



UCL

PROJECT PROFILE

Sweden

Stockholm Air Link (Arlanda Express)

Arlandabanan

omega centre

Centre for Mega Projects in Transport and Development

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A INTRODUCTION

Type of project

Project name

The Arlanda rail link (*Arlandabanan*).

Description of mode type

A two-track railway from Stockholm central station to Arlanda Airport connected to the existing rail network between Stockholm and Uppsala. The complete project is henceforth called the Arlanda rail link project and includes both the publicly financed parts and the privately funded. The public parts are an extension from two tracks to four from the north of Stockholm to the point where the siding to Arlanda Airport takes off, two tracks from the Airport connecting again to the main trunk line north of the Airport, and a station and parallel track underneath the Airport for long distance trains and other operators than the shuttle operator.

Technical specification

Gauge: 1435mm, type of tracks: UIC 60 and BV 50.

Principal transport nodes

Arlanda international and domestic airport (18.1m passengers, 2008), Stockholm central train station (Linköping – Nyköping – Stockholm – Gävle; Svealandsbanan, Mäljarbanan, Uppsala).

Major associated development

Upgrading of the main trunk line to increase availability, extension to four tracks from Karlberg to Skavstaby (the southern link to the Arlanda rail link). Rail connection towards north from Arlanda airport to main trunk line (the Northern Bend) (www.jarnvag.net).

At the airport, a third runway has been constructed. Due to a political deal, the construction could not start until the railway to Arlanda was established. All domestic flights were moved from Bromma airport to Arlanda airport leading to restructuring of terminal usage. To meet the increase in the number of flights another terminal building was erected. Terminal 2 opened in 1990.

At Stockholm Central Station tracks number 1 and 2 with associated station areas were upgraded. Stairs were built from the World Trade Centre to the part of the central station where the shuttle departs. (Interview B5)

Parent projects

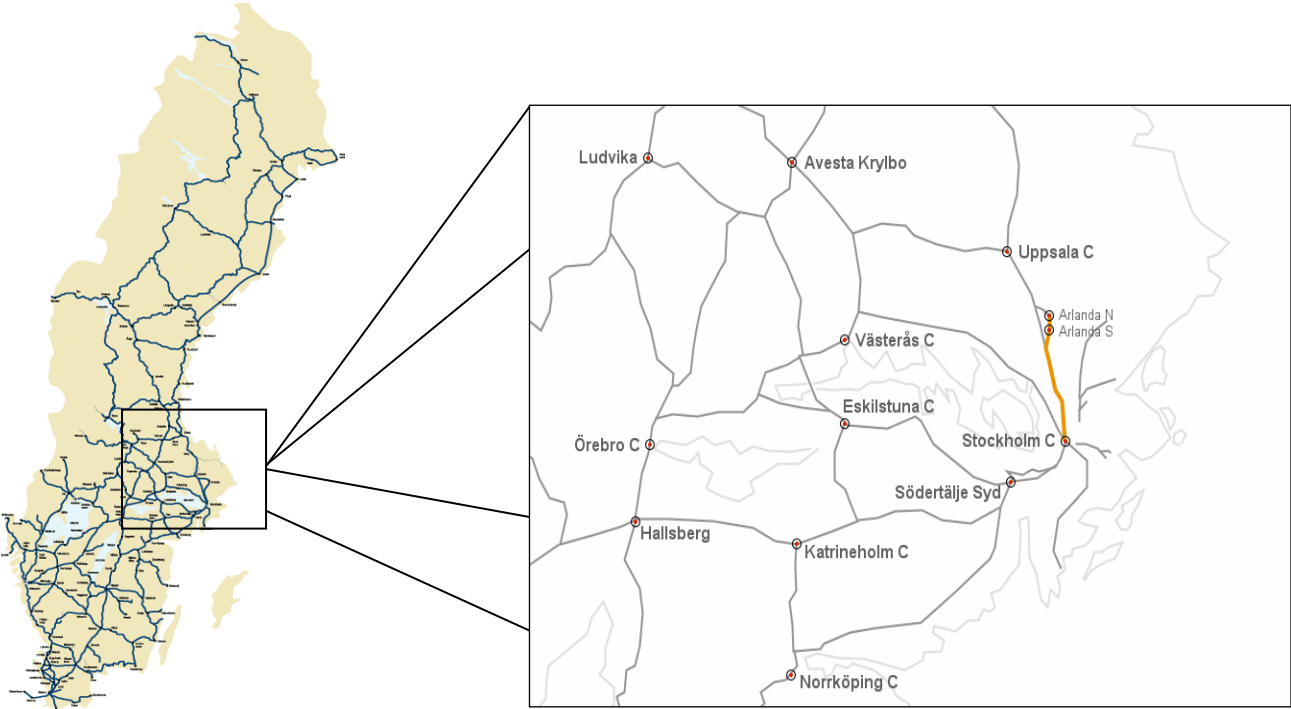
The decision to build the railway became more urgent when the discontinuation of domestic flights at Bromma airport was decided. Bromma was the main airport from the 1930s until SAS (Scandinavian Airlines) made an order for several DC-8 airplanes. As a response to the increased demand for better runways, Arlanda airport was founded. A political decision moved all scheduled airline flights to Arlanda in 1962. The number of domestic flights increased at Bromma until 1983 when Linjeflyg (50% owned by SAS) moved their flights to Arlanda in 1983. Between 1983 and 1992 (when the flight market was deregulated) there

were mostly private flights at Bromma. The traffic at Arlanda airport now expanded heavily and needed to develop capacity for flight traffic as well as ground traffic to and from the airport (www.lfv.se (a)).

In August 1991 the Social Democratic government made a decision about a third runway at Arlanda airport. The permission to construct and start operating the runway was stipulated with a demand that a railway connection to Arlanda had to be constructed. This settlement also included a clause that the level of carbon dioxide and nitric oxide emissions from airport activities and ground transportations must not exceed the emission levels of year 1990. This regulation is in line with the European Union objective of reducing greenhouse gas emission levels by 20% by 2020 compared to 1990. The Swedish government agreed to this objective as a non-member state. The cap was seen as a short-term solution and it was decided to be more rigorous after ten years of operation of the third runway. (Trafikutskottets betänkande1993/94:TU06; SOU 2007:70)

Country/Location

Figure 1: Map of railway between Stockholm central station and Arlanda airport.



Source: www.banportalen.se.

Current status

The Arlanda rail link project is completed.

B PROJECT BACKGROUND

The Arlanda rail link project is a build-operate-transfer (BOT) contract between the government and a private consortium. The Swedish government decided the structure of the procurement and the type of PPP-project chosen. The private consortium operates the railway services and controls other train companies running the distance with station fees. (Nilsson et.al. 2008 p78; Wiwen-Nilsson 1995 p92). The government has been the sole financier of some parts of the rail link between Stockholm central station and the connection to the main trunk line north of the airport.

The BOT project includes:

- design and construction of the railway from Rosersberg to Myrbacken;
- design and construction of a station and a station area at Stockholm Central Station including ticket facilities and baggage handling;
- design and construction of three underground stations and a station area at Arlanda airport, two for the shuttle and one for long distance trains.;
- procurement of rolling stock (seven trains);
- operation of shuttle and maintenance of infrastructure and station areas;
- financing, except the parts that the government financed and some subsidies and loans that will be explained in detail later (Wiwen-Nilsson 1995 p92).

Principal project objectives

The explicit main objective of the railway project was the advantages to society and that the number of passengers would be large enough to be beneficial for business. It was of great importance that parts of the project should be funded by private capital; therefore the dual objective of advantages for society and business was important. The form of the procurement was the main challenge for the project; it was an objective in itself to find new forms of financing infrastructure objects. The government in chair had set a political objective to open up the railway network for private sector participation in financing, something that so far had been handled by the public sector. The form of financing was and is seen as a result of the procurement and was never an objective itself.

The Government's objectives for the Arlanda rail link project are expressed in the tender documentation as being to:

- lower the emissions related to the ground bounded traffic in association with Arlanda airport;
- create a sustainable solution for the emissions in order to get permission to build a third runway at Arlanda airport;
- promote increased competition and private sector involvement in the rail sector;
- arrange for the private sector to construct and manage the project;
- minimize the Government's risks and financial commitments;
- stimulate private initiatives, achieve a passenger friendly service and optimised business, and promote an environmentally friendly transportation system by encouraging rail development. (RRV 1995 p9)

From a public welfare point of view, the objective was to create better conditions for the integration of the local, regional and national railway traffic with the flight activity at Stockholm-Arlanda airport. (Arlandabanan Infrastructures 2009a) It was also assumed that

the rail link would lead to a reduction in bus and car traffic to and from the airport, in line with the environmental objectives. (A-Banan 2006)

Later, when the Macquarie Group through Macquarie European Infrastructure Fund (MEIF) bought A-train AB (the operating consortium) in 2004, their objective was to create a long-term sustainable business model. One of their key focuses is to manage and invest in infrastructure assets, all funded by risk capital. (A-Banan 2006; www. Macquarie.com (a))

Key enabling mechanisms and decision to proceed

In the 1980s Sweden reformed the national structural holding of the railway network. In 1988, the Swedish state railways (SJ) were vertically separated and the National Rail Administration was founded with responsibilities for rail infrastructure. The state railways remained responsible for operating trains. The reform involved new legislation, a structural break-up of the monopoly, change of ownership and opening up to market entry. Similar to the road industry, investments in railway infrastructure became a budget post for the government budget (Nilsson et.al. 2008 pp78-79)

In the early 1980s the concept of a double tracked railway between the city centre of Stockholm and Arlanda Airport progressed. Increasing demand for flights and the desire to relieve the burden on the road network gave birth to the idea at a time when environmental issues started to appear on political agendas. In the late 1980s, when the National Rail Administration made plans to provide a rail link from the existing rail network to Arlanda airport, the real planning of the Arlanda rail link contoured began. In 1990 the National Rail Administration produced the first project plan. The plan was discussed and analysed politically until 1993 when a definite decision was made to realise the plan. (Arlandaban Infrastructure 2009b)

The general election in 1991, when the conservative and liberal parties achieved a majority, was the single greatest influence on the on-going planning. The procurement was based on free market principles and needed to be finished before the next general election in order to authenticate the agreement. This was the first time the Social Democrats had not won the election since the 1970s and the new government wanted to change some basic structures reflecting their ideological beliefs. The need to finish the Arlanda rail link project within three years was an outcome of the insecure position in government. (VTI 46-2004)

The time of planning and designing the procurement was a time of growing demand for public money. There was also a recession in the economy that made off-budget investments attractive for most parties. The conservative and liberal parties also saw the possibility of opening up the railway market for ideological reasons. The Arlanda rail link project was a great opener for this agenda when investigations started in the former Social Democrat government. The project was one of few considered to be a safe investment due to the character and expected increase of the passenger base. The new government saw the project as a proving point for their politics. It was something new and something that challenged the existing structure with a strong intervening state. (Interview B6)

A description of key mechanisms which enabled the project to proceed

The relatively fast planning process for the Arlanda rail link should be understood in its historical context, of economic recession, of environmental issues starting to be of political concern and of deregulation of the historically strong state in Sweden. It was also during the lead-up to a general election on Sweden's entrance into the European Union, which took place amid stormy debates.

