II

(Acts whose publication is not obligatory)

COMMISSION

COMMISSION DECISION

of 18 October 2000

on State aid which the Netherlands is planning to grant to Océ NV for the development of colour ink-jet printers

(notified under document number C(2000) 3016)

(Only the Dutch text is authentic)

(Text with EEA relevance)

(2001/637/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community, and in particular the first subparagraph of Article 88(2) thereof,

Having regard to the Agreement on the European Economic Area, and in particular Article 61(1)(a) thereof,

Having called on interested parties to submit their comments, pursuant to the provisions cited above [1],

Whereas:

I. PROCEDURE

(1) By letter dated 18 December 1996, the Netherlands notified the Commission of planned aid of EUR 22,7 million to be granted to the company Océ NV for the development of colour ink-jet printers and associated technologies (Cobalt). The Netherlands provided the Commission with further information by letters dated 28 May, 16 September and 22 December 1997, and during a meeting in Brussels on 10 February 1998.

(2) By letter dated 12 May 1998, the Commission informed the Netherlands that it had decided to initiate the procedure laid down in Article 88(2) of the EC Treaty in respect of the aid.

(3) The Commission decision to initiate the procedure was published in the *Official Journal of the European Communities* [2]. The Commission called on interested parties to submit their comments. The Commission received no comments from interested parties.

(4) By letter dated 24 July 1998, the Netherlands responded to the initiation of the formal investigation procedure and answered further questions which the Commission had put on 7 July 1998. On its own initiative, the Netherlands provided further information in the form of an expert evaluation report (hereinafter referred to as the 'second opinion') on 11 November 1998. Further information was sent by letter dated 25 March 1999, following another meeting with Commission officials on 3 March 1999. By letter dated 6 July 1999, the Netherlands sent information which had been presented to Commission officials during a visit to the R & D premises of Océ NV on 25 June 1999. Some further documents were provided on 19 July 1999. At a meeting held on 29 September 1999, the Netherlands promised further information, which was sent by letters dated 27 October 1999, 12 November 1999 and, following a further Commission request on 29 November 1999, by letter dated 20 December 1999. Confirmation of the eligible costs was sent by fax on 19 July 2000.

II. DESCRIPTION OF THE AID

(5) The aid is to be granted by the Dutch Ministry of Economic Affairs as new individual research and development (R & D) aid for the development of colour ink-jet printers and associated technologies (Cobalt) to the company Océ NV, located in Venlo. The proposed direct grant amounts to EUR 22,7 million (NLG 50 million) for a project which, when notified, was to cover the period 1997 to 2001 and claimed eligible costs of EUR 93,6 million.

[1] OJ C 270, 29.8.1998, p. 2.
[2] See footnote 1.

The recipient company

(6) The recipient company Océ NV (hereinafter referred to as 'Océ') is the holding company of the international Océ Group, which is active in 80 countries. The Group had an annual turnover of EUR 2,5 and EUR 2,7 billion in the years 1997 and 1998 respectively ([3]). It has been fast-growing in recent years and operates profitably. The Group employs some 17 000 people. Océ's product range includes a sophisticated range of copiers and printers for office and specialised uses, plotter systems, as well as the corresponding consumables and imaging supplies, such as paper and toners. Océ develops, produces and markets many of its products itself.

(7) Océ's R & D investments have consistently represented around 6 % of its turnover over the last 10 years. Total R & D expenditure reached EUR 155 million in 1998, after strong annual increases since 1996, while spending stayed constant at around EUR 84 million annually over the years 1990 to 1995. Océ has 1 500 persons working in its R & D centres in the Netherlands, Germany, France and the United States, most of them being employed in Venlo within the central operating company, Océ-Technologies BV.

The R & D project

(8) The project to be aided concerns the development of new wide-format colour printers on the basis of piezo ink-jet technology using hot-melt polymer inks. The Netherlands described this new combination of special inks and specific printheads as a 'new technology platform'. The specific components to be developed and their development objectives and envisaged eligible costs (in brackets) were summarised under the following five subheadings.

(9) (EUR 15,6 million) Piezo printhead with [...] (*) nozzles, an integration density of [...] (*) nozzles per inch, high jetting frequency of [...] (*) kHz, being long-term non-corrosive at the high operating temperature of 130 °C. Further objectives relate to short warm-up periods, clean-keeping, thermal control and ink-handling.

(EUR 31,3 million) Printhead production technology, the 'microelectromechanical' technology.

(EUR 9,7 million) Hot-melt polymer colour inks with toner-like properties for use on a range of reception media and controlled viscosity characteristics at the operating temperature of 130 °C.

(EUR 13,4 million) Integration of printer engine and process, comprising paper-handling, design, user interface and printhead transport with fast and high precision carriage movements and reliable ink supply.

(EUR 0,4 million) Front-end issues refer chiefly to developing a high-speed colour raster processor, a print strategy to hide tolerances and nozzle failures, and the colour management.

(10) In the original notification, costs in each category were said to be equally split between the two phases 'industrial research' and 'pre-competitive development activity' according to the terms under point 5.9 of the Community framework for State aid for research and development (the R & D framework) ([4]). For each of the five subheadings and for each of the two phases, the Netherlands presented a short list of activities to be carried out. By letter dated 28 May 1997, the Netherlands amended the breakdown of costs, with EUR 37,2 million qualifying as 'industrial research' and EUR 33,1 million as 'pre-competitive development activity', and provided overall cost figures for each of the five subheadings.

(11) A further eligible cost of EUR 22,7 million was claimed for the purchase of patents and licences. These were classified as 'industrial research'.

(12) In the original notification, further EUR 9,1 million in eligible costs were specified for a new building with laboratories. However, by letter dated 16 September 1997, the Netherlands amended its plans and estimated the costs of *using* the building for the project's *duration*. Eligible costs for the building were thus scaled back to EUR 0,6 million.

