titled *The NDRE long term programme 1971-75 and the programme for 1971 – the needs of the Armed Forces [FFIs langtidsprogram 1971-75 og arbeidsprogram 1971 – det militære forsvars behov]*, dated April 10th 1970, reference 2217/70/FST/F III/RK/LD/101.

¹⁵⁵ E. Reine, 'Et scenario for første fase av kampflyanalysen for perioden 1975-1990', *FFI Notat S-222* (1970).

¹⁵⁶ The NDRE Archive, Forskningssjefenes Råd/Utvidet, 1267R – 1319R, meeting titled *The Research Chiefs Council, proposals for new projects and termination of completed projects [Forskingssjefenes Råd, forslag til nye jobber – avslutning av jobber]*, September 9 1970, reference H1302/70/FFIS/RFE/AKM/203.

¹⁵⁷ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 5.

The pre-study stated that *the starting point for this study is the main tasks of our armed forces. Under the prerequisite of a set type of conflict – a limited attack on north Norway – one attempts to find the alternatives that are available to the RNoAF in helping to fulfil these tasks by the use of its combat aircraft, bases, ground based air defence systems and control and warning stations [...]. A main issue in these discussions will be to clarify the possibilities of identifying measures of effectiveness which are comparable enough that they can form the basis for a credible comparison and prioritisation of the various mission types.*¹⁵⁸

Two traditional main tasks for the Norwegian Armed Forces were identified as the basis for the pre-study: To deter aggression and, if attacked, to mount the most effective defence possible. The main tasks and the various means available for carrying them out were presented, with a listing of associated mission types.¹⁵⁹ Three different Soviet attacks were discussed; a very limited attack on only a small part of Norway, a more ambitious attack aimed at taking bigger parts of Norwegian territory, and a conflict where the enemy set out to occupy the whole country. Assuming a limited attack, with enemy ambitions short of those outlined for the third type of conflict, the pre-study upheld that *an attack on the northernmost parts of our country seems the most likely. This is mainly based on an assessment of the importance of this area for Soviet maritime expansion and the need for reliable access to the oceans.*¹⁶⁰ A surprise attack was deemed most likely, one in which a lack of ample warning time would deny timely mobilisation or allied reinforcements. The Soviet intent was assessed to be seizing control of important bases in Troms as soon as possible, and quickly creating a stable situation before a conflict developed with larger NATO forces. The pre-study stated that *the size and composition of the enemy's forces must be specified, and assumptions will have to be made on how the enemy will apply his forces.*¹⁶¹ Allied fighter aircraft were expected to be of assistance within a few days. Norwegian mobilised forces (mainly army

¹⁵⁸ Ragnvald Solstrand, 'Analyse av kampflyenes oppgaver i Forsvaret - Forstudie', *FFI Notat S-211* (1970), p. 4. Original text: *[Studien tar sitt utgangspunkt i hovedoppgavene for vårt forsvar. Under forutsetning av en bestemt konfliktramme – begrenset angrep mot Nord-Norge – forsøker man å finne de muligheter som er tilstede for Luftforsvaret til å bidra til å fylle disse målsetninger ved bruk av sine kampfly, baser, luftvernmidler og K&V stasjoner [...]. Et hovedpunkt i denne diskusjonen blir å belyse mulighetene for å finne effektivitetsmål som er så vidt sammenlignbare at de kan danne grunnlag for en troverdig sammenligning og prioritering av forskjellige oppdragstyper].*

¹⁵⁹ Ibid pp. 6-8.

¹⁶⁰ Ibid p. 10. Original text: *[under forutsetning om en begrenset konflikt, vil muligens angrep mot de nordlige deler av vårt land synes mest sannsynlig. Dette er hovedsakelig basert på en vurdering av den betydning dette området har i forbindelse med den Sovjetiske maritime ekspansjon og behovet for en sikker adkomst til verdenshavene].*

¹⁶¹ Ibid p. 10. Original text: *[Størrelse og sammensetning av fiendens styrker må spesifiseres, og det må gjøres antagelser om hovedlinjene i hans angrepstaktikk].*

units) were expected to join in on day three of the conflict, whilst allied ground forces could be expected after a few weeks.

It may be noted, despite Norway's openly declared inability to defend herself alone, and the view that allied help should be planned and prepared for in advance in order to be efficient, very few allied forces were earmarked for wartime service in Norway. In 1970 the only allied squadron of fighter aircraft earmarked for wartime operations from a Norwegian base was the USAF 3rd Air Force Task Force North (AFTFN).¹⁶² This unit was stationed in Britain, initially flying F-84Fs, and later the F-100 Super Sabres. Moreover, although earmarked for wartime operations in the northern region, the AFTFN aircraft would not be made available to CINCHNORTH before they had carried out strike missions under SACEUR's Atomic Strike Plan (ASP). The AFTFN initially had Sola Airbase in Stavanger as their wartime base, and later Flesland Airport in Bergen. Both these bases are situated on the south-western coast of Norway.

The Soviet invasion threat

The pre-study examined Soviet invasion by land, sea and air assault.¹⁶³ By attacking through the Finnish Wedge, two days would have to elapse between Soviet forces crossing the Soviet-Finnish border before reaching the Lyngen area. If attacking through the north-easternmost part of Norway, approximately 3 – 4 days would elapse before Troms was reached. The Soviet forces would be mechanised, and mainly advance on roads. Sailing times would vary with a variety of factors. However, from entry into Norwegian waters it would take approximately one day before the forces were ashore and ready to advance. The pre-study had a detailed sketch of a typical landing area, with shoreline, distances, parking areas etc.¹⁶⁴ A typical landing area would be in the inner parts of a fjord, relatively wide and flat, preferably with one or more quays, and with roads leading out of it. Thus the coast of Troms and Finnmark had relatively few suitable landing areas.

Regarding airborne assault the pre-study found that a division could be landed on vital targets in north Norway in just hours. Heavy transport aircraft would be escorted by fighters, and

¹⁶² Kjetil Skogrand og Rolf Tamnes, *Fryktens likevekt – atombomben, Norge og verden 1945-1970*, (Oslo: Tiden Norsk Forlag AS, 2001), pp. 211-12.

¹⁶³ Ragnvald Solstrand, 'Analyse av kampflyenes oppgaver i Forsvaret - Forstudie', *FFI Notat S-211* (1970), pp. 11-16.

¹⁶⁴ *Ibid* p. 14.

helicopters could be used from forward bases on Finnish territory to insert lightly equipped units in the Troms area.

The use of combat aircraft

The pre-study divided combat aircraft operations into two types, depending on whether they had a direct or indirect effect on the ground warfare. Operations aimed at destroying enemy land-based fighting units such as tanks, armoured vehicles, guns, troops etc were defined as direct-effect operations. Operations aimed at other types of enemy capabilities, such as escort, air defence systems, transport, air bases and combat aircraft were defined as indirect-effect operations.

It may be argued that those definitions were somewhat unusual. For instance, using fighters to destroy enemy combat aircraft, whether on the ground or in the air, is commonly viewed to have a direct effect on achieving air superiority. In turn this creates freedom from enemy attack and, more importantly, freedom to manoeuvre other own forces (sea-, air- and ground). However, in the pre-study the term ‘direct operations’ strictly referred to *operations aimed at directly inflicting damage on the opponents combating ground forces*.¹⁶⁵ RNoAF Air Power Doctrine gave three possible ways to define direct- and indirect-effect operations. Although not viewed to be the most common way, the pre-study was in fact in line with one of these three ways.¹⁶⁶

Direct- and indirect-effect operations were divided into six roles: Attack on surface targets, armed reconnaissance, fighter sweep, fighter escort, combat air patrol and scrambled interception.¹⁶⁷ The two first mentioned roles were traditional anti-surface fighter-bomber roles. The rest were roles of counter-air operations. One of these can be seen as an offensive counter air role, as a fighter sweep was defined to be *missions flown in an area with enemy air bases, aimed at attacking targets of opportunity*.¹⁶⁸ The remaining three roles were defensive counter-air. Intercepts carried out by aircraft scrambled from ground alert and initiated by the Control and Warning System (K&V System) would be aimed at preventing enemy transport aircraft, bombers and fighter-bombers from reaching their targets. For such a role to be

¹⁶⁵ Ibid p. 16. Original text: [med direkte virkende operasjoner forstås de som har til hensikt direkte å påføre motpartens landstridsenheter skade].

¹⁶⁶ Håndbok For Luftforsvaret 95-1, *Luftoperasjoner. Prinsipielle retningslinjer for bruk av luftstridsmidler*, (Oslo: Sjefen for Luftforsvaret, 27. juni 1969), chapter 8, p. 5, paragraph 14.

¹⁶⁷ Ragnvald Solstrand, 'Analyse av kampflyenes oppgaver i Forsvaret - Forstudie', *FFI Notat S-211* (1970), p. 17, figure 4.1.

¹⁶⁸ Ibid p. 21. Original text: [tokt mot et bestemt område med fiendtlig kontrollerte flybaser for å angripe forefallende flymål].

effective the pre-study pointed out the need for a certain capability in both detecting enemy aircraft as well as guiding interceptors to the target. The pre-study especially addressed the vulnerability of the contemporary K&V System to enemy Electronic Counter Measures (ECM), and its limitations in detecting aircraft at low altitudes.

Fighter escort would primarily defend other aircraft, while CAP would primarily be used for defending surface combat units and bases. The roles of fighter escort and CAP were found to be quite similar, as both were *aimed at establishing local air superiority in an area in order to reject incoming enemy aircraft intending to attack targets in that particular area.*¹⁶⁹ However, the effectiveness of fighter escort and CAP were expected to be limited, not only due to the real problem of detecting enemy aircraft. Fighters would also need ample time in order to get to the enemy before the enemy launched his weapons. Of the two roles CAP was seen as the most relevant, as CAP could be used to defend own surface operations vulnerable to enemy air attacks.

The pre-study predicted that the upcoming analysis would have to clarify whether all incoming aircraft had to be shot down, and ultimately suggested that this was probably not necessary: *A pilot who considers his chances of being shot down as quite high if he continues his mission, will tend to jettison his weapons and try not to be shot down. In the case of bomber aircraft it is likely that the aircraft will have to be shot down in order to prevent it from completing its mission. This type of assessments will be important in evaluating the effectiveness of combat aircraft in defensive counter air operations.*¹⁷⁰ Along with the problems of K&V System detection of enemy aircraft; both regarding low level aircraft and the need for early detection so that defensive fighters could achieve tactical advantages, the range to the bases and aircraft endurance were thought to influence the effectiveness of own fighter operations.

In examining *the effect of combat aircraft on the course of war* the pre-study aimed to find how combat aircraft could interact with sea and ground forces.¹⁷¹ The effects of combat aircraft operations were defined as primary or secondary. Primary effect was direct,

¹⁶⁹ Ibid pp. 22-23. Original text: [*begge har til hensikt å etablere lokal luftoverlegenhet i et område for å avvise fiendtlige fly som har til hensikt å angripe mål i dette området*].

¹⁷⁰ Ibid p. 23. Original text: [*Det er trolig ikke nødvendig at et inntrengende jagerfly blir skutt ned. En flyver som vurderer sjansen for å bli skutt ned som ikke uvesentlig dersom angrepstoktet fortsettes, vil tendere til å slippe utvendig våpenlast og prøve å unngå å bli skutt ned. Mot bombefly er det sannsynlig at nedskyting vil være nødvendig for å hindre at oppdraget fullføres. Denne type vurderinger vil være vesentlige for å bedømme effektiviteten av fly i defensive kontraluft-operasjoner*].

¹⁷¹ Ibid p. 26. Original text: [*flyinnsatsens virkning på det totale stridsforløp*].

observable results of combat aircraft missions, such as destroyed enemy tanks or enemy fighter-bombers aborting their missions. Secondary effect was the effect on the course of war; i.e. the influence on the realization of the armed forces' two main tasks: To deter aggression or, if deterrence failed, put up a best possible defence.

However, several factors could influence the effects of combat aircraft operations. What seemingly would be the one and same primary effect, for instance a destroyed tank, could produce quite different secondary effects (on the overall course of war), depending on the circumstances in which the tank was destroyed. Destroying a tank carrying out an attack, about to break through vital defence lines would produce a greater secondary effect than killing a reserve tank parked in an enemy rear area. Moreover, the primary effect in itself would also be affected by a range of variables: The number of combat aircraft sorties, the quality of the pilot, type of aircraft, type and number of weapons, terrain and weather, enemy actions and so on. Also the selection of targets would make a difference: Should one target enemy air bases, aircraft, sea or ground forces, or enemy support units or his lines of communication? Likewise the effects of combat aircraft operations would be influenced by what one selected to protect; whether it was own air bases, the K&V System, sea and ground forces, infrastructure and such.

Measure of Effectiveness (MoE)

One would clearly need some point of reference, something that could aid in carrying out the analysis in such a way that its results would be valid as a basis for decision-making. The pre-study thus stated that *in order to evaluate the value of the primary effects caused by the use of combat aircraft in wartime operations, it is necessary to establish a relevant measure of effectiveness.*¹⁷² The pre-study found that *all the primary effects that had been discussed were connected either to the relative strength of the enemy or external factors of significance to the battles, thus influencing the velocity of enemy advance and his possibilities to break through.*¹⁷³ Referring to these discussions the pre-study upheld that *the measure of effectiveness must be seen in relation to the progress in the land warfare.*¹⁷⁴ The discussion on alternative measures of effectiveness started out by referring to the 1963 analysis, resulting in

¹⁷² Ibid p. 35. Original text: [For å kunne bedømme verdien av de primærvirkninger som oppnås ved bruk av kampfly i en stridssituasjon, er det nødvendig å ha et relevant mål for effektiviteten av flyinnsatsen].

¹⁷³ Ibid p. 35. Original text: [De forskjellige virkninger som ble diskutert, hadde alle en tilknytning til styrkeforholdet eller ytre forhold av betydning for kampene, og påvirket slik fiendens fremrykningshastighet og muligheter for gjennombrudd].

¹⁷⁴ Ibid p. 35. Original text: [som nevnt tidligere i dette kapittelet vil effektiviteten måtte ses i relasjon til forløpet av striden på bakken].

buying F-5 fighter-bombers, and in which the number of destroyed enemy targets was used as the MoE. Such a MoE was considered relevant if all targets of interest were equally important relative to the overall course of the war. As this would not be the case in the upcoming analysis, such a MoE was ruled out.

