

Finland and the Space Era

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1 A Modest Start

World War 2 had isolated Finnish geophysicists within purely national activities, and the subsequent Cold War period tended to continue this isolation.

This is illustrated by the preparations for the 1945 total solar eclipse. In May 1943 the Solar Eclipse Committee of the Finnish National IUGG (International Union of Geophysics and Geodesy) Committee, naïvely expressed a belief that even Soviet participation in such an important geophysical research project would be possible. Professor V.A. Heiskanen, a prominent figure in Finnish geophysics at that time, expressed his wish for full international cooperation, despite the raging war and Finno-Soviet hostilities. According to Heiskanen, a neutral Sweden would certainly help Finland to open the connections.¹

Contacts for the Finnish Solar Eclipse Committee remained very vague and only some Swedish scientists responded positively.² After the war the Finns began to strive for new western contacts. However, Finland was under an Allied Control Commission, dominated by the Soviets, former enemies, and not until the abolition of the Control Commission in 1947 could Finland strive to be neutral and more associated with the West. Formal contacts of Finnish geophysicists with international organisations were restored, but in practice contacts remained weak.

All activities amongst Finnish geophysicists remained rather weak and sporadic. The Government resources were scarce. For years to come, reparations to the Soviet Union constituted great cuts in the national income. Under Soviet pressure the Government even had to refuse Marshall Aid. Yet, the Government did not deny the importance of geophysics or astronomy. Research and teaching continued in these sciences at the universities and other research institutions. Despite limited funds the Government regularly paid membership fees to international scientific associations.

By 1952 Finland had paid its war reparations to the Soviet Union and a boost in the Finnish National economy was evident. The preparations for the International Geophysics Year (IGY) were going on at an international level, which opened a brighter vista for Finnish geophysics. After Stalin's death in 1953 a period of détente characterised the superpower politics. This was welcomed with enthusiasm in Finland. At last Finland had remarkably more freedom of action in national economics and foreign policy. Although the economy had not recovered very much on an absolute scale, even a small improvement was welcomed by the Finns.

1 Minutes of the Solar Eclipse Committee of the Finnish National Committee of IUGG, 5 May 1943 and 23 October 1943, (IUGG corr. 1945-1956).

2 Solar Eclipse Committee's report 15 September 1945-30 April 1945 (IUGG corr. 1945-1956).

2 Finland participates in the IGY

In March 1954 the Chairman of the Finnish National Committee of IUGG, Prof. Jaakko Keränen, and the Secretary, Dr Eyvind Sucksdorff, submitted to the Ministry of Education a memorandum in which they emphasised the unusual importance of the forthcoming Assembly of the IUGG to be held in Rome in September the same year. At the conference decisions would be made about arrangements for the IGY.³

The preceding years had seen some negligence. The Finnish National Committee of the IUGG had not compiled annual reports nor reported to IUGG about its activities since 1950. No mention of the IGY is to be found in the Finnish archives before March 1954. Awareness of the 10th Assembly, which was to be held in September 1954, led to a hasty report by Dr Sucksdorff, in April 1954, to the IUGG on the Finnish activities from the years 1951-1954. In this report IGY-related matters were emphasised, such as the foundation of a Geomagnetic Observatory in Nurmijärvi in 1952, as well as the plans to establish earth current instrumentation at the Sodankylä Magnetic Observatory (SGO).⁴ Even the Government was now willing to give its support to Finnish geophysics. On September 2, 1954, the Minister of Education announced the Government's decision to fund the IUGG General Assembly in Helsinki in 1960. Professor Keränen immediately announced his Government's decision to the Assembly in Rome.⁵

The Importance of the IGY was fully understood by contemporary Finnish geophysicists. In Rome on 15-29 September 1954, Finland was represented by a proper delegation. In the Assembly, Finland was given an important role in the arrangements of the IGY. Jaakko Keränen and Eyvind Sucksdorff had tactically referred to the Second Polar Year, organised some 25 years earlier, which had been a success for Finnish geophysical research. The Second Polar Year had shown and ensured that geophysical research in Finland fulfilled the requirements for accessing international co-operation.

The IGY was a forum for the establishment of new contacts and the re-establishment of old ones. Within the framework of IGY, the geographical location of Finland in the auroral zone regained its value. It immediately elevated Finland back to the international level. It brought to Finland observational instruments from the international scientific community. Germans contributed an ionosonde of the Max-Planck-Institute to the Sodankylä Geophysical Observatory. Further, the Finnish National Board of Post and Telecommunications paid for the installation of the ionosonde at the Nurmijärvi Geophysical Observatory. Geophysical communities from 66 countries took part in the IGY.⁶

In conjunction with the start of the IGY, the very first artificial satellite was launched in 1957. Although the Soviets had promised to participate in the IGY program with an Earth-orbiting satellite, the launch of *Sputnik I* came as a great surprise, if not as a great political threat and challenge.⁷ With the launch of *Sputnik I* a very rapid development of rocket and satellite technology was initiated on both sides of the Atlantic.

Satellites offered an opportunity for geophysical researchers to investigate *in situ* upper atmospheric and near-space phenomena that had up to that time mainly been studied by ground-based observations, with balloons to a few tens of kilometres or sounding rockets to no higher than 250 km. *Sputnik I* orbited at an altitude of 500 km. A new dimension of space research was opened to geophysics and Finnish geophysicists were prepared to participate in the new programme.

3 Finnish National Committee of the IUGG Chairman Keränen and Secretary E. Sucksdorff: Aide mémoire for Ministry of Education 18 March 1954 (IUGG corr. 1945-1956).

4 Report of the Finnish National Committee, 2 April 1954 (IUGG corr. 1954-1956).

5 Minister of Education to the Finnish National Committee of IUGG 9 Sept. 1954 (IUGG corr. 1945-1956).

6 J. Krige and A. Russo, *A History of ESA*, vol. 1, p. 5; Walter Sullivan: *Assault on the Unknown*, Preface p. vii.

7 Jan Stiernstedt: *Sweden in Space*, p. 5; Roger Bilstein: *Orders of Magnitude*, p. 47.

3 The Space Era opens for Finland

If Finland wanted to stay abreast of the development of space research, somehow she had to get a grip on satellite projects. To start with, the Government funded satellite observations from the year 1958 with an appropriation of 2.5 Million FIM (44200 Euro in 2002).⁸ Astronomy Professor Gustaf Järnefelt at the University of Helsinki had organised the observation project. The importance of these arrangements can be seen as preparatory actions towards Finnish membership in the Committee on Space Research (COSPAR).⁹

COSPAR was established in 1958 as the most important subcommittee for space research under ICSU (International Committee of Scientific Unions). It was a step towards the internationalisation of space activities, with a balanced representation of both superpowers. The chairmen were to be appointed by the board of COSPAR, and of the two deputy chairmen one ought to be a US and the other a Soviet citizen.¹⁰ Finland certainly profited greatly from this development.

Why did Finland not join COSPAR in 1958 when the organisation was established and Finland's interests in space research had its most evident advocate in Professor Järnefelt? An adequate reason for Finland's hesitation to join COSPAR could have been the lack of readiness. Only the participation in the IGY activated Finnish geophysical research from its post-war quiescence. Finnish geophysicists or astronomers did not have the psychological, or the organisational prerequisites needed for prompt membership when the idea was proposed. However, in January 1961 Professor Gustaf Järnefelt was able to state to the Chairman, H.C. van de Hulst, that Finland's membership in COSPAR was only a question of time. The membership fee was US\$ 1000 (5000 Euro in 2002).¹¹ Such a limited expense could not have been the real obstacle, not even for the Government.

No doubts were ever raised in COSPAR concerning possible Finnish membership. On the contrary, the Secretary of COSPAR, F.H.M. van Straelen, seems to have taken the initiative for Finnish membership, in October 1960, in a quite casual manner. Van Straelen addressed an application form to Järnefelt at the Finnish Academy of Sciences and Letters, stating that it could be used in the event that Finland intended to join COSPAR informally.¹² For the time being Finland was not yet ready, but this did not disturb COSPAR. In February 1961, van de Hulst invited Järnefelt to attend the General Assembly to be held in Florence in April of the same year. In the margin of the invitation letter van de Hulst had written by hand: "I hope that you will be able to come yourself!" COSPAR had indeed integrated diplomacy into its policy. Furthermore, van de Hulst offered that COSPAR could pay up to US\$ 400 for travel expenses, with the support of UNESCO and some foundations.¹³

Frankly, it could be said that COSPAR was in a sense putting pressure on Finland to submit its application. In March 1963 van de Hulst reminded Järnefelt of the UNESCO support available for Finnish participation in the General Assembly held in Washington DC. Somewhat later, the Secretary of COSPAR, P.J. Beaulieu, wrote to the "Finnish COSPAR" inquiring why they had not received any news from Prof. Y. Väisälä and his assistant, Dr L. Oterma, even though they had been invited to attend the COSPAR Symposium on "Opportunities for Small Scale Space Research" in Washington DC. Beaulieu suspected the reason to be a lack of sufficient finances, and gently hinted at the travel support available.¹⁴ In the same context Beaulieu reminded Järnefelt of the above-mentioned symposium to be held in Washington, and he noted politely that

8 About 40000 AU; Gustaf Järnefelt/HU to van de Hulst/ COSPAR 31 Jan.1961 (GJA/GEO). 2.5 MFIM in 1958 is equivalent to about 42000 Euro in 2002.