Between 1990 and 1994 a seemingly bottomless bank, finance and real estate crisis hit the Swedish welfare system. Public money needed to be redirected to the financial system to obtain some kind of welfare. Investment money from private capital was no longer an ideological question; it was the Social Democrats who built the welfare state who first suggested a privately financed railway link to the main airport.

Process/events leading up to decision and date of decision

The first formal proposal for a railway link to the Arlanda airport was made in 1986 in a committee report. This was before the vertical separation of the railway structure. The year after the National Rail Administration was founded (1989) and the monopoly dissolved, the new organisation established a ten-year investment programme, with a railway connection to Arlanda airport as top priority. The then Social Democratic government gave an assignment to the national rail administration to evaluate possibilities for private funding. The agency concluded that revenues from ticket sales would not be enough to cover both the construction of infrastructure and operation of the shuttle. (RiR 2004:22)

After the general election in 1991 when the conservatives and liberals gained a majority, the project remained of interest as a project involving private capital. The new government set up a working group within the ministry, with handpicked experts taken from national industries. The Senior Business CEO from Saab Scania (Georg Karnsund and Sivert Nordgren) chaired the group and manned it with officials who had been working with complex financing and procurements in their earlier careers. One secretary of state also represented the political side from each of the four parties¹ that formed part of the government. It is important to note that neither the Swedish railways nor the National Rail Administration were included in this committee. (Nilsson et.al 2008 p79)

On 15 August 1991 the Swedish government made a positive decision that the national civil aviation administration should construct and operate a third runway at Arlanda airport. This was accompanied by a condition that a railway connection to the airport would be opened, and that, before this connection was running, no activity could take place at the third runway. The decision was made according to the then existing legislation on nature resources. (RiR 2004:22)

In 1993 the procurement was prepared by a sub-ordinate group (headed by the senior industrialist Georg Karnsund) of the committee for infrastructure investments (DELFIN). The group engaged a financial consultant, the American investment bank Solomon Brothers, and a legal advisor, the law firm Mannheimer Swartling. Staffing was established and the outlines of a business plan took form. After the procurement team was formed, the events leading up to a final decision can be divided in to three phases: prequalification; appointment of preferred bidder; and government decision.

Prequalification phase

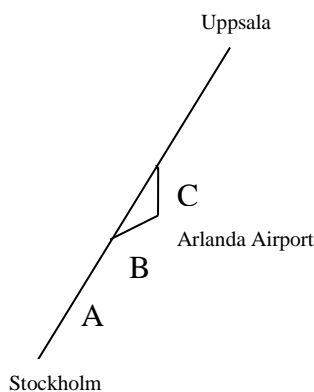
In June 1993 the project was announced to prospective applicants in newspapers, most of them non-Swedish. Companies that showed an interest were sent detailed information as standard procedure. In September the same year some 80 interested consortia and private agents had expressed interest. From these, four tenders were chosen by the delegation DELFIN. One month later the most eligible consortia were sent the contract 'Request for Proposals'. Returning tenders were expected on 15 February 1994. (RRV 1995 p24)

¹ The four-party government consisted of Moderata samlingspartiet, Folkpartiet liberalerna, Centerpartiet and Kristdemokratiska samhällspartiet (the Moderates (conservatives), The Liberal Party, The Centre Party and The Christian Democrats)

At the end of 1993 the procurement was handed over from the delegation to the newly-formed state-owned company AR Company (although the constellation of people was basically the same). On 13 January 1994 the AR Company received a request from one of the consortia (Grupo Ferrovial) to expand the time limits because most of the material was written in Swedish. Due to the strict time constraints given by the government the request was not accepted. A few days later another consortium announced that they couldn't obtain mechanical and technical suppliers, and that the main company (NCC) in the consortium was now part of another consortium, ALC. These two events meant that in the end only two consortia submitted tenders. These were ALC and ATAB (with Skanska as the main company). The consultant company Solomon Brothers evaluated the two tenders and concluded that both consortia had feasible offers and that they both required the same size of the stipulated loan that the AR Company had guaranteed in the contract proposals. It was also considered that none of the proposals satisfied the technical requirements. (RiR 2004:22)

In June 1994 the Solomon Brothers again evaluated the revised tenders. Still none of the consortia could be considered Preferred Bidder because they did not fulfil the requirements. In comparison, however, ALC was considered superior in technical skills and therefore the other consortium was given another chance to supplement its shortcomings. While the ATAB consortium tried to make up for the shortcomings, further discussions were held in parallel with the ALC consortium. (RiR 2004)

Figure 2: Stylised map of main nodes in the Arlanda rail link project



Source: authors

Preferred bidder appointed

In early 1993 the parliament decided to construct the four-track extension and the North Bend (Sections A and C) within the government budget. A pre-qualification round saw some 30 bids for the complete section B or parts of it. The final round included four bidding consortia formed after an initiative from the working group. In April 1994, the government submitted the consortia's basic contracting principles to the parliament². (RiR 2004)

The Arlanda Link Consortium (ALC) was announced preferred bidder in July 1994 and the contract was signed in August just one month before the next general election.

² Prop. 1993/94 Godkännande av grundläggande principer för avtal rörande Arlandabanan

Accounts of how the preferred bidder was appointed differ widely between the people being interviewed. Some indicate that it was a game to tell the state railways off the single market. (Interview B10) Some assert that it was the first public procurement to be based on this openness and transparency before Sweden entered the EU with its laws on public procurement and non-discriminatory principles. The procurement was, from this perspective, viewed as fair and as a way to open up for the international market to invest in Sweden. (Interview B6)

The criteria for choosing preferred bidder were officially:

- Size of the stipulated loan offered by the government. This was the single regulation on the size of public participation;
- That the bidder could guarantee minimal technical requirements;
- Any adjustments to the agreement prepared by the rail administration and the government;
- The credibility and strength of each bidder's financial plan and financing structure, including fair play (Wiwen-Nilsson 1995 p94).

Government decision

The government became directly involved in the planning process when planning was moved from agencies to ministry level. The uniqueness of the planning process meant a lack of experience from former projects and of applicable laws and regulations. Therefore direct government involvement during the process was necessary.

Poor poll ratings for the government at the time of the election in September 1994 made the deadline for closing the deal of great importance. The Social Democrats had made an election pledge to tear up the decision if possible. The final close was made at the very last government meeting before the general election. This meant that the only option for the new government (the Social Democrats) was to negotiate on the basis of the existing agreement, because of the high costs implied by ripping up the agreement.

The following factors are the most important regarding public sector involvement:

- Stockholm central station (through the state railways) and Stockholm-Arlanda Airport (through the aviation administration) are government-owned property;
- The railway north of Stockholm where the shuttle runs is government property (through the national rail administration);
- Management of rail traffic north of Stockholm is the responsibility of the state railways;
- The government's conditions that the shuttle and the Arlanda rail link be connected to regional and long-distance rail networks, and that the Arlanda rail link began operating before the third runway could be activated;
- A Parliamentary decision on the greatest possible extent of private financing

(Wiwen-Nilsson 1995 p95)

Criticism from the left wing parties stated that there were no public consultations or external public involvement and that the design of the procurement process did not allow for the normal procedure of appeals from the public. (Motion 2008/09:T220)

Key decision makers

A few key persons within the government were involved. The minister of communication, Mats Odell, was in charge on the political side. In the government delegation working directly under the Department of Communication, four Secretaries of State participated, one from each party in government. Urban Karlström was Secretary of State for Mats Odell and was one of the initiators of the project. Georg Karnsund and his co-worker Sivert Nordgren headed the delegation. Legal advisers from the law firm Mannheimer Swartling worked closely with the group on the design of the procurement.

The national rail administration and the civil aviation administration functioned as consultant companies working with the technical requirements in order to ensure that no complications occurred as a result of running on the same rails as other train operators and the connection to the airport.

The private companies with their legal and financial advisors were also of great importance for closing the deal and deciding the content of the project.

Feasibility studies

The final decision was based on a report by the National Rail Administration in 1990³ (RiR 2004:22). This is more or less the only study made of the feasibility of the project. This report presents another solution than the one later constructed, for example, the Northern Bend is not included in the prognosis. Later studies by the national rail administration and consultant companies have other focuses than feasibility, which is only of public interest, not commercial interest.

Main organisations involved

The winning consortium was called the Arlanda Link Consortium initially and A-Train during the operation phase. It recruited Vattenfall, the Swedish state-owned energy company, as a subsidiary. The Arlanda Link Consortium consisted of:

- GEC Alstom Group companies – an English supplier of rolling stock and electro-mechanical equipment;
- NCC AB – a Swedish construction company;
- SIAB AB – a Swedish construction company;
- Svenska Kraftbyggarna Entreprenad AB – a Swedish construction company;
- John Mowlem Group companies – an English construction group.

In 2004 the consortium sold its shares to the Australian investment company Macquarie Group Limited. The name A-Train is still used and the contract relations with the Swedish government have not changed. Macquarie is listed in Australia and is a global provider of banking, financial, advisory, investment and funds management services. Macquarie is also the owner of transport nodes and links in other countries. Community assets contribute approximately 13% of the total underlying operating income. (Macquarie (b)) The Macquarie European Infrastructure Funds (MEIF) manages the Arlanda rail link. The majority investors in these funds (the market is shared by different European funds) are public/industry and corporate pension funds. (Macquarie (c))

The A-Banan Projekt AB was, and still is, the company representing the government's side of the agreement. The state owned company has two employees and a board with government

³ This report is not found in the national rail administration or state archive

representatives. From the beginning the shares were half owned by the national rail administration and half by the civil aviation administration. Today the ministry of industry owns all the shares. (Wiwen-Nilsson 1995 p93)

Pre-construction phase

In the summer of 1993 the government delegation DELFIN started a procurement process for the route between Rosersberg and Arlanda including stations. After the summer the delegation sent a report to the government. Some of the questions raised by the delegation were also considered by the Swedish parliament and answers were given in a government bill (Prop. 1993/94:39). The general outline of the bill was that:

- a collaboration in funding between state and private capital should be tried out, in which the private interest would be given the right to operate the Arlanda rail link and in certain extents the four tracks between Stockholm central station and Rosersberg;
- a state-owned company should be formed for further procurement and for handling coordination of the complete project from Rosersberg to Arlanda. (Prop. 1993/94:39).

