

Summary:

Pilots as vessel traffic operators

Scope of the project

This report evaluates an experimental scheme of using trained pilots (traffic pilots denoted as TLL) as vessel traffic operators (VTS operators) at Kvitsøy VTS instead of maritime traffic operators (denoted as MT).

Conclusions and recommendations from a safety perspective

Man-technology organisation

Based on the consideration of an optimal interaction between operators and technical systems the best solution is to use maritime traffic operators (denoted as MT) rather than traffic pilots (denoted as TLL) as Vessel Traffic operators (VTS operators).

Situation awareness

It is important for an operator to have good knowledge of the waters they supervise. Due to the piloting experience the TLL will have an advantage, to the extent that he/she has a pilot certificate for the area, which, however, is not always the case.

Task analysis – specialisation

The principal view expressed in the report is that the best exploitation of competence is to use MTs for traffic management and pilots for pilotage. This is based on the appreciation that the two tasks are basically different, and that there is little transfer of competence from traffic management to pilotage or vice versa. One should, however, also consider the fact that the requirements regarding basic professional background are similar for the two kinds of positions.

Work-related travel

Travelling is an integrated part of the job for pilots, and safety is ensured through imposed breaks after duty and travel periods. If a TLL must travel a long way before arriving at the VTS central, suitable rest periods have to be afforded after arrival, and this will reduce the active period on VTS duty. To reduce the risk of

inattention or fatigue we recommend that the VTS not be manned by TLLs from outside the county of Rogaland.

Overtime

The number of piloting operations varies from month to month, and also from year to year. There have been hopes and expectations among Coastal Administration officials that the introduction of the combined traffic management and piloting position would result in a more stable level of overtime among the pilots. It appears, however, that such a combined position is not sufficient to stabilize the overtime. It has been suggested that the overtime problem could be reduced by the use of part-time MTs, or stand-ins during traffic peaks. However, the use of part-time positions in the VTS may increase the risk of operational errors, because it would be difficult for a part-time employee to keep continuously updated on all technological and administrative changes affecting the work situation.

Requirements for optimal use of maritime traffic managers

To maintain a highest possible safety level by using MTs in the VTS central, it is essential that the MTs know the waters where they are responsible for traffic management. A systematic competence maintenance programme is necessary. The contents and scope (e.g., the frequency of sailing the waters) of such a training programme should be specified and implemented as soon as possible.

Summary considerations of safety

The weight of the evidence that is collected and assessed in this report leads to the conclusion that using MTs rather than TLLs in the VTS central would be an advantage from the safety point of view. The main basis for this conclusion is the consideration of how to optimise the interaction between the operators and the technical systems.

It is further recommended to use established methods from the field of user-centred design to achieve as far as possible a complementary man-machine system. More specifically, this implies among other measures the implementation of ISO standards 13407 and 11064.

Economic effects of manning Kvitsøy Vessel Traffic Services (VTS) with pilots in combined positions¹ (TLLs) or, alternatively, with maritime traffic operators (MTs)

The manning of Kvitsøy VTS consists of two desks 24 hours a day. This means that 12 man years are necessary for manning the VTS at Kvitsøy throughout the year. Two persons are then on duty for 8 hours and 20 minutes each in continuous shifts. The 20 minutes are used to overlap the subsequent shift.

Alternatives for manning of the Kvitsøy VTS

We look at three alternatives for manning Kvitsøy VTS. The first two alternatives (A and B) both assume 24 man years per year.

Alternative A: The Kvitsøy VTS is manned by 24 TLL in 50/50 services as a pilot and as a pilot traffic controller.

Alternative B: The Kvitsøy VTS is manned by 12 maritime traffic controllers. In addition we assume 12 pilots in ordinary pilot service.

In the alternatives C and D we assume 36 man years per year.

Alternative C²: The Kvitsøy VTS is manned by 36 TLL in 33 pct service in the VTS, while for the rest of their man years they do ordinary pilot service. This means that 12 of the pilots' total of 36 man years are in the VTS, while the rest (24 man years) are in ordinary pilot service.

Alternative D: The Kvitsøy VTS is manned by 12 maritime traffic controllers (MTs). In addition we assume 24 pilots in ordinary pilot service. This assumption is done to fill up with 36 man years as assumed in alternative C. The pilots in ordinary service have no education in the VTS work.