(13) The sum of these costs is EUR 93,6 million. Expressed as personnel cost-equivalents, the original amount, according to the Netherlands, equals the cost of 1 000 man-years of R & D work, i.e. 200 researchers working for five years. The proposed aid of EUR 22,7 million corresponds to an overall aid intensity of 24 % of the claimed eligible costs.

(14) At the meeting held on 29 September 1999, however, the Dutch authorities stated that the Cobalt project would, because of technical difficulties, cover a longer period than originally planned and that the costs would be significantly greater than originally notified. The new forecast was that the duration would extend to 2003 and that the costs would rise to NLG 209,625 million (EUR 95,1 million), excluding the cost of purchasing patents and licences. The proposed aid of EUR 22,7 million would therefore correspond to an aid intensity of 24 % of the eligible costs indicated.

([3]) See under 'total revenues' in the 1998 annual report of Océ.
(*) Confidential information.

([4]) OJ C 45, 17.2.1996, p. 6.

The product markets of the R & D outcome

(15) According to the Netherlands, there are two markets for which the wide format (A0) printers are developed: (1) the 'engineering systems' market, geared mostly towards printing computer-aided designs (CAD), and (2) the 'display graphics' (or 'graphic arts') market, geared towards printing colour posters, banners and billboards on various materials, mainly for advertising purposes in shops, exhibitions, or on the roadside. Both markets demand printers that are also economical for small numbers of prints (short runs). In both markets, digitisation and colour are growth-determining factors. One third of Océ's current revenues stem from these two businesses.

(16) Engineering systems: According to its 1998 annual report, Océ has a leading market position in engineering systems worldwide (printing and copying). In 1998, the Netherlands stated that Océ's market share was 22 % in Europe and in the United States, the two most important markets ([5]). Its largest competitor, Hewlett Packard, held a 21 % market-share, while Xerox had 9 %. Growth in the engineering systems market overall is fairly flat, except in the digital segment.

(17) Display graphics: Océ treats this market as a subcategory of the engineering systems market. Océ holds only 'a few percent' in this market. In the fast-growing display graphics market, Océ is currently trying to build up a market position. Its 1998 annual report states that with its new ink-jet technology Océ is seeking to achieve a leading position in the high-volume segment of this market.

Grounds for initiating the procedure under Article 88(2) of the EC Treaty

(18) The Commission noted that the final printer markets and the markets for the subcomponents printheads and inks are highly competitive international markets. It further observed that there are ongoing R & D and production activities of subcomponent suppliers by competitors in Europe, such as Modular Ink Technology, Xennia Technology Ltd, Xaar plc, Mutoh Europe NV and Epson Europe BV.

Moreover, the Commission noted that there would be potentially distortive competition effects with regard to the secondary markets for printer and imaging supplies because ink-jet piezo technology is substitutable for existing thermal (black) and electrostatic (black and colour) printing technology in the display graphics market.

(19) As regards the type of R & D in the project, the Commission doubted that the project could be described as being 'industrial research' and 'pre-competitive development' activity within the meaning of the R & D framework. This was due to the following reasons.

(20) The Commission noted that Océ NV had in 1994 received EUR 3,2 million in State aid (aid intensity 31 %; under a Commission approved scheme ([6])) for a similar ink-jet project covering the period 1994 to 1996. The R & D work thus carried out seemed to address the same general issues as described in the present aid proposal and resulted in 20 patents on printheads and inks. It also led to a complete 'test assembly' (mechanical, electronic and digital parts) for a wide-format colour printer in a laboratory environment. In this regard, the Commission noted that, according to Annex I to the Community R & D framework, 'pre-competitive development' activity excludes the creation of an initial prototype which can be used commercially, and excludes demonstration and pilot projects that can be converted or used for industrial applications or commercial exploitation. The Commission doubted that the 1996 test assembly would not already constitute such a prototype.

(21) The Commission also noted that eligible costs presented covered 85 % of the total R & D costs, leaving only 15 % development costs for the phase of preparing series production and commercialisation of a final product.

(22) Moreover, the Commission could not rule out the possibility that the new aid proposal corresponded to a product-development work programme aiming at developing existing prototypes to maturity and readying them for series production. In addition, the cost elements of the project had not been sufficiently justified as R & D costs eligible for public financing in accordance with Annex II to the Community R & D framework. In particular, costs of EUR 22,7 million for the acquisition of patents and licences raised doubts as to their classification as 'industrial research'.

(23) Finally, the Commission noted that the project was said to be dependent on the construction of a 7 650 m^2 R & D facility in Venlo with 4 000 m^2 to be fully assigned to the ink-jet project. The Commission expressed doubts whether parts of the new facilities would not already be used for series production of piezo printhead arrays.

([5]) Océ's 1997 annual report stated market shares of over 35 % worldwide and 25 % in Europe.

([6]) PBTS scheme: Programmatische Bedrijfsgerichte Technologiestimulering (business-oriented technology-stimulation scheme).

(24) As regards the 'incentive effect' of the project, the Commission expressed doubts that the aid would induce Océ to carry out R & D it would not have anyhow carried out without the aid. It seemed that in the face of strong competition the company had adopted the business strategy of developing its own ink-jet printheads and inks. The company, therefore, seemed to be committed to pursuing the R & D efforts under set commercial imperatives and had already begun the construction of new facilities for the project without the guarantee of receiving State aid.

III. COMMENTS FROM THE NETHERLANDS

(25) The Netherlands responded by letter dated 24 July 1998 to the initiation of proceedings and to questions the Commission had asked by letter dated 7 July 1998. These comments are summarised below. Complementary information contained in subsequent letters and the second opinion are specifically indicated.

The activities of other companies with the same technology

(26) The R & D and production activities of other companies described in the Commission decision were, it was argued, different from the activities of Océ. Modular Ink Technology, Xaar plc and Seiko Epson were developing piezo printheads for liquid inks (solvent and water based), which, in general, were not suited to combining the attributes of high-speed and high-quality wide-format printing on normal paper. The new ink-type was a determining factor in the entire research.