In order to attract and persuade foreign companies and to avoid political lobbying the procurement was delegated to a group of people outside the political arena, working directly under the department of communication. This group (DELFIN, eventually A-Banan Projekt AB) was also given the right to choose the preferred bidder. The group was headed by two senior industrialists and the American investment bank Solomon Brothers through its London office in order to assure the project's feasibility and that it would be bankable. The delegation was also there to assure that the procurement was objective, fair and transparent. (Wiwen-Nilsson 1995 p94)

The Government was concerned that the procurement should be transparent, international, on equal terms and that the project should include as much private participation as possible. To avoid public intervention in the form of financial subsidies or other financial support the government designed clauses regulating the scope for participation in the bidding by public entities such as the Swedish state railways and the Stockholm Public Transport Company. The clauses limited the participation of public entities to a maximum of 20% of the bidding consortia regarding justness participation, voting control and restricted the scope for public entities to indirectly support the project with public money through sharing in losses. (Wiwen-Nilsson 1995 pp93)

Four consortia were invited to the tender, which was decided by an evaluation group from the national rail administration and the civic aviation administration. One was the Arlanda Link Consortium (ALC), which was later awarded the contract. After the competition the large construction company NCC joined the ALC. The leader of the consortium at the time of application was GEC Alstom Ltd, and other members were SIAB AB, Svenska Kraftbyggarna Entreprenad AB and John Mowlem Construction plc. Technical advisers were BAA International, Swedrail, Tyréns Infrakonsult, Steer Davies Gleave, Progo, White Coordinator and Scandiakonsult. Nordbanken and Barclay de Zoete Wedd were financial advisers and the law firm Lindahl were legal advisers. (RRV 1995 p10p)

At the end of 1993 A-Banan Projekt AB became accountable for the public procurement and coordination of state interests. The contracting entity was named Arlanda Rights Company (ARC). The company was activated on 1 January 1994 and was owned equally by the National Rail Administration and the Civil Aviation Administration. Instead of hiring people to join the company, a range of consultant companies were used. Solomon Brothers became financial adviser and had the main responsibility for evaluation. The law firm Mannheimer Swartling was contracted as legal consultant. For technical support and evaluation of

tenders a group from the National Rail Administration and the Civil Aviation Administration was formed. (RRV 1995)

Construction phase

The Swedish consortium (ATAB with Skanska and SJ) had great support from private domestic capital and Swedish politicians. The Arlanda rail link procurement was the first in Sweden that officially actually wanted to give the contract to the most beneficial bidder and not to national agents. When it became clear that a foreign consortium (ALC) was chosen as the preferred bidder, opposition was mobilized among politicians and national businessmen. There were debates in newspapers but nothing strong enough to affect the work in progress.

The agreement consists of about 40 sub-agreements involving some 20 parties. In ten of the agreements, the government is directly or indirectly involved. The most important of these ten agreements are:

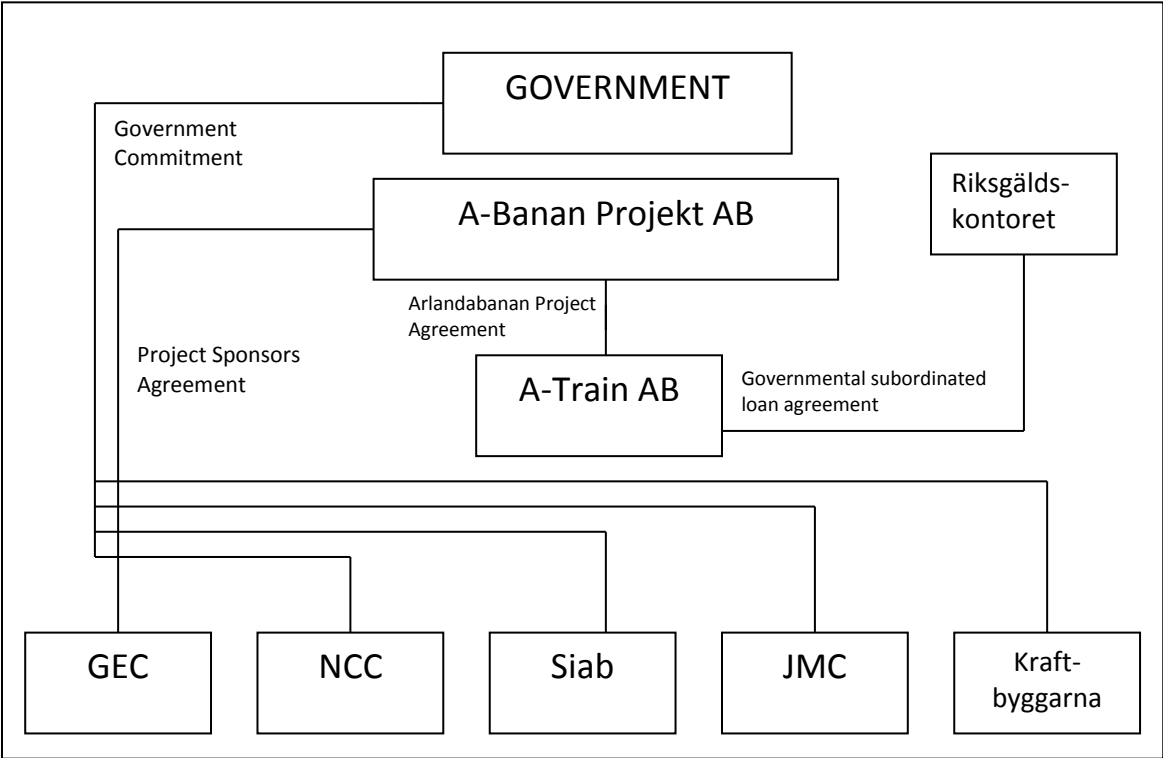
- Arlandabanan Project Agreement;
- Agreement between ARC and A-Train;
- Arlandabanan Project Sponsors Agreement;
- A sponsors' agreement between the state-owned company and the winning consortium;
- Arlandabanan subordinated government loan agreement;
- Agreement between the consortium and the government regulating the conditional loan provided by the government;
- Arlandabanan government commitment;
- Agreement between winning consortium and government regulating the responsibilities (RRV 1995).

ALC was the contractor and financier of the Arlanda rail link. When the construction was completed in 1999, the railway was transferred to A-Banan Projekt AB. In exchange ALC (A-Train since the start of operation) was given a monopoly in using the railway for the next 45 years to refund their investment. All the incomes from ticket sales go to ALC as long as they maintain the operation of the railway. From 2010 the agreement can be terminated if ALC is considered not to fulfil its commitment. (Arlandabanan Infrastructures 2009b)

The national rail administration was in charge of the extension from two to four tracks on the route near Stockholm, between Ulriksdal and Rosersberg. The winning consortium Arlanda Link Consortium (ALC), managed the distance between Rosersberg and Arlanda, the actual Arlanda rail link, since August 1994. The consortium consisted of the Swedish companies NCC, Siab and Vattenfall and the British companies Mowlem and GEC Alstom. NCC and Siab managed all construction and design including aerial lines, Mowlem delivered tracks and switches and Alstom the trains, signal- and telesystems. (Arlanda Express 2009) The consortium formed a new company, A-Train AB, to enable the roles of constructor and operator until the year 2040. (Arlandabanan Infrastructures 2009b)

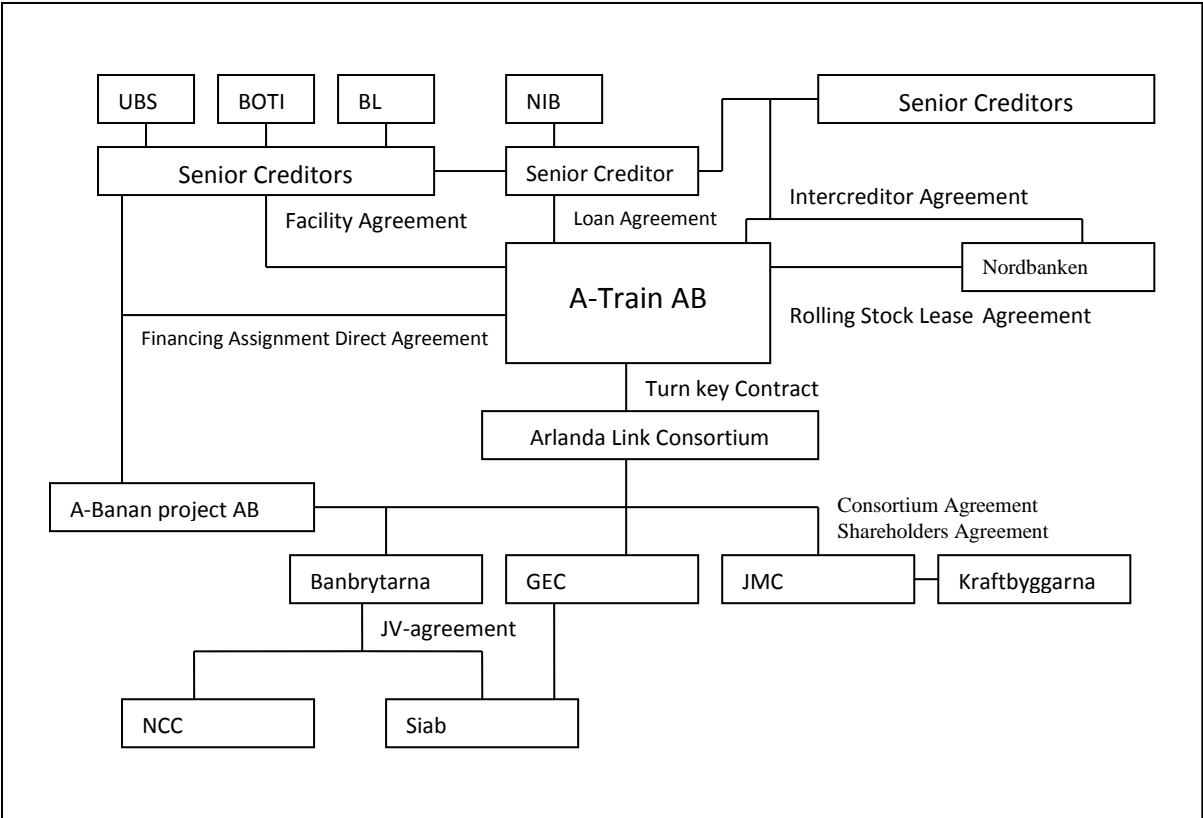
The state railways had to give two tracks away to the consortium and the national rail and aviation administrations had to cooperate in the forthcoming planning. This relationship was established in A-Banan Projekt, which was owned equally by both administrations.

