

**Papua New Guinea: Transportable Air Traffic Control Tower, Airport Equipment I and II**

**Ex post evaluation report**

<b>OECD sector</b>	21050 / Aviation		
<b>BMZ project ID</b>	1)	1994 66 343	
	2)	1997 65 934	
	3)	1999 66 094	
<b>Project executing agency</b>	1-3) Office of Civil Aviation, now Civil Aviation Authority		
<b>Consultant</b>	1)	Weidleplan, Klaus Maraun (individual expert)	
	2-3)	Klaus Maraun (individual expert)	
<b>Year of ex post evaluation</b>			
		<b>Project appraisal (planned)</b>	<b>Ex post evaluation (actual)</b>
<b>Start of implementation</b>	1)	1st quarter 1995	1) 2nd quarter 2000
	2)	2nd quarter 1998	2) 3rd quarter 1998
	3)	1st quarter 2000	3) 3rd quarter 2002
<b>Period of implementation</b>	1)	9 months	1) 28 months
	2)	16 months	2) 53 months
	3)	22 months	3) 39 months
<b>Investment costs</b>	1)	EUR 1.28 million	1) EUR 1.90 million
	2)	EUR 4.01 million	2) EUR 4.01 million
	3)	EUR 3.83 million	3) EUR 3.18 million
<b>Counterpart contribution</b>	1)	EUR 0.00 million	1) EUR 0.28 million
	2)	EUR 0.43 million	2) EUR 0.43 million
	3)	EUR 0.77 million	3) EUR 0.03 million
<b>Financing, of which Financial Cooperation (FC) funds</b>	1)	EUR 1.28 million	1) EUR 1.62 million*
	2)	EUR 3.58 million	2) EUR 3.58 million
	3)	EUR 3.06 million	3) EUR 3.15 million**
<b>Other institutions/donors involved</b>	AUSaid		AUSaid
<b>Performance rating</b>	1)	3	
	2)	4	
	3)	3	
<b>• Significance/relevance</b>	1 and 3)	3	
	2)	4	
<b>• Effectiveness</b>	1 and 3)	3	
	2)	4	
<b>• Efficiency</b>	1 and 3)	3	
	2)	4	

\*Of which EUR 112,000 from residual funds from the project Airport Equipment I and EUR 234,000 from the Studies and Experts Fund

\*\* Of which EUR 90,000 from the Studies and Experts Fund

### **Brief description, overall objective and project objectives with indicators**

The project Transportable Air Traffic Control Tower comprised the delivery and installation of a transportable air traffic control tower in Papua New Guinea (PNG). It was installed at the alternative airport of Tokua on the island of New Britain (1997) after a volcanic eruption had destroyed the regular airport at Rabaul (1994). A new airport was constructed in Tokua with Japanese development cooperation funds. After completion in 1999 the ATC was installed at the Goroka Airport (Papua New Guinea mainland). The original overall objective of the project was to contribute to connecting the region around Rabaul and Goroka safely to Papua New Guinea's air transport network (indicator: 70 flights per day at Rabaul and 60 at Goroka). The original project objective was to achieve smooth communication between the airport and aircraft in the region around Goroka (indicator: equipment functionality of at least 95%).

The projects Airport Equipment Phases II and III comprised the procurement and installation of navigation, communication and runway lighting systems as well as emergency generators for a total of 10 airports in Papua New Guinea. The original overall objective was to improve air safety in selected airspace segments (no indicator). The project objective was to improve air safety in the directly affected airspace around the newly equipped airports, particularly during take-offs and landings (indicator: at least 95% functionality (Phase II) and 90% functionality (Phase III)).

In the target systems of the projects Airport Equipment II and III the overall objective is largely identical to the project objective. The target systems of all three projects are no longer state of the art. From today's perspective, the developmentally relevant impacts of the project consist in contributing to economic growth and to improving the living conditions of the population (modified overall objective) by bringing about an improvement in air traffic (improved air safety). The modified project objective consisted in improving their safety through the utilisation of the FC-financed equipment. The indicator for the achievement of the project objective was to be the functionality of the equipment as well as changes in the number of flight accidents and incidents. As the air traffic control tower project can be considered an emergency project as established in the project appraisal, the rapid entry into operation of the FC-financed measures is also to be considered an essential criterion for success.