9 F.H.M. van Straelen/COSPAR to Gustaf Järnefelt/HU Nov. 17,1960, and Gustaf Järnefelt to van de Hulst: COSPAR 31 Jan.1961 (GJA/GEO).

10 G. Haerendel, et al: *40 Years of Cospar*, p.5- 6; Walter Sullivan: *Assault on the Unknown*, p. 410-412.

11 About 5000 AU; Minutes of the Committee established by the Finnish Academy of Sciences and Letters for preparation to join COSPAR, 5 Nov. 1963 (GJA/GEO).

12 COSPAR/F.H.M. van Straelen to Järnefelt in the Finnish Academy of Sciences and Letters, 7 Nov. 1960 (GJA/GEO).

13 COSPAR/van de Hulst to Järnefelt, 20 Feb. 1961, (GJA/GEO).

14 COSPAR to the Finnish National Committee of COSPAR, 6 March 1962 (GJA/GEO).

the symposium should certainly raise interest in Finland, where the scientists had shown lively activity in this field.¹⁵

NASA took part in this symposium as well, as did the United Nations. In response to a UN-launched project on "Peaceful Exploitation of Space" the Ministry of Foreign Affairs requested Professor Järnefelt to prepare a position statement on the issue. In autumn 1963 the Finnish Academy of Sciences and Letters formed a committee to prepare Finland's adhesion to COSPAR. Professor Gustaf Järnefelt acted as chairman and the other members were Matti Franssila the Director of the Finnish Meteorological Institute, T. J. Kukkamäki the Director of the Finnish Geodetic Institute, Professor of Meteorology at the University of Helsinki, Lauri A. Vuorela and Pekka Jauho the Director of the Government Technology Centre. The committee provided the justifications needed and the organ capable of acting. Finland was now ready to join and on 2 June 1964, Finland was accepted as a member of COSPAR.¹⁶

The Finnish National Committee of COSPAR was created and nominated by the Finnish Academy of Science and Letters. As the Finnish Academy of Science and Letters was a private association, yet with some public tasks in the science administration, Finland had no specific organisation dedicated to space research. Since geophysics and astronomy had traditionally been practised at several government institutions and universities, the situation caused unnecessary confusion among representatives from different research groups.

15 COSPAR to Järnefelt, 15 March 1963 (GJA/GEO).

16 COSPAR Chairman Maurice Roy to Chairman R. Koskimies of the Finnish Academy of Sciences and Letters 2 June 1964 (FNC/COSPAR).

4 Satellites enter Finnish space research

Membership of COSPAR contributed to bringing Finnish geophysical research into space research. Especially notable was Prof. Martti Tiuri, who became a member of the Finnish National Committee of COSPAR in 1964, its Secretary in 1965 and Chairman in 1969.¹⁷ His activity continued for more than two decades, with a clear aim of participating in satellite missions. For him, the important thing in space activities was high technology and its spin-off effects on Finnish industry and the economy, and ultimately on the image of the country.¹⁸ In particular he linked technology with space research in Finland in the mid 1960s.

Space research in the form of pure science has long traditions in Finland. It was based on geophysical research involving geomagnetism and auroral studies. These research areas are still important for space research, and even for planetary research. Astronomy represents the third traditional space research area found in Finland. It started at the Royal Academy in Turku in the 17th century and moved with the Academy to Helsinki, where the Academy was transformed into the Imperial Alexander University in the early 19th century. From the mid 1960s to early 1980s, supporters of technology and of traditional science seemed to clash with each other. In time a change of generations dissolved the strain and joining the European Space Agency (ESA) as an associate member in 1987 finally cleared the way for a new approach to space science, where science acts as a catalyst for the development of space technology.

Artificial satellites represented modernity and dynamics within the Finnish National Committee of COSPAR. Space research was considered the forefront of progress in science and particularly in the natural sciences. COSPAR was a global organisation where matters were considered only at a general level. The European Space Research Organisation (ESRO), and European Launcher Development Organisation (ELDO) were established as its more pragmatically oriented twins.¹⁹

Officially, Finland never applied for membership in ESRO or ELDO, but it is not surprising to see that the Finnish National Committee of COSPAR, during the chairmanship of Professor Tiuri, carefully investigated the ESRO membership option. Following his retirement, Professor Järnefelt, the first chairman of the National COSPAR Committee, was succeeded by Prof. T.J. Kukkamäki, who had acted as secretary of the Committee. Professor Kukkamäki served as chairman for a short period before Prof. Martti Tiuri was elected. Professor Kukkamäki was rather conservative and actually a geodesist, for whom a satellite was just a superb triangulation tower.

In May 1964 Professor Tiuri gave a report to the Committee in which he emphasised that space research was defined elsewhere as research using rocket and satellite technologies. In April 1964 he had attended for the first time, with Dr Juhani Oksman from the University of Oulu, a space research meeting held by the Scandinavian countries at the Kiruna Geophysical Observatory in Kiruna, Sweden (established on 2 July 1957, on the second day of the IGY).²⁰ In March 1964, Sweden and ESRO had reached an agreement on establishing ESRANGE, a rocket launch facility to be located within the town limits of Kiruna, the activities of which could then be initiated.²¹ Sweden and Denmark were already involved in CERN, and became involved in ESRO right from its start. Norway had its own rocket programme that was administered by a permanent national space committee. The programme at ESRANGE included sounding rockets with 30 kg payloads, carried to altitudes of 150-250 km. According to Professor Tiuri's report, Sweden, Denmark and Norway were looking at the use of rockets and satellites for scientific space research. The report also mentioned that the design and construction of the first European satellite was in progress and that the

17 Prof. Martti Tiuri/FNC/COSPAR to Pirkko Mela/Ministry of Education, 18 Oct. 1965 (FNC/COSPAR).

18 Martti Tiuri, private communication.

19 *A History of ESA*, J.Krige and A. Russo, Vol. 1, Chapter 1, p. 13-33 gives a full account of the process; Jan Stiernstedt: *Sweden in Space*. p. 6-7; Haerendel et al.: *40 Years of COSPAR*. p. 16, in it Jacques Blamont: "A Few Souvenirs from COSPAR's Early History".

20 Martti Tiuri: aide mémoire: *Space Research in Nordic countries*, 22 April 1964 (FNC/COSPAR); C. Sucksdorff: *Earth Magnetism and Aeronomy*, 1964. s.d., probably January 1965 (IUGG).

21 Jan Stiernstedt: *op. cit.* p. 11-12, 108.

Swedish Aircraft Company SAAB was involved in this project. Sweden paid 3.6 Million crowns (0.41 Million Euro in 2002) for its ESRO membership and at the same time invested the same amount on its national space research efforts. In May 1964, at the General Assembly of COSPAR in Florence, Professor Tiuri reiterated his opinion on the definition of space research.²²

Dr Oksman did not fully share Tiuri's opinion. Oksman stated that ESRO membership and rockets were an extremely expensive business. Instead he recommended involvement in establishing receiving stations serving a Nordic network of stratospheric balloons. Furthermore, Finland could offer satellite receiving facilities. Oksman also moderated the terms set by Tiuri for space research. According to him, space research was research of the upper atmosphere with instruments positioned *in situ* during the measurements. Namely, stratospheric balloons up to altitudes of 30-40 km, sounding rockets up to altitudes of about 250 km, and artificial satellites up to the outer limits of the atmosphere and beyond. According to Oksman, the Scandinavian countries were already actively using these kinds of instruments.²³ Radars were not mentioned.

The meeting in Kiruna had an important impact on Finnish space research. Finns had now a close view of ongoing Scandinavian projects and observed that Sweden was also reorganising its scattered space research organisation. In general, it could be argued that it was through Sweden, Denmark and Norway that Finland had entered into modern space research at an international level, in addition to becoming a member of COSPAR. The Finns gained through Sweden a European vision of the state of space research, not only in Scandinavia, but also in ESRO, as well as of ESRO's role in Sweden.