Figure 3: Arlanda rail link Contractual Structure – Arlanda rail link agreements



Source: Wiwen-Nilsson 1995 p. 101

Figure 4: Arlandabanan Contractual Structure II



Source: Wiwen-Nilsson 1995 p. 102

Operation phase

The Arlanda rail link project is owned and managed by Arlandabanan Infrastructures AB (previously A-Banan Projekt AB). The government offices hold 100% of the shares, which imposes upon Arlandabanan Infrastructures AB a responsibility to follow and obey state duties and rights (Arlandabanan Infrastructures 2009a).

A-Train is obliged due to the agreement with the state to run and manage the railway. The agreement concerns the transport of passengers to and from Arlanda airport. A-Train has the right and obligation to let other train companies use the railway for a non-discriminatory fee (Arlandabanan Infrastructures 2009b). The BOT solution requires a high level of competence in setting the legal framework. Due to the many sub agreements there is a high risk of civil cases during the operation phase.

Macquarie European Infrastructure Fund purchased A-Train in 2004 (Arlandabanan Infrastructures 2009b). All shares in A-Train and the debt of SEK 400m were included in the deal. Estimations have been made that the original consortium had made a loss of SEK 200m by the time of selling (Nilsson et.al 2008). Macquarie is an Australian investment group with a focus on infrastructure objects in Europe and other OECD countries. The year after the change of ownership, 2005, was the first year with a positive result.

Planning Regime

Current European Union legislation concerning public procurement was imposed on 1 January 1994. The act does not apply to projects initiated before that time; therefore the Arlanda rail link project is not covered by the act. The project was however affected by Swedish rules and regulations on procurement. There were also planning and building regulations to consider. These were, at the time, not very articulated or complicated to consider. Neither was there a separate environmental code to consider as today.

The planning process began in the mid-1980s when a railway to Arlanda (the biggest airport in the country) was identified as being of national concern. In the early 1990s the flight market was deregulated and all domestic flights were redirected from Bromma airport to Arlanda airport, which already had international and freight flights. Due to the forecast increase in the number of passengers at Arlanda, a third runway was planned. In the permission to construct the runway, the environmental effects were regulated through an emissions cap. In addition it was stipulated that a rail connection to Arlanda from Stockholm should be established (RiR 2004:22).

The planning to adjust to the new environmental demands embraced all traffic and vehicular modes. This is not generally the case in Sweden where the different modes of transportation have their own department. In the planning for the Arlanda rail link it was mainly the civil aviation administration and the national rail administration that were involved but also the national road administration. The initiator of the project was the national rail administration but their involvement in the planning process became more limited when the public-private partnership (PPP) solution was decided. An alternative form of financing was initially intended: the rail administration suggested that the aviation administration could charge an airport fee for every flight passenger, a small amount of money included in all flight ticket prices, which were originally planned to fund the Arlanda rail link. The aviation administration was not very fond of the suggestion and it never became more than an idea in the planning stage (Interview B4; Interview B10).

Another new aspect of the environmental cap for the airport was that it included ground transport. When it became clear that it was not possible to do anything about the emissions

of flight activities the only way to meet increased environmental demands seemed to be to include transport to and from the airport.

The BOT-solution was the first of its kind in Sweden. The new government wanted to do something new, to show that it was possible to attract private capital to former state-based investments in infrastructure. The Arlanda rail link was, and still is, the only planning process carried out at department level. The Department of Communication was in charge of procurement even though it did not start from scratch. The rail administration did the initial planning and consulted the municipality (Sigtuna) affected by the plan. Because of the new form of procurement there was no expertise or adviser within the state organisation. Therefore the delegation was headed by people recruited from Saab, a company where more advanced forms of procurement were common. The delegation also included State secretaries from each of the four government parties (Interview B6; Interview B14; RiR 2004:22).

Outline of planning legislation/policy related to the project and its associated developments

In many ways the project became a test of the legal framework and led to the formation of new sets of rules and regulations. Because of its unique character, even detailed decisions were made directly by the government. This is also why the delegation included representatives from all parties that formed the government. In this way, all the parties could be well informed and the decision process could be speeded up when reaching government.

In principle, land-use planning in Sweden is a municipal responsibility. Municipalities have a so-called 'planning monopoly' (*planmonopol*) that gives them legal authority to decide on land-use planning in their geographical area. Every municipality is required to have a general (comprehensive) plan, in which the use of and intentions for land and water are described. These intentions are not legally binding in the general plan, but become so when they are further worked out in a detailed plan. The role of the state is to supervise the municipalities in fulfilling the comprehensive national objectives (Nyström 2003 p57). This procedure had to be followed for the Arlanda rail link. Before the planning landed at the Department for Communications, a plan had been produced by the national rail administration in co-operation with the municipality of Sigtuna. Arlanda airport is situated in the municipality of Sigtuna but the land is owned by the aviation administration, which historically had been given a large degree of freedom in planning the area. Before the planning process was taken over by central level, the municipality had already approved the plan prepared by the rail administration.

During the following planning process the rail administration was used as a reference authority and they also made sure it complied with the current planning legislation (Interview B4).

Environmental statements and outcomes related to the project

Environmental statements concerning the Arlanda rail link are dependent on assumptions of the growth in numbers of passengers. If the number of passengers increases, it is reasonable to believe that they take the train instead of cars or taxis. Therefore a growth in passengers for A-Train is desirable. An obstacle to a larger passenger-base is the price of tickets, which has been argued to be too high. This gives buses to Arlanda a greater share of the market. A-Train produces detailed statistics on emissions related to its enterprise and is very proud to market its business as environmentally friendly.

The main effects on the environment are reductions in road traffic when passengers shift from taxis, buses and private cars to the train. This was also one of the rationales (both

rhetorical and real) present at the time of planning. The airport had a high local density of emissions because of its character as a traffic hub.

The reduction in road traffic has not been as high as expected or wished for. The aviation administration have worked out new policies for reducing emissions since the Arlanda rail link has not produced a satisfying decrease in ground bound transport. In 2006 the level of emissions from aeroplanes was 2.66m tonnes carbon dioxide equivalents and the level of emissions from road traffic was 18.5m tonnes (Press release LFV 2008).

In 2008 19% of employees went to their workplace at Arlanda airport by train, 20% by bus and 55% by private car. About 19% of flight passengers went by bus, 26% by train and 5% by private car or taxi (Arlanda - utsläpp till luft 2008). The environmental work now is mostly directed to mode of transportation and level of emissions from vehicles travelling to the airport. Clean taxi vehicles have better located parking lots than ordinary cars, and today they represent 43% of the taxis stopping at the airport. All buses owned by the administration are run on biogas and the administration actively works with improving the availability of buses and trains (www-arlanda.se).

Another problem identified by the aviation administration is that there are no goods going by train to the airport due to security. Rail bound transportations go to a wharf station where they repack to trucks (Press release LFV 2008).

Overview of public consultation

The government's role in the procurement came to be defined out of the condition that Swedish law at the time did not provide any special consideration to construct and operate a railway or operate railway traffic. Railways had not been built for a long time and the legal structure had therefore not developed. The Arlanda rail link was the first project in need of a legal structure in modern time and since then a separate law on railways has been practised.

In the Swedish planning process there are many opportunities for appealing or openly discussing the content of a new plan. The plans have to be exhibited publicly before a final decision can be made. The public consultation is not only an opportunity to speak your mind, it is also a legal right to have your opinion investigated and formally responded to. The Arlanda rail link was not only the first railway project for a long time, it was also the first PPP. The ordinary planning process had to be set aside in favour of business interests. The public consultation was restricted to the planning process before the procurement was finished. After the procurement the planning process became closed to those outside the working group and the consortium. Legal outlines for a new PPP have not been drawn because of the lack of interest in this kind of projects within the government. Discussions about the extent of public consultation and critiques of the process being undemocratic would arise again if the same form of procurement were used for another project.

Regeneration

No specific figures have been presented on jobs created by the project but it is considered that the airport is one of the region's biggest workplaces. The new connection is also said to have led to many smaller airports around the country cancelling their activities, at least in terms of domestic flights. When it became possible to go by train to Arlanda airport, smaller airports were quickly driven out of the market (Interview B2). If new stations are planned along commuting routes operated by Stockholm public transport, surrounding areas will be affected. Today real estate prices are mapped to investigate how those areas can be exploited. Real estate prices are expected to increase and more capital intensive inhabitants expected to move closer to a fast connection with the airport (Interview B5).

Archaeology and heritage

The archaeological investigation was publicly procured and was awarded to the National Heritage Board. In 1991 an archaeological investigation was made for the northern part of the Arlanda Link Project, Rosersberg-Arlanda-Knivsta. The area was a corridor, 20km long and 200m wide. The investigation registered several relics of antiquities such as single graves, graveyards, stone rows, systems of stone rows, ancient strongholds and settlement relics (www.raa.se). The archaeological investigation was paid for by the government and had to be finished in a shorter period of time than usual because of the time limits (Interview B10).

A description of complaints procedures

See 'overview of public consultation'.

