 <b>SINTEF</b>  <b>SINTEF Telecom and Informatics</b>  Address: NO-7465 Trondheim NORWAY Location Trondheim: S.P. Andersens v 15 Location Oslo: Forskningsveien 1 Telephone: +47 73 59 30 00 Fax: +47 73 59 43 02  Enterprise No.: NO 948 007 029 MVA		<b>MEMO</b>						
		MEMO CONCERNS <b>Comparison of tracks and profiles from flight recorder and from the radar tracking system at Gardermoen airport</b>			FOR YOUR ATTENTION	COMMENTS ARE INVITED	FOR YOUR INFORMATION	AS AGREED
		DISTRIBUTION Kåre H. Liasjø, Luftfartsverket Knut Holen, Oslo Lufthavn A/S Nils Ivar Nilsen, Forsvarsbygg Odd Kr. Ø. Pettersen Svein Ådne Storeheier Herold Olsen Idar L. N. Granøien Asbjørn Ustad			X X X		X X X X X	
		FILE CODE <b>40-NO 020034</b>			CLASSIFICATION <b>Unrestricted</b>			
ELECTRONIC FILE CODE  40-NO 020034.doc								
PROJECT NO. <b>403129.07</b>	DATE <b>2002-05-13</b>	PERSON RESPONSIBLE / AUTHOR <b>Rolf Tore Randeberg</b>			NUMBER OF PAGES <b>4</b>			