22 Martti Tiuri: Report on COSPAR meeting in Florence, 8-20 May 1964 (FNC/COSPAR).

23 Juhani Oksman, Report on Kiruna meeting 4 May 1964 (FNC/COSPAR).

5 Finland considers ESRO Membership in 1968

In April 1968, Vaisala Ltd, the foremost of the few high technology companies in Finland at that time, contacted Professor Tiuri through the Finnish National Committee of COSPAR. Vaisala proposed that the National Committee should take the appropriate measures to investigate Finland's possibilities to join ESRO.

Vaisala saw in ESRO membership an opportunity to increase the demand for its instruments and devices and to gain other market benefits. This reasoning was justifiable. ESRO acquired instruments and devices solely from its Member States. The long negotiation between Vaisala and ESRANGE on radio wind sondes had failed because Finland was not a member of ESRO. Moreover, in its proposal Vaisala emphasised that Finland should actively participate in the scientific and technological activities in order to keep up with the latest technology. This was the only way to cope with competition and to benefit from technology transfer. Finally, Vaisala emphasised the significance of ESRO in promoting space research for peaceful purposes, and pointed out ESRO's political independence.²⁴

These were all the same justifications that have been used subsequently. Vaisala's communication was a reply to the inquiry made by the Finnish National Committee of COSPAR. At a meeting on 20 April 1968 Professor Kukkamäki had raised the question of Finland's membership in ESRO. According to Professor Kukkamäki Vaisala had shown interest, and the committee decided to request more detailed information.²⁵ Vaisala provided industrial justifications and the Finnish National Committee of COSPAR acted as a promoter and initiator.

The National Committee of COSPAR took the issue seriously and sought a breakthrough. High expectations were foreseen within international space research and technology. The experimental rocket station of ESRO, ESRANGE, was under development in Sweden. The USA and the Soviet Union were, ever more frequently, launching telecommunication, weather, and scientific satellites into Earth orbit and further into space.²⁶ In the autumn of 1968 Chairman Järnefelt and Secretary Tiuri wrote: "We are expecting continuing progress in the field of space research".²⁷

Professor Tiuri was at that time in close contact with the Ministry of Foreign Affairs, which he urged to take action towards joining ESRO. In 1967 and 1968 one such memorandum circulated in the Ministries of Foreign Affairs, Communications, and Defence. The Ministry of Defence noted that ESRO was not a military institution, but refrained from a view, either in favour of or against possible membership. The Ministry of Communications was flatly against joining ESRO.²⁸ The Ministry of Foreign Affairs did not produce a statement, but rather a report to the ESC (European Space Conference) Meeting on 11-14 November, 1968, in which ESRO was considered in a very negative way.²⁹ The Finnish Government did not see any advantage in joining ESRO. The viewpoint was mainly economic.

Politically, Finland still had one option. On 19 August 1968 Dr Matti Franssila, Director-General of the Finnish Meteorological Institute (FMI), had discussed with Klaus Häkkänen, Undersecretary in the Ministry of Communications, a proposal for a joint Nordic institution in space research.³⁰ Nordic cooperation had often proved to be a refuge for Finnish governments from the distress of superpower politics. Franssila and Häkkänen decided to ask the opinion of the National Committee of COSPAR about a memorandum covering this issue. Chairman Järnefelt and Secretary Tiuri warmly approved the proposal, and thereby expected a first stage of reorganisation of the national space sector. The National Committee hoped for a breakthrough and for this purpose, in October 1968, the Committee adopted the following programme:

24 Vaisala Ltd to FNC/COSPAR 25 April 1968 (FNC/COSPAR).

28 Finnish National Committee of COSPAR, Minutes, 20 April 1968 (FNC/COSPAR).

26 R. Bilde: *Orders of Magnitude*, p. 82-83.

27 FNC/COSPAR/Järnefelt and Tiuri to the Finnish Delegation of the Nordic Council, 10 Oct. 1968 (FNC/COSPAR).

28 Ministry of Communications and Defence reports to Ministry of Foreign Affairs, 12 Dec. 1968 (UM90AASK).

29 European Space Cooperation, Memorandum, 25 Nov. 1968 (UM90EY).

30 FMI/Director Franssila to the Finnish National Committee of COSPAR Chairman Järnefelt 19 Aug. 1968, with supplement "Medlemsförslag om nordisk samarbete på rymdområde" (FNC/COSPAR).

*A joint organ for the Nordic space sector will be established within the framework of collaboration of the Nordic Council. Finland will be in this respect represented by the National Advisory Council on Space, which will be responsible for gathering the existing know-how and organisational capacity in the space sector. Finland will participate immediately in the EUROSPACE-conference, and Finland intends to join immediately ESRO as observer. This procedure should not cause any political obstacles, since European neutral countries are members of both organisations.*³¹

The first step towards the realisation of this programme was soon taken. On 12 December 1968 the Ministry of Education appointed a Committee on Space Research, with Prof. Martti Tiuri as its chairman.³² The Committee on Space Research was divided into two sections. One section focused on surveying the space research carried out in Finland and on evaluating Finland's position within the international space research community. The other section would assess the significance of space research for Finnish industry and other economic sectors. In addition, the Committee was also to draft proposals on how to promote space activities.³³ To fulfil these tasks the Committee carefully investigated the organisation of space research in the other Nordic and European countries. As its very first action the Committee recommended to the Ministry of Foreign Affairs that Finland should join INTELSAT.³⁴ The Ministry of Foreign Affairs set up a group of observers to attend the INTELSAT conference held at the end of February 1969.³⁵ This arrangement led to membership of INTELSAT in 1972.³⁶

At the end of April 1969, the Committee had finalised the first draft version of its report. It listed various applications of space research from ore prospecting to prevention of forest fires.³⁷ These activities constituted only a part of space research and poorly reflected the ambitions of modern space research. The overemphasis on applied research was probably chosen to appeal to the Government. Nonetheless, the report was only a draft, and the real interest of the committee was seen in the attention it paid to the possible ESRO membership.

In February 1969, a representative of the Ministry of Foreign Affairs met with Dr J.R.U. Page, the Head of Scientific Communication of ESRO. The Ministry reported on the meeting to the Committee on Space Research. There is no information available here on the content of that report, but the Committee considered the matter of such interest that the Chairman, Tiuri and the Secretary, Seppo Urpo, visited the Headquarters of ESRO in Paris and the research centre in Noordwijk, the Netherlands.³⁸ The Foreign Ministry was responsible for organising the meeting. The delegation was strengthened by representatives of the Finnish Embassy in Paris and by a representative of the Finnish industry. The reception was cordial, as expected. In Paris the delegation was received by the Director General of ESRO, Professor Hermann Bondi, the Administrative Director, M. Depasse, who was responsible for the Legal and International Affairs, Dr Kaltenecker, the Head of the Office of the Director General, Mr Schalin, Dr J.R.U. Page, and Dr Isotta, responsible for Documentation and Information Services. ESRO had proposed the following discussion topics: possible forms of collaboration between ESRO and Finland, questions relating to ESRANGE, and finally all those subjects Finland wished to have placed under discussion.³⁹

31 FNC/COSPAR/Järnefelt and Tiuri to the Finnish Delegation in the Nordic Council, 10 Oct. 1968 (FNC/COSPAR).

32 Ministry of Education to Professor Martti Tiuri, 12 Dec. 1968 (FNC/COSPAR).

33 Working plan of Space Committee, Martti Tiuri, 9 Jan. 1969 (FNC/COSPAR).

34 Space Committee to Ministry of Foreign Affairs, 20 Jan. 1969 (FNC/COSPAR).

35 Ministry of Foreign Affairs/Karhilo to Space Committee, 18 Feb. 1969 (FNC/COSPAR). Chairman of delegation was Secretary of the Finnish Embassy Pekka Malinen, members Prof. Martti Tiuri and Holger Rotkirch from Ministry of Foreign Affairs.

36 Pentti O. Kärkkäinen, Aide mémoire: Proposals in the Space Research Committee requiring political decision, 10 Feb. 1970 (UM90YE); Risto Pellinen: Suuntana Mars p. 62.