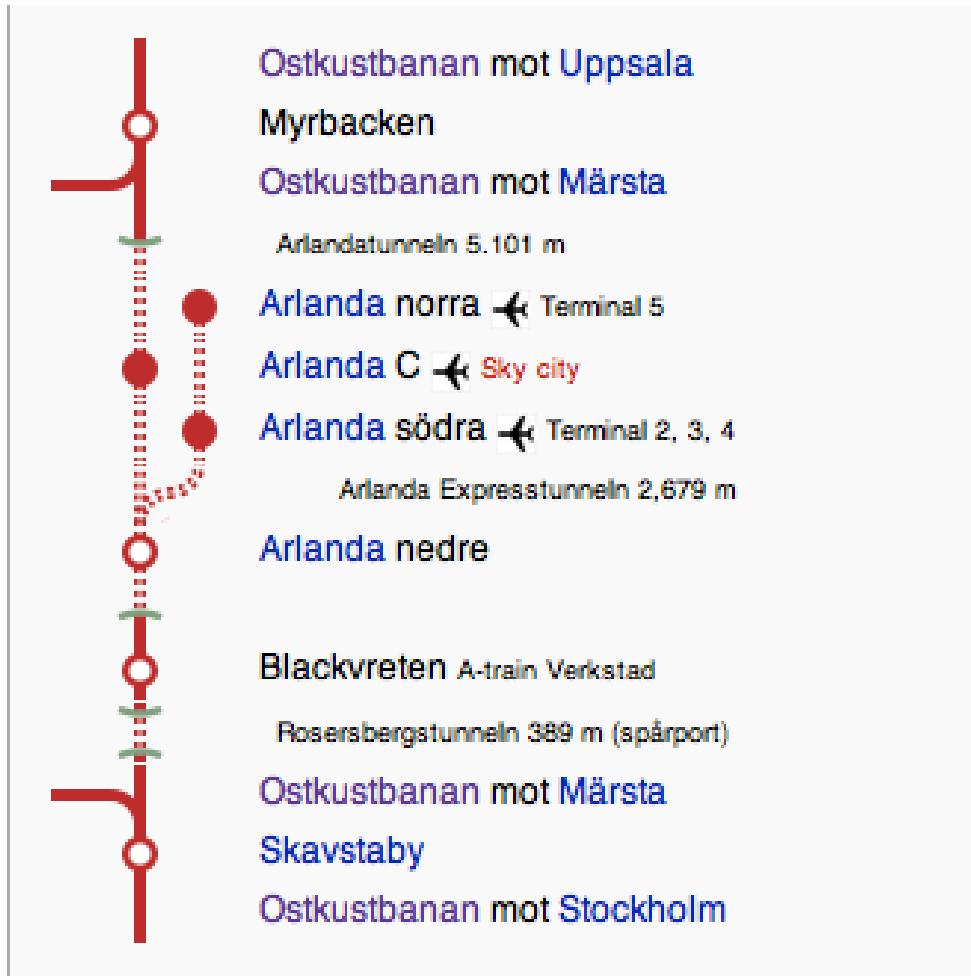
Land acquisition

The land was reserved in the general plan produced in the early 1980s when a railway connection was first considered as a future project. The airport area is owned by the civil administration, and the land where the rail connects from the main trunk line by the municipality of Stockholm and Sigtuna. Private land owners had been consulted by the time the national rail administration held in the project. There were no complications on this topic because of the nature of the land in need. The rail tracks do not cross or connect to built-up areas and the area reserved had been intact since the general plan.

C PRINCIPAL PROJECT CHARACTERISTICS

Detailed descriptions of route

Figure 5: The Arlanda rail link and other connections



Source: authors

Arlanda airport is situated in the municipality of Sigtuna between the cities of Stockholm and Uppsala. A 75km double track rail line connects Stockholm and Uppsala. This old line passes Arlanda airport and is, at its closest, 3km from the airport. Therefore bus shuttles were the only option for public transport. Buses still have a large market share of transport to the airport. From Stockholm central station this is a 42km ride (Nilsson et.al. 2008 p78).

To enable the new rail link, upgrading of the main trunk line between Stockholm Central Station and Rosersberg (Figure 5, section A) was required. With state funding, the railway was extended from double tracks to four tracks. The extension was necessary to make the investment in the Arlanda rail link attractive to private actors.

The section linking the main trunk line with the airport is the core of the BOT project. This is the section called the Arlanda rail link (Figure 5, section B). This section also includes the underground stations at the airport. The rail line north of the airport connecting to the main line by Myrbacken is called the North Bend and is funded outside the agreement with state money (Figure 5, section C) (Nilsson 2008 p78).

Detailed description of main and intermediate travel nodes

Planning context

The airport is situated in the municipality of Sigtuna and parts of the railway in Stockholm. Therefore those two municipalities have a monopoly on planning according to Swedish planning law.

Proposed development

When the planning process for the Arlanda rail link started, Arlanda airport was by far the dominant airport in the Stockholm region. Today (2009) there are three large airports in the region. Bromma airport has domestic flights again and also some international flights. Skavsta airport was built in response to the cheaper flights that entered the market after deregulation.

The motorway between Arlanda airport and Stockholm city centre has been upgraded and the capacity for private cars is now higher than in the early 1990s. The national aviation administration has expanded parking spaces at the airport (Nilsson et.al 2008 p85).

Discussions about further integration of the Arlanda rail link with the general rail network are still held.

Project costs

The decision in 1994 made direct references to the cost benefit analysis in the initial report by the National Rail Administration. The benefits were said to be timesaving, ticket revenues, lower emissions and reduced congestion, and it was estimated that those benefits exceeded the costs. It was also estimated that ticket revenues by themselves could not reach the balance. To make the rail link more integrated with the national rail network, it was decided that the North Bend should be built with public money. The section was not considered to be of commercial interest for private investors (Nilsson et.al 2008 p81).

In 1995 The Swedish state provided a subsidy to A-Train AB of SEK 850m for the project and gave a stipulated loan of SEK 1bn (<http://www.abanan.se> (a)).

Since the project has been partly funded by private money, only an expected cost can be provided. Officially this sum is set to about SEK 6bn at 1992 prices. This number includes costs for sections A, B and C and leasing of rolling stock. Out of this, the consortium had a calculated cost of SEK 2.6bn including the SEK 1bn stipulated loans. The cost estimations made afterwards show that the costs for section B and C are similar to the ex-ante calculations. Section A, funded by the National Rail Administration, had an overrun of about 25%. The overrun can (Nilsson et al, 2008) be explained by uncertainties regarding whether the connection to the main line was included in cost estimations made before construction. For section C there are no specifications for costs. Considering the sum the consortium was given to construct section C at the same time as they were constructing section B can provide the basis of estimation. A further uncertainty is that the stations discussed during the early planning process were not the same solutions as the ones A-Train chose (Nilsson et.al 2008 p83).

What can be said on the final cost is that the consortium's part of the agreement was set to SEK 2.7bn. Of those, SEK 1bn was the guaranteed loan and SEK 1.1bn loans from banks. Share capital was SEK 400m and partners lent SEK 200m to A-Train. The rolling stock is leased for about SEK 700m (guaranteed by the government). So far, the government have

not had any extra costs due to cost overruns. According to an article written by amongst others one of the project's initiators, the conclusion is that the need to raise tax revenues or sell bonds is now reduced by 1.7bn SEK in return for the project's opening ahead of schedule. Also, the guaranteed loan can be claimed if the receipts rise, even though it is a high risk for the government because of the low priority in A-Train's loan portfolio (Nilsson et.al 2008 p83).

Table 1: Ex ante and ex post costs for the Arlanda rail link project (in SEK bn, year of estimate)

Section	Ex ante (1992)	Ex post (1999)
A	1.9	2.4
B	2.6	2.7
C	0.85	0.85
Rolling stock	0.6	0.85

Source: Nilsson et.al 2008 p83

All previous evaluations of the Arlanda rail link project that have tried to present the total project costs have not been given access to any figures from A-Train. It is also complicated to present a correct picture of financing because of different definitions of the outlines of the project.

Predicted costs in year project gained parliamentary consent against actual costs

This is a calculation by the consortium, and has not been published.

Timeline of project cost estimates

1991	15 August. The government allows SEK 200m from the new appropriation to a first stage of the extension of the railway between Ulriksdal and Rosersberg.
1993	A decision according to government bill (prop. 1993/94:39) that half of the stakes will be held by the National Rail Administration, the other half by Luftfartsverket.
1994	7 April. The government subsidises by SEK 850m the construction of the North Bend and a guarantee loan to the opposite private party of maximum SEK 1bn the government's agreement to vouch for half of the cost of connecting sections A and B to the main line by Rosersberg and Odensala.

Main engineering features

Engineering: detailed statistics of engineering projects

The complete project of Arlanda rail link:

- 400,000m³ of soil were excavated;
- 100,000m³ of railway bank were filled;
- 820,000m³ of rock were excavated;
- 300,000m³ of track ballast were laid down;
- 29 switches were installed and 8,660m of tunnel were blasted;
- three stations were built under Arlanda Airport;
- 21 artificial buildings (such as bridges and concrete tunnels) were constructed. (www.arlandaexpress.com (b))

The tunnel:

The shuttle project demanded 8,000 metres of tunnelling. Three different kinds of tunnels were excavated: single track of 54-65m²; double track of 95-105m²; and station potholes of up to 9.5m by 23m (218m²). The span of the tunnels is 23m and the rock cover less than 10m from the terminal's foundation. Some of the terminal pillars carried a mass of over 1,000 tons (S.I 1997 p4).

From the start of construction in November 1995 to July 1997, 1,385 tons of explosives and 350,000 units of detonators were used (S.I 1997 p20).

Drilling equipment:

- Site 1 Atlas Copco Boomer H175;
- Site 2 Atlas Copco Rocket Boomer 353ES-1838;
- Site 3 Atlas Copco Rocket Boomer 353ES-1838;
Tamrock Superdrilling Jumbo 316G;
Tamrock Robolt 306;
- Site 4 Atlas Copco Rocket Boomer 353ES-1838;

The average drilling speed at Site 3 with the Atlas Copco equipment was 3metres/min. This was when the rocks consisted of mica schist, gneiss and biotite. The ensemble pulled off about 200-225 drill metres/hour on average (S.I 1997 p.8).

Blast hole drilling data:

- 2,020,000 meters drilled;
- 48mm diameter blast holes size;
- 100 holes per 60 m² (S.I 1997 p.8);

Number and types of major civil engineering contracts and number of contractors working on each contract

The tunnels:

Main Contractors

- Banbrytarna;
- NCC;
- Siab.

Subcontractors

- Nitro Consult;
- AB DYNO;
- Dyno Nobel;
- Besab;
- Fogden AB;
- Vattenfall Hydropower;
- Modern Betongteknologi;
- MBT International Underground Construction Group;
- Master Builders Technologies;
- Tibnor Industrivaruhus;
- Pumpex;
- Byggs Sprutbetong AB;
- Atlas Copco;

- Secorock;
- Hedins Hjulgrävmaskiner.

Stockholm Central station:

Reconstruction of platform

- Berg Arkitektkontor AB.

(Source: S.I 1997)

Key facts and figures

Rock tunnels under the airport terminal were considered the most difficult part of the construction. From the rock excavation when the airport was built the foundation had come to consist of mica schist with a low strength. Cavities had been filled with clay and mica. The mica schist is very layered and problems with hole deviation were solved with the use of cross bits, which normally gives straighter holes. Outside the airport area the rock mainly consists of granodiorite of good quality.