### **Project design / major deviations from the original project planning and their main causes**

The delivery and installation of the equipment for the project Transportable Air Traffic Control Tower, including power supply and communications systems, were largely in line with the planning. The result was the installation of a functioning ATC tower at the Tokua airport. Delays caused by the government of Papua New Guinea in the conclusion of the loan agreement as well as delays in the rendering of the counterpart contributions by the executing agency prolonged the implementation considerably. The ATC tower did not go into operation until mid-1997 (planned date: autumn 1995). After the expansion of the Tokua airport in 1999, which was financed from Japanese development cooperation funds, the ATC tower was no longer needed here. As its removal to the Goroka airport was substantially delayed it did not go to operation there again until autumn of 2002.

Measures planned under the project Airport Equipment II included primarily the renewal of ultra shortwave transmitting and receiving equipment at four major airports (Nadzab, Madang, Mt. Hagen and Wewak) and the renewal of ultra shortwave radio equipment at up to six remote stations. The programme measures were considerably changed during implementation. They were complemented by a new satellite-based component (VSAT) for more cost-efficient and reliable communication between the airports, which had been communicating through the unreliable public telephone network. VSAT installations were set up at the airports of Nadzab,

Madang, Mt. Hagen, Tokua, Goroka and Port Moresby. They can be operated and monitored centrally from Port Moresby. With the inclusion of the VSAT component the investment costs increased so much that the measures originally planned at the Wewak airport and the remote stations could not be implemented.

Under the project Airport Equipment III different investments in equipment were planned in up to eight airports (renewal of the emergency generators, replacement of approach path indicators, and renewal of runway lighting systems, among others).

Significant deviations from the original planning occurred during the course of implementation. These deviations affected primarily the precision approach path indicators, which were implemented without the originally planned, costly full renewal of the runway lighting system. Complementing Phase II, voice communication control systems for ground-to-air and ground-to-ground communication, VSAT and meteo equipment were installed at three airports.

The main focus of the projects was the delivery and installation of the technical equipment that was financed. The executing agency, the Civil Aviation Authority (CAA), was supported by a consultant financed from FC funds in the planning, tendering and evaluation of the bids. The supply contracts included training in equipment operation for the executing agency's operating personnel. The project was considerably overdue as a result of delays in the conclusion of the loan agreement caused by the government of PNG as well as delays in the rendering of the counterpart contributions. In addition, lengthy negotiations over the nature and scope of the equipment to be financed from FC funds led to a substantial prolongation of the implementation periods of the projects Airport Equipment II and III. This circumstance as well as extensive modifications in the equipment financed required a considerably more comprehensive consulting assignment.

### **Key results of the impact analysis and performance rating**

The measures financed from FC funds focused primarily on eliminating specific deficits that impaired air safety at individual airports, and they created the necessary technical capacities. Their utilisation differs greatly depending on the component. The ATC tower, for instance, is still being used at the Goroko airport. Because of the reduced air traffic here (fewer than 30 flights per day), the CAA plans to discontinue operating a manned ATC. Even in unmanned operation, however, important technical air traffic control installations would be used to control runway lighting and the omnidirectional radio beacon. The operating situation of the equipment installed under the projects Airport Equipment II and III varies greatly depending on the type of equipment. The VHF radio equipment generally posed the fewest problems. These are comparatively well-built devices which are fitted with backup modules. The technical acceptance of the precision approach path indicators installed under the project Airport Equipment III took place at the end of 2005. Initially they were not put to use because of problems involving internal acceptance by the executing agency. The executing agency reported in August 2006 that the PAPI equipment had been transferred to the operative Department in the meantime and was being used. A serious operating deficit accumulated in the area of satellite-based communications equipment (VSAT), which accounted for a major share of the equipment financed under the project Airport Equipment II (55%) that went into operation at the end of 2002. As the executing agency failed to pay the corresponding transponder fees the operation of this equipment was suspended in 2005. Ever since, communication between airports has been through the relatively unreliable network provided by the public telecommunications company which is designed only for voice transmission but not for modern data transmission. The executing agency informed us recently that it has now paid the outstanding fees and has commenced negotiations with a satellite operator. We have not yet received any information as to whether the financed VSAT equipment is back in operation.

What has negatively impacted the achievement of the modified overall objective is that the number of domestic air passengers has declined noticeably against the level prevailing in the early 1990s (1993: 1.24 million; 2004: 0.62 million). It appears plausible that the projects contributed to improving air safety, so that a further safety-related decline in air travel could be avoided. The projects contribute to improving the social living conditions of the population by enabling NGOs to use air transport to bring teachers and healthcare workers to remote areas.

The ex post evaluation revealed that the executing agency was having considerable problems operating the installations properly. One of the main causes was the lack of spare parts and funds for maintenance. Insufficient budgets sometimes prevented specialised maintenance personnel from flying into remote areas from the executing agency's headquarters in Port Moresby. What should positively affect future operation is the revenue situation of the executing agency, which has improved significantly in the last two years. Considerable deficits remain in the area of upkeep and maintenance. However, the executing agency now has sufficient funds to prevent the maintenance situation from deteriorating further. Besides, it has an interest in preventing air transport declining and air traffic fees dropping sharply as a consequence of inadequate flight safety.