37 Draft to paper of Space Committee, 29 April 1969 (FNC/COSPAR).

38 Space Committee to Foreign Ministry, 11 April 1969 (FNC/COSPAR).

39 Mr Pietinen from Finnish Embassy in Paris, 22 May 1969, over Foreign Ministry to Space Committee (FNC/COSPAR); Martti Tiuri and Seppo Urpo: Travel report to Paris and Noordwijk 1969, 5 June 1969 (UM90AEE)

Director General Bondi clarified the possible forms of collaboration. According to him full membership was the best option for both parties concerned. This was accepted unanimously.⁴⁰ Full membership was demanding and at that time Finland hardly fulfilled any of the requirements. But, according to ESRO representatives, the observer status that Finland was seeking was not worth negotiating. Instead, they recommended collaborative agreements. These could be agreed upon taking into consideration the needs and opportunities. Through this arrangement ESRO projects would be opened to Finnish industry, and as Bondi phrased it, “this sounded precisely like what Finland was seeking”. In Noordwijk the delegation was cordially received by Director W. Kleen. In both meetings the atmosphere was very friendly and collaborative. The report of the delegation to Ministry of Foreign Affairs had an overall enthusiastic tone.⁴¹

Prior to its visit to ESRO, the Finnish National Committee on Space Research opened contacts with space research officials in the Soviet Union through the Soviet-Finnish Committee on Scientific and Technological Cooperation. The first purpose of these contacts was to obtain information on the situation in the Soviet Union, but in the long run the Committee sought to create an exchange programme in the field of space research between the Soviet Union and Finland.⁴² The space research programme of the Soviet Union was not entirely unknown. Contacts were made with Soviet scientists through COSPAR Assemblies.⁴³ Finnish scientists in the fields of meteorology and geodesy worked normally with their Soviet counterparts.⁴⁴ Moreover, at that time the Soviet space researchers were seeking contacts in the West, but only France and Italy had responded to these efforts.⁴⁵

Soon after the excursion to the ESRO Headquarters, the Report of the Space Committee was published (14 October 1969). In this report emphasis was put on technology, to be followed by space research that would raise the level of knowhow, improve research methods and promote expansion of new routes for development. The report also stated that space research as a multidisciplinary activity should not be confined to a single institute, but should be encouraged at any research institute or university. Even establishing a space policy centre was not fully excluded. It was also explicitly stated that the Helsinki University of Technology should have a Laboratory (Department) of Space Technology. According to the committee report space industry is mainly electronics, which would be highly suitable for Finland. The essential foundations must be laid through Government subsidies for Finnish space industry, as well as through suitable international associations, which could provide orders for Finnish industry. This was certainly a hint at membership of ESRO and of COST (Cooperation in the Field of Science and Technology), an industrial programme for advancement of high technology by the EEC- and EFTA-countries.⁴⁶ It was proposed that within five years space activities should be financed by the Government at a level of one Finnish Mark per inhabitant (equivalent to 1 Euro in 2002). This was at that time the common Nordic level for space activities. In addition the Committee proposed the funding of a permanent National Advisory Space Council to operate under the Ministry of Communications.⁴⁷ The *Helsingin Sanomat*, the largest daily newspaper in Finland, supported the proposals made by the committee and labelled Finland in its leader article as “an underdeveloped country in space research”.⁴⁸

40 Martti Tiuri and Seppo Urpo: Report of travel to Paris and Noordwijk to familiarise with ESRO, 3-5 June 1969, 5 June 1969 (FNC/COSPAR).

41 *Ibidem*.

42 Space Committee to General Secretary Paukkunen of Finno-Soviet Science-technological Cooperation Committee, 24 May 1969 (FNC/COSPAR).

43 Finnish National Committee of COSPAR to Secretariat of COSPAR, 26 April 1969, a report of delegation, Prof. Martti Tiuri.

44 The IUGG Chairman was a Soviet Professor V.V. Belousov, Secretary of the IUGG Leon Knopoff of California, General Secretary of IUGG Knopoff to Prof. Kukkamäki 18.11.1965 (IUGG).

45 Haerendel et al., *40 Years of COSPAR*, p. 17.

46 *Fifty Year of Environmental Measurements*, p. 64.

47 Publication of Space Committee, 14 Oct. 1969 (FNC/COSPAR).

48 *Helsingin Sanomat*, 16 Nov. 1969, “Avaruustutkimuksen kehitysmää” (“An underdeveloped country in Space Research”).

6 A Single Space Research Centre?

At the end of the 1960s, concern was felt that without rapid and adequate contributions to space research and technology Finland would fail to keep up with economic developments elsewhere. The development of new rocket and satellite technology advanced very quickly in the USA and the Soviet Union.⁴⁹ ESRANGE started its operation in Sweden with the involvement of ESRO members.⁵⁰ From the Finnish point of view, the COST Programme initiated by the EEC countries in 1969 particularly seemed to give problems. With the support of the COST the EEC- and EFTA-countries sought new technological progress to improve and maintain their competitiveness.⁵¹ Unfortunately, Finland was not even invited to participate in the project.

“It is alarming to be left out”, Finnish Meteorological Institute Director General Lauri A. Vuorela wrote to the Ministry of Foreign Affairs in May 1972. After the submission of the report by the Committee on Space Research no substantial measures had been taken. But in 1970, the overall situation improved when the old and troublesome way of applying for funds through the Natural Science Council, which operated under the Ministry of Education, was replaced by the Academy of Finland as a governmental office for research funding.⁵² Through the activity of Professor Tiuri in the newly founded Academy of Finland a Section (i.e. a standing committee) for Space Research was established in 1970⁵³ as a surrogate for a permanent National Advisory Council on Space, which the Committee on Space Research had proposed, but which had not given any signs of coming into existence. Space research now had a visible position amongst the sciences in the Academy of Finland.

Professor Vuorela’s letter to the Ministry of Foreign Affairs in May 1972 was preceded by a question presented by the General Secretary of COSPAR Zdzislaw Niemirowicz. He politely inquired whether Finland was interested in hosting a General Assembly of COSPAR. Vuorela welcomed the idea, but made a remark, as a member of the Section of Space Research of the Academy of Finland, about the ESRO membership recommended by the Committee on Space Research. According to Vuorela at least observer status would be necessary for Finland, since the fact of “not being a member hinders the opportunities of receiving education, information and data for research purposes. Moreover, it prevents our electronics industry from obtaining subcontracts, and our researchers from participating in research programmes with our own instrument projects. Particularly now, in conjunction with the first ESRO geostationary satellite [which] will be launched at the end of 1976, the fact that we are not members raises great concern”.⁵⁴

A few years later Finland had still not become a member of an international space organisation besides INTELSAT. The establishment of ESA, the European Space Agency, in 1975, to replace its precursors, ESRO and ELDO, was on the agenda of the meeting of the Finnish National Committee of COSPAR in August 1973. The cooperation agreements with ESA that would enable participation in separate, individual projects was still considered to be a more plausible alternative than the more expensive option of full participation in the scientific programmes of ESA. Since this was the case, the committee decided to propose to the Ministry of Foreign Affairs that Finland should seek to participate in the Meteorological, Geodetic and Earth Observation programmes.⁵⁵ This meant that Finland was still at the same point as in June 1969.

49 R. Bilstein: *Orders of Magnitude*, p. 88-91, 84-88.

50 Jan Stiernstedt: *Sweden in Space*, p. 53, where Stiernstedt calls ESRANGE “The Entry Ticket to Europe”; J. Krige and A. Russo, *A History of ESA*, vol. 1, p. 48, 52.

48 *Fifty years of Environmental Measurements*. p. 64.

52 Kari Immonen: *Suomen Akatemia suomalaisessa tiedepolitiikassa 1970-luvulla*, Helsinki 1995 (Academy of Finland and Finnish science policy in the 1970s). A basic monograph on the science policy changes in Finland in the 1960s and 1970s.

53 Aide memoire/Professor Tiuri: *A Section of Space Research established in the Academy of Finland*, Nov. 26, 1970 (FNC/COSPAR); Academy of Finland, chairman Olavi Granö to Ministry of Foreign Affairs Oct. 28, 1970 (UM90AM).

54 FMI/Director Lauri A. Vuorela to “the Ministry of Foreign Affairs, 5 Sept. 1972. Report of attendance at a meeting abroad (FNC/COSPAR).

55 Invitation to the Finnish National Committee of COSPAR meeting 20 Aug. 1973, and Finnish National Committee of COSPAR Minutes 28 Aug. 1973 (FNC/COSPAR).