(27) Mutoh (Japan) sold similar printers on the basis of a licence from Tektronix (USA) for the graphic arts market. These printers were, however, much slower than the ones to be developed by Océ, had inferior (i.e. waxy, not polymer-ink) print quality and were mainly aimed at the low-volume market. The Belgian subsidiary Mutoh Europe NV was only an assembly plant for parts produced in Japan and thus created little added value in Europe.

(28) The author of the second opinion considers that there is no significant ink-jet R & D contribution in Europe and that production in this field is based mainly on R & D carried out in the United States and Japan. He considers the technology to be developed by Océ to be novel, ground-breaking and of a more generic nature than other printing technologies.

The secondary markets for printers and imaging supplies

(29) No distortion of competition could occur in these wider markets because the thermal and electrostatic print technologies would not be substitutes for the new Océ technology. This would be so because: (1) colour printing constituted a completely different product and market combination than black printing; (2) the display graphics market uses special paper, while Océ's technology will use normal paper; (3) electrostatic printing was, at present, faster than hot-melt printing for large formats; (4) thermal-transfer technology is hardly ever used for large formats.

The type of R & D in the project

(30) The Netherlands argued that a comprehensive description of the project and of the terms 'industrial research' and 'pre-competitive development' was contained in the original notification and the subsequent correspondence. The Dutch Government would, in addition, commission a study so as to allow an independent expert to establish the R & D project's distance from the market.

(31) In this second opinion, the author states in general terms that the project plan would establish which activities are 'industrial research' and which 'pre-competitive development'. He states that, in times of 'concurrent engineering' (all R & D objectives are pursued at the same time and with a clear market/product orientation), the borderline between the two terms became somewhat blurred. However, in his opinion, the facts in the notification were described as correctly as possible, and the transition between the two phases would be adequately stated in the project plan. Moreover, market and product orientation of R & D should not be misread as preparation of production.

(32) The Netherlands later, and in particular during a company visit by Commission officials, provided further explanations and documentation regarding the R & D nature of the project, including the demonstration of several development steps in the research facilities.

(33) As regards the low portion of non-eligible R & D costs remaining after finalisation of the current R & D project, the Netherlands confirmed that these costs would, as stated by the Commission, amount to EUR 15,9 million. They would be part of further non-eligible costs of EUR 99,8 million required to put the product on the market.

Earlier research funding until 1996 ([7])

(34) Océ had benefited from public funding in the development of piezo ink-jet technologies since 1987. Up to 1996, total aid of EUR 4,2 million was granted for three projects under the Commission-approved PBTS scheme ([8]). All of this R & D had to be regarded as a feasibility study for the current project.

(35) Océ had never made an initial laboratory prototype of a wide-format ink-jet colour printer using hot-melt ink and piezo printheads. The device at the end of the PBTS-financed feasibility project had only a 4 × 24 nozzle array and no paper management. At the end of 1997, ink-jet arrays with 75 nozzles per inch (three nozzles per millimetre) were made, and the first arrays of 96 nozzles per inch (four nozzles per millimetre) were produced at the beginning of 1998. The target was to produce a 2 × 128 nozzle (five nozzles per millimetre array) by the end of 1998.

(36) The author of the second opinion worries that terms such as 'prototype' were not well defined, especially in a high-tech context, and therefore led to misinterpretations. In his view, what he read in the project description and what he was shown during his company visit could not be described as a prototype in the normal sense of the term.

Eligibility and the breakdown of costs

(37) As regards the breakdown of costs per year, the Netherlands at first considered as sufficient the details provided in an annex to the original notification, in which costs were calculated as an integral tariff per R & D man-year. However, following a request by the Commission, the Netherlands provided, by letters dated 27 October 1999,12 November 1999 and 20 December 1999 additional cost-accounting data and in particular a declaration from an independent accountant. The accountant certified on the basis of his analysis of real expenditure for the years 1997 and 1998 that the claimed eligible costs had been incurred for the Cobalt project and that the project's cost-accounting was functioning accurately.

(38) The Netherlands revised the costs for the building. The new laboratory was indeed needed for the Cobalt project, but only the temporary use of the building would be eligible for assistance. There would be no plans for industrial scale printer production in the new laboratory and such production would not even be possible.

([7]) A detailed description of earlier R & D is included in the 'assessment' part of this Decision.
([8]) See footnote 6.

(39) With regard to the purchase of patents or licences, details on the intended acquisitions and costs were included in an annex. During the company visit by Commission staff on 25 June 1999, the Netherlands stated that the patents were necessary in order to ensure that Océ would eventually be able to make commercial use of its R & D results. They were not needed for the technical advancement of the R & D project. The author of the second opinion had earlier come to the same findings.

Incentive effect

(40) Océ began systematic research into ink-jet technologies in 1986. Prior to this date only incidental projects on ink-jet inks were carried out. At the beginning of the research period, efforts focused mainly on ink formulation for piezoelectric and thermal ink jets, although some work was also done on continuous ink-jet technology.

(41) Additionality of costs was particularly difficult to prove for R & D projects undertaken by large companies. Océ's level of research had increased due to the Cobalt project, measured in increased R & D investments and higher number of researchers employed. Furthermore, the proposed aid would accelerate and intensify the research. In their letter dated 25 March 1999, the Netherlands pointed out that due to uncertainty about the granting of the aid, the number of man-years actually deployed in the period 1997 to 1999 would be only 270, instead of the anticipated 475.

(42) The author of the second opinion writes that the relevant sector of microsystems technology is characterised by continuous innovation, with rapid performance increases in products. In his view, every market participant is forced to undertake major R & D efforts to stay in the market.

(43) As regards risks, the author of the second opinion holds that the Cobalt project, if successful, would mean a 'quantum leap' in printing technology, but the project also involved extremely high risks of failure due to its technical complexity.