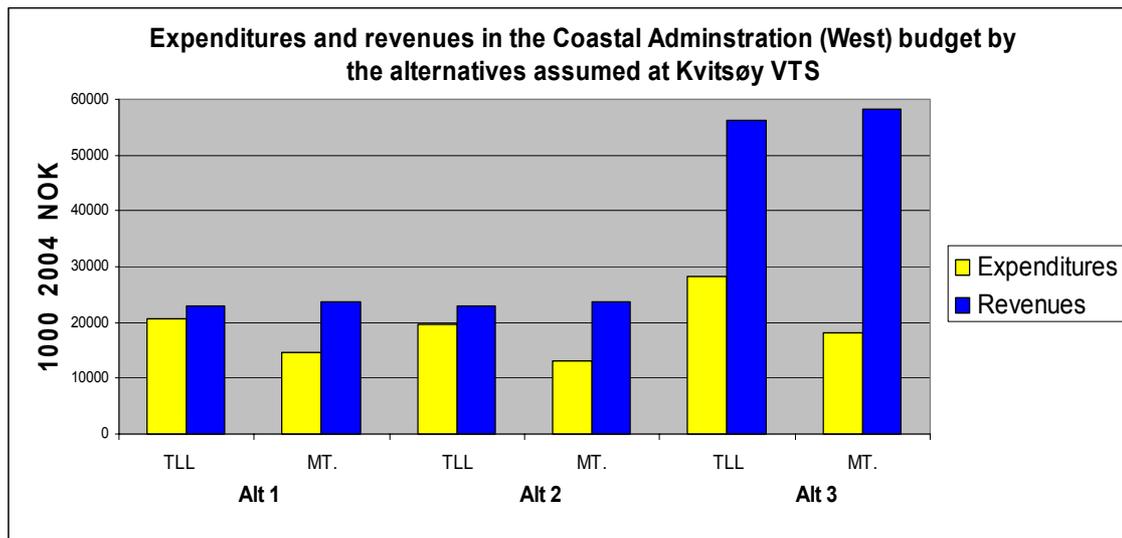
Graphical presentation of the manning alternatives assumed above

For simplicity we have shown the alternatives in figure S1 below. In this figure the alternatives TLL and MT are comparables as pairs of alternatives in the alternatives 1 to 3 in the figure.

¹ In order to work at The Kvitsøy VTS both pilots and maritime traffic controllers have to be educated especially to carry out the skills that VTS service demands. Estimates for the costs show that the TLL educational costs per person are higher than the MT costs per person.

² We have looked at 24 TLL and not 36 TLL because today there are not so many TLL available (not enough educated TLLs presently) for the Kvitsøy VTS.

Figure S1. Expenditures and revenues for the Coastal Administration (division West) in 1000 NOK for the alternatives assumed.



TØI-rapport 781/2005

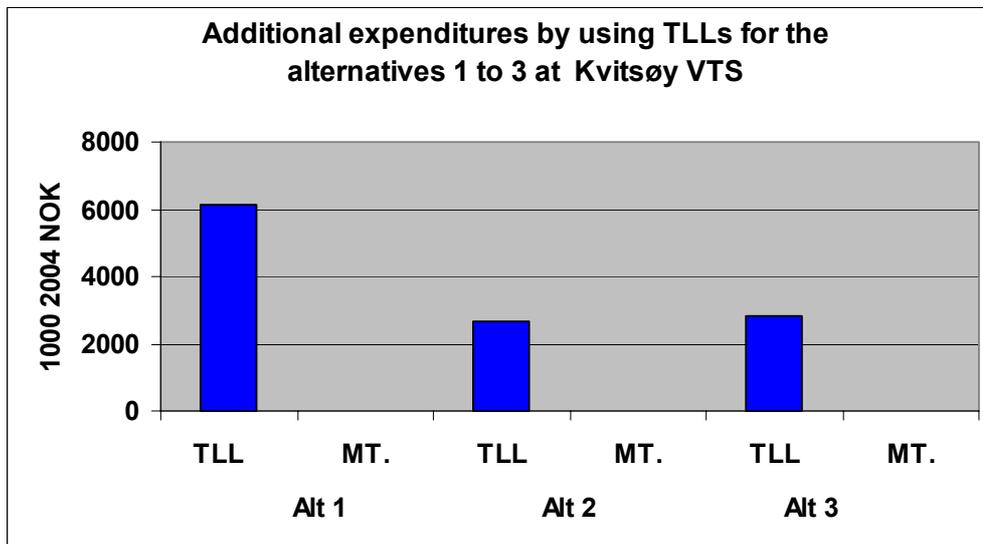
In Alternative 1 in the figure (alternatives A and B assumed above) shows the expenditures and revenues for the budget where all the educational costs for the TLLs and the MTs are included in the first year of service. In alternative 2 we have depreciated the educational costs over 5 years in such a way that only 20 pct of the educational costs are included in the bars in the figure S1. The revenue bars are therefore identical, while the expenditures are lower in alternative 2 compared to alternative 1. If we look at the revenue bars in these two alternatives we see that the revenues are higher in the MT alternatives, because there will be time for more ordinary pilot service in this alternative compared to the alternative where the pilots serve as TLL in the VTS.