The Ministry of Foreign Affairs had followed ESRO and ELDO intensively since 1964. First it was a routine follow-up as a part of West European policy monitoring. Gradually the Ministry of Foreign Affairs indicated a growing interest in West European space efforts and their effects on questions of interest to Finnish foreign policy, such as West European integration, its relation to America as a self-assertion and to the Soviet Union in a relaxed coexistence.⁵⁶ That was interesting enough to the Finnish foreign political leadership, especially to President Urho Kekkonen.⁵⁷ It was highly interesting, even highly important for Finland, but there was no necessity to react in any way. In the autumn of 1970 all was possible. The Finns felt that ESRO could have collapsed if Britain had refused to participate in the launcher programme. In that case, America, with its Post-Apollo Program, would inevitably have achieved a globally dominant position in the entire satellite business.⁵⁸ After a couple of years, in June 1973, at the time of the ESC Meeting, ESRO was in a much better position, as the Finnish Embassy reported, and even an important political message was heard. Belgium and France stressed that with the ever growing importance of operational satellites in telecommunication, meteorology and remote sensing etc., Europe, seeking political and economic independence, could not accept complete dependence on US launchers,⁵⁹ because satellites were becoming important for telecommunications etc. This report went to President Kekkonen, among others.⁶⁰

The Finnish political élite monitored the process in and around ESRO and ELDO with a keen but political eye. By far the most important intermediary between the Foreign Ministry and space research circles in the first half of the 1970s was Professor Martti Tiuri. His message for the political élite was always the same: Join ESRO, then ESA, for the sake of Finland's development. Tiuri was on a Foreign Ministry posting list, so he got full information on all space research related matters monitored by the Foreign Ministry. He was the chairman of the Finnish National Committee of COSPAR, to be sure, but after all COSPAR was just a civilised club to discuss theoretically interesting matters in a pleasant atmosphere.

At the start of the 1970s Tiuri led an effort to change the "Space Research Section of the Academy of Finland" into a leading organ of Finnish space research. Although the main purpose of the Academy of Finland was to support science financially, to direct national science policy and to promote international cooperation, it was still a political agency that in the years 1970-1975 was affected by serious domestic political crises.⁶¹ In addition, the "Oil Crisis" in November 1973 and the high inflation rate in 1973-76 certainly hampered Tiuri's plans to change the "Space Research Section" of the Academy of Finland into "A National Organisation of Space Activities".⁶²

It was at this point, in November 1975, that the Chairman of the Council of the Academy of Finland, Professor Helge Gyllenberg and Director of Research Elisabeth Helander, said no to the practical propositions for action that Professor Tiuri had generated in order to give flesh to his ideas.⁶³ That was the

56 Lennart Eckenberg, Swedish Ministry of Foreign Affairs, Aide mémoire: European Space Conference, 27 August 1970, and Pentti O. Kärkkäinen, Aide mémoire: European Space Conference 4, Brussels 22-24 July 1970, 24 July 1970, and Bo Åhdahl, aide mémoire: Nordic position on 4. European Space Conference, part 2, 9 Sept. 1970 (UM90AASK).

57 Lennart Eckenberg, Swedish Foreign Ministry, Aide mémoire: European Space Conference, 27 August 1970 (UM90AASK). Document reveals a Nordic collaboration in monitoring European space cooperation, which is in the paper unhesitatingly connected to the whole question of the EEC; Pentti O. Kärkkäinen, Aide mémoire: European Space Conference 4, Brussels 22-24 July 1970, 24 July 1970 (UM90AASK). In this document formulations are clear concerning relations to the USA; Bo Åhdahl, Aide mémoire: Nordic position on 4. European Space Conference, part 2, 9 Sept. 1970 (UM90AASK). This document expresses the view that Finland has no economic interests, but only political.

58 Report on a Nordic conference between Sandgren, Brynskov, Rantanen, Lykke, Stiernstedt, 20 Oct. 1970 (UM90EY).

59 Report from Brussels to Ministry of Foreign Affairs, 13 July 1973 (UM90AASK 90/1408).

60 Report from Brussels to Foreign Ministry, 13 July 1973 (UM90AASK 90/1408).

61 Kari Immonen: Suomen Akatemia, *ibid.*

62 "Space Activities in Finland 1975", Chairman Martti Tiuri and Secretary Seppo Urpo, 9 Feb. 1976 (UM90ESA 50/1393).

63 Academy of Finland, Leading Committee, Chairman Helge Gyllenberg and Research Director Elisabet Helander to Foreign Ministry, 25 Nov. 1975, and "Space Activities in Finland 1975", Martti Tiuri and Seppo Urpo 9 Feb 1975 (UM90ESA 50/1393).

end of the Section of Space Research in the Academy of Finland, and it was a lethal blow to the idea of a concentrated centre for space research in Finland up to now.

The drive for Finnish membership in ESRO, later ESA, continued. In particular, a memorandum issued by the Section of Space Research at the Academy of Finland⁶⁴ was widely circulated in Finnish governmental circles. Finally, in May 1976 the question of Finnish membership in ESA was brought up for discussion at a ministerial level. That process led to a meeting of ministries in the same month. Now the question of joining ESA was for the first time evaluated seriously. The meeting concluded that joining was too expensive in comparison to the benefits, but did not close the matter.⁶⁵ This was the first of several governmental meetings, which eventually led to the goal, but only after ten years. In November 1976 Klaus Törnudd, the Deputy Director of the Foreign Ministry's Political Department, which was under the direct surveillance of President Kekkonen, dealt with a set of reports, *aides mémoire* and evaluations from the Governmental Science Council, a science-political evaluations body in the Ministry of Education, and sent them to the Foreign Ministry's management group, which came directly under President Kekkonen. Somebody marked with pencil on the side of the main paper: "Why not! No obstacles!"⁶⁶

That was the moment closest to success and then the matter again drifted further. The government administration could not yet find unanimity. The matter continued to lie on the table, but sufficient political support was still missing.

64 Martti Tiuri/The Section of Space Research of Academy of Finland, PM: Finland and ESA, 25 April 1975 (UM90ESA).

65 Aide mémoire from a meeting about the question of joining ESA, 24 May 1976 (UM90ESA).

66 Klaus Törnudd/Foreign Ministry, 25 Nov. 1976 (UM90ESA). The handwriting is not that of President Kekkonen, but of someone from the management group.

7 Small steps forward

A “Great Leap” towards building satellite instrumentation had narrowly failed. Even if the first attempt to create a central, politically, economically, and scientifically capable centre for space research in Finland and the attempt to gain Finnish membership in ESA in 1976 had both failed, these activities “had set the wheels rolling”. That great apparatus of governmental administration gained momentum and gradually prepared the ground for a positive solution.

The position of Dr Christian Sucksdorff, as the Head of the Geomagnetic Division at the Finnish Meteorological Institute, made him the person responsible for understanding the significance of the magnetosphere, not only as a physical phenomenon, but as a factor in science policy. During the 1970s Sucksdorff first formulated a strategy that eventually raised the Geomagnetic Division to the position of leading institution in Finnish space research.

The focus of Finnish space research shifted from organisational activities to actual scientific research, especially as the International Magnetospheric Study (IMS) was starting. The winners were those institutes that had shown interest in research. The Universities of Helsinki, Oulu and Turku, and the Finnish Meteorological Institute had strong existing ties to the international space research community which responded positively to the Finnish interest in becoming involved in space projects. As mentioned above, the founding of the Academy of Finland in 1970 significantly improved the funding situation for scientific research in Finland.

In the 1970s magnetospheric physics stood at the forefront of space research in Finland. During the IGY (1959) the magnetosphere surrounding the Earth was found to be essential for life on Earth; it screens harmful radiation from reaching the surface of the Earth and prevents oxygen from leaking out from the atmosphere. Scientifically this discovery can be compared to the finding of the tropopause in 1902. As new information and knowledge about magnetospheric phenomena grew, the need for novel equipment and more specific measurements in well defined regions became a necessity. The importance of measurements in the auroral regions was understood internationally.

The University of Oulu was founded in 1959, and the teaching of physics started in the autumn of the same year. In looking for a suitable research topic, one that would not overlap any other field of Finnish research, the Physics Department leadership decided to build a telescope for observations of cosmic ray muons. The challenge of building a muon telescope was accepted by Mr Pekka Tanskanen, who completed the work by the end of 1963. It was soon to be complemented by a neutron monitor for measuring the nucleonic component of cosmic rays.⁶⁷ This instrument has now been in operation for more than 38 years and is today one of the few cosmic ray instruments existing in Europe.