IV. ASSESSMENT OF THE AID

Aid within the meaning of Article 87(1) of the EC Treaty

(44) Article 87(1) of the EC Treaty lays down that, except where otherwise provided, aid which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods is, in so far as it affects trade among Member States, incompatible with the common market.

(45) The proposed grant of EUR 22,7 million constitutes aid within the meaning of Article 87(1) of the EC Treaty as it would allow the undertaking Océ NV to be relieved, by means of State resources, of part of costs which it would normally have to bear itself.

(46) Where financial aid from the State strengthens the position of an enterprise in relation to its competitors in the Community, it must be regarded as affecting competition. Competitors are companies that compete on the same product markets. Such markets are determined by demand substitutability of the products ([9]). In the case of R & D, the main markets to be examined are those for the products that are the result of the R & D and possibly the market for R & D activities itself. The direct product markets for the result of Océ's R & D will be CAD printers and the display graphics market. As there are smaller European competitors on the printer market and the market for R & D activities, the aid proposed by the Netherlands for Océ is deemed to distort competition within the meaning of Article 87(1) of the EC Treaty.

(47) As there is intense trade between Member States in printers, as well as subcomponents and input materials and secondary supplies, the Commission considers trade to be affected by the aid for Océ.

Exemptions for R & D aid under Article 87(3)(c) of the EC Treaty

(48) Article 87(2) and (3) of the EC Treaty contains a number of exemptions from the principle of incompatibility with the common market.

(49) As the proposed aid for Océ is R & D aid, it is not covered by the exemptions in Article 87(2). In particular, the proposed aid is neither (a) aid having a social character and granted to individual consumers, nor (b) aid to make good the damage caused by natural disasters or exceptional occurrences, nor (c) aid granted to the economy of certain areas of the Federal Republic of Germany. Furthermore, the aid is not granted in a region eligible for regional aid under the exemption set out in Articles 87(3)(a) or (c). Finally, the exemption set out in Article 87(3)(b), referring to projects of common European interest, does not apply, and the Netherlands has not attempted to justify its applicability.

(50) This leaves the exemption set out in Article 87(3)(c) of the EC Treaty for aid to facilitate the development of certain economic activities, where such aid does not adversely affect trading conditions to an extent contrary to the common interest. Under this Treaty provision, the Commission has adopted the R & D framework, which guides its assessment of R & D aids.

(51) When examining whether Article 87(3)(c) of the EC Treaty is applicable, the Commission, in accordance with point 3.6 of the R & D framework, will pay special attention to the type of research carried out, the aid beneficiaries, the aid intensity and the accessibility of the results.

Assessment of the type of research

(52) According to point 2.2 of the Community R & D framework, the closer the R & D to the market, the more significant may be the distortive effect of the State aid on competition and trade. In order to determine the closeness to the market of the aided R & D, the Commission's assessment is guided by a distinction between 'fundamental research', 'industrial research' and 'pre-competitive development activity'.

(53) The Netherlands proposed to grant aid to Océ for the two phases 'industrial research' and 'pre-competitive development activity'. Annex I to the Community R & D framework defines both terms. 'Industrial research' means planned research or critical investigation aimed at the acquisition of new knowledge, the objective being that such knowledge may be useful in developing new products, processes or services or in bringing about a significant improvement in existing products, processes or services. By 'pre-competitive development activity' is meant the shaping of the results of industrial research into a plan, arrangement or design for new, altered or improved products, processes or services, including the creation of an initial prototype which could not be used commercially.

(54) As Annex I clarifies, these definitions are indicative and are merely designed to help the Member State to formulate its notification. The Commission, in its letter to the Netherlands of 12 May 1998, explicitly recalled that it is up to the Netherlands to demonstrate that the project to be aided falls within those definitions.

([9]) As Article 87(1) of the EC Treaty also stipulates 'potential' distortion of competition, potential competitors also have to be considered, which means that the analysis must include the concept of supply substitutability, i.e. the ability of other companies to easily produce (switch to) the product in question. As in the present case there is in fact actual competition, supply substitutability need not be examined in detail in this Decision.

(55) The Netherlands has presented the R & D project under the five subheadings: (1) piezo printhead; (2) printhead-production technology; (3) hot-melt inks; (4) integration of printer design and process; and (5) front-end issues. For each of these subheadings, the two research phases 'industrial research' and 'pre-competitive development activity' were explained by a list of activities. Costs were specified only per subheading and research phase.

(56) When initiating the formal investigation procedure, the Commission expressed serious doubts as regards the Dutch classification in research phases. The Commission noted that the descriptions of the activities under the subheadings were not self-explanatory in respect to the terms used in the Community R & D framework. In particular, the descriptions of activities under 'pre-competitive development activity' resembled product-development activities in the phase of preparing series production. Examples of items mentioned are: developing a production cost accounting system; developing dustproof packaging for inks; regular monitoring of the print quality and reliability and of working areas; setting-up of a standard for colour reproduction; and establishment of interface with scanner.

(57) The author of the second opinion submitted on 11 November 1998, an expert in the field of microsystems technology, states that after having seen the project plan and visited the company he considers the distinction between 'industrial research' and 'pre-competitive development activity' to have been stated as correctly as possible in the project plan. The Commission notes that he provides no definition of the terms used, nor any specific reference to the use of the terms in the Community R & D framework. Furthermore, he writes that he is not aware of ongoing research in other companies and relied for judging the state of the art mostly on the information provided by Océ. He did not have an overview of the situation of patents in the field. Finally, he states that, in the case of 'concurrent engineering' (all R & D objectives are pursued at the same time and with a clear market/product orientation), the borderline between the two terms becomes somewhat blurred.

(58) The Commission considers the statements of this second opinion not sufficient to alleviate the doubts it had issued in the initiation of the formal investigation procedure. In particular, the Commission cannot deduce sufficient evidence from the report to establish the distinction between the two research phases 'industrial research' and 'pre-competitive development activity' in the project plan.