The micro-economic effects of the projects Air Traffic Control Tower and Airport Equipment Phases II and III consist in the installation of modern systems to replace old maintenance-intensive and costly equipment (Airport Equipment Phases II and III) and infrastructure destroyed by natural disasters (air traffic control tower). As no site-specific operating and maintenance costs were established for existing old equipment at the time of the project appraisal and no detailed operating and maintenance costs are available from the CAA for the new equipment, the cost savings at the micro-economic level cannot be ascertained. Some of the financed equipment (PAPI) went into operation only after considerable delays and other equipment (VSAT) was not operational at times, so the cost savings actually achieved at the project level thus far are lower than was expected at the time of project appraisal. It is not possible to quantify the overall economic effects of the project, which were mainly expected to consist in improvements to flight safety in specific parts of the airspace of PNG. No model calculations were made to ascertain the economic benefit of the project at the time of project appraisal. Flight safety in PNG overall also depends to a significant degree on the investments made by other donors active in the aviation sector. The isolated contribution which the projects financed from FC funds have made to improve safety in air traffic cannot be ascertained.

A differentiated assessment must be made of the overall economic impacts which improvements in air transport have on the economic and social development of PNG. As PNG does not have an adequate road network to connect the country's main economic centres and towns, air transport has a fundamentally greater importance for development here than in other countries. However, the number of passengers on domestic flights has declined since the time the project was appraised. For most export goods air cargo is not an economically sound alternative as the high transport costs would make them uncompetitive internationally. On the other hand, part of the air cargo (such as spare parts and radio equipment) is particularly important for the economy and for supplying remote areas, and this represents a positive impact. High passenger fares permit only a small and relatively wealthy part of the population to use air travel regularly. There are no national government programmes with any significant social effect of which air travel would be an integral part, such as in education or health care. NGOs use air transport in the context of their cooperation, thereby benefiting poorer groups of the population as well. In 2005 the NGO Mission Aviation Fellowship airlifted around 12,000 people on important social assignments (health workers, teachers, missionaries) and performed around 1000 ambulance flights. Air transport benefits poorer groups of the population indirectly, for instance through business travel which increases local economic activity. In terms of quantity, however, these impacts are likely to depend heavily on flight intensity. Other positive impacts of air travel consist in government representatives and high officials using air transport

between the provinces and the capital city, thereby contributing towards the integration of Papua New Guinea.

The projects had no direct potential for improving gender equality. No measures were carried out that would have had any positive impact in this field. The projects did not pursue the goal of improving governance or participation. Nor did the projects intend to improve the environmental situation. No significant adverse impacts occurred during the course of implementation. The projects were not specifically designed to improve the economic and social situation of poor groups of the population. Air transport does have an indirect impact on poverty reduction, however, in that it is being used by NGOs, thereby improving the delivery of social services.

We rate the developmental effectiveness of the project as follows:

Effectiveness: The objective of the project Transportable Air Traffic Control Tower was to enable smooth communication between the alternative airport at Tokua and the approaching aircraft (the main airport at Rabaul had been destroyed by a volcano eruption). The FC-financed equipment was scheduled to be available on a short-term basis and long before the completion of the airport expansion, which was financed from Japanese development cooperation funds. Instead, the tower at Tokua ended up being in operation for only about two years as a result of the substantial delays in implementation. It was transferred to the airport of Goroka with considerable delay (entry into operation in August 2002; scheduled for 1998). The equipment is still in acceptable technical condition, but it is being used less intensely than planned as a result of declining air traffic. In the medium term the CAA plans to put an end to manned flight control at the Goroka airport. Important control tower equipment would still be needed then, however. The CAA's spare parts supply is inadequate. Considering the CAA's improved financial situation we consider the risks to sustainability to be acceptable. We rate the effectiveness of the project Transportable Air Traffic Control Tower as sufficient (sub-rating: rating 3). The objective of the projects Airport Equipment II and III was to increase flight safety in the airspace immediately surrounding the airports equipped under the projects. In relation to the financed equipment, the project objectives have been achieved to very varying degrees. The ultra shortwave radio equipment financed under Project II (financing share around 25%) is being used appropriately. The financed satellite-based communication equipment (VSAT, financing share 55%), which was fully installed at the end of 2002, has not been in operation since early 2005 because the executing agency failed to pay the fee required for operation to the satellite operator. This payment is said to have occurred in August 2006. However, a contract with a new satellite operator has not yet been concluded. Of the four years the equipment has been in place, it lay idle for 1.5 years. Consequently, we regard the project objectives as not having been sufficiently met (sub-rating 4). The PAPI financed under Project III (financing share 67%) were said by the executing agency to have gone into operation in August. Considering the substantially improved financial situation of the executing agency, we regard the risks to sustainable operation as still acceptable and rate the effectiveness as sufficient (sub-rating 3).