The pre-study also discussed the possibility of defining the value of own and enemy capabilities, by giving them ‘battle-points’. After determining points one would seek to maximise the number of destroyed enemy points, whilst minimising the loss of own points. However, with such a MoE it would have been necessary to concentrate on just one minor part of the conflict at a time, as the points given to the various units would express the value of that particular unit only within the exact context by which it received its points. The value of attacking similar targets outside that particular context (for instance forces under withdrawal, under deployment, or even fighting elsewhere in the theatre) could not have been measured using the same set of points. Although linked to the velocity of the enemy advance during an invasion, ‘battle-points’ as a MoE were ruled out. This was mainly because one thought that *in assessing the entire course of an invasion [...], it will not be sufficient to deal with parts of the conflict individually [...]. Dispositions made in one stage of the conflict, will have consequences both for further fighting [...] and for the ability to make use of our combat aircraft in the conflict phases that follow.*¹⁷⁵

Based on this it was therefore found it would make the most sense to use *the total time delay forced on the enemy up to the point where the most important areas are seized, as the measure of effectiveness. This will be a relevant measure of effectiveness in a situation where our in-place forces would not be strong enough to reject the invasion attempt on their own.*¹⁷⁶

The analysis and use of models

The pre-study also discussed how the upcoming analysis would be carried out.¹⁷⁷ It was pointed out that the guidelines for the analysis should be made on the basis of a realistic timeframe and manpower. Also the need for close cooperation between analysts and officers was pointed out. The necessity of defining an appropriate problem was addressed, along with

¹⁷⁵ Ibid p. 38. Original text: *[Prøver man å vurdere hele invasjonforløpet [...], vil det ikke være tilstrekkelig å behandle delsituasjonene enkeltvis og uavhengig av hverandre for å minimalisere fiendens fremryknings hastighet [...]. Det vil være slik at de disposisjoner som foretas på ett bestemt utviklingstrinn, har konsekvenser for både de videre kamper mellom overflateenhetene og for våre kampflys evne til å bidra i de senere fasene av striden].*

¹⁷⁶ Ibid p. 38. Original text: *[å bruke den totale tidsforsinkelse påført fienden frem til de viktigste målområder er tatt, som effektivitetskriterium. Dette vil være et relevant mål i en situasjon hvor de stående styrker vi har til rådighet, er for små til selv å kunne avvise invasjonforsøket].*

¹⁷⁷ Ibid pp. 43-57.

simplifications that could (or possibly would) have to be made to make the analysis manageable.

In particular the use of models was addressed, with associated limitations, and the relationship between models and war-games. What data would be needed was discussed for the various roles and tasks, as well as associated systems and equipment. Some information would be available in Norway, but in other cases one would have to contact allies. Based on the threat and conflict scenario discussed earlier in the pre-study the invasion was formed into an integrated model consisting of progression models and a number of phases, based on the type of enemy activity.¹⁷⁸ As an example the progression model for a sea invasion started with the enemy loading his vessels.¹⁷⁹ After leaving its bases and transiting international waters, the enemy would then enter Norwegian waters, advance through Norwegian defences, before setting forces ashore, securing the landing area and then preparing to move on. The three progression models (land, sea, and airborne invasion forces respectively) would merge in a land battle phase, in which the invasion forces would try to seize their main areas of interest. In this phase one would thus seek *to clarify those circumstances and factors that will be the most relevant for achieving an optimum use of combat aircraft.*¹⁸⁰

The land battle phase would be described through relative strength of the forces, speed of enemy advance (based on factors as terrain, means of transportation, the need to fight or circumnavigate Norwegian defences and so on), and estimates of when the enemy would break through defence positions. It was expected that *the result of the calculations in the land-battle model would be an enemy advancement velocity, with a certain time elapsed before the enemy had seized the main area of objective of the invasion.*¹⁸¹ The pre-study pointed out that in case Norwegian forces got the opportunity to repel the invasion forces on their own, then ‘probability of repelling enemy forces’ could be used as a MoE. However, this was not considered an option in the upcoming analysis, *based on assessments of Soviet strategy indicating that they will hardly start an invasion without considerable superiority in terms of strength of forces.*¹⁸²

¹⁷⁸ Ibid p. 45, figure 6.1.

¹⁷⁹ Ibid p. 48, figure 6.2 and p. 49, figure 6.3.

¹⁸⁰ Ibid p. 46. Original text: *[det legges vekt på å få frem de forhold og faktorer som har størst relevans for en optimal utnyttelse av kampflyene].*

¹⁸¹ Ibid p. 53. Original text: *[resultatet av beregningene i landstridsmodellen vil være en fremryknings hastighet med tilhørende tid før fienden har tatt hovedmålområdet for invasjonen].*

¹⁸² Ibid p. 53. Original text: *[Det er trolig at man vil velge inngangsverdiene slik at denne siste situasjonen ikke forekommer. Dette er basert på vurderinger av sovjetisk strategi som indikerer at de neppe vil sette i gang en invasjon uten å ha en betydelig styrkeoverlegenhet].*

The main purpose of the models would be to help analyse the effects of using combat aircraft. Regarding the relationship between models and war gaming, it was pointed out that using the model structure proposed in the pre-study would require a well defined conflict scenario. In turn this required *a thorough understanding of the military operations involved, in turn requiring close contact between analysts and a few key military personnel who possess the right combination of overview, knowledge of details and ability to assess and think systematically.*¹⁸³

The limitations of the model were also addressed. One of the general limitations discussed was that although army and navy operations would be incorporated in the analysis, this would only serve the purpose of *clarifying how the other Services' operations influenced a best possible choice on how to make use of the combat aircraft in defence matters, within a given cost framework to purchase and operate such aircraft.*¹⁸⁴

Other limitations were discussed in greater detail. For instance the need for assumptions on how the enemy would make use of his aircraft was particularly contentious, as *this could be of great significance for how our own combat aircraft can best be used.*¹⁸⁵ This matter would always be somewhat uncertain, and the analysis would therefore be aimed at finding an optimum allocation of combat aircraft for several different situations. One hoped *to find how defensive counter air operations could best be carried out, and how this would affect the ability to conduct other types of missions, in situations involving offensive use of enemy aircraft. However, it would still be up to military planners, in a given situation, to assess the possibility of such a situation occurring, as well as whether this would, at any rate, call for the use of defensive counter air operations or not.*¹⁸⁶

¹⁸³ Ibid p. 54. Original text: *[situasjonen forutsetter en grundig forståelse av de militære operasjoner som kan tenkes involvert. Dette vil kreve en stor grad av kontakt mellom analytikere og en del militære nøkkelpersoner som innehar en riktig kombinasjon av oversikt, detaljinnsikt og evne til å vurdere og tenke systematisk].*

¹⁸⁴ Ibid p. 57. Original text: *[hvordan de andre forsvarsgrenenes operasjoner påvirker et optimalt valg av oppgaver for kampfly i vårt forsvar, innen en gitt kostnadsramme for innkjøp og drift av slike fly].*

¹⁸⁵ Ibid p. 57. Original text: *[hvordan fienden disponerer sine flystyrker vil kunne være av stor betydning for hvordan våre kampfly best kan disponeres].*

¹⁸⁶ Ibid p. 57. Original text: *[f.eks håper man å kunne komme fram til hvordan defensive kontraluft-operasjoner best kan utføres og hva dette betyr i relasjon til å kunne utføre andre oppdrag, dersom fienden velger å bruke sine fly offensivt i den situasjonen som studeres. Men det vil fortsatt måtte overlates til de militære planleggere i en gitt situasjon å bedømme mulighetene for at dette vil skje, og om det vil være noe behov i det hele tatt for å satse på defensive kontraluft-operasjoner].*

The Vesle Skaugum conference

In March 1970, the same month that the pre-study was completed, the RNoAF Staff issued invitations to a conference at the RNoAF holiday resort Vesle-Skaugum on 13-14 April.¹⁸⁷ Referring to its 1969 request and the ongoing work at the NDRE, the RNoAF Staff invited the FST, the HQs of Northern and Southern Norway, the Air Force Material Command and the NDRE. The aim of the conference was to familiarise key personnel with the project, and to discuss guidelines and vital assumptions on which the analysis should be based. The report from the conference, a document of some 20 pages, covers the main topics that were discussed.¹⁸⁸ It stated that after 1975 the RNoAF expected to gradually replace its combat aircraft. The resources available for this were assessed to be relatively limited. It would therefore be necessary to choose the new aircraft after careful consideration of operational effect and total cost. Aircraft performance, and with that the total cost, would to a great extent depend on what missions and tasks one prioritised.

The first main topic to be discussed was the threat from the Soviet Union, which was divided into four classes of conflict.¹⁸⁹ The first class was a limited Soviet attack on Finnmark, aimed at forcing political and military concessions. This attack was assessed to be possible without any foregoing tensions or episodes elsewhere in the NATO region. It was assessed that conflict class 1 would rest on a *Soviet premise that such an attack could be accomplished so fast that NATO would not be able to, or willing to react in time.*¹⁹⁰ This assumption was related only to class 1, not the other three. The Norwegian reaction would be to immediately establish a war-fighting situation and thus make it clear that Norway – and therefore NATO – was at war. Conflict class 2a described a Soviet attack aimed at occupying Finnmark and Troms. It was assessed that Soviet attacks would be made further to the south, at least in Nordland, to isolate the northern part of Norway. The national objective would be, along with that for class 1, to hold the area and at the same time prepare for receiving reinforcements. Class 2b was a larger version of 2a; still a somewhat limited Soviet attack, but now also Nordland would be occupied along with Finnmark and Troms. It was however assessed that *already in a class 2a conflict most of the tasks that are of relevance to our combat aircraft*

¹⁸⁷ The NDRE Archive, Saksarkivet 161, 1970, letter titled *Analyses of tasks for combat aircraft in the Norwegian Armed Forces - Conference [Analyse av oppgaver for kampfly i det norske forsvar - konferanse]*, from the RNoAF staff to NDRE dated March 4th 1970.

¹⁸⁸ The NDRE Archive, Saksarkivet 161, 1970, Report from the conference at Vesle skaugum 13-14 of April 1970 [*Hovedmomenter fra møte på vesle-Skaugum 13-14 april*], dated June 8th 1970.

¹⁸⁹ Ibid pp. 2-15.

¹⁹⁰ Ibid p.4. Original text: [*hovedforutsetningen for et slikt angrep fra sovjetisk side ville være ar det kunne utføres så raskt at NATO ikke ville være i stand til eller villig til å reagere*].

*will be represented, included the matter of defending own airbases. Assuming that the combat aircraft sector (combat aircraft, the active and passive defence of airbases and the Control and Warning System) will continue to receive approximately the same share of the defence budget as today, the heaviest types of conflict in these classes will possibly generate questions whether the available resources allow for a sensible way of dealing with given tasks.*¹⁹¹ Conflict class 3 would be a large conventional Soviet attack, both from the north and from the south, aimed at occupying large parts of Norway. It was decided that with the total resources available to the national services, mounting a meaningful defence to a class 3 conflict would be very complicated. The outcome of such conflicts, and the consequences for the Norwegian people and territory, would mainly depend on the priorities and efforts made by other states. It was thus stated that *it is the view of FST that it is within conflict class 1 and 2 that national defence efforts will be decisive in terms of deterrence, heightening the threshold for attack and the outcome of the warfare. It therefore follows that conflicts in these two classes should mainly be the basis for the planning problem at hand.*¹⁹²

Two different ways of conducting the analysis were discussed; map studies and model studies. As the model studies were based more upon the use of quantitative methods than map studies, model studies would provide *a much better and deeper understanding of the relations and mechanisms that determine the development and outcome of the conflict.*¹⁹³ It was thus stated that it would be *most suitable to mainly focus the main portion of the work using model studies, and to supplement these with map studies to the extent time permitted.*¹⁹⁴ Developing knowledge and analysis tools was furthermore seen to be beneficial also in a wider perspective as they could be applied in future analyses on *resource allocations in-between the Services depending on their efficiency in dealing with various conflict situations. These are likely problems that in the long term will become very central in our defence planning, and in which the Armed Forces as a whole will have much to gain having at their disposal a flexible,*

¹⁹¹ Ibid p.6. Original text: [*Selv i konflikter av klasse 2a vil de aller fleste oppgavetyper som er aktuelle for våre kampfly, være representert. Spørsmålet om luftforsvar av baser vil også melde seg med full tyngde i konfliktklasse 2. Tenker man seg at man i kampflysektoren (kampfly, aktivt og passivt flyplassforsvar og K&V systemet) i årene fremover vil disponere omtrent samme del av forsvarsbudsjettet som nå, vil allerede de større konfliktene innen disse klassene muligens reise spørsmål om tilgjengelige ressurser tillater en rimelig dekning av oppgavene*].

¹⁹² Ibid p.8. Original text: [*FST er av den oppfatning at det er i konfliktklassene 1 og 2 norsk forsvarsinnsats vil være spesielt utslagsgivende både når det gjelder avskrekning, hevning av terskelen og utfallet av striden. Det er derfor konflikter i disse klassene som først og fremst bør legges til grunn for det foreliggende planleggingsproblem*].

¹⁹³ Ibid p.12. Original text: [*i forhold til kartstudier gir modellstudier en langt bedre og dypere forståelse av de mekanismer og relasjoner som bestemmer utviklingen og utfallet av konfliktsituasjonen*].

¹⁹⁴ Ibid p.13. Original text: [*mest hensiktsmessig å konsentrere hovedtyngden av arbeidet om modellstudier og å supplere disse med kartstudier i den utstrekning tiden tillater det*].

well founded analysis tool.¹⁹⁵ I find it likely that this was seen as important also for the sake of the NDRE, and not just for defence planning purposes.

The matter of tasks in peacetime was also addressed, mainly focusing on the need to police national airspace. In addition the role of surveillance and reconnaissance was highlighted. It was recognised that the sheer size of Norway's national airspace would in itself be an important factor. But more importantly measures of effectiveness were discussed. Initially it was stated that the MoE suggested by the NDRE (i.e. the amount of time that vital basing areas could be held), was *well suited for evaluating most combat aircraft tasks in a situation of limited attack on a defined area*.¹⁹⁶ However, there were several objections that holding-time as a MoE would have shortcomings.¹⁹⁷ Three of these, concerning the use of combat aircraft in peacetime operations, the value of reconnaissance, and the value of establishing a clear situation of war fighting (upon invasion) by quickly inserting combat aircraft were only briefly discussed before being dismissed. This was partly due to problems in measuring the individual value of these operations, and partly because a quantitative comparison of the value of these operations to wartime operations would not be possible. Nevertheless, it was found that all three could to some extent be assessed separately if need be. The last concern addressed was that holding-time as a MoE might be inadequate in the case of an invasion aimed at a larger geographic area. This would cause problems in determining what bases and vital areas to hold; i.e. problems in defining the relative value of bases for instance in Troms compared to Trøndelag (the county south of Nordland). Even with a reasonable good understanding of which areas would be essential to hold, the increased complexity of such a large invasion scenario would complicate defining the relationship between the ability to hold these areas and the use of combat aircraft. Still, it was anticipated that quantitative sub-models would be helpful in making a good starting point for assessing these relationships. Also, an alternative MoE was discussed, namely using the amount of enemy effort needed to carry out the invasion in a defined amount of time. To use this MoE was however seen to be very similar to the use of 'holding-time'. The only practical difference would be that one would have to determine a defined amount of time which would have elapsed by the point where Soviet troops had seized the goal areas of their invasion, and calculate 'backwards' from there

¹⁹⁵ Ibid p.15. Original text:[*på et senere tidspunkt å kunne ta opp og analysere på fullgod måte problemer som involverer ressursallokering forsvarsgrenene imellom, ut fra deres mulige yteevne i ulike konfliktsituasjoner. Dette er trolig problemer som på lengre sikt vil bli meget sentrale i vår forsvarsplanlegning, og hvor Forsvaret som helhet vil ha meget å vinne ved å kunne disponere et fleksibelt, godt underbygget analyseverktøy*].

¹⁹⁶ Ibid p.16. Original text:[*velegnet til en vurdering av de fleste oppgavetyper for kampfly i en situasjon med begrenset angrep mot et bestemt målområde*].