D PROJECT TIMELINE

Type of decision

Year	Month	Type of decision/event	Key Decision/Event.
1988	January	Project Initiation	Political decision on investment in railway network for the next ten years. Railway to Arlanda is considered important for national growth.
		Project Initiation	The Government orders the National Rail Administration to study how funding could be accomplished outside the national budget. Demand for construction to start in 1991 and for the public sector to be free of risks.
1989	August	Project Initiation	The recently formed National Rail Administration introduces the Arlanda rail link project in the three years plan delivered to the government.
	November	Financing	The National Rail Administration prepares a complete scheme for funding the project.
1990		Appraisal	The National Rail Administration finishes the task and concludes that a railway to Arlanda will be economically profitable for the public and that the societal benefits will exceed the costs of between SEK 4.3bn and SEK 4.7bn (net. value 2004). All the funding alternatives required state subsidies. The National Rail Administration concluded that it was not possible to finance the project through traffic fees alone. The total costs of the project were set at SEK 5.2bn. Furthermore, a third runway at Arlanda Airport was considered essential to secure the increase in passengers.
1991		Negotiation	The Government assembles a delegation for negotiating agreements.
	15 November	Financing	While waiting for the final decision on funding, the government puts SEK 200m into a first development of the rail between Ulriksdal and Rosersberg. This is seen as cutting the first sod for the Arlanda rail link.
	15 November	Political Decision	The government decides to agree on a third runway at Arlanda Airport provided that a rail link is established.
		Political Decision	General election – the new conservative congress approves the investment plan including state subsidies.
1992	13 March	Financing	The government allows an additional SEK 550m to develop the line haul between Stockholm and Rosersberg. In all, the expansion from double track to four lane tracks had been allowed SEK 750bn from the national budget.
		Financing	The delegation hires an American consultant company, Solomon Brothers, to investigate if and how the Arlanda rail link could be run and funded under private management.
	December	Financing	The Solomon Brothers present the feasibility of a PPP, suggesting subsidies should be for individual passengers and that all airport buses should be stopped in order to attract private risk capital into the project.
	December	Political decision	The same day that the Solomon Brothers report is presented the delegation suggests the government goes ahead with a semi-funded development of the tracks from Stockholm and Rosersberg, and that private management and funding are eligible for Rosersberg to Arlanda, the railway station at Arlanda and the reconstruction of Stockholm central station.

Year	Month	Type of decision/event	Key Decision/Event.
	December	Project Initiation	The Arlanda rail link project is divided into three parts in order to improve the market conditions for private capital. This results in a greater share of external funding.
	December	Financing	The decision is made to finance the double tracks ongoing extension from Stockholm to Rosersberg solely through government money. The section between Rosenberg and Arlanda should preferably be under private management. The decision is made to delay construction of a railway between Arlanda and Odensala (the North Bend) until a national economic analysis has been made.
1992		Appraisal	The National Rail Administration concludes in the national economic report that it would be most profitable to construct a new rail line between Arlanda and Odensala. The North Bend is not investigated despite being questioned.
1993	January	Negotiation	The government mostly supports the delegation's suggestion of a split project. The delegation can now start negotiating with interested parties about the line between Rosenberg and Arlanda including the railway station at Arlanda and the reconstruction of Stockholm central station.
	April	Appraisal	A report by the National Rail Administration compares the North Bend with alternative lines where passengers would get off the train at Häggvik, Sollentuna or Märsta, changing to another mode of conveyance or another train. The report is from a national economic perspective.
	June	Project initiation	The delegation starts the procurement process for Rosersberg-Arlanda. About 30 parties from Sweden and abroad show interest in constructing and managing the railway and stations. The delegation chooses four consortia to submit a final bid before 15 February 1994.
	September	Alignment	The delegation writes an official letter to the government with questions they think need political support.
	October	Financing/ Political Decision	The government answers (prop. 1993/94:39) that co-funding between the public and private sectors should be tested, where the private consortium is given the right to manage the link including the part funded by public money.
	October	Administration	A state-owned company is founded to take the procurement further and to coordinate the whole project. The delegation is dismissed.
	1994	January	Administration
February		Financing	By the deadline for final bids, two consortia have noted preliminary tenders for a contract. Both required a government stipulated loan of SEK 2bn.
February		Other	A-Banan Projekt evaluates the bids and realises that none can meet the technical requirements.
March		Alignment	A-Banan Projekt writes an official letter to the government in which basic principles are suggested.
April		Political Decision	The government agrees on suggestions. (prop. 1993/94:213)
May		Financing	A-Banan Projekt AB invites the two consortia to submit revised bids before 7 June. The content of the procurement was changed in order to change the conditions for the government stipulated loan.

Year	Month	Type of decision/event	Key Decision/Event.
	8 June	Political Decision	The government approves the basic principles and the contractors' rights and duties are specified in four agreements.
	21 June	Financing	The American investment bank Solomon Brothers evaluates the revised bids. They conclude that Arlanda Link Consortium (ALC) has the best bid.
	6 July	Other	A-Banan Projekt receives a revised bid from ALC.
	6 July	Planning Approval	The board of A-Banan Projekt selects ALC as the Preferred Bidder.
	September	Planning Approval	A-Banan Projekt chooses ALC and approves the agreements.
	9 November	Political Decision	The government approves the agreement concerning the Arlanda rail link.
	22 December	Negotiation	The new government summons a group to conduct negotiations within the agreement on coordinated and integrated train services.
1999	November	Implementation	Construction of the Arlanda rail link is completed and it is ready to operate.
2003	October	Evaluation	<i>Riksrevisionsverket</i> (the national audit office) decides that an investigation of the PPP contract for the link is required. The investigation will study whether the government and public authorities are in charge of the PPP, if it is in compliance with the decision by the Parliament and if the Parliament has received the information it needs to monitor the development of the project.
2004		Other	Macquarie buys A-Train via the MEIF-fund for SEK 400m.

(Sources: RiR 2004; Prop. 1987/88:50; Prop. 1990/91:87 ; Prop. 1992/93:176 ; Prop. 1993/94: 39 ; Prop. 1993/94:213; SOU 1995: 25 ; RRV 1995 ; Arlanda Express 2009)

E PROJECT FUNDING/FINANCING

Introduction

The Arlanda rail link was the first infrastructure PPP in Sweden with a BOT (Build Operate Transfer) solution. In order to make the project possible, public revenue and a circulation of passengers that made the business management profitable were required. The BOT arrangement was a way for the government to avoid financing the project via the government budget. Instead, a private company implements and funds the construction. After the construction the project is handed over to public ownership. In return the constructor gets the complete rights to operate the project for a certain time.

Background to funding/financing

From the early planning stages in the late 1980s, the Arlanda rail link was decided to be a project funded by as much private capital as possible. After several suggestions on arrangements for financing, an agreement was reached on a BOT solution. Today this means that the Arlanda rail link is owned by the Swedish state but that a private actor has a monopoly in operating the railway.

The BOT model implies an agreement that the construction is funded by private capital, in this case A-Train. When the link was ready for operation, all the stationary inventories were handed over to the state, through its company A-Banan Projekt AB. In exchange A-Train was given monopoly use of the railway for 45 years. The agreement guarantees A-Train all the incomes from the shuttle passengers. In addition, A-Train has the right to charge other train companies for using the Arlanda rail link. This means that the only securities the granter of loans have are the number of passengers and the revenue from ticket sales (RiR 2004 p13p). Because of this risk, the government was willing to give the entrepreneur a stipulated loan to avoid doubt from investors. The refund is dependent on the profits made by the managing company.

The conditional loan is at the bottom of A-Train's loan portfolio, above share capital. The repayment is therefore not expected until towards the end of the 45-year period. By then, the total sum could even be greater than the loan if A-Train has managed to repay other higher priority loans. The size of the stipulated loan was decided in a bargaining process and was a trade-off with the grade of monopoly control that A-Train received. If, for example a reduction in bus services to Arlanda airport had been imposed (as A-train wished), the loan would have been smaller (Nilsson et.al 2008 p82).

Before the collaboration between the government and the consortium a state-owned company was formed. A-Banan Projekt AB (later Arlandabanan Infrastructures) chose its partner in business following the preferred bidder principles. The winning consortium joined in a company called A-Train. A-Train was required by law to plan, finance and construct the Arlanda rail link, manage the activities when operating and be responsible for the maintenance and renewal of the construction.

The total project cost was estimated to be some SEK 4.5bn. Within this estimation the government was supposed to contribute SEK 850m for construction of the North Bend. In addition, the conditioned loan from the government of SEK 1bn was provided. The difference between this type of loan and a traditional one is that it is not tied to a fixed rate of interest. Instead, the government is entitled to a proportion of the company's returns. This means that if the operating business is doing well, revenues for the government will also increase. For this type of loan, the best outcome that can be expected for the public

economy is that the operating company will do so well that the loan can be paid back with a good rate of interest (RRV 1995 p10).

Revenue forecasts and actual revenue

Three prognoses on the effects on public welfare were made before the start of construction. They are presented separately and in chronological order below. At the end of the chapter the actual revenues are discussed, as well as the prognosis in relation to the outcome. The discussion in this chapter is based largely on a report by the Swedish National Audit Office (RRV 2000).

- The National Rail Administration 1990

The first cost-benefit analysis (CBA) by the National Rail Administration in 1990 showed that the nominal cost for the project would run to SEK 5.2bn and that it would generate net revenue of SEK 4.2bn-4.7bn. Behind those numbers were assumptions that ticket prices would be the same for the train as for airport buses. In a sensitivity analysis on the impact of ticket prices, it was concluded that if the price for taking the train were higher than the bus, smaller bus companies would be established with even lower ticket prices. If so, this would affect the number of passengers taking the train (RRV 2000 p7). In the prognosis, no comparisons were made between the new railway and, for example, an expansion of bus traffic, even though there was already an existing road network and a working infrastructure of buses going to and from the airport from different destinations (RRV 2000 pp10).

The CBA showed that the investment would be profitable (Table 2).

Table 2: Cost estimate from the National Rail Administration novel report in SEK bn (present value) (60 years, 5% and prices of 1990).

Construction	-5.12
Rolling material	-0.88
Variable costs	-1.43
Time profits	-4.34
Ticket receipts	5.09
Environmental benefits	0-0.7
Total	2.06/2.76
Benefit-cost ratio (BCR)	0.4/0.54

Source: authors

The surplus from traffic (SEK 5.09bn-0.88bn = SEK 4.21bn) is, according to the first prognosis, not enough to cover the costs of construction (SEK 5.12bn). It was estimated that the main benefits would go to passengers in terms of time savings. This was the sole reason that the project could be considered to be publicly motivated in terms of its benefits in the first inquiry (VTI 2004 p6).

- The Solomon Brothers 1992

The report of the Solomon Brothers has been widely criticised by audits examining the project on behalf of the government (RRV 2000). The main purpose of the report was to evaluate the size of state subsidies in order to create a successful PPP. In the report there is no actual analysis of public welfare, instead subsidies are calculated based on private investors' demand for returns. The need for financial support is listed as 'Government

Revenues from the Project' but no social benefits are included, nor are any alternative uses of the money in a tax income calculation. The audit office could not find any post in the report with significance for the economics. From a business management point of view, the report of the Solomon Brothers is however far more satisfying than the first prognosis by the National Rail Administration. This one contributed the suggestion to split the project into two parts (RRV 2000 pp15).