In October, 1961, at the initiation of Mr Jean Pierre Legrand at the Laboratoire de Physique Cosmique of the Centre National de Recherche Scientifique (CNRS), a group of European cosmic ray researchers met in Paris under the chairmanship of Prof. C. de Jager from the Utrecht Observatory, to discuss the possibilities of establishing a coordinated programme to measure cosmic rays, utilising balloon-borne instrumentation. In April 1962, at a second unofficial meeting, Prof. Alfred Ehmert was chosen to take the lead of this organisation, which in December 1963 was given the name SPARMO (Solar Particles and Radiation Monitoring Organization).⁶⁸

In 1964 Mr Tanskanen, now in the Oulu University Physics Department, met with Professor Pfozter and Professor Ehmert, both directors at the Max Planck Institut für Aeronomie, Lindau, Germany. Professor Pfozter suggested that the University of Oulu should join some of the existing SPARMO-teams to participate in balloon observations in and around the auroral zone. Since the University of Oulu was located at the gateway to the auroral zone, Mr Tanskanen realised that participation in auroral research involving high altitude measurements using balloons would be just right for their laboratory, which was still in its

67 Matti Salo-Matti Lackman: *Oulun yliopiston historia*. (A History of the University of Oulu) p. 413.

68 *Space Activities in Finland in 1967*, a report from Secretary of FNC/COSPAR, Martti Tiuri, 1 March 1968 (FNC/COSPAR); Space Physics p. 338.

infancy, and lacked both manpower and financial resources to carry out research with more sophisticated space research tools such as satellites.⁶⁹

The year 1965 marked the beginning of Finnish balloon launches as a member in SPARMO. In its first campaign, the University of Oulu operated from Finland in close cooperation with a team from the Laboratoire de Physique Cosmique, Meudon, led by Mr Legrand. The French team built the instruments, supplied the entire radio telecommunication system, and provided the plastic balloons to be used. The balloons were able to carry the payloads to an altitude corresponding to about 6-7 mb (~30 km). The first balloon was launched on 24 July 1965, and before 5 September a total of 24 balloons had been launched from Ivalo in Finnish Lapland. The last balloon campaign took place in 1979.

Space-related activities at the University of Oulu were rapidly expanding. In February 1966, under the leadership of Prof. Juhani Oksman, reception of weather satellite data was started at a station near Oulu. Ground-based recording of geomagnetic micropulsations was being made in cooperation with the University of Alaska, with equipment donated by the same university, thus extending the measurement series of over 125 years still being continued at the Finnish Meteorological Institute.⁷⁰

As noted before, in the early days of the Finnish space era research focused on magnetospheric physics. The activity required international ties, some of which were maintained through the organisations, and some of which were personal.⁷¹ The IMS was initiated at the beginning of the 1970s. It was an ICSU-programme, a continuation in the same series as IGY. It was also global, performed from 1976-1979.⁷² IMS became one of the main international activities in space research.⁷³ During the IMS the Geomagnetic Division at the Finnish Meteorological Institute, together with other Finnish geophysicists, had an opportunity to open contacts with Soviet geophysical researchers. Contacts with the Geophysical Institute of Apatity near Murmansk, the IZMIRAN institute and the University of Leningrad became especially important. In conclusion, in the mid-1970s magnetospheric measurements developed to cover a very wide range of activities. Finland participated in observations along with a large international scientific community. The involvement of Austria, the Federal Republic of Germany, Norway, Sweden, the Soviet Union and the United States were particularly lively.⁷⁴

From a Finnish point of view EISCAT (European Incoherent Scatter Radar facility) was the most important tool developed during the IMS in the late 1970s. EISCAT was formed in 1976 as a international association, the participants being the German Federal Republic, France, Great Britain, Sweden, Norway and Finland. Finland participated with a 5 % share of the cost.⁷⁵ That was the first commitment by the Finnish state, in the form of the Finnish Academy. EISCAT was not just a programme, but a new permanent line of Space Research. EISCAT was a radar programme and was preceded by the STARE-programme (Scandinavian Twin Auroral Radar Experiment). Taken together IMS, STARE and EISCAT marked the accentuation of radar methods in Finland in studying the magnetosphere in the 1970s.

In the mid 1970s a lively magnetospheric research activity developed in Finland. The Geomagnetic Division at the Finnish Meteorological Institute (FMI) attracted several young scientists who focused their research into studies of the magnetosphere. *Phil. lic.* Risto Pellinen (who later became a key player in space activities in Finland) moved from the University of Helsinki to the Geomagnetic Division in 1972 and focused his

69 FNC/COSPAR Protocol 20 Feb. 1970 (FNC/COSPAR).

70 A Report of the International Activities 1966-1967, FNC/IUGG, 18 Feb. 1967 (IUGG).

71 A few examples of the early contacts: Minutes of the 1st meeting of the Western European Subcommission of the International Commission for Artificial Satellites held at Lagonissi, Athens, 28-29 April 1965, and C. Sucksdorff: *Earth Magnetism and Aeronomy*, report, 29 Jan. 1965, and First European Earth and Planetary Physics Colloquium, Reading, UK, 30 March-2 April 1971, (IUGG).

72 C. Sucksdorff: *Kansainvälinen magnetosfäärin tutkimus IMS ja sen tulokset Suomessa* (International Magnetospheric Study IMS and its Results in Finland), X Geofysiikan päivät, Helsinki 1981.

73 A circular, to FMI, SCOSTEP (Special Committee on solar-terrestrial Physics)-working meeting, 8-18 Oct. 1974 in Schloss Kleinheubach, 1 Oct. 1974, and Risto Pellinen: "Model for the onset of a magnetospheric substorm", 1977; C. Sucksdorff: "International magnetospheric study IMS and its result in Finland", 6 March 1981 (Geo corr.-see p. 25 *Unpublished Sources*).

74 Aide mémoire: Data handling of the N-MAC Night 6-7 January 1975 (Geo corr.).

75 C. Sucksdorff et al.: Space Physics p. 329; The EISCAT Scientific Association (www.eiscat.com/about.html).

research on the physics of the auroral phenomena. His work was supervised by Professor Walter Heikkila from the University of Texas at Dallas.⁷⁶ Both acted as catalysts in the international cooperation (especially towards the USA) and obtained remarkable scientific results during the IMS.

In the context of magnetospheric research projects the ties with foreign colleagues were greatly intensified. Part of the new research was carried out with equipment installed in Finnish Lapland,⁷⁷ but the ties worked well in both directions. In fact Finnish space research, especially of the Geomagnetic Division and University of Oulu, integrated well with the Global Space Research. The Geomagnetic Division became a central institution for space research at the time, although other institutes were also actively involved, The University of Oulu, together with the Sodankylä Geophysical Observatory, developed teaching programmes supporting auroral research topics, whereas the University of Turku focused on studies of cosmic ray air showers. Rockets and satellites became part of everyday life for Finns as well.

Government budgets were still tight in the 1970s however. New projects were not easily initiated. But at the end of 1970s signs appeared of a changing situation.⁷⁸ Joining EISCAT was in fact one of the first signs of a better time. In a few years, up to the beginning of the 1980s, many sectors experienced remarkable improvement in their capacity to operate. This was also the case in space research. From the beginning of the 1980s the Government rapidly had more resources available.

The progress made in international co-operation emphasised the increasing importance of bilateral collaboration, as distinct from formal membership in international organisations. At the end of the 1970s the Soviet Union made an offer to Finland for a cooperation project to manufacture satellite instruments.⁷⁹ Other forms of bilateral cooperation, for example the Finnish-Swedish cooperation in Kiruna, and Finno-Soviet cooperation in Apatity, have already been mentioned.

The negotiations aimed at manufacturing a satellite instrument together with the Soviet Union were not successful at this stage. The cooperation carried out with the Swedes culminated in 1982 in the *Viking 2* satellite project.⁸⁰ Finland was offered an opportunity to participate in the project with her own instrument, or as co-investigator in other programmes. *Viking 2* was planned for launch in 1987. The estimated cost for providing a purely Finnish instrument for *Viking 2* was around 100 Million Finnish marks (29 Million Euro in 2002). The scientific community and Vaisala Ltd were willing to participate, but other industrial sectors did not show sufficient interest. The required readiness was not there and, the country not being a member of ESA, no guarantees of industrial return could be given. Finnish industry simply would not take the required risks. The project fell apart.⁸¹

76 R. Pellinen to Walter Heikkila, Texas 1.Oct. 1974 (Geo corr.). University of Texas at Dallas; Professor Walter J. Heikkila, retired (www.utdallas.edu/dept/physics/faculty.html).

77 Aide mémoire: Data handling of the N-MAC Night 6-7 January 1975. J.Kisabeth (USA), W. Heikkila (USA), D. Klumpar (BRD), D. Winningham (UK), H. Ranta and T. Turunen (Finland), R. Pellinen (Finland) acts as a central point of this study (Geo corr.).

78 Ilkka Seppinen: Valtaväylä. p. 211-219, and p. 88-96, about this change in Finland. .

79 *Avaruustutkimuslaitostyöryhmän* (Space Research Centre Committees paper) muistio p. 6.

80 *Aide mémoire*, a draft. 21 Sept. 1989 (Geo corr.).

81 FMI/Div. of Geomagnetism C. Sucksdorff: "Finnish effort to participate in the Viking II project", 3 Jan. 1983 (Geo corr.).

8 1983: ESA, at Last!