## Introduction

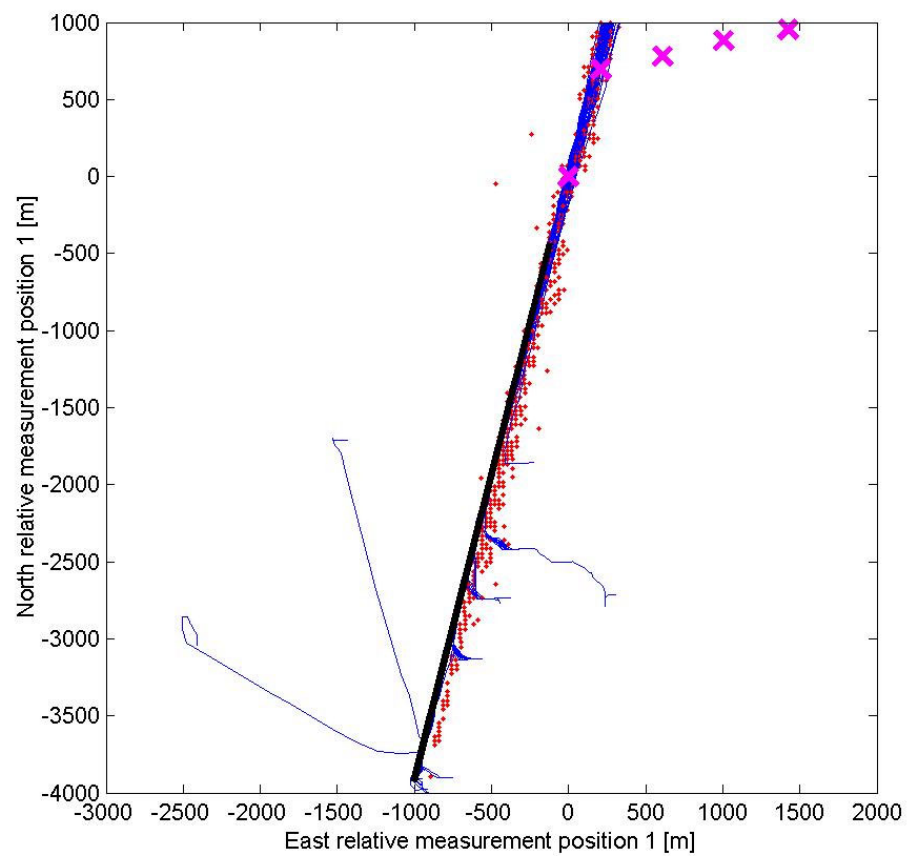
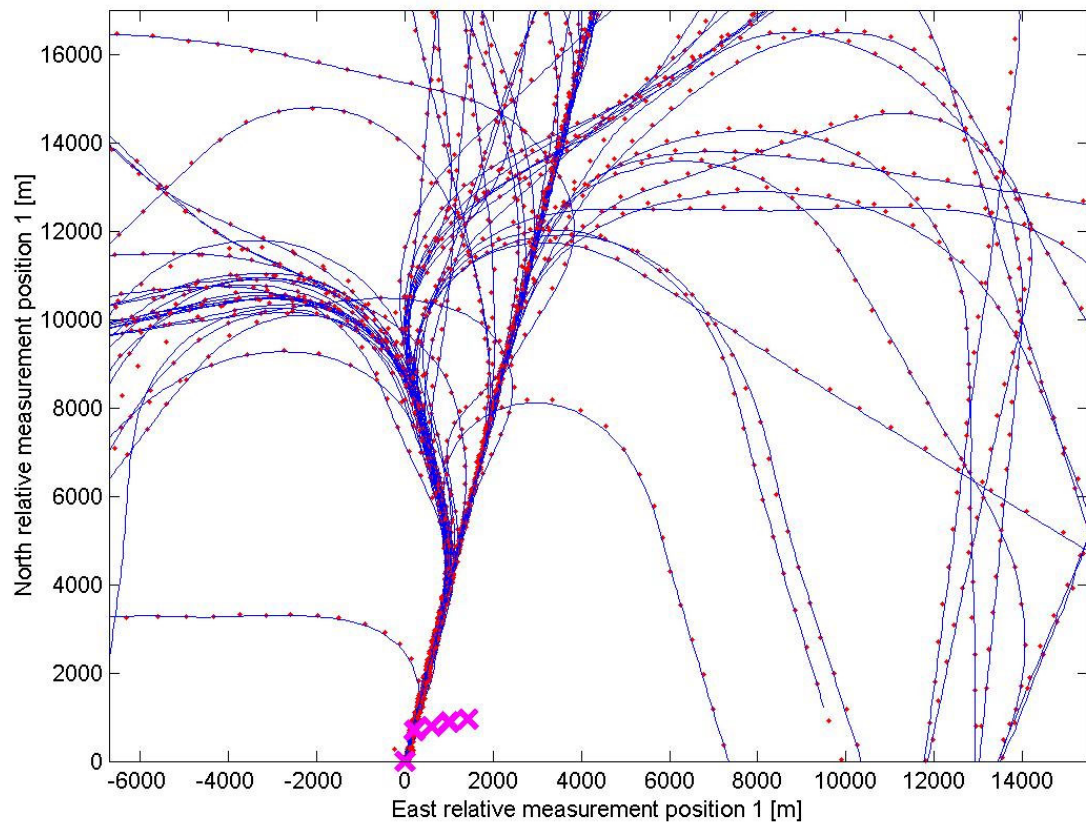
For a total of 155 flights, flight record data were collected as part of the validation project at Gardermoen airport. 70 of the flight records included GPS position data. For all flights, data from the radar tracking system were available. The main report describes the extraction of the data.

This memo presents figures where the GPS position and pressure altitude as given in the flight records are compared with corresponding data reported from the radar tracking system.