- The National Rail Administration - The North Bend 1993

The second report by the national rail administration examined different alternatives for a railway connection for passengers travelling towards or from the north of Arlanda airport. It was not an aim of the report to consider whether the connection should be constructed or if it was economically justifiable. Three alternatives were compared which were all very large investments. All three demanded investment in tracks and stations, and the winning concept was therefore decided to be the one that minimised time used by passengers. Since a business-as-usual alternative did not exist (that is not to invest in a new rail track), benefits for passengers were only presented as a comparison between the three alternatives. The benefits alone are never shown. Because of this, it is not possible to compare the different options from a public welfare point of view. It is also not possible to assess whether the North Bend was beneficial for public finances. The North Bend that fell under public investment was examined in terms of public welfare. The southern part, constructed with private capital, was not examined in those terms at all (RRV 2000 p15pp).

- Actual revenues

In its report, the Swedish National Audit Office compared the actual revenues from the Arlanda rail link with the prognosis mentioned above (RRV 2000). It concluded that no actual estimations had been made of whether the project would involve a cost to public welfare or what the revenues would be before the project started. The National Rail Administration based the decisions on the first prognosis but according to the National Audit Office this calculation was not appropriate for the circumstances and the actual outcome of the project. The critique is therefore that the investigations that the decision was based on were mainly about business economic profits. After the project had finished a renewed analysis of revenues was requested. This has not been done and there has been no examination of the decisions or investigations made before the start of construction.

Later on in the project, when it was notable that ticket prices were going to be higher than those of buses, no revised analysis of the consequences for public finances was made. In all three prognoses a price level equivalent to that of buses was a prerequisite for the analysis. The train service therefore became directed to those passengers willing to pay a higher price, and not to everybody. Because of this it became clear that the market would be divided between the train and buses (RRV 2000 p13).

Since the prognoses were based on a different type of project than the actual project, it is not possible to make justifiable comparisons.

Table 3: Revenues and costs for A-train (in SEK m)

	Revenue	Operation costs	Financial costs	Result	Equity net of accumulated deficit
2002	341	305	86	-50	105
2003	359	310	100	-51	140*
2004	402	315	155	-68	72
2005	440	298	134	9	80
2006	469	338	127	4	84

Source: Nilsson et.al 2008 p87

* SEK 85m was added as own capital by owners.

Financing costs forecasts and actual financing costs

The point of departure for the construction of the railway was that as much as possible, and certainly the greatest part, ought to be funded by private interests. To create a more attractive investment the Arlanda rail link project was split into two parts. The state financed the extension of the double tracks from Stockholm to Rosersberg. The remaining part, from Rosersberg to Arlanda and the connection north of Arlanda to the trunk main line near Odensala became a collaboration project between the state and the privately owned consortium A-Train.

Below, the different costs forecasts are presented separately and in chronological order. Four forecasts were made, including the final decision by the government showing the foundation for the project. The actual costs are related to the forecasts and discussed from the perspective that a different project from the one planned was constructed.

When the agreement was made in June 1994 the parliament decided that the state itself should finance the North Bend (Section C) and at least half of the costs for connecting links B and C to the main line. The consortium agreed to contribute at least SEK 0.6bn or 15% of the total project cost in the form of share capital or loans. They also agreed to raise at least 75% of the total costs for section B on commercial terms (Nilsson et.al 2008 pp81). The remaining construction costs were provided by the stipulated loan from the government that was a part of the basis of the procurement.

Additional costs in case of new laws, archaeological discoveries etc. would be paid by the government. The consortium bore the entire market risk concerning passenger numbers. They also took on the risks of construction cost and unexpected increases in operation costs.

- The National Rail Administration 1990

The investment plan of the National Rail Administration covered the section Stockholm central station – Ulriksdal – Rosersberg – Arlanda station – Knivsta. The required investments are shown in Table 4. As mentioned above, the National Rail Administration did not examine options other than a new railway.

Table 4: Estimated costs made by the National Rail Administration. Numbers in SEK m

Stockholm Central – Karlberg	550
Ulriksdal – Rosersberg Extension of main line	1,750
New station between Stockholm and Arlanda	800
Two tracks to Arlanda	950
Station under Arlanda airport	1,400
Connection to trunk main line	600
Total estimated costs	6,050

Source: VTI 2004 p.6.

- Solomon Brothers 1992

The report by the Solomon Brothers in 1992 suggested three alternatives, one of which introduced the suggestion to split the project into two parts.

Case 1) The entire distance Rosersberg – Odensala via Arlanda airport is built as one project with one station solution underground at a total cost of $(1.172+1.27+1.06=)$ SEK 3.51bn.

Case 2a) $(1.472+1.021+0.847=)$ SEK 3.342bn. Three underground stations and one project.

Case 2b) Project in two phases:

- Phase 1: The route between Rosersberg – Arlanda with two suburban train stations over ground, one elevated between terminals 1 and 2, and one elevated by the international flights terminal, to a total cost of $(1.07+0.251=)$ SEK 1.321bn.
- Phase 2: A rail between Arlanda – Odensala and one intercity station underground, with connecting tracks from the point where phase 1 ends. The estimated total cost $(0.847+0.763=)$ SEK 1.61bn. The price tag for both phases amounted to SEK 2.931bn (VTI 2004 p7).

The report by the Solomon Brothers compared the differences in cost between an underground station at Arlanda airport and one at surface level. The conclusion was that if the station was situated underground the price would increase by about SEK 1bn without any positive outcomes in either service or revenues (for the business economy). The report is focused on the railway as the only option. No comparisons are made with other options such as buses.

- Solomon Brothers #2 1992

In 1992 the Solomon Brothers presented a second report studying the financial feasibility for the Arlanda rail link project. The aim was to investigate whether a PPP solution was appropriate. Furthermore, it was an estimation of how big the subsidies would have to be to make the project feasible. The calculations are based on the private investors' demand for returns.

- Government Bill 1993/94:213

Cost estimations used as a budget frame (ex-ante) are identified as being shown in the decision by the government in a bill from 1993 (prop. 1993/94:213). Referring to the national audits report the calculations have to be supplemented by the earlier investigations mentioned above.

Table 5: Cost estimations for the Arlanda rail link project in the Government Bill (prop. 1993/94:213). Numbers in SEK bn.

	Estimated cost (year)
Rosersberg-Arlanda	1.474 (1992)
Station at Arlanda	1.021 (1992)
Measures at Stockholm Central	0.1 (1992)
The North Bend	0.85 (1992)
Rolling Material	0.593 (1992) – 0.68(1990)
Four-tracks Stockholm Central-Ulriksdal	?
Four-tracks Ulriksdal-Rosersberg	1.9 (1992)
Connection Rosersberg/Odensala including Land costs	?
Total	5.938 – 6.025

Source: VTI 2004 p.13.

It is not clear whether this is the project budget for the Arlanda rail link. The measures on the main line are also beneficial for other routes using those tracks. In plans for infrastructure it is also not very common to include rolling material. If we exclude these elements the estimated cost for the Arlanda rail link between Rosersberg and Arlanda is SEK 3.4bn. This calculation is based on measures carried out only for travellers going to or from Arlanda airport (VTI 2004 p13).

- Actual costs

Comparing the actual cost to the proposed costs is problematic due to the differences between plans and the product. The total costs for the completed project are about SEK 6bn including costs for rolling material; if this is excluded, the cost is about SEK 5.4bn (VTI 2004 p12).

The cost of connecting the Arlanda rail link with the trunk line and the costs for land use were estimated in 2001 to be SEK 540m. The total cost goes up to at least SEK 6.8bn. If only the costs that only benefit travellers to and from Arlanda airport are included, the total costs run up to SEK 4.1bn, excluding trains.

Table 6: Actual costs for the Arlanda rail link (in SEK bn)

	Outcome (year)
Rosersberg-Arlanda	2.683 (1999)
Stations at Arlanda	
Measures at Stockholm Central	
The North Bend	0.85 (1999)
Rolling material	0.838(1999-2000)
Four-tracks Ulriksdal-Rosersberg	1.9 (2001)
Connection Rosersberg/Odensala and land costs	0.54 (2001)
Four-tracks Stockholm Central-Ulriksdal	?
Total	6.811

Source: VTI 2004 p.14

The construction was to a considerable degree financed by the Swedish state. The National Debt Office, the Swedish Export credit and the Nordic Investment Bank accounted for SEK 1.8bn of the total SEK 2.2bn that A-Train borrowed from other sources than its owners in 2003. In addition, SEK 120m (20%) was ventured in A-Train's joint stock by the state-owned company Vattenfall (Committee for Traffic 2004).

The total cost of the construction is estimated to be about SEK 6bn. Of this, SEK 2.4m was public capital and SEK 4.1m capital generated from the PPP.

Table 7: The financial structure for A-Train (the PPP-part). Numbers in SEK bn

Subsidies	State subsidy	0.85
Loans	Stipulated loan from government	1
	Nordic Investment Bank (1)	0.3
	Nordic Investment Bank (2)	0.2
	Bank consortium (1995)	0.503
	Bank consortium (1999)	0.484
	Financing of leased trains	0.726
Owner stakes	Risk capital by owners	0.4
	Loan company owners	0.2
Total		4.16

Source: RiR 2004 p.9.

Overview of key stages in funding approach

The Arlanda rail link is co-financed between a private consortium and the government. The private consortium paid for (parts of) sections B and C (see Table 5) and when the construction was completed, the ownership was given to the state-owned company A-Banan Projekt AB. In return, the private consortium was given sole right to run train services on the rail link for a 45-year period.

The Minister of Communication was criticised because he pushed the agreement with the private investors just a couple of weeks before the general election in 1994. The criticism concerned the very beneficial terms and conditions for the private consortium (Dagens Nyheter 071002).

Traffic forecasts and financing/funding response

The number of travellers at Arlanda airport has a great impact on the number of people using the airport shuttle. In the following chapter both prognosis and actual outcomes of the number of travellers at the airport and at the shuttle are shown.

- Transek and the freight council (1990)

The traffic forecast by the consultant company Transek and the Swedish national freight council was the first to be produced in the plans for the Arlanda rail link. The forecast, presented in 1990, formed the basis for the near-term reports from other companies and national councils. The prognosis on which the final decision is based (by the consultant

company Halcrow Fox) is, according to the Research Institute for Roads and Freight (VTI) no longer available (VTI 2004 p24).

Transek firstly estimated the number of flight passengers to and from Arlanda airport. This estimation formed a foundation for the rest of the analysis concerning passenger behaviour when travelling to and from the airport. Before this, a general prognosis had been made by Luftfartsverket (the civic aviation administration) on domestic and international aviation in the year 2000 (RRV Report 2000/01:5 p10).

The prognosis by Transek forecast that the annual increase in flight passengers would, as a direct outcome of the new shuttle, be 1.4m.