¹⁹⁷ Ibid pp.16-18.

to find what effort this would have required. However, since these two measures of effectiveness for practical purposes were the same, ‘holding-time’ was viewed as the most preferred measure because *the calculations will, in the case of ‘enemy effort’ as a criterion, be considerably more time consuming due to their complexity.*¹⁹⁸

The report from the conference at Vesle Skaugum conveyed two main conclusions: At the next conference it would be vital to *clarify what conflict situations to use as basis for the upcoming analysis work [...], and also that the measure of effectiveness should be the subject of an increased and clarifying discussion.*¹⁹⁹

Settling the scenario and MoE

The next conference was held at the RNoAF headquarters in Oslo on 22 June 1970. A series of work-meetings had been held between the NDRE, RNoAF Staff and FST since the Vesle-Skaugum conference. It was now believed that *a basis for the upcoming work had been developed.*²⁰⁰ FST approved the use of conflict classes 1, 2a, 2b and 3 as guidelines for the analysis.²⁰¹ Following this conference the NDRE report S-222 ‘A Scenario for Phase One of the Analysis of Combat Aircraft for the 1975 – 1990 Period’ was developed, based on conflict class 2a and *to a great extent built on the basis of plans developed during war games conducted at Headquarters Northern Norway (ØKN) in 1969.*²⁰² These 1969 war games, both the preparations for them as well as carrying them out, had been assisted by the NDRE System Group.²⁰³

Although a few changes and adjustments were made, the Combat Aircraft Analysis was to a great extent based on scenario 2a, which set out to describe *one of many equally likely attacks which may be launched against North Norway in 1980. This scenario will form a common*

¹⁹⁸ Ibid p.20. Original text:[*Det vil derfor – med den kompleksitet som vil ligge i disse beregningene – være betydelig mer tidkrevende å optimalisere med fiendtlig innsats som kriterium*].

¹⁹⁹ Ibid p.22. Original text:[*Det vil være meget vesentlig på dette møtet å få avklart hvilke konfliktsituasjoner som skal legges til grunn for det videre analysearbeid [...] effektivitetskriteriet bør gjøres til gjenstand for en del videreførende og avklarende diskusjon*].

²⁰⁰ The NDRE Archive, Saksarkivet 161, 1970, letter titled *The NDRE Study on the role of Combat Aircraft in the Armed Forces [FFIs Studie av kampflyenes plass i Forsvaret]*, signed General Major Førde, Chief of the RNoAF Staff, dated June 5th 1970. Original text:[*En regner nu å ha utredet grunnlagsmaterialet for det videre arbeid*].

²⁰¹ The NDRE Archive, Saksarkivet 161, 1970, letter titled *Jobb 242-S/161Analyses on alternative use of resources in the Combat aircraft Sector [Jobb 242-S/161Analyse av alternative anvendelser av resurser innen kampflysektoren]*, signed Erik Klippenberg, dated November 9th 1970.

²⁰² E. Reine, ‘Et scenario for første fase av kampflyanalysen for perioden 1975-1990’, *FFI Notat S-222 (1970)*, p. 3. Original text:[*Det scenariet som er beskrevet i dette notatet bygger i store trekk på planer utarbeidet under ØKNs krigsspill i 1969*].

²⁰³ The NDRE Archive, Saksarkivet 161, 1972, letter titled *Overview of NDRE System Group Analyses and Tasks in the period 1962-1972 [Oversikt over Jobber og Oppdrag utført av FFI Systemgruppen I perioden 1962-1972]*, page 10. Signed by Erik Klippenberg, Chief of the System Group, dated 11th of July 1972.

*base for the development of various sub-models, all aimed at studying alternative roles and effectiveness of combat aircraft in the 1975 – 1990 period.*²⁰⁴

Moreover the scenario set forth that in case of a Soviet invasion; a situation of explicit war fighting was to be established as close to the border as possible, thus making it most likely that Norway would secure Allied reinforcements. The national Norwegian commander's task were thus to delay Soviet advancements in north Norway while putting the main effort on defending bases in Troms in order to secure these reinforcements.²⁰⁵ It follows that with this not only the scenario was set for the oncoming Analyses, but also the MoE – i.e. 'holding time' – was set.

S-222 set forth the scenario's background to be a tense international situation. The Norwegian CoD has deployed forces from the south to the north (a fighter squadron, an infantry battalion, a SAM unit, two minelayers and a frigate). The Soviets were to be conducting exercises with at least two motorized divisions on the Kola Peninsula, supported by strong tactical air forces. A large naval exercise has also just taken place in the Norwegian Sea. In order not to escalate the situation, the Norwegian government has however not acted on the CoD's advice to call in reserves. The Chief of the Leningrad MD has been directed to occupy parts of north Norway through a surprise attack, with forces large enough to quickly reach a favourable state.²⁰⁶ In doing so he could make use of Finnish territory, but not Swedish. Based on these directives, operations orders were issued stating the objective to be to occupy Norwegian territory north of Lofoten – Vestfjorden. Bases in Troms and airports in Finnmark were to be seized as soon as possible.²⁰⁷

The air order of battle, not including fighter aircraft designated to defend Soviet territory, included 75 medium and light bombers, 175 interceptor fighters, 110 fighter-bombers, 5 Airborne Early Warning and Control (AEW) aircraft, 150 transport aircraft, 60 reconnaissance aircraft, 70 transport helicopters and 20 combat helicopters.²⁰⁸ It may be noted that the final Analysis does however not mention the 20 light bombers and the 20 combat helicopters.²⁰⁹

²⁰⁴ E. Reine, 'Et scenario for første fase av kampflyanalysen for perioden 1975-1990', *FFI Notat S-222* (1970), p. 3.

²⁰⁵ Ibid p.6

²⁰⁶ Ibid p.5

²⁰⁷ Ibid p.5

²⁰⁸ Ibid p. 28, attachment 1

²⁰⁹ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 8, table 3.2.

Land forces included four motorized infantry divisions, one Surface to Surface Missiles brigade, one Surface to Air Missiles (SAM) regiment, one engineer regiment, one field artillery brigade, one tank regiment, two paratrooper regiments and one marine infantry regiment.²¹⁰ The naval forces were defined in more general terms, the Northern Fleet and likely changes that would be made closer to 1980 were referred to, particularly in relation to a force needed to transport and protect one marine infantry brigade and one motorized infantry division.²¹¹ The Soviet naval forces and the sea invasion scenario were given in detail in a NDRE report completed in May 1971.²¹² Using the 1971-report as a starting point, but with new assumptions on the contents and composition of a Soviet sea-invasion anno 1980, a revised report on the Soviet sea-invasion threat was completed in May 1973.²¹³ In this report Soviet naval forces consisted of 20 landing craft transporting the marine infantry brigade, escorted by 3 destroyers and 11 frigates. Another 24 commercial transport vessels (Volgols class) would transport the motorized division, sailing with an identical escort force. These two groups would have four hours of spacing between them. In addition to 6 destroyers, each armed with two SAM systems and 76 mm guns, and 22 frigates each armed with one SAM system and 57 mm guns, there would also be a smaller group of Soviet naval vessels (1 destroyer and 4 frigates) covering the flank to the south of the two escorted transportation groups. The assessments on the amount of forces available to the enemy were according to the *Analysis made in cooperation with the Armed Forces Intelligence Service (FO/E)*.²¹⁴

For conflict classes 1, 2a and 2b it was assumed that *the enemy wants to limit the operations as much as possible, and declare his goals reached before NATO or allies in general can react in a manner that will disturb his operations. The attack must therefore be as surprising as possible. Based on this it is hardly acceptable that the enemy will transfer forces from elsewhere in the Soviet Union to the northern region.*²¹⁵ Given Soviet objectives and forces

²¹⁰ E. Reine, 'Et scenario for første fase av kampflyanalysen for perioden 1975-1990', *FFI Notat S-222* (1970), attachment 1, p. 27.

²¹¹ Ibid p. 28, attachment 1

²¹² J C Løken and E Amundsen, 'Delbeskrivelse av sjøinvasjonsfasen for kampflyanalysen', *FFI Notat S-239* (1971).

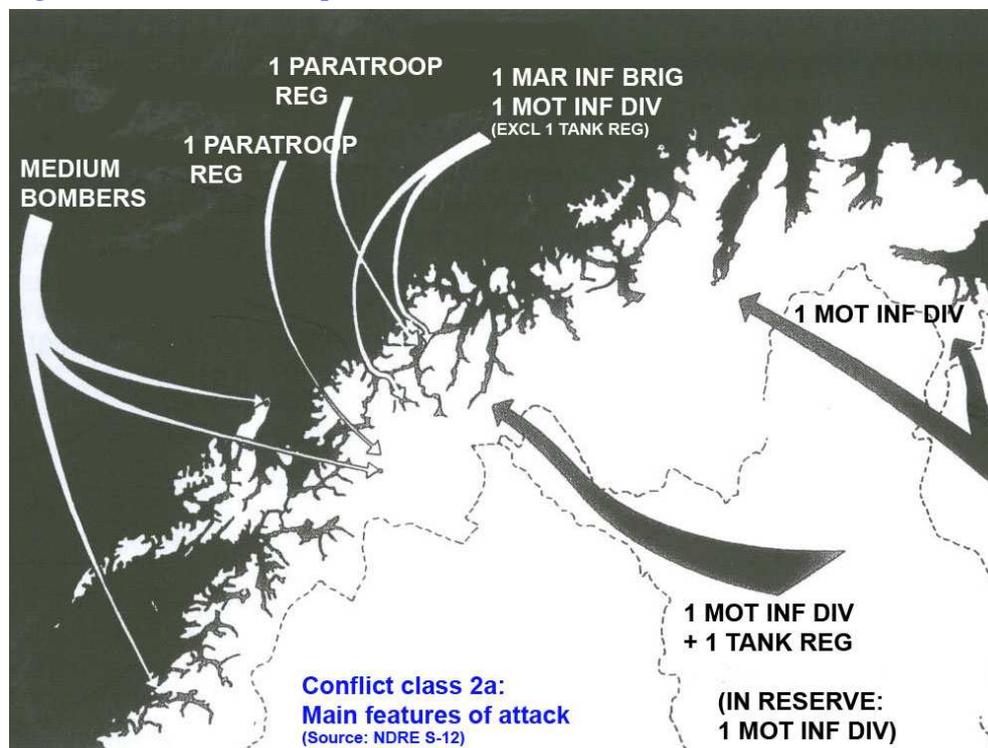
²¹³ E Amundsen, 'Sjøinvasjonstrusel/kampflyanalysens scenario', *FFI Notat S-303*, (1973)

²¹⁴ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 8. Original text: [*I samarbeid med FO/E har man kommet frem til at angriperen for slike operasjoner kan disponere styrker i et omfang som angitt i tabell 3.2.*]

²¹⁵ Ibid p. 8. Original text: [*For alle de tre hovedsituasjoner 1, 2a og 2b gjelder den forutsetning at angriperen ønsker å holde operasjonene begrenset og erklære sine mål nådd før NATO eller enkelte av våre allierte når å reagere på en måte som vil påvirke operasjonene. For å oppnå dette må angrepet settes inn så overraskende som mulig. Det vil derfor neppe være akseptabelt å overføre store styrker fra andre deler av Sovjetunionen til nordområdet.*]

as discussed above, the main features of the Soviet attack were assessed to be as shown in figure 2.

Figure 2. Source: NDRE report S-12



The main attack²¹⁶ would consist of a Soviet motorized division of 11,000 men plus a tank regiment advancing towards the Bardufoss area through the Finnish Wedge. A reserve division stays in Finland. A third motorized division attacks the Varanger and Porsanger areas further northeast. A fourth motorized division is set ashore at three different locations; one third on Tromsøya (where Langnes airport is located), and two-thirds in the inner parts of Malangen.²¹⁷ It may be noted that the S-222 assessed three different options regarding where sea-borne Soviet forces could be landed,²¹⁸ and found that the Ulsfjord - Balsfjord (the fjord east of Malangen) area would be preferable. This was based on the assumption that a landing in Malangen would be the least surprising alternative, and that a strong Norwegian defence could be expected. Moreover, landing in the Ulsfjord - Balsfjord area would give the most favourable conditions for establishing contact with the land forces advancing through the Finnish Wedge. The division landing in Malangen was to be preceded by four hours by a marine infantry brigade. In addition, paratrooper regiments were to be landed on Tromsøya to secure Langnes airport, and at Olsborg (north of Bardufoss Air Base) in order to assist and

²¹⁶ Ibid pp. 8-9.

²¹⁷ Ibid p. 9. Original text: [to tredjedeler gjør landgang innerst i Malangen].

²¹⁸ E. Reine, 'Et scenario for første fase av kampflyanalysen for perioden 1975-1990', *FFI Notat S-222* (1970), pp. 13-15, and p. 17, figure 6.1.

ease the advancement of the sea-borne invasion forces. The timing of the invasion was such that the land forces were to cross the Soviet-Finnish border 8 hours before the leading edge of the sea-borne invasion forces entered Norwegian territorial waters, assuming that Norwegian political authorities, in order to avoid provocation, would not issue mobilisation orders until the Norwegian borders had been violated. As the first Soviet naval vessels entered Norwegian waters Soviet aircraft were to attack the air bases in north Norway, aiming to preventing Norwegian combat aircraft operations. Simultaneously communications and radar sites in north Norway were to be attacked in order to reduce warning and control capabilities. The S-222 assessed that the Soviet invasion would depend heavily on achieving and maintaining air superiority in the theatre until it achieved its main goals. Soviet air forces would therefore establish air bases in Finland in advance of the first crossing into Norwegian territory (time H), neutralize the K&V System from time H, neutralize air forces at bases Bodø and Andøya from time H to H + 48 hrs and those at Bardufoss from H to H + 24. Furthermore they would aim to achieve air superiority in the areas where air and sea forces would be landed, carry out interdiction, reconnaissance and CAS in support of its own surface operations in the theatre from time H onwards, support air transporters and bombers, establish own air bases on Norwegian territory, and also establish a forward Control and Warning capacity in order to be able to support air interceptions over occupied areas.²¹⁹

Chapter 4 in perspective

With its request to the NDRE to carry out a Combat Aircraft Analysis in 1969, the RNoAF primarily intended to make sure that the F-5s and the F-104s would be replaced by new fighter aircraft. The well respected NDRE received this request where its services were clearly called for. The US weapon aid programmes had come to an end, prices for combat aircraft had rocketed, and Parliament had made it completely clear that the NDRE capability to provide a basis for military planning decisions would be very much needed in the coming years.

Before quantitative methods could be applied, it was however necessary to clarify some vital guidelines and key factors. Initially the most important ones were to reach a clear and agreed-on definition of a threat scenario, and how to best measure the effectiveness of own actions (i.e. set a MoE). In addition it would be necessary to clarify budget limits. On the latter it was

²¹⁹ Ibid pp. 16-18, and list on p.19.

quite simply assumed that NOK 4 billion (in 1972-value) would be available for investments and operating costs in the combat aircraft sector over a 15-year span.²²⁰

Threat scenario 2a seems to have been built with close attention to costly lessons drawn from WWII. It describes a surprise attack whereby the enemy invades and occupies parts of Norway very rapidly. Although not specifically addressed, the scenario seems at the same time also to mirror US and NATO thinking. This is not only due to the element of surprise or the use of Finnish territory, both of which were addressed in the contemporary NATO assessments of the Soviet threat towards the Scandinavian Peninsula. The point here is that Norway, viewed from an Allied perspective, would not be invaded for the sake of her territory itself. Rather the occupation would, as assessed in MC 161/70, be aimed at limiting NATO options and freedom of manoeuvre through the occupation of the very parts of Norway that scenario 2a describes. Soviet bases in north Norway would have extended Soviet early warning on NATO attacks, prohibited Allied use of bases in the region, and benefited Soviet submarine operations and strategic air attacks towards the West.