(59) As the Netherlands did not clearly establish the type of R & D to be carried out or the closeness to the market, the Commission has examined the particular context of Océ's R & D project. Three crucial factors were evaluated and will be summarised in turn: (1) earlier R & D carried out by the company in the field, so as to pinpoint the beginning of the Cobalt project; (2) the proposed cost structure of the project, so as to examine the final stages of the R & D; (3) the technology state of the art, so as to put Océ's effort into perspective with the general R & D and product trends in the sector.

Assessment of Océ's earlier R & D in the field

(60) According to the Netherlands, Océ began systematic research into ink-jet technologies in 1986. As from 1987, Océ benefited from State aid for the development of piezo ink-jet technologies, receiving EUR 4,2 million in subsidies up to 1996. The following is a more detailed description, as provided by the Netherlands.

(61) In 1987, a subsidy of EUR 0,1 million was paid for a project entitled 'Piezoelectric materials for use in ink-jet multi-nozzle arrays'. The project established specifications of a piezoelectric material for use in ink-jet arrays of 16 nozzles per millimetre.

(62) In 1991, a subsidy of EUR 0,9 million was given under the PBTS scheme for a project entitled 'New ink-jet technologies for colour copying and printing'. The project focused on the development of a high-density multi-nozzle array, interactions between the array and inks, and the development of hot-melt inks and water-latex inks.

(63) In 1994, a subsidy of EUR 3,2 million was granted for a project covering the period 1994 to 1996, entitled 'Ink jet', aimed at developing piezo ink-jet technology for use with hot-melt inks at a temperature of about 120 °C. The project included finalising work on ink-jet array designs from a number of variants and test arrays built to study their jetting behaviour.

Work was carried out on techniques for the production of ink channels (within the array) using micro-machining, photolithography and etching processes, and electro-forming. Joining technologies were developed to bind piezoelectric materials to one another as well as to substrates.

Work was carried out on the saw-cutting and casting of piezo materials, and a definitive selection made of the piezoelectric material from a preliminary study. Interconnections between the piezo elements and the control electronics were studied and a connection technology chosen. In 1996, the production of broad test arrays (with 2 × 128 nozzles) was carried out on a limited scale.

Work was carried out on the array materials including permanency of the piezo materials, chemical corrosion by the ink, and gluing and soldering processes.

Work was carried out on hot-melt inks including the development of an ink formulation, interaction of inks with the printhead, and print and colour quality. New directions for development of hot-melt inks were identified.

Work was carried out on removing air from the ink channels in the printhead and ink system. The ink supply to the array and the heating of the entire printhead was tested. A total test assembly was built which could be used to print from a roll over A0 (36-inch) width. This was full colour printing using four small arrays.

(64) The Commission notes that by 1996, with public subsidies, the company had developed and integrated key technologies and printer subcomponents into a laboratory printer model. However, the Netherlands specified that Océ had never made an initial laboratory prototype of a wide-format ink-jet colour printer using hot-melt ink and piezo printheads. The device at the end of the PBTS-financed feasibility project had only a 4 × 24 nozzle array and no paper management.

(65) In assessing the achievements of the earlier project until 1996 as compared with the descriptions provided for the Cobalt project, the Commission gathered information about the situation at the start of the project, so as to be able to evaluate the additional R & D challenges of the Cobalt project.

(66) The Netherlands stated that, at the end of 1997, Océ made ink-jet arrays with 75 nozzles per inch (three nozzles per millimetre), and the first arrays of 96 nozzles per inch (four nozzles per millimetre) were produced at the beginning of 1998. On the other hand, the target in the Cobalt project was to produce a 2 × 128 nozzle (five nozzles per millimetre array) by the end of 1998.

(67) From the elements provided by the Netherlands, after comparing the technical features of the projects, the Commission concluded that the main additional technological challenges of the Cobalt project over and above the earlier projects lay, first, in the complications involved in producing higher nozzle densities and in controlling the cross-talk this engendered between the nozzles. The second challenge lay in controlling corrosiveness of materials when subjected to polymer inks at 130 °C. The third challenge was the fact that the technology must be suitable for application on normal paper. The fourth challenge lay in cost-effective production technology.

(68) The company visit by Commission officials helped to confirm the above information on the advancements of the project and the technological challenges. However, it did not lead to the conclusion that any of the R & D activities could qualify as 'industrial research' within the meaning of the Community R & D framework.

(69) The Commission concludes that the Cobalt project reaches beyond the achievements of the earlier projects.

Assessment of the cost structure of the overall project

(70) Considering Océ's earlier R & D results in the field of wide-format colour piezo ink-jet hot-melt printers, the Commission proceeds to assess the cost structure of the Cobalt project in order to pinpoint the phase for which costs are claimed eligible in the overall product development.

(71) In the original notification of 18 December 1996, the Netherlands stated that the remaining final product-development activities would start from the laboratory models and prototypes and would lead to the definitive design of the printer, including tooling and other production means. This phase would cost approximately EUR 15,9 million.

(72) The Commission asked for justification why some 80 % of the total costs were considered eligible for R & D. In its response of 28 May 1997, the Netherlands announced new total project costs for the period until the product was launched on the market. These costs amounted to EUR 202 million instead of EUR 118 million envisaged in the original scope of the project. These additional non-eligible costs included investments in production, marketing and service. The Netherlands later confirmed these sums: only 15 % additional R & D costs are projected after finalisation of the Cobalt project. This EUR 15,9 million would fall within the aforementioned subsequent costs of EUR 99,8 million before the product is put on the market.

(73) The Commission concludes that the Netherlands intends to subsidise the project costs up to the point where only very limited further development costs are still outstanding before the phase of preparing series production and commercialisation of a final product.

Assessment of the technological state of the art

(74) An analysis of the technological state of the art pursues two objectives. It can, first, establish the technological challenges of the R & D examined, by assessing the R & D of other companies carrying out comparable work. Secondly, the analysis considers the R & D work of competitors in the product market. This examination helps appreciate the development dynamics of the market and thus put Océ's effort into perspective with the general R & D and product trends in the sector.