The conclusion drawn in the space research sector was clear at the start of the 1980s: Finland must join ESA, even though it would be expensive.⁸² For example, in 1983, Sweden invested over 500 Million crowns (199 Million Euro in 2002) in space research, but estimated that the benefits for industry would be even more in the long run. The moment had come to reinforce the traditional areas of competence. In the field of auroral research the existing capacity, equipment, and relations should be exploited. The Academy of Finland should support research projects promoting international collaboration in the application areas of satellite technologies. By putting priority on space research projects the Academy of Finland should encourage the applicants to focus on their scientific projects in the application of satellite data. This was the way to aim for the objective of ESA membership, and for participation in space instrument manufacturing.⁸³

In the summer of 1983, the Finnish Meteorological Institute emphasised that Finland would have to join ESA before any major progress could be made in space research.⁸⁴ A positive signal came, when the Finnish Parliament unanimously accepted the payment for EUMETSAT weather satellite membership in 1983.⁸⁵ EUMETSAT was fully European, and the membership provided not only the weather satellite images for the use of the Finnish Meteorological Institute, but opportunities for Finnish industry to participate in the organisation's procurements.

Joining ESA was drawing closer now. In January 1984 the government sent a delegation to negotiate on the matter. One member of the delegation, Counsellor of Education Osmo Ranta from the Ministry of Education, was provided with a memorandum well prepared by Christian Sucksdorff. The memorandum included all the key arguments for membership.⁸⁶ Finland chose *associate membership* from the alternatives available. The associate membership negotiations were initiated in 1984, and the text was signed in September 1986.⁸⁷ Finland became an Associate Member of ESA at the beginning of 1987.⁸⁸

Parallel to this rise of Finnish space research is the development of the national financing system. The Finnish Technological Agency (TEKES) was established in 1983 to foster not only space research but the technological development, under the authority of the Ministry of Commerce and Industry. TEKES has been an important financer of Finnish space technology.⁸⁹ Moreover, TEKES is an integral part of the new economic-social system, which developed in Finland at the turn of the 1970-1980s. The National Advisory Council on Space was established under the authority of the Ministry of Transport on 1 June 1985.⁹⁰

Finnish participation in the Soviet space programmes belongs to the same rather accelerated phase of development. This was achieved through Sweden. After Risto Pellinen's membership from 1982 onwards in the Swedish Research Committee on Space Administration, Finnish space researchers had available all the information on Sweden and ESA. Sweden had a common satellite project in progress with the Soviet Union. This was INTERBALL, consisting of two satellites measuring auroras. Sweden provided a plasma spectrometer to the project. Finnish researchers were immediately accepted to join the project when they expressed their willingness. The first planning meeting was held at the Finnish Meteorological Institute in June 1984. This happened even before the economic and political aspects of the project were accepted. The Foreign Ministry looked into the political aspects of the project without finding anything dubious, and

82 *Aide memoire* on the importance of space research for Finland, s.d. probaly 7 April 1983 (Geo corr.).

83 *Avaruusteknologian kehittämistarpeet ja -tavoitteet* (Method to develop space technology), p. i-iii, 4-6; Evaluation of Finnish Space Science, p. 4.

84 FMI Director Erkki Jatila, *Aide Memoire* draft 10 August 1983 (Geo corr.).

85 FMI/Jatila, Sucksdorff to Communications Ministry 12 August 1983 (Geo corr.).

86 FMI/C. Sucksdorff to secretary Osmo Ranta Ministry of Education 30 Jan. 1984 (Geo corr.).

87 Risto Pellinen: *Suomen avaruus*. p. 73.

88 *Avaruustutkimuslaitostyöryhmän muistio* (Report of Space Research Intitute Committee) p. 6.

89 *Avaruustutkimuslaitostyöhmän muistio* (Report of Space Research Intitute Committee) p. 6.

90 Minister of Communications Matti Luttinen: Communiqué on Establishment of National Advisory Council on Space 20 June 1985 (Geo avaptk 1); *Avaruustutkimuslaitostyöhmän muistio* (Report of Space Research Intitute Committee) p. 6.

TEKES decided to give financial support to the project.⁹¹ Initially the Finnish side acted through the Swedes with the approval of the Soviet Union, but in January 1985 the Finnish delegation met Soviet researchers in Moscow and direct collaboration was initiated. In January 1987 an agreement between the Governments of Finland and Soviet Union was signed for the basis of the collaboration.⁹² In July 1988 the Soviet Union launched the *Phobos 1* and *2* spacecraft, destination Mars. Finland had involvement in both satellites. The two INTERBALL satellites were launched much later, in the mid-1990s.

This was the starting point for Finland's getting involved on a broader scale in scientific collaboration with European and Soviet Union space activities. All the political obstacles had disappeared. Space research was relatively free of the tensions and threats which marked some other areas in the cold war. COSPAR had even acted as a cushion from the cold war since, within COSPAR, the United States and the Soviet Union had respected a collaborative spirit from 1958 onwards.

91 Risto Pellinen: *Suomen avaruus*. p. 71.

92 Risto Pellinen: *Suomen avaruus*. p. 76

9 From Earth to Mars

By the year 1987 Finnish space research was rising rapidly. Finland was strongly involved in ESA activities as an associate member and as a full member in the scientific programmes. Finland had a science and research agreement with the Soviet Union⁹³ and the cooperation between the two countries expanded, as cooperation with Sweden was continuing strongly. The range of cooperation included Finnish made PI-instruments, and Co-I participation in instrument projects.

At the Finnish Meteorological Institute, where the accelerating progress was felt the most, an initiative was made for the reorganisation of Finnish space research. It was generally felt that space research was well suited to the various research institutions and universities, but that the scattered organisation needed a unifying “research centre” to support its aims.

For the new research centre the following supporting tasks were proposed: 1) the negotiation and maintenance of industrial relations, 2) the maintenance of technical data banks, 3) assistance of the research and industrial groups in legal and contractual matters.⁹⁴ Administrative tasks such as contractual matters had rapidly grown, but scientific administration also needed more inputs. The National Advisory Council on Space needed a full time chairman at the professorial level, since the Chairman should also represent Finland at ESA. The council needed staff, and its members should represent a high level in the governmental administration or politics. The secretaries of the different committees were also supposed to be employed on a full time basis.⁹⁵

The Space Research Centre was planned to be established within the Finnish Meteorological Institute.⁹⁶ The existing institutes would continue as its research organs where the number of workers would be strengthened, and ultimately have permanent posts. However, administrative tasks would be moved to a supporting unit. Planning would be carried out at the National Advisory Council on Space, which would attain agency status. The Council itself would be comprised of experts, similar to various other committees. In this way the direction of space research would be kept within the grip of the scientific and technological sector. In 1987, when this plan was complete, everything in Finland seemed to be ready and the sky was the limit. Money was no problem, it was even plentiful.

Finnish space research required a radical reorganisation. Examples were found in Sweden, where a comparable organisation had been realised.⁹⁷ At the very least the status of the National Advisory Council on Space should have been strengthened immediately in order to be able to assume the tasks of conducting space research financing and co-ordination of space research.⁹⁸ This degree of status promotion met with opposition. At the end of 1988 the establishment of a less ambitious support group for space activities within the authority of the Communications Ministry was introduced. This support group included legal, technical, and economic expertise. The associated memberships in ESA and increased activities had brought with them more complicated international and national contracts and applications. In 1986 the economic activity of space research was only about 36 Million marks (8.48 Million Euro in 2002) but it was estimated that by the year 1992 the amount would increase to 82 Million (19.33 Million Euro in 2002).⁹⁹ Moreover, if it is borne in mind that scientific and technological activities were increasing rapidly at the same time, better organisation was clearly desirable.

93 FMI Memorandum for Finance Ministry, 26 May 1987 (FMI/Geo corr.)

94 *Aide mémoire*: The FMI view of near future developing prospects in Finnish Space Research 16 Nov. 1987 (Geo corr.).

95 *Ibidem*.

96 *Evaluation of Finnish space science*, p. 7. The Geophysics Division of FMI was in 1994 evaluated as clearly the strongest and most active research group in Finland. Development to this result began at latest at the start of the 1970s as a conscious aim. By 1987 this setting was already clearly felt, maybe even more pointedly than later.

97 *Avaruustutkimuslaitostyöryhmän muistio* (Report of Space Research Institute Committee) p. 11-12.

98 C. Sucksdorff: Supporting Group to Space Activities, A Proposal of FMI, 11 February 1988, (Geo corr.).

99 *Ibidem*.