Scenario 2a clearly took into account the fairly limited amount of resources that would be available for defence purposes. However, nothing in the sources at hand suggests that the anticipated amount of resources were argued to be too small. Doing so could arguably have been interpreted in several ways; for instance as a call for a re-thinking of the policy not to allow allied bases in peacetime, or as a call for substantially increased defence budgets and so on. At the same it was never upheld that the 2a scenario was the most probable one. The 2a scenario was chosen as basis for the Analyses because it was thought to represent a spectrum of conflicts that could be manageable with the resources available; based on the idea *to structure our Armed Forces in such a way that it will be able to exploit its full potential in that part of the conflict spectrum where its relative importance is greatest.*²²¹ In other words; larger types of conflict would simply render Norwegian forces more or less obsolete in terms of influencing the outcome of the conflict, which in such a case would be determined by greater powers' decisions and actions. Consequently the scenario rests quite heavily on a few but very vital assumptions; for instance that only those Soviet forces already positioned in the

²²⁰ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 10 and 16.

²²¹ Ibid p.7. Original text: [*ledetråden i langtidsplanleggingen i Forsvaret, er at Forsvaret skal struktureres for å ha den høyeste yteevne i den delen av konfliktspekteret hvor den relative betydningen av vårt nasjonale forsvar er størst*].

region neighbouring Norway would be involved in the way that the scenario describes. In turn the Analyses themselves are of course equally dependant on the same assumptions.

The MoE on which the Analyses are based – ‘holding time’ – was introduced by the NDRE already in the pre-study, referred to as the total time delay forced on the enemy before he reach his objectives in terms of occupied areas. ‘Holding time’ is thus not directly linked to the effects stemming from own fighter aircraft usage, as was the case in the F-5 study just a few years earlier. Instead the MoE chosen for the Analyses were inseparably tied to the warfare on land and the progress of Soviet advances and occupation of Norwegian territory. It is probable that this contributed to the opposition against ‘holding time’ as a MoE. The Air Force, primarily looking for new fighter aircraft, would probably have favoured a MoE which reflected directly the effect of combat aircraft operations.

The 2a scenario resembled both lessons drawn from the war, contemporary allied assessments and repeated national political signals since WWII. In addition it took into account the limited amount of foreseeable defence resources. With the selection of the 2a scenario and ‘holding time’ as a MoE the stage was set for the upcoming Combat Aircraft Analyses, in which the aim would be to support the overall objective for the defence of Norway in case of invasion. This would be to produce, with the resources available, the greatest ‘holding-time’ possible, i.e. delaying enemy advances and thus preventing him (for as long as possible) from reaching his invasion goals.

Chapter 4 is largely based on sources that up to now have been classified and therefore not available. Based on these sources it seems clear that the NDRE System Group took lead in the analysis work from the very start, initially aiming to establish a scenario and a MoE upon which the Analysis could be conducted. Viewed in a NDRE perspective an Armed Forces approval of these two elements seems to have been a necessity, and the 2a scenario and the use of ‘holding-time’ as the MoE were clarified and decided upon by the end of 1970. These two elements, originating at the NDRE and finalised with a close eye to political signals and in relatively close cooperation with the Armed Forces, were fundamental both as basis for and as prerequisite to the Analysis.

5 The Analyses and how to use own Combat Aircraft - Forward Air Defence and Attack on Seaborne Invasion Forces

The Analysis' final report, Report S-12, opens with a short summary stating that *the RNoAF is planning to replace its present aircraft inventory of F-104 and F-5 aircraft in the time period from 1980 to 1985. [...] The aim of the study was to clarify role priorities and desirable characteristics for the next generation of aircraft, and to find the balance in resource allocation between aircraft and support functions.*²²² In addition to (new) fighters, which were assumed to be serviceable for approximately 15 years, the combat aircraft sector also included main support functions such as air bases and the K&V System. It was assumed, as previously discussed, that a total 15-year budget of NOK 4 billion would be available for procurement and operational costs of the aircraft and associated support functions. It was further stated that *the results show that top priority should be given to the roles of attack on seaborne invasion forces and forward air defence. Concentration of air resources in these two roles could considerably increase the ability of our entire defence forces to hold key areas in case of a limited surprise attack.*²²³

However, before examining these two roles we will briefly look into a few other aspects. After presenting the conflict classes and the 2a scenario the S-12 clarifies the use of 'holding-time' as a MoE; defining it to be *the amount of time our forces can hold key areas in the part of our country that is under attack.*²²⁴ This is very much in line with how the MoE was described in the pre-study as previously discussed.²²⁵ As 'holding-time' is given in hours later in Report S-12, the reader is advised not to read too much into the numbers: *One will warn against putting too much weight on the given amount of hours as an absolute measure of our defence forces' ability to hold defined key areas. It is commonly acknowledged that operations tend to elapse quicker in analyses than they do in reality. However, used as a relative measure in comparing alternative combat aircraft structures, the calculated hours of holding-time are acceptable.*²²⁶

²²² Ibid p.5.

²²³ Ibid p.5.

²²⁴ Ibid p.11. Original text: *[den tid forsvarsstyrkene kan holde nøkkelområder i den angrepne landsdel].*

²²⁵ Ragnvald Solstrand, 'Analyse av kampflyenes oppgaver i Forsvaret - Forstudie', *FFI Notat S-211* (1970)

²²⁶ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), pp. 11-12. Original text: *[Det må advares mot å legge for stor vekt på*

Report S-12 described the use of models in making the Analysis. The description of the model system is relatively short and general. However, detailed descriptions of the models used are available in sub-reports such as NDRE Report S-362.²²⁷ The initial plan of how one should make use of models, as discussed both in the pre-study and at Vesle-Skaugum, was to programme the sub-models into a computer as one integrated model. This turned out to be problematic, as *it was discovered that the computer available did not have the required capacity for such a comprehensive integrated model [...]. One therefore proceeded with sections, consisting of two and two sub-models at a time.*²²⁸ This resulted in the running-through of a reduced number of alternative force compositions and strategies when compared to what had been initially hoped for. Although viewed as a limiting factor in the Analysis, this was not considered to be of substantial significance. Report S-12 also addressed the question of how to verify results through the use of the models. As a comparison between model results and real world results not was an option, one would have to verify model results in other ways. It was assessed that parts of the model results could be verified using American data and experiences; other parts could be verified using data from peacetime tests or exercises. Lastly; regarding model results *to which not even those kinds of results are available, one will have to make use of experienced officers' assessments of the results that the models produce.*²²⁹

Also, the establishing of combat aircraft classes was addressed. A variety of aircraft, up to some 20 - 30 types, were seen as potential candidates as a replacement for the F-104s and F-5s. Such an amount of aircraft could simply not be handled within the Analysis, and thus combat aircraft classes (CACs) were developed. The CACs were defined by characteristics such as speed, manoeuvrability, dog-fighting ability, characteristics of the radar, short-field take off and landing capabilities, aircraft range and weapons load, accuracy in weapons delivery, and total cost.

timetallene som et absolutt mål for vårt forsvars evne til å holde nøkkelområdene. Det er en alminnelig oppfatning at operasjoner har en tendens til å gå raskere i analyser enn i virkeligheten. Men som et relativt mål for sammenligning av alternative kampflystrukturer, er de holdetidstimer beregningene gir, akseptable.

²²⁷ K.T. Vebjør, 'Basemodellen – en modell av sortieproduksjonen fra et basesystem under en begrenset konflikt', NDRE Report S-362 (1974).

²²⁸ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', NDRE Report S12 (1975), p.12. Original text:[*det viste seg under arbeidet med modellsystemet at den regnemaskinen som var til rådighet, ikke hadde kapasitet nok for en så omfattende modell [...].Fremgangsmåten ble derfor en blokkvis kjøring av to og to delmodeller under ett.*]

²²⁹ Ibid p.12. Original text:[*Og for atter andre deler hvor ikke en gang slike resultater er tilgjengelige, må man støtte seg til erfarne offiserers vurdering av de resultater modellene gir.*]

The work on establishing the CACs was initiated early on, and was discussed with the Project Advisory Council in a meeting in February 1971.²³⁰ At this meeting seven CACs were proposed. The final set of nine CACs was described in detail and was, along with discussions on the use of various air-to-air and air-to-ground weapons, presented in NDRE Report S-350.²³¹ It may be noted that CAC 1 and 2 were included only as part of the threat. The costs associated with CAC 2, in which the reference aircraft was the F-14 Tomcat, were regarded as

Table 1: Combat Aircraft Classes (CAC).

CAC	Description	Ref type aircraft
1	Medium heavy bomber	Blinder, Badger
2	Very advanced interceptor fighter	Foxbat, F-14
3	Simple fighter-bomber	F-5E, Fishbed
4	Advanced subsonic fighter-bomber	A-7
5	Advanced supersonic fighter-bomber	Cobra, F-15
6	Armed trainer aircraft	Saab 105G, Alphajet
7	VTOL fighter-bomber	Harrier
8	Armed helicopter	AH-1
9	Armed light aircraft	MFI-17

Source: NDRE Reports S-350 and S-12

too high. It may also be observed that although each CAC was given a reference type aircraft, these were not to be seen as a first choice within their respective CAC. The reference aircraft mainly served

the purpose of illustrating the various CACs and the characteristics that could make them interesting as alternatives for the RNoAF.

After assessing what categories of weapons were best suited for the various types of targets within the scenario at hand, a relatively limited number of various weapons were selected for use in the Analysis. In general the efficiency of these weapons (against air, army and naval targets respectively) was well known, except in the case of guided and homing anti-ship missiles. Nevertheless, although new at the time, these weapons were expected to become highly efficient.²³² However, as their efficiency under real world conditions was unknown, one arranged the analyses on this particular matter so that one could identify a minimum efficiency level for this type of weapon to stay relevant throughout the analysis process. It was thus stated that *the results of this analysis will greatly depend on whether the efficiency is found to be above this critical lower limit. It is therefore important that the development of*

²³⁰ The NDRE Archive, Saksarkivet 161, 1971, 'Report from Project Advisory Council meeting nr 3 for Job 242-S/161', meeting held on the 16th of February 1971. The Project Advisory Council [*Jobbrådet*] consisted of high ranking officers from all the Services and leaders from the NDRE.

²³¹ Olav Aamo, 'Beskrivelse av kampflyklassenes referansetyper for anvendelse i Kampflyanalysen', *NDRE Report S-350* (1974).

²³² Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p.14.

*these new anti-ship weapons is closely monitored after the completion of the analysis at hand.*²³³

Forward air defence

The Analysis pointed out two roles to be the most interesting: Attacking seaborne invasion forces (or 'Anti-Shipping'), and defensive counter air operations over the battle area (hereafter DCA). Within the scope of the Analysis air defence operations were viewed in light of three main problem areas:

- Own ground forces' need for air support.
- The attackers' need for air superiority, and thus his ability to secure his operations.
- The possibilities of keeping own forward located air bases open for reinforcements.

The first problem area (the Army's need for air support) was divided into two categories; offensive and defensive support respectively. Offensive support was defined to be the use of own fighter-bombers against enemy ground forces in order to inflict as much damage and delay as possible. Defensive support was defined to be the use of own aircraft in an air superiority role, aimed at preventing enemy fighter-bombers from attacking our ground forces. All CACs could to some extent conduct offensive operations against army targets, but *only classes 3 and 5 were viewed to have satisfactory qualities in a defensive role.*²³⁴ In further discussions it is therefore referred to CACs 3 and 5.

The Army's need for air support was based on the results from four sub-studies, which in turn were underpinned by several NDRE reports. For instance; the sub-study on the effect of fighter-bomber attacks against various army targets was supported by reports on losses inflicted upon land forces by battlefield support and interdict missions,²³⁵ the effect of using fighter-bombers against targets at sea and on land²³⁶ and air-to-surface delivery of unguided weapons.²³⁷ Typical factors of importance in the sub-studies were navigation, target detection and own losses to enemy ground-based air defences. Also weapon delivery methods and weapon types were of particular interest. For instance, regarding attacks against enemy army targets, it was presupposed that if they were to be undertaken, such attacks would involve the

²³³ Ibid p.14. Original text: *[Resultatene av analysen avhenger i stor grad av om effektiviteten kommer til å ligge over denne kritiske nedre grensen. Det bør derfor bli en viktig del av oppfølgingsarbeidet etter analysen å følge utviklingen av de nye anti-shipping-våpnene].*

²³⁴ Ibid p.15. Original text: *[...bare to klasser som kan sies å ha fullverdige egenskaper i en defensiv rolle, nemlig klassene 3 og 5.]*

²³⁵ F H Brinck 'Air-to-ground attack – Losses inflicted upon land forces by battlefield support and interdiction missions', *NDRE Report S-62* (1974)

²³⁶ KT Vebjør 'Jagerbombere mot sjø- og landmål', *NDRE Report S-301* (1973).

²³⁷ F H Brinck and O Aamoth, 'Air-to-surface delivery of unguided weapons – Weapons, release parameters and delivery accuracies', *NDRE Report S-351* (1974).

use of cluster weapons, as these were seen as the most effective type of weapon against most targets.²³⁸

Another of the four sub-studies looked into the effect of offensive combat aircraft support on army units conducting delaying operations in funnelling terrain.²³⁹ One of the main findings in this sub-study was simply that *because of our army's inferiority its tactic must be to conduct delaying combat operations.*²⁴⁰ This would be achieved through the use of fairly small units pre-positioned at carefully selected places along the enemy's path of advance; places where the enemy would not be able to benefit from having larger forces. Through early preparation of several such positions (hereafter referred to as 'bottleneck positions') along the expected route of enemy advancement, and other measures such as demolition and roadblocks, it was expected that *the army would be able to cause fairly substantial delays to the progress of enemy army units' advance.*²⁴¹

The third sub-study looked into the effect of air defence operations under various levels of support from the K&V System.²⁴² It stated that *the effect of air defence operations has proved to depend heavily on the possibility to give warning of enemy air activity, and the possibility of conducting [tactical] control of fighter aircraft.*²⁴³ In peacetime the K&V System would allow own fighters to stay on ground alert. Upon detection of enemy air activity own fighters would be scrambled and give precise vectoring to their targets. However, the K&V System was expected to be operational for only a few hours after the outbreak of a Soviet attack. From then on DCA would have to be conducted as CAP, leaving it to the fighters themselves to detect and intercept enemy aircraft. The Analysis found that less accurate vectoring (hereafter referred to as 'coarse vectoring') than was typically available in peacetime would be sufficient in wartime, provided that own fighters were equipped with air-to-air radar. In that case an average deviation from actual target data of up to 5 nautical miles off actual

²³⁸ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 15.

²³⁹ T Langsæter, 'Virkingen av offensiv fly-støtte til Hæren under oppholdende strid i kanaliserende terreng', *NDRE Report S-342* (1974) and T Langsæter, 'Datagrunnlag for aksemodellen – bedømmelse av tank/antitankstrid', *NDRE Report S-354* (1974).

²⁴⁰ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 16. Original text: [*På grunn av våre hærstyrkers underlegenhet, må deres taktikk gå ut på å føre forsinkende strid.*]

²⁴¹ Ibid p. 16. Translation based on original text [*våre hærstyrker vil derfor kunne påføre angriperen ganske betydelige totale forsinkelser.*].