(75) As regards the technological developments, there are several other companies developing hot-melt piezoelectric printheads and inks, which seem to face comparable technological challenges. The Netherlands has pointed out that the hot-melt polymer inks of Océ's project had different characteristics than the resin-based hot-melt inks used by other developers. In particular the corrosiveness of the inks at temperatures of 130 °C would present additional challenges. However, the Commission has not received any data to substantiate this claim, although it asked for it. The author of the second opinion does not comment on this issue.

(76) From the information at its disposal, the Commission concludes that although the Cobalt project involves special ink characteristics, it is justified to compare the technological challenges of the Cobalt project with its closest alternative, the development of other hot-melt printers and printheads. Hot-melt ink-jet printers were first offered commercially in the mid-1980s ([10]). Already by 1995, sophisticated colour hot-melt ink-jet printers based on piezoelectric technology were introduced in the office printer market ([11]) (see the Table). The Tektronix and Mutoh printers introduced in 1996 and 1997 are claimed not to need specially coated print media, being able to print on virtually any media, ranging from vellum to vinyl and canvas. The Mutoh HJ-800 can print a poster (34 inches by 44 inches) at 300 dpi in about 12 minutes (standard mode). The DisplayMaker, available in 1996, prints a photorealistic poster in about six minutes. The technology continues to evolve rapidly and print speeds have increased markedly since then ([12]). Other major developers are the companies Spectra, Brother and Dataproducts.

Table

Wide-format piezoelectric hot-melt ink-jet colour printers

Company	Product name	Market introduction	Product description (hot-melt piezo colour ink-jet)
Alpha Merics Corporation	Spectrum	End-1995	51-inch print width, 300 dpi ([1])
ColorSpan Corporation	DisplayMarker Express	1995/1996	High-speed, 54-inch print width, 307 dpi
Tektronix	Phaser 600	November 1996	36-inch print width, 300 dpi
Mutoh	HJ-800M	March 1997	36-inch print width, 300 dpi

([1]) Resolution and thus print quality is measured in dots per inch (dpi).

(77) As regards the market developments, wide-format printers for display graphics applications and based on liquid inks are at present better established than solid ink-jet printers. Printers based on piezoelectric ink-jet technologies and those based on thermal piezoelectric ink-jet technologies are firmly established on the market and compete with each other. As with solid-ink developers, liquid-ink developers are aiming at comparable product specifications ([13]).

([10]) Howtek's Thermo-Jet and the Pixelmaster.
([11]) 'Color encroaches on the desktop', Byte, June 1995.
([12]) In 1998, Tektronix demonstrated laboratory hot-melt ink printers operating at speeds of up to 100 (small format) colour pages per minute (press release of 13 October 1998). The latest commercially available small-format solid-ink printer of Alpha Merics uses resin-based solid-ink sticks and is capable of producing 10 colour pages per minute of photorealistic prints of up to 1 200 dots per inch (dpi).
([13]) One of the first piezoelectric ink-jet printers capable of colour photorealistic printing at 360 dpi was the Cammjet introduced by Roland in 1996. Rapid evolution in piezoelectric printhead technology is evidenced by the fact that in 1998 the company introduced the Hi-Fi Jet, a wide-format printer capable of producing photorealistic prints at 1 440 dpi. Several other products are capable of producing 54-inch-wide prints at a resolution of 720 dpi. In terms of printing speed, several of the current generation of printers can print a poster (34 inches by 44 inches) at a resolution of 300 to 360 dpi in about four minutes. The Xerox ColorgrafX Xpress 54, CalComp CrystalJet 7000 Series, Raster Graphics Piezo Print 5000 and ColorPix Pro 54 fall within this group.Products based on thermal ink-jet technologies became commercially available in the early 1990s. Encad and Hewlett Packard introduced the first wide-format printers in 1993. The latest products, such as the Encad PRO 600e and HP DesignJet 3500CP, can print a poster (34 inches by 44 inches) at 600 dpi in about seven minutes (economy mode). Continual advances in thermal ink-jet technology now means that products with 72-inch print widths and apparent resolution of 1 200 dpi are on the market (e.g. Colorspan's DisplayMaker Series).

(78) As regards companies that focus on the main subcomponents, printheads and/or inks, there are European competitors developing comparable components as marketable products. Modular Ink Technology (Sweden) develops and manufactures high-performance PiezoJet printheads. In combination with specially formulated inks, these printheads can be used in numerous printing applications including wide-format colour graphics printers. For example, PiezoJet printheads are used in the PiezoPrint 5000 and the VivaGrafX wide-format colour ink-jet printers for graphics applications. Xaar plc (UK) develops piezo ink-jet printheads and inks that enable high-speed near photorealistic printing. Through its XaarJet subsidiary, Xaar will manufacture printheads for low-volume specialist applications and develop inks for printing on a wide variety of materials including paper, board, plastics and metal. Through its Xaar Technology subsidiary, the company licenses its technology to volume manufacturers of equipment with a diverse product range, including wide-format colour printers. Xennia Technology Ltd (UK) is a leading developer of inks for industrial and commercial ink-jet printing.

(79) The analysis of technology and market trends revealed that the attributes of the hot-melt wide-format ink-jet printer developed by Océ: (1) describe technological challenges other companies are faced with in a comparable way, and (2) constitute general product development goals of many developers of ink-jet printers or subcomponents for colour graphics applications.

(80) Indeed, some of the stated development objectives of the Océ printer are not advanced in comparison to existing technology, for example, the development of ink-jet arrays (2 × 128 nozzles) with an integration density of four nozzles per millimetre and suitable for use with hot-melt inks. Another commercially available solid-ink printer for office applications uses new resin-based solid-ink sticks and has a new printhead with 448 nozzles, evenly split between four process colours. XaarJet offers 70 mm printheads with either 500 or 1 000 nozzles, corresponding to a nozzle density of about seven and 14 nozzles per millimetre respectively. This is more than three times the nozzle density that Océ hopes to achieve.