Table 8: Comparison of prognosis (by Transek) and actual outcome of number of flight passengers to Arlanda airport

Year	Prognosis; number of flight passengers (m)		Outcome
	Without Train to Arlanda airport	With	
1988			10.8
1998			16.1
1999			17.1
2000	20.2	21.6	18.3
2001			18.1
2002			16.4
2003			15.1
2004			16.3
2005			17.1
2020	31.5	33.5	

Source: VTI 2004 p25; Nilsson et.al 2008 p85

For the year of the opening of the Arlanda rail link (2000), the estimations were more than 3m higher than the actual outcome. The investment in the Arlanda rail link is therefore based on a 10-20% overvalued estimation.

In 2001, the aviation administration published a new prognosis on air traffic.

Table 9: The Swedish Civil Aviation Administration's prognosis for flights in Sweden 2000 and actual outcome 1999 (in thousands)

	LFV, min	LFV, mid	LFV, max	Outcome (1999)
Domestic	12,500	15,000	19,000	7,188
International	12,600	14,800	16,600	14,614
Total	25,100	29,800	35,600	21,802

Source: RRV 2000 p11

Table 10: The prognosis ordered for the Arlanda rail link investigation for flights to and from Arlanda airport 2000, and actual outcome 1999 (in thousands)

	Transek & Freight council	Outcome (1999)
Domestic	10,000	6,424
International	10,200	10,705
Total	20,200	17,129

Source: RRV 2000 p.11.

Both of the prognoses above were used as a basis for decisions on the Arlanda rail link as well as on the third runway (which in money terms is a bigger investment than the new tracks).

The analysis shows that 6.7m passengers were estimated to use the Arlanda shuttle in the projected year of opening (1996). This amount required, according to the report, eleven sets of trains (VTI 2004 p6).

- The National Rail Administration 1990

The National Rail Administration showed in 1990 that without the investment in the railway system road traffic would double over a 25-year period. If the investment was made the number of cars would remain the same as when the report was written over the same period. This statement was drawn from the conclusion that airport bus services would be non-existent once the new railway began operating. The reduction in airport buses would compensate for the increasing number of cars (RRV 2000 p10).

- Solomon Brothers 1992

The estimation was that the market share for the airport shuttle would increase to 6% of the total travelling from greater Stockholm. This share was expected to grow and from 2002 onward would reach 22%. Furthermore, the Solomon Brothers' forecast estimated the total number of travellers at Arlanda airport to be 18.2m people per year in 1990 with an annual increase of 4.3% to 2005, when the number would be 21.5m people. The number of people using the airport shuttle was then calculated to be $(21.5 \times 0.22 =) 4.7$ m people (VTI 2004 p7).

- Halcrow Fox (1993)

The government based its decision on a report by the consultant company Halcrow Fox. The report included a development prognosis on travelling, with the result that the number of passengers on the airport shuttle was to be 5.1m in the year 2005 and 7.4m in the year 2020. Most of the passengers were expected to transfer from the airport buses. The report also excluded the alternative with a station between Stockholm and Arlanda; this station would only have a marginal effect of some 100,000 additional passengers (VTI 2004 p5).

Funding sources

Table 11: Funding sources for the Arlanda rail link

Source:	
Sponsors' Equity	SEK 0.6bn
Government Grant	SEK 0.85bn
Government Subordinated Loan	SEK 1bn
Union Bank of Switzerland, Bayerische landesbank and Bank of Tokyo	SEK 1bn
Nordic Investment Bank	SEK 0.3bn
Nordbanken Finans	SEK 1.025bn (lease of rolling stock)

Source: Wiwen-Nilsson 1995 p92.

Comments on financing/funding

The Swedish National Audit Office has conducted a general examination of the risks the government has taken in the Arlanda rail link project, with a particular focus on the ownership model after its establishment.

For the development near Arlanda airport the public has paid SEK 540m for connections to the trunk line and has additionally given a subsidy of SEK 850m to construct the North Bend. Following the proportion 25/75, according to the final decision, the private risk capital should be SEK 2.7bn of the total cost (SEK 4.7bn). But, besides the government investment mentioned above, the government also gave a stipulated loan of SEK 1bn, which means that no private party carried any risks for this part. The Swedish Research Institute for Road and Freight (VTI) concludes that private risk capital has financed about $(1.7/4.1=)$ 40% of the costs for the infrastructure. Besides this the consortium paid for the trains – but the government stands for the leasing. (VTI 2004 p15)

Another element in the agreement that puts the owner of the risks in another light is that A-Train has the right to postpone payments for renting Stockholm central station and Arlanda airport during the first seven years of operation. The value of this interest-free debt will, after seven years, amount to SEK 90m. Another arrangement is that the state has a duty and a right to transfer six trains from A-Train, if the company does not fulfil its duties, the bank Nordea leases these trains. The arrangement can be seen as a financial security for the consortium (RiR 2004 p9).

The forecasts on the cost for construction showed that the total consumption of resources would be between SEK 3.4bn and SEK 4.1bn to construct the distance Rosersberg-Arlanda-Odensala. The actual outcome was between SEK 4.1bn and SEK 4.9bn. The costs were thus underestimated by 20%. This difference would decrease if inflation is counted. The inflation in Sweden was, however, very low during this time so the effect would not have influenced the outcome much. It is not certain if the total project would have been cheaper if the National Rail Administration had implemented it. It is however worth considering due to the great underestimations made on the actual cost and the total amount of money the public economy contributed to the project.

One objective for the Arlanda rail link was that the public economy would be released from a great investment if a private partner were included in the business agreement.

Due to the recession in the economy in the early 1990s, inflation was low during the time of construction. Because of the recession it would be expected that lots of savings were made

compared to a project constructed in times with higher demands for industrial capacity (Nilsson et.al pp82).

The political decision in 1994 to fund the railway partly with private money was based on the CBA made by the National Rail Administration in 1990. The project that was constructed was not the same as in the report by the National Rail Administration. Supposedly, because of strict time limits, the CBA that had been made was used in the belief that the numbers and positive outcome were still valid (Nilsson et.al 2008 p88).

F OPERATIONS

Traffic volume

Part of the agreement was that A-Train is committed to run at least four trains per hour between 6am and 11pm. A-Train has, according to the contract, the right to operate six time-slots per hour on the main line (Nilsson et.al 2008 p82).

During the preparation before the Parliament decision in 1991, both the National Rail Administration and the Government had made prognoses of the growth in passengers using the Arlanda rail link.

Table 12: Prognosis of number of travellers on the Arlanda rail link

Year	Prognosis on number of passengers (BV 1990)	Prognosis on number of passengers (prop. 1993:94:213)	Actual outcome, number of passengers	Relative increase from previous year	Relative increase since 2000	Expected increase related to 2000 (BV 1990)
2000	6,800,000		2,100,000			
2001			2,900,000	38%	38%	
2002	7,200,000		2,750,000	- 5%	30%	5%
2003			2,550,000	- 7%	21%	
2005	7,600,000	5,100,000				12%
2020	10,200,000	7,400,000				50%

Source: RiR 2004:22 p. 55.

As the table above shows, the overestimation of passenger numbers in the initial operating phase is of great significance in the prognosis by the National Rail Administration. Even if the actual outcome is closer to the decision (prop. 1993/94:213) the overestimates are still high. One basis for the report by the National Rail Administration in 1990 was that ticket prices for trains and buses would be the same. During operation, it has transpired that the ticket prices for the train are twice as high as for the bus. International disasters such as 11 September and the SARS disease in 2001 have generally affected the number of flight passengers. These are factors that are nearly impossible to capture in a prognosis. Another expectation was that the number of flight passengers at Arlanda would increase by 1.4m in the first year as a direct result of the shuttle (RiR 2004:22 p55).

In the report by the National Rail Administration, it was estimated that the train would drive the buses out of the market. Because of the big differences in price, however, there are today two types of public transport directed to different target groups. Because of the high price profile of the Arlanda Express, even taxis and private cars can be competitive.

Since 2006, commuting trains from Uppsala northwards stop at Arlanda airport. In agreement with the commuting trains company in Stockholm (SL) they also stop at one of the train stations in the system for Stockholm trains.

Table 13: Number of passengers with Arlanda Express

	Passengers	Employees	Total	Official forecast	Consortium forecast
2000	1,700,000	400,000	2,100,000		
2001	2,500,000	400,000	2,900,000		
2002	2,400,000	350,000	2,750,000		
2003	2,200,000	350,000	2,550,000		
2004	2,456,000	365,000	2,865,000		
2005	2,635,000	388,000	3,023,000	5,100,000	4,000,000*
2020				7,400,000	

Source: SOU 1995:25 p40; Nilsson et.al 2008 p86.

Traffic predictions by mode

Table 14: Market shares for different modes of transportations to Arlanda airport

	1999	2001	2003
Arlanda Express	-	19	19
Other trains	-	4	5
Airport buses Stockholm	24	14	13
Airport buses Uppsala	-	2	2
Other buses	-	4	4
Taxi	23	22	21
Car	35	35	35
Other	10	3	4
No response	8	-	0.2

Source: RiR 2004 p59.

Formulation of traffic forecasts

A-Banan Projekt has not been given any responsibility by the government to reach any particular goals on traffic. There are no compulsory results in any regulation for the company to show annually. The company has on its own decided that it should make efforts to develop train traffic at Arlanda airport and that the shuttle should have a competitive function in transport. The National Rail Administration and the Civil Aviation Administration are the responsible administrations for following up and reporting in relation to the political goals for the transport sector in total. In their assignments there are no obligations to follow up on specific projects (RiR 2004:22 28).

During the period from 1988 to 1994, when the Swedish Parliament made decisions on constructing a connecting railway to Arlanda airport, the overall political goal on traffic was to "offer the citizens and the economy in different parts of Sweden satisfying, safe and environmental friendly traffic maintenance to the least possible public cost" (Prop. 1992/93:176). Since the decision in 1998 on political goals for traffic, it is formulated as "to safe a public economy efficiency and a long-term provision of transportations for citizens and economy in the whole country" (Motion 2008/09:T220). According to the formulation in 1988 the revenues for public economy were of great importance for policies on traffic. When the Parliament agreed on the Arlanda rail link project proposal from the Government in 1991 one of the conclusions was that the project was favourable for the public economy. The

investment would generate economic growth as well as environmental gains, due to reduced levels of car and bus traffic. In a 1992 Government Bill (prop. 1992/93:176) the investment was motivated as an “important project because of several reasons. Not at least environmental issues speak for a well functioned and safe solution for problems in traffic between the capital and the airport” (RiR 2004:22 p51).

Of great importance is the development in travelling according to political goals. No explicit numbers that can be connected to the new railway connections are to be found in the pre-construction phase. In the goal formulation the Arlanda rail link was thought to contribute to a more efficient local, regional and national railway system, but there are no specific expectations on the development (RiR 2004:22 p.223).

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