In 1990 the worst recession in decades began. All new Finnish activities requiring Government funding were buried. The Space Research Centre did not appear again on the agenda until the year 2000. From the scientific point of view activities continued well, or even increased. Finland established its position among space nations. In the Soviet/Russian programme, *Phobos*, *Mars 96*, *Interball*, *Spectrum-X* and *Radioastron* were the major milestones. In ESA programmes, *SOHO*, *Cluster*, *Cassini-Huygens*, *ISO*, *XMM*, *INTEGRAL*, *SMART-1*, *Rosetta*, *Mars Express*, *Planck* and *Herschel* have had components developed and manufactured in Finland, as well as scientific participation. In addition, *Envisat* has a large Finnish element onboard, as have some recently launched NASA space probes. The recently begun cooperation with France in the *NetLander* Mars programme may become one of the largest Finnish contributions in space research in the current decade.¹⁰⁰

Finnish space industry was brought to life together with science instrument activities. The first contacts were made in 1986 and today more than 30 companies and 200 peoples are involved in the space sector. There are four major companies covering system design, space electronics and constructions, microwave-, X- and gamma-ray technologies. In science there are three major geographical centres of activity involving university departments and research institutions both in astronomy and space physics. About 90 people are active in space-related science, having an annual project budget of 10 Million Euro, which is expected to grow by 30 % in the coming five years.¹⁰¹

In the spring of 1993 the Finnish government decided to initiate negotiations for Finland's full membership in ESA.¹⁰² Full membership was obtained at the beginning of 1995. With full membership Finland has finally risen to the same level in space research as other ESA member states.¹⁰³

100 Risto Pellinen: *History of Space Activities in Finland*. ESA History Workshop, Paris, Jan. 25. 2001.

101 *Ibidem*.

102 *Space Activity, Research and Strategy* p. 1.

103 *Ibidem*, p. 8.

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Annexes

Annex 1 **Highlights in the National Space Effort**

- 1960-63 Preparation for COSPAR membership; Muon telescope built for measuring cosmic ray muons
- 1964 Finland joined COSPAR 2.6.1964; Neutron monitor built for measuring the nucleonic component of cosmic rays
- 1965 First national COSPAR committee nominated. Finnish participation in international balloon activities to measure auroral X-rays
- 1966 First national activity report at COSPAR IX Plenary Meeting,
- 1967 Germany proposes Finland to receive its first satellite data in Lapland
- 1968 Finnish industry proposes that Finland joins ESRO
- 1969 Comprehensive proposal for joining ESRO published

- 1970 National subcommittee for space matters established
- 1971 First results of the analysis of Apollo 11 rock samples reported
- 1972 Finland becomes active in EISCAT preparation
- 1973 First proposal to join ESA to be established in 1975
- 1974 Preparation for the International Magnetospheric Study
- 1975 Final report of the analysis of Apollo rocks
- 1976 Geodetic laser observations started
- 1977 STARE auroral radar started operation in Finland
- 1978 ESA membership considered in the Ministry of Foreign Affairs
- 1979 A working group for ESA membership preparation proposed

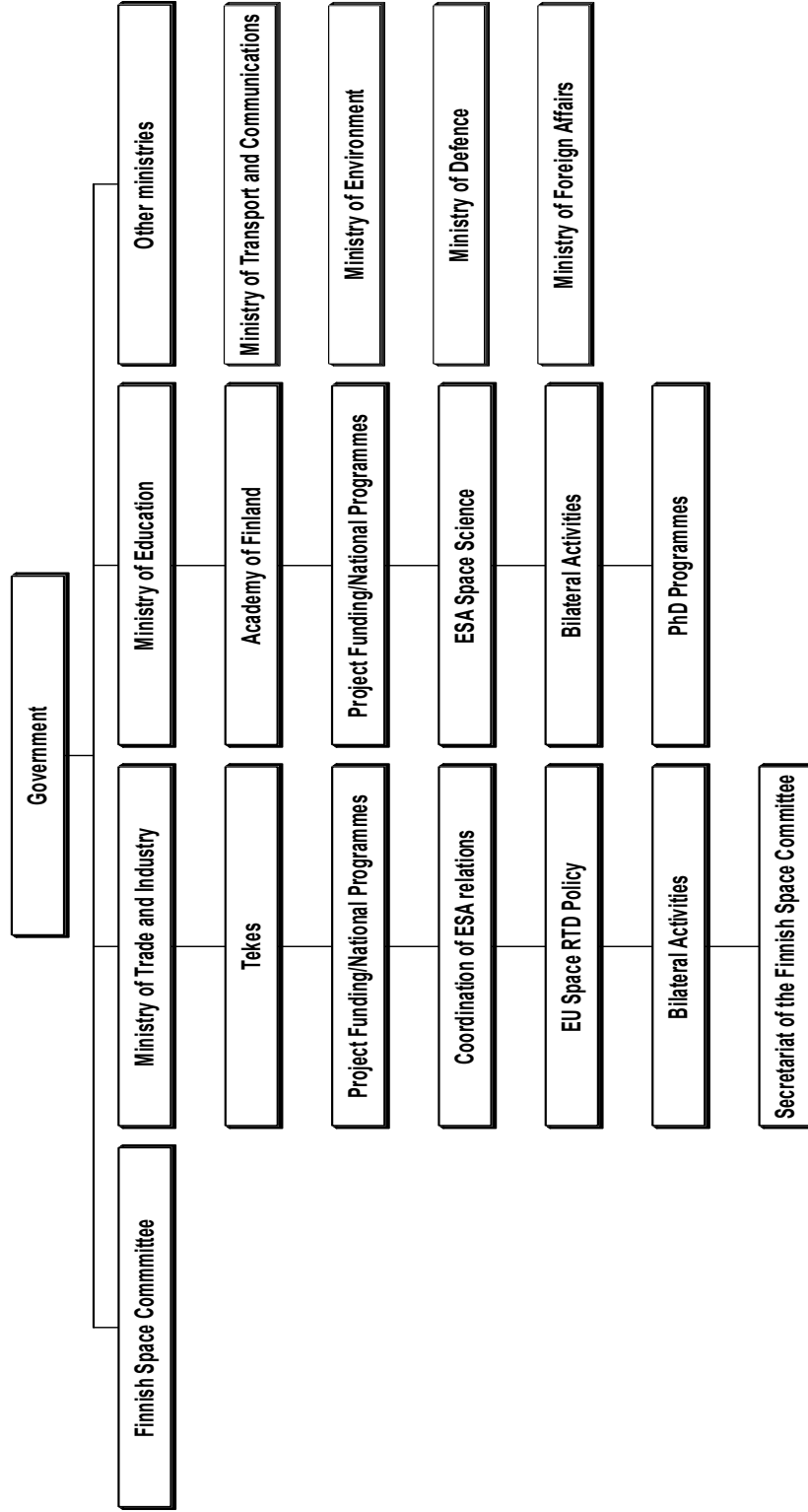
- 1980 ESA preparation stopped by the Ministry of Trade and Industry
- 1981 ESA membership proposed to the Ministry of Education
- 1982 Sweden invites Finland to join Viking 2 satellite mission
- 1983 No special highlights
- 1984 First official contacts with ESA
- 1985 Proposals for Space Agency activities in Finland
- 1986 ESA membership negotiations, signing of the agreements
- 1987 Preparations for the Plenary Session 1988 in Finland
- 1988 Plenary Session activities, first space experiment launched
- 1989 Proposal for the organisation of scientific space research in Finland

- 1990 First comprehensive space strategy published

Annex 2 Administrative Organisation

(Source: Report to COSPAR 2000)

Organisation for Administration of Space Matters in Finland



Annex 3 Statistical Data on Space Science in Finland 1988-1992

(Source: 55th SPC meeting presentation of National space science programmes)

| Programme | 1988 | 1990 | 1992 |
|--|-------------|-------------|-------------|
| Total Space expenditure | 7,3 | 18,1 | 33,7 |
| Contribution to ESA | 2,6 | 6,1 | 8,0 |
| Total ESA/SPC | 1,7 | 6,5 | 8,8 |
| National and Bilateral space science projects | 0,7 | 4,7 | 4,3 |

* Monetary figures in MAU. 1 AU= about 1 Euro.

Annex 4 Finnish Space Funding 1995-1999; values in MEuro

(Source: Report to COSPAR 2000)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|------|------|------|------|------|------|------|
| Teles | 14.3 | 16.0 | 17.7 | 16.7 | | 16.5 | 25.0 |
| National, Bilateral & ESA Funding | | | | | 17.7 | | |
| Academy of Finland Scientific Research | 2.5 | 2.5 | 2.5 | 2.5 | 6.8* | 2.2 | 1.7 |
| Ministry of Trade and Industry | 1.2 | 1.4 | 2.8 | 1.7 | 1.7 | 1.7 | 2.0 |
| Others, Infrastructure, Research & Development | 4.7 | 4.7 | 4.7 | 4.7 | 5.3 | 19.3 | 11.3 |
| Total | 22.7 | 24.6 | 27.7 | 25.6 | 31.5 | 39.7 | 40.0 |

* Mostly covers years 1998-2000