In the last alternative in figure S1 (alternative 3), we have compared the alternatives C and D as assumed above. The bars are higher because we now are looking at 36 man years, while we looked at 24 man years in the alternatives 1 and 2. The revenue in the MT alternative is even higher compared to the TLL alternative in this case. This is because of the loss of pilot assignments³ in the case of joint service as TLL and in ordinary pilot service.

We have in the next figure (S2), looked at the budgetary “loss” by having TLLs compared to MTs manning the Kvitsøy VTS. The additional expenditures are calculated and shown in figure S2.

³ A pilot’s working time is calculated from the time he leaves his home or nearest pilot station. This is in their working agreements with the Coastal Administrations for all pilots in Norway.

Figure S2. Additional expenditures on the Coastal Administration's budget by using TLLs compared to MTs at the Kvitsøy VTS. The "losses" in each of the alternatives are calculated in 1000 NOK.



TØI-rapport 781/2005

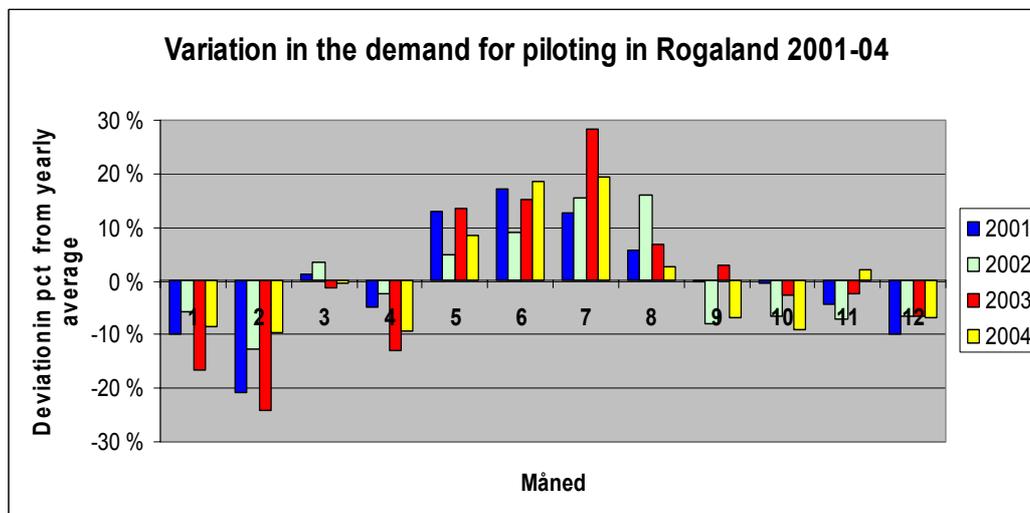
The alternatives are identical to these shown in figure S1.

Note that the educational costs will be higher in alternative 3 since there are many pilots in this alternative that need education in order to serve only 33 pct of their working time at the Kvitsøy VTS.

The demand for piloting at The Rogaland Pilot District

Demand fluctuates both from month to month and from year to year. We have looked at piloting over the last 48 months for the Rogaland area. In 17 of the 48 months there are differences of 10 per cent or more compared to the average for the period from 2001 to 2004. The fluctuation in demand was greatest in 2003.

Figure S3. Monthly demand for piloting at Rogaland Pilot District 2001-04. Deviation from annual averages.



TØI-rapport 781/2005

The demand is higher in late spring and summer while it is low during the winter season. The variation in demand makes it more difficult to adapt the pilots' employment to current demand.

We have calculated the best practice for employing pilots at the Rogaland Pilot District for each of the three alternatives assumed. The results of the calculations are shown in table S1 below.

Table S1. Optimal manning of pilot force in Rogaland Pilot District (lowest costs for the Coastal Administration) where the demand for piloting is given. Estimates for the average number of hours per pilot of overtime and the redundant time for the three alternatives assumed 2001 – 2004.

Alternatives	Description of the manning of the Kvitsøy VTS (pct time in VTS/pct in pilot service)	The total number of pilots available in The Rogaland Pilot District	Overtime in hours per pilot per year	Redundant time in hours per pilot per year
Alt 1	12 MTs	42	256	333
Alt 2	24 TLLs (50/50)	56	124	339
Alt 3	36 TLLs (33/67)	56	129	357

TØI-rapport 781/2005

The estimates in the table S2 above represent the best results for each alternative. There are small differences for the three alternatives in redundant time per pilot, compared to the estimates for overtime.

The present practice for manning the Kvitsøy VTS is that the pilot districts borrow pilots to and from their neighbouring districts, in order to minimize the estimates given in table S2 for both overtime and redundant time.

Conclusion

There are no evident economic benefits from using TLLs in the Kvitsøy VTS.

As indicated above, using TLLs does not yield any safety benefits. It is therefore concluded that staffing Kvitsøy VTS by MTs is the best solution.