²⁴² Ragnvald H Solstrand, 'En operativ vurdering av K&V-systemets rolle i en konflikt konsentrert om Tromsområdet', *NDRE Report S-268* (1972).

²⁴³ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 16. Original text: [*...Luftforsvarsoperasjonene og den virkning disse har, viser seg å være sterkt avhengig av hvilke muligheter som finnes for varsel om fiendtlig flyaktivitet og kontroll av jagerflyene.*].

position, 15 degrees off in course, and 50 knots off in speed, would be acceptable.²⁴⁴ It was concluded that *a supplementation and strengthening of the K&V System is necessary, both with regard to sensors and communication systems*, but it was also made clear that ‘coarse vectoring’ would suffice.²⁴⁵ One should not aim for the level of vectoring accuracy that would typically be available in undisturbed peacetime operations. An own project (Job 285-E/113) was established at the NDRE in order to find proper and economically feasible solutions to these matters.²⁴⁶

The fourth and last sub-study on the Army’s need for air support studied the effect of air defence operations under various levels of airbase support, particularly in terms of producing aircraft sorties.²⁴⁷ The discussions assumed that the air bases would be in such a condition that the fighter fleet could be efficiently used during the first vital days of a conflict. Bases at which operational flying units were regularly stationed had in general been enabled to produce enough sorties to meet peacetime training requirements. Those bases therefore had a fairly good (though unprotected) maintenance capacity, a rather limited weapon support capacity, and practically no runway rapid repair (RRR) capacity. Air bases with no regularly stationed flying units had severe shortcomings in all these capacities. A more balanced support system for aircraft sortie production was found to be necessary, with a considerable strengthening in the areas of RRR, maintenance & repair of aircraft (which would have to be performed in protected facilities) and weapon support & turnaround capacity.²⁴⁸ The issue of RRR was thoroughly addressed. The S-222 threat scenario contained a defined amount of Soviet aircraft capable of conducting runway attacks, and the effect of runway bombing was carefully studied.²⁴⁹ Some of the problems associated with damaged runways could be alleviated through other measures than RRR, for instance via short field takeoff and landing capacities in the (new) fighters. Such measures could however not be expected to be sufficient alone. Moreover, as the building of hardened aircraft shelters (due to lessons taken from the 1967 six-day war) had increased, the interest in runway attacks had also grown. SHAPE had set specific time limits for repairing defined runway damage, but so far only the RAF had

²⁴⁴ Ibid p. 43.

²⁴⁵ Ibid p. 44. Original text: *[det må til en supplerings og styrkelse av det K&V system vi i dag har, både hva angår sensorer og samband.]*.

²⁴⁶ Ibid p. 43.

²⁴⁷ A Mortensen and R H Solstrand, ‘Strukturering av et flystasjonssystem for kampflyoperasjoner i en begrenset konflikt i Nord-Norge’, *NDRE Report S-60* (1974).

²⁴⁸ Ragnvald H Solstrand, ‘Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990’, *NDRE Report S12* (1975), p. 39.

²⁴⁹ A Mortensen, ‘Bombing of runways with fighter-bomber aircraft’, *NDRE Report S-249* (1971).

developed a RRR capacity that could meet those requirements. The RAF RRR concept was studied in detail at the NDRE.²⁵⁰

The threat scenario on which the Analysis was based assumed that a Soviet attack would involve 110 fighter-bombers (50 advanced, 60 simple) and 175 interceptor fighters (35 very advanced, 60 advanced and 80 simple).²⁵¹ However, not all of these aircraft would be used in support of Soviet land operations, and thus different combinations of fighter-bombers and interceptors were studied. Norwegian fighter forces are based on a 15-year budget of NOK 4 billion which would allow for either 48 CAC 5 advanced supersonic fighter-bombers, or 120 CAC 3 simple fighter-bombers. Fighters would have to be deployed to bases in the Troms area. Fighters on ground alert at Bodø, and any of the other bases further south, were assessed to be too far away from the battle area given the estimated warning time.²⁵²

Two main strategies for how Soviet fighters would be used were put forward. In strategy one (S1) fighter-bombers would be used against Norwegian army units. At the same time Soviet interceptor fighters would fly CAP over the battle area, in order to prevent RNoAF fighter-bombers from attacking Soviet ground forces. Strategy two (S2) was different with respect to the use of the Soviet interceptor fighters, who in S2 would be specifically used against RNoAF air defence fighters. In S2 the Soviet interceptor fighters would fly fighter sweep missions. This meant flying into Norwegian airspace, where RNoAF fighters would then be drawn into aerial combat. The aim was to tie up and preferably kill as many RNoAF fighters as possible. The purpose of S2 was to prevent RNoAF fighters from interfering with Soviet offensive fighter-bombers, and not (as was the case in S1) to prevent RNoAF aircraft from attacking Soviet ground forces.

Based on the four mentioned sub-studies and the various reports supporting them, evaluations were made on the kind of fighter aircraft needed to support the Army- offensive, defensive or a mix thereof.²⁵³ The aim was to find what would produce the most 'holding-time' for the Norwegian defence as a whole. 'Holding time' was given in hours, varying with the use of own fighters, and reflecting how much time that would elapse before Soviet forces had seized control of the Bardufoss region. A full presentation of all results is given in NDRE Report S-

²⁵⁰ A Mortensen, 'Hurtig rullebanereparasjon, Exercise Sky Pink II, RAF Laarbruck', *NDRE* (1972).

²⁵¹ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 8.

²⁵² *Ibid* p. 17.

²⁵³ *Ibid* p. 17-24.

63 'The use of fighters in support of the Army'.²⁵⁴ However, here it will be sufficient to look at the results that reflect the use of CAC 5 and CAC 3 respectively, with variations in the number of aircraft used in an offensive (RNoAF fighter-bombers against Soviet ground forces) and defensive role (RNoAF fighters aimed at preventing Soviet fighter-bombers from attacking ground forces).

In case of a Strategy 1 (S1) Soviet attack, assuming 80 Soviet fighter-bombers and 50 interceptors, and with no use of RNoAF fighters whatsoever, the 'holding-time' would have been 64 hours. With the use of CAC 5, without assistance in the form of 'coarse vectoring' from the K&V System, the 'holding-time' would increase to 70 hours. It is noteworthy that this would be the case whether all CAC 5 fighters were used for CAP, or if they were used solely in an offensive role. The reason for such a low increase in 'holding-time' (from 64 to 70 hours) is the sheer size of the fighter fleet. Just 48 CAC 5 aircraft would have been ineffective flying CAP missions. If own fighters were to be used only in an offensive role, the Soviet fighter-bombers could have targeted army units undisturbed. The available Soviet fighter-bomber strength would be sufficient to inflict such damage that Norwegian units would have to withdraw from their 'bottleneck positions' before causing desired delays to the attacking Soviet forces. The Norwegian side could not have expected to succeed through a similar method of operations. Being much smaller than the adversary, and facing much larger ground forces (division-size), the Norwegian CAC 5 fighter fleet could not have inflicted enough damage on the enemy. In other words, as it was relatively expensive, only 48 CAC 5 advanced supersonic fighter-bombers could be purchased. In order to achieve any effect worth mentioning from such a low number of fighters, it would have been a necessity for our K&V System to at the very least produce 'coarse vectoring'. On the other hand, with 50% of the CAC 5 aircraft (i.e. 24 fighters) used in a defensive role, supported with 'coarse vectoring' (the other half still in an offensive role), the 'holding-time' increased to 110 hours. With 75% of CAC 5 on defensive missions and 'coarse vectoring' the 'holding-time' would increase to 140 hours, or nearly six days.

Similar findings were made when evaluating the less advanced CAC 3 in the same S1 situation. No own fighter usage gave the same 64 hours of 'holding-time'. With all 120 CAC 3 fighters in an offensive role the 'holding-time' increased to approximately 70 hours. Also, an increase of fighters in a defensive role resulted in more 'holding-time'. 75% of the CAC 3 in a defensive role and 'coarse vectoring' gave about 120 hours 'holding-time'. But, regarding

²⁵⁴ K T Vebjør, 'Bruk av kampfly til støtte for Hæren', *NDRE Report S-63* (1974).

CAP missions without ‘coarse vectoring’ from the K&V System, the CAC 3 would be the better choice. ‘Holding-time’ would have stayed 70 hours no matter how many of the available CAC 5 fighters flew CAP, due to the low number of aircraft available. However, using 75% of the CAC 3 fighters on CAP would increase the ‘holding-time’ to 90 hours. Nevertheless, a particular finding regarding support to the Army is quite important here.²⁵⁵ The best use of the Army would be to fight from ‘bottleneck positions’, as this would cause as much delay as possible to advancing enemy forces. In order to secure this type of army operations it would thus be vital to protect them against Soviet fighter-bombers. It would be pointless to even consider offensive missions in support of army forces before this was assured. In short, supporting the Army through defensive missions would result in the most ‘holding-time’ – a finding that was valid for both CAC 3 and CAC 5.

S1 would have involved a lot of enemy effort in protecting the ground advance from air attacks. These evaluations and findings regarding the use of S1 were also considered to likely be found by the Soviets. The Analysis assessed that *with the same knowledge and insight into the aspects discussed, the adversary would not choose such a strategy. The biggest threat to him would not be our fighter-bombers; rather it would be our air defence forces used in order to prevent Soviet fighter-bombers from attacking our army units.*²⁵⁶

In the case of Strategy 2 (S2) the evaluations gave somewhat different results. The Soviet side, who in S1 would have used up to 50 interceptor fighters in order to prevent Norwegian fighter-bombers from attacking Soviet ground troops, would in S2 fly fighter sweep missions with these interceptors. With 75% of Norwegian fighters on defensive missions, receiving ‘coarse vectoring’, and other parameters staying the same, a CAC 5 fighter fleet were found to give a “maximum” ‘holding-time’ of 140 hours in a S1 situation. But in a S2 situation, with some 50 Soviet interceptors flying sweep missions, the ‘holding-time’ would be reduced from 140 to 80 hours. Using CAC 3, a max ‘holding-time’ of 120 hours would have been achievable in a S1 situation. With 75% of the CAC 3 fighters used defensively the ‘holding-time’ would have been reduced to 90 hours in a S2 situation.

Although ‘holding-times’ would decrease in a S2 situation compared to a S1, an important finding remained valid. Given the assumptions that were made about the scenario in general,

²⁵⁵ Ragnvald H Solstrand, ‘Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990’, *NDRE Report S12* (1975), p. 19 and p. 21.

²⁵⁶ Ibid p. 19. Original text: *[Med kjennskap til de forhold som er diskutert ovenfor, burde en angriper ikke velge en slik strategi. Det er ikke våre jagerbombere som er den største trusel, men det vi måtte disponere av luftforsvarsstyrker som kan forhindre angriperens jagerbombere fra å angripe våre hærstyrker.]*

and on enemy forces and strategies in particular, RNoAF fighters should fly defensive missions in support of the Army. This also would result in the most 'holding-time' during a S2 situation. Priority to air defence missions would result in up to 90 hours of 'holding-time' in the case of S2, and up to 140 hours in S1. Flying no defensive missions and putting maximum priority on offensive missions would have given up to 70 hours whether CAC 5 or CAC 3 was used. In other words: Flying defensive counter air missions with 75% of the fighters would produce nearly a full day of additional 'holding-time'. Depending on the enemy choice of strategy, priority to defensive counter air would at best result in nearly six days of 'holding-time'; approximately double of what could have been achieved otherwise.

The arguments in favour of defensive counter air, apart from the increase in 'holding-time', can be summed up as follows.²⁵⁷ The use of own fighters in the role of defensive counter air was based on the Army's need for protection against enemy air attacks. Unhindered aircraft attacks against Norwegian ground forces (that aimed to fight at carefully selected 'bottleneck positions' along the enemy route of advancement) would spoil the chances of creating any substantial delays to the Soviet advance. Furthermore, RNoAF air defence fighters would be a threat not only to Soviet fighters, but also to bombers, transport aircraft and so on. Hence, in order to avoid unacceptable risk of losses, the enemy would have to protect his assets by providing them with fighter escort. In other words; Soviet fighter aircraft would have to carry out a number of different tasks. In turn this would lead to fewer Soviet fighters in any given position where the Norwegian side might choose to concentrate its own fighter activities. Lastly, forward air defence along with a strengthened RRR capacity would make it possible to fly in reinforcements to airbases in the Troms region.

Attack on seaborne invasion forces

It was assumed that a Soviet attack would involve two waves of ships, each escorted by 14 frigates and destroyers. The first wave would consist of 20 landing craft (primarily Polnochny class). This wave would set ashore a marine infantry brigade of 1,900 men and 2,500 tons of munitions, fuel and other equipment. The goal of the first wave would be to seize and secure landing areas. The second wave would follow approximately 4 hours later, consisting of 24 merchant vessels (primarily Volgoles class vessels) equipped with cranes, carrying a motorised infantry division of approximately 11,000 men and 30,000 tons of munitions, fuel

²⁵⁷ Ibid pp. 23-24.

and equipment.²⁵⁸ The landing of the division would be assisted by the first wave landing craft.²⁵⁹ The main goal for the infantry division would be to move towards Bardufoss and, along with the Soviet paratrooper regiment landed in the Olsborg area, take control of the Bardufoss area as soon as possible.

The air defence capability of the escort vessels would be substantial, with the potential of inflicting decisive losses on the RNoAF fighter fleet. The analysis of the Anti-Shipping operations were based partly on sub-studies of maritime operations, the capacity of the air bases, air defence operations and the SAM and Anti Aircraft Artillery (AAA) capacity of Soviet naval escort-vessels.²⁶⁰ Two aspects were in particular studied as to the use of fighters in an Anti-Shipping role. The first was to discover how much Anti-Shipping force would be needed, and what affects such operations would have. The second was to discover what category of weapon would contribute the most to reducing the vulnerability of own aircraft, whilst simultaneously producing the desired amount of Soviet losses.

Four main categories of weapons were assessed. These included short range weapons (such as 2,75” or 5,0” rockets, or conventional bombs), laser guided bombs, laser guided missiles and finally full stand-off capable missiles.²⁶¹ The latter could be launched 30 kilometres or more from the target, and different guidance systems (such as active or passive radar, or TV) were available. The two former types were assessed to involve too many losses of own aircraft to enemy seaborne SAM and AAA systems, as both types of weapons would require either weapon release at short ranges, and/or prolonged exposure time to enemy weapon systems. The use of missiles proved more promising. Cost-efficiency comparisons between short range weapons on one the hand, and laser guided missiles on the other clearly favoured laser guided missiles. However, as laser guided missiles had to be launched at a range typically 15 to 10 kilometres from a target, the attacking aircraft would still be inside enemy SAM coverage. This would involve losses, although less so than in the case of short range weapons.

The laser guided missile was clearly better than the first two weapon categories, but it nevertheless fell short of full stand-off capable missiles. Given the same circumstances as with the use of laser guided missiles, losses of own aircraft using full stand-off capable missiles would occur only through engagements with Soviet fighter aircraft. Losses using

²⁵⁸ E Amundsen, 'Sjøinvasjonstrusel/kampflyanalysens scenario', *NDRE Report S-303* (1973), p. 4 and p. 28.

²⁵⁹ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 24.

²⁶⁰ *Ibid* p. 24.

²⁶¹ *Ibid* pp. 25-28.

short range weapons would have been from 75 -85 %, whereas losses using missiles would be between 30 - 40 %. Reduced loss rates would keep more aircraft available for later use.