(81) The Commission concludes that the technological challenges faced by the company in many aspects correspond to the general R & D challenges of competitors, which are all engaged in advancing related technology. The author of the second opinion confirmed the high development speed in the sector and that the relevant sector of microsystems technology was characterised by continuous innovation with rapid performance increases. In his view, confirmed by the Netherlands, every market participant was forced to undertake substantial efforts to stay in the market.

(82) The fact that comparable products are already on the market, with main differences being the print speed and ink characteristics, is an indicator to the Commission that Océ's R & D project is to be considered close to the market.

Conclusions on the assessment of closeness to the market

(83) The above assessments reveal that:

(a) Océ made major progress in earlier R & D work on the same subject;

(b) the Netherlands plans to subsidise work until very advanced project stages, covering 85 % of all costs before the phase of preparing series production and commercialisation;

(c) the technological state of the art of Océ's R & D corresponds to the technological challenges of other companies, and Océ's Cobalt project corresponds to the general product development trend in the sector.

(84) These elements taken together make the Commission conclude that Océ's development activities are close to the market within the meaning of point 2.2 of the Community R & D framework. The assertions of the Netherlands that the development of piezo printheads for use with hot-melt inks is novel and ground-breaking cannot as such be considered sufficient to classify the R & D as 'industrial research', thus situating it as less close to the market.

(85) However, it is possible to conclude that Océ carries out 'pre-competitive' development, because of the technical challenges of the project, as laid out in recitals 67 and 68 above, in three areas: (1) increased nozzle densities and their cross-talk; (2) the corrosiveness of polymer inks; (3) the fact that the technology must be suitable for application on normal paper; and (4) finding cost-effective production technology. Therefore, the Commission considers that the permissible aid intensity can be set at at least 25 % for the whole project, since this would be the permissible aid intensity if the entire Cobalt project consisted of R & D in the phase of 'pre-competitive development activity' in accordance with Annex I to the Community R & D framework.

Assessment of eligible costs

(86) When initiating the investigation procedure, the Commission asked the Netherlands to justify better the claimed eligible costs of EUR 93,6 million as being eligible costs according to Annex II to the Community R & D framework, in particular as regards the purchase of patents and licences. As regards costs for buildings, the Commission wondered whether parts of the new facilities were destined for the series production of piezo printhead arrays.

(87) The Netherlands at first responded by referring to the original notification and subsequent letters and provided further details only on the costs for patents and licences. Except for building and patents/licences, the bulk of eligible costs were presented as man-year-equivalents for researchers, using a methodology similar to one practised for Community Esprit projects. Cost categories considered in the method were: salaries, other personnel costs, equipment, materials and tools, and other costs, each expressed as direct and support costs. Annex II to the Community R & D framework comprises these cost categories. The Commission therefore considers these cost elements to constitute eligible costs within the formal meaning of Annex II to the Community R & D framework.

(88) For buildings, the Netherlands explained that there were no plans for industrial-scale printer production in the new laboratory and that such production would not be possible. During its site visit on 25 June 1999, the Commission was able to verify to a sufficient extent the actual use of the facilities. Hence, the Commission considers justified the planned eligible costs of EUR 0,6 million, as amended by the Netherlands itself.

(89) For the purchase of patents and licences, Annex I to the Community R & D framework specifies that such costs must be used exclusively for the research activity. The Netherlands has stated that the patents are not used for the R & D project as such, but rather ensure that later commercial production is not hindered by unexploitable intellectual property rights. As the costs are incurred to ensure production, and not for use in research, the Commission considers these costs not justified under the framework. Consequently, EUR 22,7 million for the purchase of patents and licences are not eligible for State aid under Article 87(3)(c) of the EC Treaty.

(90) Following a request by the Commission, the Netherlands provided, by letters dated 27 October 1999, 12 November 1999 and 20 December 1999, additional cost-accounting data and in particular a declaration from an independent accountant. The account certified on the basis of his analysis of real expenditure for the years 1997 and 1998 that the claimed eligible costs had been incurred only for the Cobalt project. The independent accountant also certified that the project's costs were calculated correctly and that the breakdown of costs was made fully in accordance with the Esprit method, as laid out in the notification.

(91) The Dutch authorities also provided information on the new estimates of the project's costs, these being substantially higher than originally notified. According to the new estimates, the costs will amount to NLG 209,625 million (EUR 95,1 million), excluding the costs of patents and licences.

(92) The Commission concludes that, on the basis of the R & D framework, EUR 95,1 million are eligible for aid.

Assessment of the incentive effect and the necessity of the aid

(93) The Community R & D framework states under point 6.1 that State aid for R & D should serve as an incentive for firms to undertake R & D activities in addition to their normal day-to-day operations. Where the incentive effect is not evident, the Commission may consider such aid less favourably than it usually does.

(94) Point 6.2 states that in order to verify that the planned aid will induce firms to pursue research which they would not otherwise have pursued, the Commission must take particular account of quantifiable factors, market failures, additional costs connected with cross-border cooperation, and other relevant factors. Quantifiable factors can be changes in R & D spending, the number of people assigned to R & D activities, and R & D spending as a proportion of total turnover. Proposed aid may also be permitted if it contributes towards expanding the scope of research or speeding it up. In the case of individual, close-to-the-market research projects to be undertaken by large firms, the Commission will, pursuant to point 6.5 of the framework, attribute particular importance to the abovementioned conditions. Pursuant to point 6.3 of the framework, the Member State must demonstrate the project's incentive effect.

(95) The Netherlands stated that Océ's R & D spending would increase due to the aid, that more people would be employed and that the aid would accelerate and intensify Océ's R & D efforts. Moreover, the Netherlands argued that the project bears a high risk of technological and commercial failure. Finally, the project's role as a partnership catalyst was emphasised.