Relevance/significance: In accordance with the modified target system, the developmentally relevant impact of the projects at the level of the overall objectives is that an improvement in air travel (mostly through an increase in flight safety) contributes to improving the living conditions of the population. The hypothesis on the project impacts (relevance) must be qualified in that the majority of the population benefits from air transport only indirectly. Under the project Airport Equipment II it must additionally be taken into account that the contribution of the projects to the improvement of flight safety is significantly lower than planned as a major part of the financed equipment was operated only for a limited period of time. The project also has limited significance in the sense that the importance of air transport has declined noticeably as measured by the number of domestic air passengers. As a result, air transport is also likely to have become less significant for economic development. Although there are no state-sponsored social programmes that would make intensive use of air transport, NGOs use air transport and

contribute to improving the social situation of the population by airlifting teachers and health workers to regions where they are needed. We rate the overall relevance/significance of the projects Transportable Air Traffic Control Tower and Airport Equipment III as sufficient (sub-rating 3) and of the project Airport Equipment Phase II as slightly insufficient (sub-rating 4).

Efficiency: An aspect which we have rated negative with a view to production efficiency was the significant increase in consulting costs (projects Airport Equipment II and III). The fact that major portions of the FC-financed investments (VSAT equipment) have only been operated over a limited period of time had an unfavourable impact on the allocation efficiency of the project Airport Equipment II. We rate the efficiency of the projects Transportable Air Traffic Control Tower and Airport Equipment III as sufficient (sub-rating 3) and that of the project Airport Equipment Phase II as slightly insufficient (sub-rating 4).

In summary, we rate the developmental efficacy of the projects Transportable Air Traffic Control Tower and Airport Equipment III as sufficient (sub-rating 3) and that of the project Airport Equipment Phase II as slightly insufficient (sub-rating 4).

### General conclusions and recommendations

Particularly in the case of serial projects, a continuing, critical analysis of the economic, technical and organisational capacities of the executing agency should be performed for each phase. Clear benchmarks should be defined which the executing agency must achieve in the relevant project phase before disbursements are made in ensuing phases.

As transport projects in the aviation sector are relatively expensive on the micro-economic level, a particularly thorough assessment should be made as to whether they meet the necessary preconditions for enabling a sufficient portion of the poor population to benefit from their economic and social impacts. This should mainly include indirect impacts, which should be assessed in appropriate detail at the time of project appraisal and determined in terms of quantities where possible (baseline survey).

### Assessment criteria

Developmentally successful: Ratings 1 to 3	
Rating 1	<b>Very high or high degree of developmental effectiveness</b>
Rating 2	<b>Satisfactory developmental effectiveness</b>
Rating 3	<b>Overall sufficient degree of developmental effectiveness</b>
Developmental failures: Ratings 4 to 6	
Rating 4	<b>Overall slightly insufficient degree of developmental effectiveness</b>
Rating 5	<b>Clearly insufficient degree of developmental effectiveness</b>
Rating 6	<b>The project is a total failure</b>

### Criteria for the Evaluation of Project Success

The evaluation of the "developmental effectiveness" of a project and its classification during the ex-post evaluation into one of the various levels of success described in more detail below concentrate on the following fundamental questions:

- Are the **project objectives** reached to a sufficient degree (aspect of project **effectiveness**)?
- Does the project generate sufficient **significant developmental effects** (project **relevance** and **significance** measured by the achievement of the overall development-policy objective defined beforehand and its effects in political, institutional, socio-economic and socio-cultural as well as ecological terms)?
- Are the **funds/expenses** that were and are being employed/incurred to reach the objectives **appropriate** and how can the project's microeconomic and macroeconomic impact be measured (aspect of **efficiency** of the project conception)?
- To the extent that undesired (**side**) **effects** occur, are these tolerable?

We do not treat **sustainability**, a key aspect to consider for project evaluation, as a separate category of evaluation but instead as a cross-cutting element of all four fundamental questions on project success. A project is sustainable if the project-executing agency and/or the target group are able to continue to use the project facilities that have been built for a period of time that is, overall, adequate in economic terms, or to carry on with the project activities on their own and generate positive results after the financial, organisational and/or technical support has come to an end.