Also when looking into the need for Anti-Shipping operations the overall aim of the Analysis was to find what effect this would have on 'holding-time' as a whole. However, the use of air forces could not be considered and evaluated isolated from the effects stemming from the use of maritime and land forces. In addition it was necessary to make assumptions, of which one is of particular interest. The sea-invasion phase was assessed to last approximately 24 hours, and tempo would be of the utmost essence.²⁶² For instance, if mobilisation was ordered at time H, then at best only the Third Infantry Battalion would be in place to fight in the Skibotn area, in an attempt to stop Soviet air and sea landed forces. Forces becoming available later than H + 30 hours would not be able to help stop the sea-invading forces at all. This would have been a very difficult situation, in which not even an optimum usage of combat aircraft would suffice. However, such a situation would not come about if Simple Alert were declared as Soviet forces crossed into Finland. Thus, in order to be able to describe and clarify the effects of using fighters in Anti-Shipping operations, such a declaration of Simple Alert were set as an assumption²⁶³.

The two main components contributing to a swift and speedy invasion were Soviet air and sea landing forces. Studying the paratrooper regiment that was expected to be landed in the Olsborg area, evaluations showed that own fighters would not be able to inflict enough damage to this regiment to render it unable to carry out its mission. Although not considered likely, the Analysis still presented results where the Soviet air landing operations failed. Several roads merge in Olsborg, located south of the division landing area, and 15 kilometres north of Bardufoss. Control of Olsborg would be vital for a speedy transit southbound for the motorized infantry division. Once ashore and ready to move the infantry division, divided into three groups, would progress southbound.²⁶⁴

Operations against seaborne invasion forces would be carried out by naval forces (submarines, surface vessels and coastal forts) and combat aircraft. Evaluations showed that if an air and sea landing operation as outlined in the threat scenario was launched, the Soviets would reach Bardufoss and put the airbase under fire in 30 to 40 hours (closer to 30 hours with successful paratrooper operations directed at Olsborg). Nearly twice as much time would

²⁶² Ibid p. 26

²⁶³ Ibid p. 29

²⁶⁴ E. Reine, 'Et scenario for første fase av kampflyanalysen for perioden 1975-1990', *FFI Notat S-222* (1970), p. 22

have been required had the Soviets tried to achieve the same without seaborne forces. In such a case about 75 hours would have elapsed before Bardufoss was under fire. Evaluations on how the overall 'holding-time' could be affected by inflicting losses on the Soviet seaborne forces showed that the situation in which Soviet forces reached Bardufoss after 30 – 40 hours *could only be prevented by inflicting losses on the sea invasion forces of up to 50 %, or slightly more, through combined use of own maritime forces and combat aircraft.*²⁶⁵

Results from evaluating the different CACs in an Anti-Shipping role showed that the least capable CACs were in fact unusable in such a role, as they would in any instance not be able to inflict the necessary losses on the enemy seaborne forces. Furthermore, the studies on the various types of weapons showed that own loss rates would be very high (up to 85 %) using short range weapons. Nevertheless, the capabilities of such weapons were known, and they were in themselves relatively cheap. On the other hand, even if the best suited CAC armed with short range weapons had been used, this would still require 70 – 80 % of the fighters flying Anti-Shipping in order to inflict 50 % losses on Soviet seaborne forces. Inevitably, in doing so the majority of RNoAF fighters would be lost.

At the time both laser guided missiles and full stand-off capable missiles were associated with various uncertainties. In the case of laser guided missiles the Analysis stated that it was likely that countermeasures would be developed, and that these could be expected to reduce missile efficiency. Also, if necessary to close-in to within 15 kilometres before being able to launch, the shooter would have been well inside the reach of enemy SAM systems. In principal the target could be laser illuminated by any source (the combat aircraft itself, or another aircraft, or a surface unit). Nevertheless, lasing would have to be done, at least for the final portion of the missile time of flight. Besides active (e.g. shooting back) and passive (e.g. putting out smoke) enemy actions, weather phenomena like clouds, precipitation, fog and mist can pose problems for laser operations.

The Analysis held that several types of full stand-off capable missiles were available at the time. However, it also found that *there are considerable uncertainties associated with the efficiency of these weapons used in Norwegian coastal waters, under operationally realistic conditions, and taken into consideration weapon related weaknesses and failures and countermeasures.*²⁶⁶ There were no doubt serious uncertainties associated with the use of the

²⁶⁵ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report SI2* (1975), p. 29. Original text: *[Dette kan bare forhindres ved at sjøinvasjonsstyrken påføres opp mot eller aller helst over 50% tap ved kombinert innsats av vår marine og våre kampfly.]*

²⁶⁶ *Ibid* p. 25. Original text: *[Det hersker i dag stor usikkerhet med hensyn til disse våpnenes effektivitet brukt i norske kystfarvann under realistiske, operative forhold – når en tar hensyn til våpensvikt og mottiltak].*

missiles available for use in the Anti-Shipping role. However, losses would have been unacceptable using short range weapons, and the use of these weapons *would not have enabled our anti-shipping forces to prevent an expeditious seaborne invasion from succeeding.*²⁶⁷ The Analysis thus went on to study in more detail what results Anti-Shipping missiles would bring.

Given the various uncertainties discussed above, the probability of stopping the targeted vessel was set relatively low. In the case of laser guided missiles this probability was defined at 40% for two missiles. Full stand-off capable missiles were given a stopping probability of 15% for two missiles.²⁶⁸ Several findings were made, of which two are of particular interest here. Firstly, using missiles would produce the desired 50% enemy losses with the established stoppage probabilities. Secondly, in the case of CAC 3 such enemy losses would be reached using approximately 30% of friendly fighters, whilst using CAC 5 would have required some 50 % of the fighter fleet in order to achieve this level of enemy losses. The reason for this was not related to weapon efficiency. It was simply due to a higher total number of CAC 3 fighter aircraft, and thus more weapon carriers, compared to what would have been the case with the relatively more expensive CAC 5. Based on these findings the Analysis concluded that the role of Anti-Shipping should be carried out using advanced weapons; i.e. missiles, and that it would be necessary to inflict approximately 50% losses on the Soviet seaborne force. Finally, given a total budget of approximately NOK 4 billion over a period of 15 years, it was found that the CAC 3 also made itself relevant in this role. Very expensive weapon carriers would simply demand a disproportionate amount of resources to be used in the Anti-Shipping role.²⁶⁹

Chapter 5 in perspective

Also chapter 5 is by large based on sources that hitherto have not been available due to their classification. Regarding the use of the Norwegian army, it was found that it would be best to fight from ‘bottleneck positions’, aiming at causing as much delay as possible to invading Soviet forces. Without protection against Soviet fighter-bomber attacks the Norwegian army units would quickly have been destroyed or forced to withdraw.

Without any use of fighters the ‘holding time’ would have been 64 hours. Using all fighters in an offensive role (CAC 3 or 5) would have increased the ‘holding time’ to 70 hours. Two

²⁶⁷ Ibid p. 30. Original text: *[De gir ikke mulighet for å oppnå så høye effektiviteter at vår anti-shippingstyrke kan forhindre en rask sjøinvasjon i å lykkes.]*

²⁶⁸ Ibid pp. 30-31.

²⁶⁹ Ibid p. 32.

different Soviet air strategies were assessed (S1 and S2). The S1 would have been the preferred one from a Norwegian standpoint. Using 75% of the CAC 3 fleet in a defensive role, given 'coarse vectoring' by the K&V System, would have produced 120 hours of 'holding-time' in an S1 situation, and 140 hours if using CAC 5s.

In a S2 situation the results were different. Given the same circumstances (75% of the fleet in a defensive role, with 'coarse vectoring') CAC 5 fighters would now produce 80 hours of 'holding-time', whilst using CAC 3s would have produced 90 hours. Nevertheless, although holding-times decreased in an S2 situation compared to S1, an important finding stayed valid: As flying only offensive missions (and no defensive missions) would at best have produced 70 hours 'holding-time', priority to DCA remained the best option. In short; supporting the Army through flying DCA would give the most 'holding-time'.

The main goal for the sea invasion forces would be to land and then move south to take control of the Bardufoss area. If the sea invasion had been carried out as described in the scenario, Bardufoss would have been under fire in 30 – 40 hours. It was assessed that such a speedy attack towards Bardufoss could only be prevented by stopping or destroying at least 50% of the sea invasion forces, which would have been met by naval forces and combat aircraft. For the latter several categories of anti-shipping weapons were studied. Short range weapons proved to be an unrealistic option due to high loss rates. Although associated with uncertainties, the use of missiles in the Anti-Shipping role was preferred as the best option. Both CAC 3 and 5 could produce the desired 50% of enemy losses using missiles. However, this would require the use of only 30% of the CAC 3 fleet, as opposed to half of the CAC 5s. The reason for this was simply due to the higher total number of the cheaper CAC 3 fighter aircraft available, and thus more weapon carriers.

As discussed earlier the Analyses rest on some quite important assumptions. The two Soviet air strategies serve as interesting examples. The Soviets could unquestionably have used their fighters in several other ways. Likewise, it is certainly true that if the Norwegian side could evaluate the consequences of varying air strategies, then the Soviets could as well. However, in retrospect I find it equally likely that such evaluations could have been made, on both the Norwegian and the Soviet side, also after operations commenced. Hypothetically, if this had been incorporated into the Analyses, this might have altered some of its conclusions. On the other hand; the more variables one introduces, the more complicated the calculations and evaluations become. In the worst case one could have ended up with an unmanageable set of analyses, unable to make conclusions and recommendations upon which long term military

planning decisions could have been made. I find it likely that the latter would have been an undesirable outcome seen both in an Air Force and NDRE perspective.

The sea-invasion scenario was based on what was foreseen to be the size and composition of a Soviet naval invasion threat around 1980.²⁷⁰ Contemporary anti-shiping missiles were associated with uncertainties, and the Analyses stated that development of such missiles would be very important. However, the point here is that there were seemingly not expected a similar development in other types of weapons, or in the way other weapons could be used. Laser guided bombs were introduced in the Vietnam War, and it would have been fair to expect a similar type of development in land-attack weapons as one foresaw for anti-shiping missiles. The Six Day War (1967) had shown how Israeli fighters managed to conceal their intentions of attacking Arab airforces on the ground, and how they in less than two days destroyed and inhibited operations from several Arab airbases. Again, too many variables would probably render it impossible to carry out the Analyses. It nevertheless seems that expectations were high regarding opportunities and development in anti-shiping missiles, but much less so regarding weapons and (changes to) concepts intended for attacking land-based targets such as airbase facilities, runways, shelters, communication nodes and so on.

In sum, the Analyses were nevertheless clear on how new fighter aircraft should be used. Priority should be given to anti-shiping and DCA operations. The number and type of new fighters were based on a 15-year budget (that in the words of the S-12 was *relatively loosely justified*) of NOK 4 billion.²⁷¹ CACs 3 and 5 represented the most interesting fighters. Taking into account that up to 30% of these NOK 4 billion would have to be spent on improving the K&V System and the air bases' maintenance, weapon support and RRR capacity, one could either buy 48 CAC 5 or 120 CAC 3 fighters.²⁷²

²⁷⁰ E Amundsen, 'Sjøinvasjonstrusel/kampflyanalysens scenario', *FFI Notat S-303*, (1973), p. 3.

²⁷¹ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p.10. Original text: [*dette tallet er relativt løst begrunnet*].

²⁷² *Ibid* p. 54.

6 The Analysis in perspective, and conclusions

Norway, including her Armed Forces, was in need of rebuilding after WW II. Soon the Soviet Union, bordering Norway in the northeast, emerged as a new and formidable threat. Norway had limited resources, and political authorities did not believe that Norway was able to defend herself alone.

It seems reasonably clear that the priority given to the offensive use of fighter aircraft during the 1950s and 1960s essentially stemmed more from NATO doctrines and war plans and the type of fighter-bomber aircraft the RNoAF received through US weapon aid programmes, than being the result of national priorities. SNOWCAT missions illustrate this quite well. These RNoAF wartime fighter-bomber operations were offensive missions aimed at destroying Soviet radars and at creating overload in the Soviet command- and control systems, paving the way for NATO nuclear bombers. Although gradually losing priority from the late 1960s, RNoAF squadrons kept SNOWCAT missions as wartime tasking until the mid 1970s.

The overall aim of the Analyses was to find what effects various usage of resources in the combat aircraft sector, including the use of some resources on associated support functions, would have on 'holding time' as a whole. The studies of supporting functions were quite typical in a Systems Analysis perspective. However, in a national defence planning perspective this seems to have been rather new. In the NDRE study in 1963, resulting in the purchase of F-5s for the RNoAF, the MoE were set to be the average number of targets destroyed by a squadron. Although the 1963 studies did take into consideration enemy invading forces, they still differed quite substantially from the Analyses that were initiated at the NDRE six years later. The most visible difference is of course the much broader approach one took on in the 1970-74 Analyses. This is not only reflected in the development of CACs and the quite extensive studies of what effects that would result from various usage of fighter aircraft, but also in the studies regarding the K&V System, the Air Bases maintenance and RRR capacities, and that a defined budget was set in advance.

I have found the scenario and the MoE to be of vital importance for the Analyses. These two elements originated at the NDRE and were finalised with a close eye to political signals, and thorough discussions and ultimately the approval by the Armed Forces. Since 1946 political authorities on several occasions pointed out that Norway could not defend herself alone.

Based on these signals, it could be argued to be quite natural that one planned so as to be able to receive allied reinforcements before it was too late. Moreover, the Parliament was utterly clear in Stortingsmelding 37 (issued in spring 1968), the plan for the organisation and activities of the Armed Forces for the next five years. In this plan it was clearly stated that as all-out war had become less likely, focus would now be on smaller conflicts and their potential for escalation. Moreover the long term plan stated that mounting the strongest possible defence, and preparing in the best way possible for getting allied assistance continued to be the cornerstone of Norway's defence efforts. Lastly; neither the expectations set forth to the NDRE could have been clearer. One would in the coming years make the most of the institution's capabilities in defence planning.

The selection of 'holding time' as MoE therefore – at least in retrospect – appears to have been a natural and perhaps even obvious choice in its time. But although the MoE was decided upon by the end of 1970, this did however not happen without discussions. It seems that a main reason for these discussions is that in an Air Force perspective, 'holding time' was seen to be rather vague compared to the 1963-analysis MoE. Having the effectiveness of RNoAF fighters measured by the number of destroyed invading enemy targets would certainly be a more direct and tangible method than having it measured by contributions to an overall 'holding time'. As it turned out (although reading too much into the number of hours was warned against) the Analyses determined the effect of various fighter operations down to the hour. It is nevertheless my opinion that 'holding time', as defined and used in the Analyses, on the whole is definitely a land-oriented MoE: All activity focused on the land situation, and the entire defence was indeed aimed at denying Soviet control over a defined piece of territory. As a digression; would it be possible to establish a 'sub-MoE' for the fighter's air-to-air efforts in the anti-invasion campaign, similar to what was the case regarding the anti-shiping part? It could namely be that the goal of stopping 50% or more of the invading Soviet sea-vessels in fact was a 'sub-MoE'.

The same political signals were arguably valid in respect to defining the scenario as well. I have found that Scenario 2a corresponded quite well to contemporary Soviet threat assessments, both NATO and national. It was however never argued that the scenario was selected because it was the most probable one. The reason for selecting it was simply that it represented the type of conflicts that could be manageable given the resources foreseen to be available for the structuring of national Armed Forces. Put another way; it would on one hand never be an option not to have national Armed Forces. On the other; a small nation like Norway could simply never have matched the resources available to the enemy anyway.