(96) The Commission notes that Océ's R & D spending and R & D personnel considerably increased in absolute terms over the last years. R & D expenditure doubled and an average of about 100 additional average man-years of researchers were created, which represents an increase of about 10 %. However, as a share of total company turnover, R & D expenditure has decreased from 6,3 % to 5,6 %. The Dutch authorities explained this decrease by recent acquisitions of other companies. This boosted turnover without contributing a corresponding increase in R & D ([14]). The Netherlands furthermore pointed out that the entire project is running two years behind its original schedule, partly because of the ongoing uncertainty about the aid, and that therefore the number of personnel and the level of R & D expenditure were significantly lower than initially planned.

(97) Although the factual data regarding quantifiable factors do not appear entirely conclusive for establishing the existence of an incentive effect of the aid, the Commission has to take into account that, in the case under consideration, such data, based on historical rather than future expected R & D efforts, could not suffice for the assessment of the incentive effect of aid which has not yet been paid. The Commission therefore has to look at other relevant factors including market failures, as mentioned in point 6.2 of the Community R & D framework.

([14]) The author of the second opinion believed that around 6 % is the normal share of R & D spending in the micro-systems technology sector.

(98) Where a R & D project has high risks of technological failure, the Commission considers it more probable that companies might engage in the respective R & D only if financially induced to do so. The Netherlands stated that, at the time of the decision to carry out the Cobalt project, the technological risks of the project were very high for the company. Part of the current delay in the project's execution stemmed from actual failures to develop particular components in the way originally specified and planned. As some significant subprojects are reported to have failed, the Commission now concludes with hindsight that the project actually bore high technological risks.

(99) The Netherlands also maintained that the project continues to bear a high commercial risk, which would relate to the particular characteristics of the market Océ operates in. The market of high-speed colour printers is dominated by a few large non-European companies. In addition, there are high barriers to entry due to high upfront R & D costs necessary for the development of any new competitive product. In this environment, a company such as Océ, which is small in comparison to its competitors, would bear a particular risk that a research project could ultimately fail, due to the strength of the established competitors. Indeed, the larger competitors could exercise their market power to prevent a relatively minor player from developing and marketing successfully technologies of its own. In the absence of aid, such a risk could dissuade Océ to devote significant resources to a long-term, risky research project. The aid can thus induce the company to go in its research efforts beyond what it would normally carry out. On the basis of its own assessments, the Commission can agree with the Dutch characterisation of the market situation. Moreover, as there is no other competitor known to develop comparable polymer-based technology, the Commission considers that Océ's efforts go beyond what is considered normal in this sector.

(100) Considering the arguments put forward by the Netherlands on quantifiable criteria and in particular its assessment of other relevant factors, the Commission concludes that aid was necessary for inciting Océ to carry out the Cobalt project as notified, thus increasing its R & D efforts beyond its normal day-to-day R & D activities. The incentive effect of the aid has therefore been demonstrated in accordance with point 6.2 of the Community R & D framework.

V. **CONCLUSIONS**

(101) The aid proposed for Océ's Cobalt project constitutes aid, would distort competition and would affect trade within the meaning of Article 87(1) of the EC Treaty. The exemption provided for in Article 87(3)(c) is applicable in so far as the conditions set out in the Community R & D framework are fulfilled and where such aid does not adversely affect trading conditions to an extent contrary to the common interest. The Commission established in accordance with the Community R & D framework the three main criteria: (1) type of R & D carried out; (2) eligible costs; and (3) incentive effect of the aid, as follows.

(102) From its assessment of the technical descriptions provided by the Netherlands, its company visit, its analysis of Océ's earlier R & D, the project's overall cost structure and the general product development trends in the sector, the Commission cannot rule out the possibility that some parts of the R & D carried out qualifies as 'industrial research'. However, based on the information at its disposal, the Commission can classify the type of R & D involved in the Cobalt project as at least 'pre-competitive development activity' within the meaning of Annex I to the Community R & D framework. The proposed aid intensity of 24 % of eligible costs can therefore be approved since it is below the maximum aid intensity allowed for 'pre-competitive development activity'.

(103) For the eligible costs, the Commission regards the costs as amended in respect of those originally notified and as later confirmed by an independent accountant as eligible under the provisions of the Community R & D framework, except for the costs relating to patents and licences. Eligible costs thus amount to EUR 95,1 million.

(104) As regards the incentive effect, the Commission considers the incentive effect of the aid demonstrated in accordance with point 6.2 of the Community R & D framework.

(105) The Commission has to ensure that the aid is correctly used. The Netherlands must therefore strictly monitor on an annual basis the progress of the project and ensure that all the eligible costs in fact correspond to expenditure incurred for this project. Furthermore, the Netherlands must in five consecutive annual reports provide conclusive evidence to the Commission, including detailed justifications for payments, demonstrating in particular the exact destination of the aid for the expenditure actually incurred and the eligible costs of the Cobalt project.

(106) Considering the contribution of R & D to growth, competitiveness and employment in the Community, the Commission concludes that the notified aid of EUR 22,7 million will not adversely affect trading conditions to an extent contrary to the common interest,

HAS ADOPTED THIS DECISION:

Article 1

The aid which the Netherlands is planning to implement for Océ NV, amounting to NLG 50 million (EUR 22,7 million), for the development of colour ink-jet printers, is compatible with the common market, subject to the conditions set out in Article 2.

Article 2

The Netherlands shall strictly and on an annual basis monitor the progress of the project and shall ensure that all eligible costs in fact correspond to expenditure incurred for the Cobalt project. The Netherlands shall submit at least five consecutive annual reports to the Commission. These reports shall comprise conclusive and detailed evidence of the exact destination of the aid for expenditure actually incurred and the eligible costs of the Cobalt project and shall include detailed financial statements.

Article 3

The Netherlands shall inform the Commission, within two months of notification of this Decision, of the measures taken to comply with it.

Article 4

This Decision is addressed to the Kingdom of the Netherlands.

Done at Brussels, 18 October 2000.

For the Commission

Mario MONTI

Member of the Commission