Therefore, selecting a scenario representing larger and/or more complex conflicts would simply be to fight with the setting. It would thus be best to base the Analyses on a scenario in which national forces – structured in an optimized way – could deliver maximum effect with regard to both deterring and raising the threshold for the opening of the conflict, as well as influencing the outcome. Regarding the development of the scenario as such sources at hand suggest that this was mainly the work of the NDRE, although the FO/E did provide information on Soviet types and amount of land, air and naval forces. The impression that the NDRE developed most of the scenario, and that in this respect the FO/E took only a minor part, seems to be backed by the book ‘Strengt Hemmelig – Norsk etterretningstjeneste 1945-1970’ [‘Top Secret – Norwegian Intelligence Services 1945 - 1970’] by Olav Riste and Arnfinn Moland.²⁷³ Here it is stated that in this period Norwegian military intelligence was mainly arranged so as to collect and record Soviet military capacity, not to analyse what these data could mean.

The scenario, and with it the Analyses itself, rests quite heavily on a few vital assumptions. The assumptions are openly stated and in general well explained. However, I have found reason to question the assumption that only Soviet forces already stationed reasonably close to Norway would be used in an invasion. Air forces stationed in neighbouring Soviet MDs could have reinforced the attacking Soviet forces relatively quickly as soon as the operations had been started. I have also found expectations to the development in Anti-Shipping missiles to be quite optimistic, but have not found the same regarding other weapons or other concepts of operations – for instance aimed at destroying or hampering air operations from airfields. It is however the nature of assumptions that they are made in advance of events, for later to be scrutinized in the light of facts and hindsight.

It was of course absolutely necessary to make assumptions. It would otherwise have been impossible to carry out analysis and come up with results on which long term defence planning decisions could be based. It could be argued that through establishing the 2a scenario and ‘holding time’ as MoE, the NDRE not only set premises for the Analyses, but indeed also for national security policy. The NDRE carried out a broad Defence Analysis that was completed in 1978.²⁷⁴ This Defence Analysis was to a great extent based on the Combat

²⁷³ Olav Riste and Arnfinn Moland, *Strengt Hemmelig – Norsk etterretningstjeneste 1945-1970* (Oslo: Universitetsforlaget, 2005), pp. 316-317.

²⁷⁴ R H Solstrand, ‘Forsvarsanalysen - Sluttrapport’, *NDRE Report S-14* (1978)

Aircraft Analyses and similar analysis for both the Army²⁷⁵ and the Navy.²⁷⁶ Although the Defence Analysis also looked into a scenario covering an attack on Norway as a whole, the 2a scenario was kept and so was 'holding time' as MoE. Looking into this matter could be a most interesting future research and thesis. For instance, did the Analyses results motivate a strengthened effort to get more allied forces earmarked for wartime missions in defence of Norway? Or; did it provide motivations for Norway and its Allies to establish large (ally) depots of military material on Norwegian soil?

A surprise attack in which Soviet forces quickly reached their invasion goals, a *fait accompli*, would probably have been a "worst case" scenario. Invading forces were therefore to be engaged immediately, thus making it clear that a NATO member had been attacked. Given the strength of Soviet forces one would have to fight under withdrawal, aiming at causing sufficient delays so that allied help could arrive before the Soviets reached their goals. The Analyses thus set out to find how resources available in the combat aircraft sector could best be used in order to produce the most 'holding-time'. 'Holding-time' was given in hours. It would vary with the amount and use of own fighters and Soviet strategy, and reflected the amount of time that would elapse before Soviet forces had seized control over the Bardufoss-region. One went about this task paying close attention to available resources. Up to 30% of a NOK 4 billion budget could be spent on improving the K&V system and Airbase support functions, included RRR capacity.²⁷⁷ The rest would be spent on new fighter aircraft and running costs over 15 years. As long as the budget did not vary outside NOK 2 to 7 billion the CAC 3 would be the better alternative.²⁷⁸ Given more than NOK 7 billion a fleet of the more advanced CAC 5s would have been the best option.

Although it was realized quite early that the RNoAF would not be able to have all kinds of capabilities, I have found that the RNoAF nevertheless strived for a more balanced capacity within its fighter fleet during the 1950s and 1960s than it actually achieved. One in particular made an effort to get AWX fighters. The priority to the offensive, with SNOWCAT missions as perhaps the most typical example, thus seems to stem more from the US weapon aid programmes and allied war plans and strategies than the results of Norwegian initiatives and planning.

²⁷⁵ E Reine, 'Analyse av Hærens operative enhet – Sluttrapport', *NDRE Report S-15* (1978)

²⁷⁶ J E Nilsson, 'Sjøforsvarsanalysen - Samlerapport', *NDRE Report S-13* (1978)

²⁷⁷ Ragnvald H Solstrand, 'Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990', *NDRE Report S12* (1975), p. 54.

²⁷⁸ *Ibid* pp. 54 -55.

With the 1970-74 Combat Aircraft Analyses this was changed. I have found that the 2a scenario and 'holding time' as MoE are crucial both as basis and prerequisite to the Analyses. And, almost equally important, the use of a pre-determined budget-size seems to have played a vital role. Through defining an anticipated amount of money to be available for the purchase and 15 years of expected life cycle of the new aircraft, one to a great extent made it possible to carry out analysis that could end up with clear alternatives; i.e. reaching findings and being able to make recommendations on which long term planning decisions could be made. But also other assumptions, for instance on how Soviet air strategies would be, or that only nearby Soviet forces would participate in the invasion, helped providing the same: Manageable analysis with results that could be used for decision-making. The idea was simply to make new RNoAF fighters contribute to the overall defence of Norway in the best possible way. The 'best way' would certainly not be to take on the task of fighting off a Soviet invasion alone; such an endeavour would quite simply be out of Norway's capabilities. The 'best way' would be to delay Soviet advance as much as possible, and through that prevent them from reaching their objectives before Norway's Allies could provide assistance. Hence the MoE was set to be 'holding time'.

In my thesis I have set out to explore why and how the RNoAF changed from having an offensive to a clearly defensively postured fighter fleet. In conclusion I have found that the NDRE was fundamental to this relatively sharp change, which came about based on the 1970-74 Analysis. The Analyses were greatly based on the 2a scenario, 'holding time' as MoE, and a pre-defined amount of resources available. The main tool of the NDRE was quantitative methods, and one never let go of the ambition of reaching results that could form basis upon which long term planning decisions could be made. The Analyses thus left no doubt where to how RNoAF fighters should operate in war. RNoAF fighters would contribute to the most 'holding time' through flying fly DCA and Anti-Shipping operations, and the best candidate given the expected amount of resources would be the CAC 3.

With that the focus was clearly changed from an offensive to a quite defensive use of RNoAF fighters.

Epilogue

The Analyses was no doubt also aimed at finding a replacement for the F-5s and the F-104s. The selection of the F-16 was done in competition with the French Mirage F-1, the Swedish Viggen JA-37 and the US Northrop F-17. The NDRE played an important role also in this process, but it was not part of the 1970-74 Analyses as such. The F-16 was never mentioned in any of the Analyses reports.

The Analyses were based on several assumptions, of which some have proved right, others wrong. The new fighter was expected to be in service for 15 years, from 1980 to 1995. In hindsight this anticipation came to be only halfway correct. RNoAF did receive new fighters from 1980 and on, 72 F-16 Fighting Falcons, and the F-104s and the F-5s were eventually taken out of service. However, the F-16 was not retired in 1995; it is still operational with the RNoAF. Of course the Soviet Union never attacked Norway. Entering the 1990s the cold war ended and Soviet Union collapsed, just as the Norwegian-produced Penguin Anti-Shipping missiles became operational for the F-16.

The Analysis did indeed govern the use of RNoAF fighters – and also much other development of the RNoAF - from entering the 1980s and for some two decades to come. ‘Everybody’ knew what to do. As it turned out DCA became *the* modus operandi for the F-16 during the two first decades of its operational service in the RNoAF. I completed my pilot training in the US and returned to Norway in summer 1990. Although the Berlin wall had come down and the Soviet Union and the WP were soon to disappear, the RNoAF modus operandi remained unaltered for several years. At my squadron at Ørland approximately 70% of the flying was in an air-to-air role, mostly DCA. We flew our air-to-air role armed with short-range heat seeking missiles and our internal gun, and did not get medium range radar guided missiles until the latter part of the 1990s. Our primary wartime task would be to fly CAP, either at pre-determined positions or as ordered starting from a ground alert state. The remaining 30% of our flying was in an anti-shipping role, and to some extent air-to-ground, using unguided rockets and dumb bombs. It may be that these 30% quite simply reflected the 30% of CAC 3s necessary for Anti-Shipping operations in order to stop or destroy half of the Soviet invasion sea vessels.

The Anti-Shipping and air-to-ground flying, and events such as air-to-air gunnery flying, were typically organised into periods of two to three weeks. We flew however also in these periods some air-to-air training; for instance CAP waiting for the fighter-bomber package to

pass through our area of responsibility. As the 1980s ended the two F-16 squadrons in Bodø became operational with Penguin Anti-Shipping missile. After a while also my squadron started checkout on the Penguin, and became operational with it a couple of years into the 1990s. In hindsight I find it debatable whether the Penguin actually met the requirements set forth in the Analyses.

Both training and exercises reflected the 70-30 relationship between our air-to-air and Anti-Shipping role, and thus the priority to DCA operations. Of the national exercises the so-called ECHO exercises may serve as a typical example. In these exercises, held a couple of times per year, most of the RNoAF participated. There would typically be two organised forces; Blue and Orange. The K&V System would build an air picture, provide scramble orders if fighters were put on ground alert, and of course provide airborne fighters with intercept control. Airbases would be typical targets. The K&V System would warn the applicable airbase about incoming enemy attack, so that any remaining fighters on ground could either take off or return to their respective HAS (Hardened Aircraft Shelter), and of course so that local SAM units could get ready to defend the airbase. NATO Tactical Evaluations of the airbase and its squadrons and units, in this period typically held every other year, involved mostly the same kind of activity. It was however not only the air operations that were evaluated. Also resources available, and in particular the ability to regain operational status and resume operations were evaluated. To ensure this several concepts and various procedures were developed and put in effect. For instance procedures for post-attack inspections of taxiways and runways were established, and regularly trained. One could then determine the need for repairs, and prioritize RRR capabilities so that a Minimum Operating Strip (a MOS; the minimum piece of runway required for reassuming operations) could be opened as soon as possible, and not later than given time requirements. Also the aircraft repair and turnaround capacity was evaluated, including the ability to arm the aircraft with a new weapon load and thus be ready for a new mission. In addition, to further increase the ability to operate after attacks, we regularly made use of some of the many Norwegian short-runway airfields; runways typically of 800 to 1,000 meters. Also the sustainability of the K&V System was improved, through the construction of radars that could be retracted down into the mountain if needs be. The idea was to have radar overlap; i.e. being able to monitor a certain space around each radar using other radar(-s) nearby. Through this one could react to incoming threats and avoid the destruction of radar heads by retracting them, but immediately put the radar back into operation once the threat had moved on or been eliminated by, for instance, own fighters.

In hindsight it is my view that up to the point where our F-16s underwent the Mid-Life Update programme (late 1990s), the F-16s that the RNoAF operated in the 1980s and 1990s had essentially the same capabilities as when the airplanes were received in 1980. However, it is nevertheless my impression that the F-16 was a better aircraft than a CAC 3 fighter. How big (or small) the difference actually was between a typical CAC 3, a CAC 5 fighter and the F-16 is hard to determine exactly. It is however my impression that the F-16 was perhaps not purchased in sufficient numbers; a notion that is actually backed up by the 1978 Defence Analysis.²⁷⁹

We flew DCA operations as our primary role, and Anti-Shipping as our secondary. It is perhaps symptomatic that the 1969 doctrine slowly disappeared. It was soon out of sight and out of use, not to be replaced by a new RNoAF doctrine until the late 1990s. We simply didn't need one. The outcome of the Analyses was sufficient. With that we had our doctrine - everyone knew who the enemy was, and how, where and why to fight if the worst thing happened.

²⁷⁹ R H Solstrand, 'Forsvarsanalysen - Sluttrapport', *NDRE Report S-14* (1978), p.33, where it is stated that the 72 F-16s that Norway purchased were too few in light of the conclusions of the 1970-74 Analyses. Based on original text [...*anskaffelsesplan med 72 fly. Sett i forhold til kampflyanalysens resultater er dette et for lite antall fly.*].

Bibliography

The NDRE Archives, Kjeller/Oslo

Reports

Roderburg, K and others, *NDRE Report S18 A limited effectiveness/cost study of fighter-bombers*, (NDRE: 1963) (declassified CONFIDENTIAL)

Reine, E, *NDRE Report S-222 Et scenario for første fase av kampflyanalysen for perioden 1975-1990*, [Scenario for the Combat Aircraft Analyses] (NDRE: 1970) (declassified SECRET)

Solstrand, R, *NDRE Report S-211 Analyse av kampflyenes oppgaver i Forsvaret – Forstudie* [An analysis of the tasks of the combat aircraft in the Armed Forces] (NDRE: 1970) (declassified CONFIDENTIAL)

Gjelsvik, A, *NDRE Report S-242 Eksempel på eit framtidig luftvern for ein flystasjon, eit overslag over effektiviteten* [An example on Ground Based Defence of Airbases, and associated effectiveness] (NDRE: 1971) (declassified SECRET)

Gjelsvik, A and Mortensen, A, *NDRE Report S-252 Jagerbomberfly-angrep mot luftverninstallasjonar. Ei effektivitetsvurdering av ulike angrepsvåpen* [Fighter-Bomber Attacks on Ground Based Defence Systems. The effects of various weapons] (NDRE: 1971) (declassified SECRET)

Mortensen, A, *NDRE Report S-249 Bombing of runways with fighter-bomber aircraft* (NDRE: 1971) (declassified CONFIDENTIAL)

Løken, J and Amundsen, E, *NDRE Report S-239 Delbeskrivelse av sjøinvasjonsfasen for kampflyanalysen* [The Combat Aircraft Analyses - Description of the Sea Invasion] (NDRE: 1971) (declassified SECRET)

Solstrand, R, Schibbye, E and Aamoth, O, *NDRE Report S-236 A limited study of abort criteria for fighter-bombers being engaged by interceptors* (NDRE: 1971) (declassified CONFIDENTIAL)

Mortensen, A, *NDRE Report on RRR during exercise Sky Pink II, RAF Laarbruck* (NDRE: 1972) CONFIDENTIAL.

Solstrand, R, *NDRE Report S-268 En operativ vurdering av K&V-systemets rolle i en konflikt konsentrert om Tromsområdet* [The Role of the K&V System in a conflict in the Troms region] (NDRE: 1972) (declassified SECRET)

Aamoth, O, *NDRE Report S-297 Estimer av tid for klargjøring av kampfly for bruk i kampflyanalysen* [Estimates on time required to turn around fighter aircraft] (NDRE: 1973) (declassified CONFIDENTIAL)

Amundsen, E, *NDRE Report S-303 Sjøinvasjonstrusel/kampflyanalysens scenario* [The Sea Invasion Threat/The Combat Aircraft Analyses Scenario] (NDRE: 1973) (declassified SECRET)

Vebjør, K, *NDRE Report S-301 Jagerbombere mot sjø- og landmål* [Fighter-bombers against sea- and landbased targets] (NDRE: 1973) (declassified SECRET)

Aamoth, O, *NDRE Report S-350 Beskrivelse av kampflyklassenes referansetyper for anvendelse i Kampflyanalysen* [Description of Combat Aircraft Classes in the Combat Aircraft Analyses] (NDRE: 1974) (declassified CONFIDENTIAL)

Brinck, F, *NDRE Report S-62 Air-to-ground attack – Losses inflicted upon land forces by battlefield support and interdiction missions* (NDRE: 1974) (declassified CONFIDENTIAL)

Mortensen, A, and Solstrand, R *NDRE Report S-60 Strukturering av et flystasjonssystem for kampflyoperasjoner i en begrenset konflikt i Nord-Norge* [The Structuring of Airbases for the support of Combat Aircraft Operations in a limited conflict in North Norway] (NDRE: 1974) (declassified SECRET)

Vebjør, K, *NDRE Report S-63 Bruk av kampfly til støtte for Hæren* [Using Combat Aircraft in support of the Army] (NDRE: 1974) (declassified SECRET)

Vebjør, K, *NDRE Report S-362 Basemodellen – en modell av sortieproduksjonen fra et basesystem under en begrenset konflikt* [The Base Modell – a modell of sortie production during a limited conflict] (NDRE: 1974) (declassified CONFIDENTIAL)

Langsæter, T, *NDRE Report S-342 Virkningen av offensiv fly-støtte til Hæren under oppholdende strid i kanalisierende terreng* [The effects of offensive combat aircraft support to Army units fighting in funnelling terrain] (NDRE: 1975) (declassified SECRET)

Solstrand, R, *NDRE Report S-12 Analyse av alternative anvendelser av ressurser i kampflysektoren for perioden 1975-1990* [Analysis of alternative allocation of resources in the Combat Aircraft Sector for the period 1975-1990] (NDRE: 1975) (declassified SECRET)

Solstrand, R, *NDRE Report S-14 Forsvarsanalysen – sluttrapport* [The 1978 Defence Analysis – Final Report] (NDRE: 1978) (declassified SECRET)

Nilsson, J E, *NDRE Report S-13 Sjøforsvarsanalysen - Samlerapport* [The Navy Analysis – Final Report] (NDRE 1978) (declassified SECRET)

Reine, E, *NDRE Report S-15 Analyse av Hærens operative enhet – Sluttrapport* [The Army Analysis – Final Report] (NDRE 1978) (CONFIDENTIAL)

NDRE documents

The NDRE Archive, Saksarkivet 161, 'Jobb-Sluttmelding 242-S/161 ['End-of-Project Report'] – "Analyse av alternative anvendelser av ressurser innen Kampflysektoren for perioden 1975-1990", attachment "Resultater" ['Results']

The NDRE Archive, Saksarkivet 161, 'The NDRE Study on the role of Combat Aircraft in the Armed Forces' [*FFIs Studie av kampflyenes plass i Forsvaret*], letter signed General Major Førde, Chief of the RNoAF Staff, dated June 5th 1970

The NDRE Archive, Saksarkivet 161, 'Report from the conference at Vesle skaugum 13-14 of April 1970' [*Hovedmomenter fra møte på vesle-Skaugum 13-14 april*], dated June 8th 1970

NDRE Archive, Saksarkivet 161, 'Jobb 242-S/161Analyses on alternative use of resources in the Combat aircraft Sector' [*Jobb 242-S/161Analyse av alternative anvendelser av resurser innen kampflysektoren*], letter signed Erik Klippenberg, Chief of the System Group dated November 9th 1970

NDRE Archive, Saksarkivet 161, 'Overview of NDRE System Group Analyses and Tasks in the period 1962-1972' [*Oversikt over Jobber og Oppdrag utført av FFI Systemgruppen i perioden 1962-1972*], letter signed Erik Klippenberg, Chief of the System Group, dated 11th of July 1972

The NDRE Archive, 'Forskningssjefenes Råd/Utvidet, 1267R – 1319R'. Letter to the NDRE from FST, titled *The NDRE long term programme 1971-75 and the programme for 1971 – the needs of the Armed Forces* [*FFIs langtidsprogram 1971-75 og arbeidsprogram 1971 – det militære forsvars behov*], dated April 10th 1970, reference 2217/70/FST/F III/RK/LD/101

The NDRE Archive, 'Forskningssjefenes Råd/Utvidet, 1267R – 1319R', meeting titled *The Research Chiefs Council, proposals for new projects and termination of completed projects* [*Forskningssjefenes Råd, forslag til nye jobber – avslutning av jobber*], September 9 1970, reference H1302/70/FFIS/RFE/AKM/203

Parliamentary and Governmental Papers

(Stortingsmeldinger [*Report to the Parliament*] and Stortingsproposisjoner [*Royal Proposition*])

Kongelig Resolusjon 10. juni 1949 [Royal Decree of 1949], *Direktiver for militære befalingsmenn og militære sjefer ved væpnet angrep på Norge*

Norges Offentlige Utredninger, *NOU 1978:9 Forsvarskommissjonen av 1974* [The Defence Commission of 1974] (Oslo: 5. januar 1978)

Stortingsmelding nr 32 (1945-46), *Plan for en første gjenreisning av Norges Forsvar*, (Oslo: Forsvarsdepartementet, 13. september 1946)

Stortingsmelding nr 5 (1960-61), *Om Forsvarets Forskningsinstitutt, dets organisasjon og retningslinjer for dets fremtidige arbeid og utbygging*, (Oslo: Forsvarsdepartementet, 5. august 1960)

Stortingsmelding nr. 28 (1960-61), *Gjennomføringen av målsettingen i St.prp. nr. 23 for 1957 Om hovedretningslinjer for Forsvaret i årene framover* (Oslo: Forsvarsdepartementet, 9. desember 1960)

Stortingsmelding nr 84 (1962-63), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1964-1968* (Oslo: Forsvarsdepartementet, 14. juni 1963)

Stortingsmelding nr 77 (1963-64), *Luftforsvarets styrkemålsetting i perioden 1964-1968* (Oslo: Forsvarsdepartementet, 13. september 1964)

Stortingsmelding nr 37 (1967-68), *Hovedretningslinjer for Forsvarets organisasjon og virksomhet i tiden 1969 - 1973*, (Oslo: Forsvarsdepartementet, 8. mars 1968)

Stortingsproposisjon nr 23 (1950), *Om (1) Samtykke til å ratifisere avtale med Amerikas forente stater om gjensidig hjelp på forsvarets område (Våpenhjelpavtalen). (2) Fullmakt til å motta materiell under denne avtale. (3) Dekning av utgifter i forbindelse med våpenhjelpen.* (Oslo: Forsvarsdepartementet, 3. februar 1950)

Stortingsproposisjon nr 91 (1963-64), *Om anskaffelse av jager-bombefly til Luftforsvaret* (Oslo: Forsvarsdepartementet, 28. februar 1964)

Stortingsproposisjon nr 149 (1974-75), *Om flyanskaffelser til Forsvaret*, (Oslo: Forsvarsdepartementet, 25. april 1975)

Published sources

Arheim, T, and others, *Fra Spitfire til F-16* [From Spitfire to F-16] (Oslo: Sem & Stenersen AS, 1994)

Børresen, J, Gjeseth, G and Tamnes, R, *Norsk Forsvarshistorie Bind 5* [the History of Norwegian Defence] (Bergen: Eide forlag, 2004)

Dörfer, I, *Arms Deal – The Selling of the F-16* (New York: Praeger Publishers, 1983)

Duvsete, S, *Luftforsvarets Historie Bind 3* [The RNoAF History] (Oslo: Aschehoug & Co, 2004)

Eriksen, K and Pharo, H, *Norsk utenrikspolitikk historie Bind 5* [The History of Norwegian Foreign Policy] (Oslo: Universitetsforlaget, 1997)

Erlandsen, H, *Århundrets våpensalg* [Arms Deal of the Century] (Oslo: Bedriftsøkonomens forlag, 1983)

Morse, P, and Kimball, G, *Methods of Operations Research*, (Cambridge: Massachusetts Institute of Technology Press, 1951)

Njølstad, O, and Wicken, O, *Kunnskap som våpen* [The History of the NDRE 1946-1975] (Oslo: Tano Aschehoug, 1997)

Pedlow, G, *NATO Strategy Documents 1949-1969* (NATO: 1997)

Riste, O, and Moland, A, *Strengt Hemmelig – Norsk etterretningstjeneste 1945-1970* [Top Secret – Norwegian Intelligence Services 1945 - 1970] (Oslo: Universitetsforlaget, 2005)

RNoAF, *Håndbok For Luftforsvaret 95-1 Luftoperasjoner - Prinsipielle retningslinjer for bruk av luftstridsmidler* [RNoAF Doctrine] (Oslo: Sjefen for Luftforsvaret, 27. juni 1969)

Skogrand, T, and Tamnes, R, *Fryktens likevekt – atombomben, Norge og verden 1945-1970* [Balance through Fear – the Atomic bomb, Norway and the World] (Oslo: Tiden Norsk Forlag AS, 2001)

Skogrand, K, *Norsk Forsvarshistorie Bind 4* [the History of Norwegian Defence] (Bergen: Eide forlag, 2004)

Solstrand, R, *Quantitative Methods in Long-Term Defence Planning – Towards Structural Planning, volume I & II* (Trondheim: Norges Tekniske Høgskole, 1982)

Tamnes, R, *The United States and the Cold War in the High North* (Cambridge: University Press, 1990)

Tamnes, R, *Norsk utenrikspolitikks historie Bind 6* [The History of Norwegian Foreign Policy] (Oslo: Universitetsforlaget, 1997)

NATO documents (declassified)

NATO: *DC 6/1 Strategic Concept for the Defense of the North Atlantic Area*, (December 1, 1949)

NATO: *MC 14/1, A report on Strategic Guidance* (December 9, 1952).

NATO: *MC 48, A report on the most pattern of NATO strength for the next few years military* (November 22, 1954).

NATO: *MC 70, A report on Minimum Essential Force Requirements 1958-63* (January 29, 1958)

NATO: *MC 14/3, A report on the Overall Strategic Concept for the Defense of the North Atlantic Treaty Organization Area* (January 16, 1968)

NATO: *MC 48/3, Measures to Implement the Strategic Concept for the Defence of the NATO Area*, (December 8, 1969).

NATO: *MC 161/70, A report by the Military Committee on The Soviet Bloc Strength and Capabilities*, (September 24, 1970).

Journal articles

Bekkevold, J, 'Våpenhjelpen fra USA' [American Weapon Aid] in *Luftled - Luftmilitært Tidsskrift* 2 (1996)

Duvsete, S, 'Fra luftforsvar til strategisk angrep' [From Air Defence to Strategic Attack] in *Forsvarsstudier* 2 (1998)

Dyndal, G 'How the high north became the "Northern Flank" and central in NATO Strategy - Revelations from the NATO archives', in *Unpublished article* (2007)

Espenes, Ø, and Naastad, N, 'The RNoAF – A Multipurpose Tool during the Cold War' in *Air Power History* 47 (2000)

Gjelsten, R, 'Forsvarskommisjonen og Sjøforsvaret' [The Defence Commission and the Navy] in *Norsk Militært Tidsskrift* 148, 9 (1978)

Gjelsten, R, 'Simulert forsvar? Forsvarets forskningsinstitutt og Sjøforsvaret – ulike tilnærminger til forsvarsplanlegging' [Simulated Defence? The NDRE and the Navy] in *Forsvarsstudier* 3 (2001)

Hitch, C, 'An Appreciation of Systems Analysis' in *Journal of the Operations Research Society of America* 3, 4 (1955)

Hitch, C, 'Uncertainties in Operations Research' in *Operations Research* 8, 4 (1960)

Huitfeldt, T, and Hjerde, A, 'Sør-Varanger juni 1968 – Den Sovjetiske styrkedemonstrasjonen' [Soviet show of Force in South Varanger, 1968] in *Forsvarsstudier* 3 (2003)

Mjelde, A, 'Forsvarskommisjonen av 1974 og kvantitative analyser' [The Defence Commission and Quantitative Analysis] in *Norsk Militært Tidsskrift* 148, 8 (1978)

Riste, O, 'Weserübung: Det perfekte strategiske overfall?' [Weserübung: A Perfect Strategic Attack?] in *Forsvarsstudier* 4 (1990)

Solandt, O, 'Observation, Experiment, and Measurement in Operations Research' in *Journal of the Operations research society of America* 3 (1955)

Solstrand, R, 'Kvantitative analyser i langtidsplanleggingen i Forsvaret' [Quantitative Analysis and Long term Defence Planning] in *Norsk Militært Tidsskrift* 150, 4 (1980)

Thomas, C, 'Military Operations Research', in *Encyclopedia of Operations Research and Management Science*, ed. Gass, S, and Harris, C (Norwell: Kluwer Academic Publishers, 1996)

RNoAF Academy archives

Mohr, W, (referent): *Referat fra møte i Den sentrale sjefsnemd 23. November 1956* [Joint Chiefs of Staff Meeting] (Oslo, November 26th 1956). Document available at Magasinet, RNoAF Academy Library

Monstad, E, (referent): *Referat fra møte i Den sentrale sjefsnemd 18. Februar 1955* [Joint Chiefs of Staff Meeting] (Oslo, March 12th 1955). Document available at Magasinet, RNoAF Academy Library.

WEB

<http://www.kongsberg.com/eng/KDA/Products/> , February 2007

http://www.mil.no/felles/ffi/english/start/?jsessionid=ZRDQUSKOULFBXQFIZYGSFEQ?_requestid=2248985 , February 2007

<http://www.nato.int/archives/strategy.htm> , February 2007

<http://www.nato.int/archives/> , February 2007

<http://www.nato.int/docu/stratdoc/eng/intro.pdf> , March 2007

Abbreviations

AAA	Anti Aircraft Artillery
AEW	Airborne Early Warning and Control
AFB	Air Force Base
AFTFN	Air Force Task Force North
ASP	Atomic Strike Plan
AWX	All-Weather Capable
CAC	Combat Aircraft Classes
CoD	Chief of Defence
CINCNORTH	Commander-in-Chief Allied Forces Northern Europe
DCA	Defensive Counter Air
DoD	Department of Defence
ECM	Electronic Counter Measures
FO/E	Armed Forces Intelligence (Forsvarets Overkommando/Etterretning)
FST	Armed Forces Staff (Forsvarsstaben)
HAS	Hardened Aircraft Shelter
JAMAAG	Joint Allied Military Assistance Advisory Group
K&V System	Control and Warning System
MAAG	Military Assistance Advisory Group
MD	Military District
MDAP	Mutual Defence Assistance Program
MOR	Military Operations Research
MOS	Minimum Operating Strip
NDRE	Norwegian Defence Research Establishment
NOAH	Norwegian Adapted Hawk system
NSAM	National Security Action Memorandum
OCA	Offensive Counter Air
OR	Operations Research
RAF	Royal Air Force

RNoAF	Royal Norwegian Air Force
RRR	Runway Rapid Repair
SA	Systems Analysis
SACEUR	Supreme Allied Commander Europe
SADTC	SHAPE Air Defence Technical Centre
SAM	Surface to Air Missiles
SHAPE	Supreme Headquarters Allied Powers Europe
SNOWCAT	Support of Nuclear Operations with Conventional Attacks
STA	Soviet Tactical Aviation
ØKN	Commander of Northern Norway (Øverstkommanderende Nord-Norge)