### 1 Flight Tracks

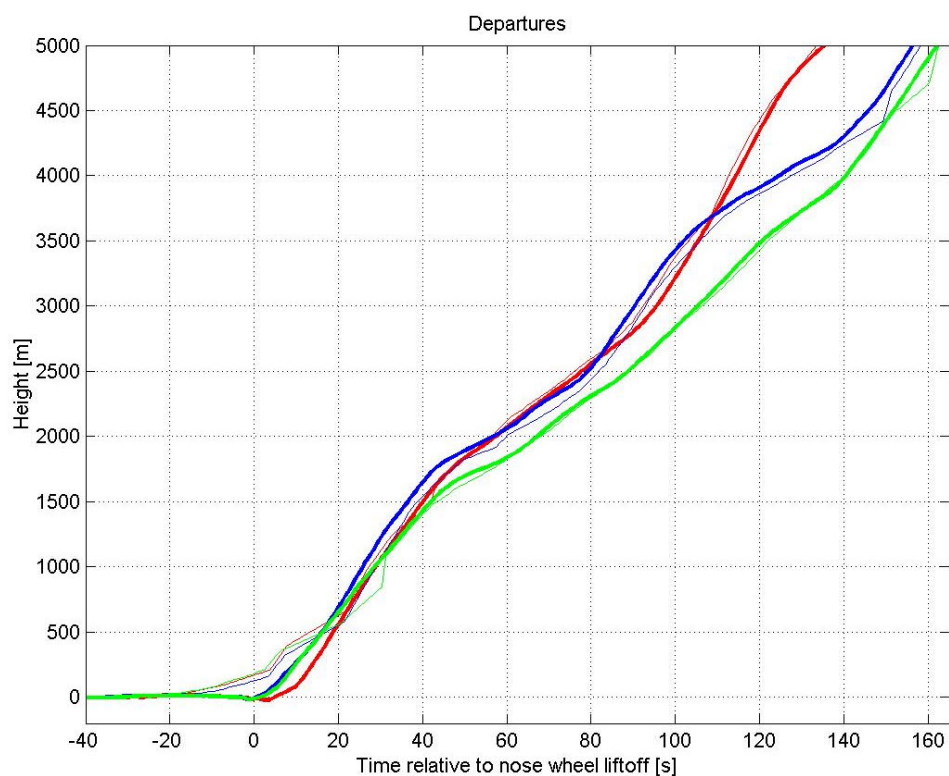
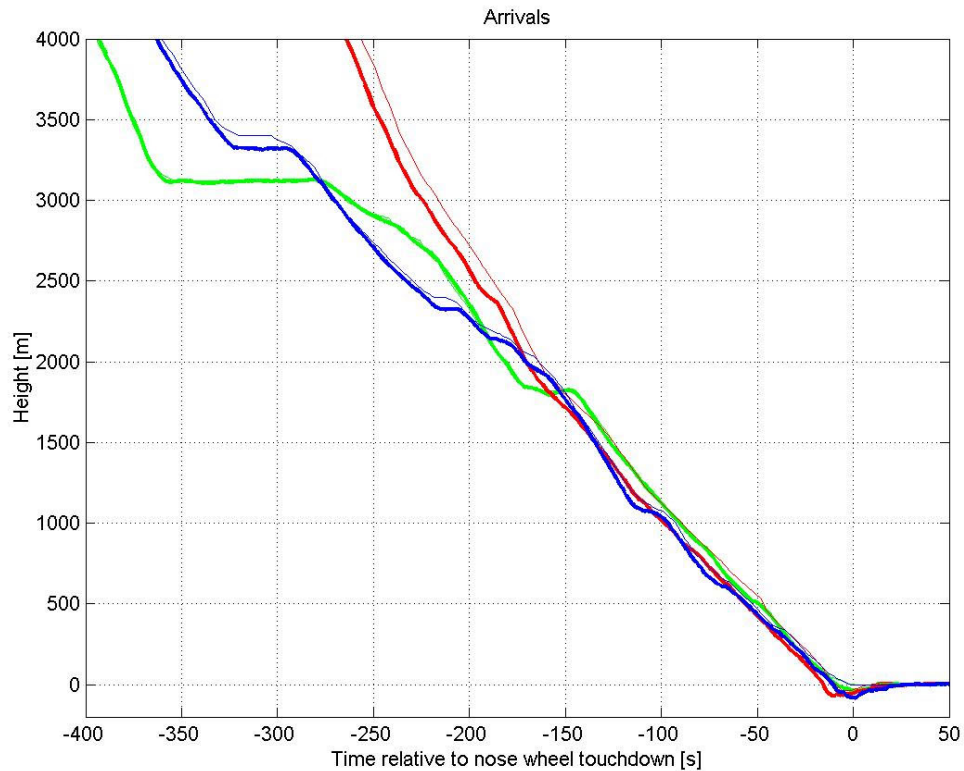
The two figures on the next page compare the position data given in the flight records and reported by the radar tracking system. The blue lines represent the GPS position (smoothed). The red dots represent the position given by the radar. The magenta crosses mark the position of the five measurement sites. The western runway is shown as a thick, black line. The coordinates are given relative to measurement position 1.

The figures show that near the ground (*i.e.* close to the runway), the radar data is subject to significant random errors. At greater altitudes, there are no large random errors, although the deviation is in the order of  $\pm 50$ – $100$  m in the north/south direction, and  $\pm 20$ – $60$  m in the east/west direction.

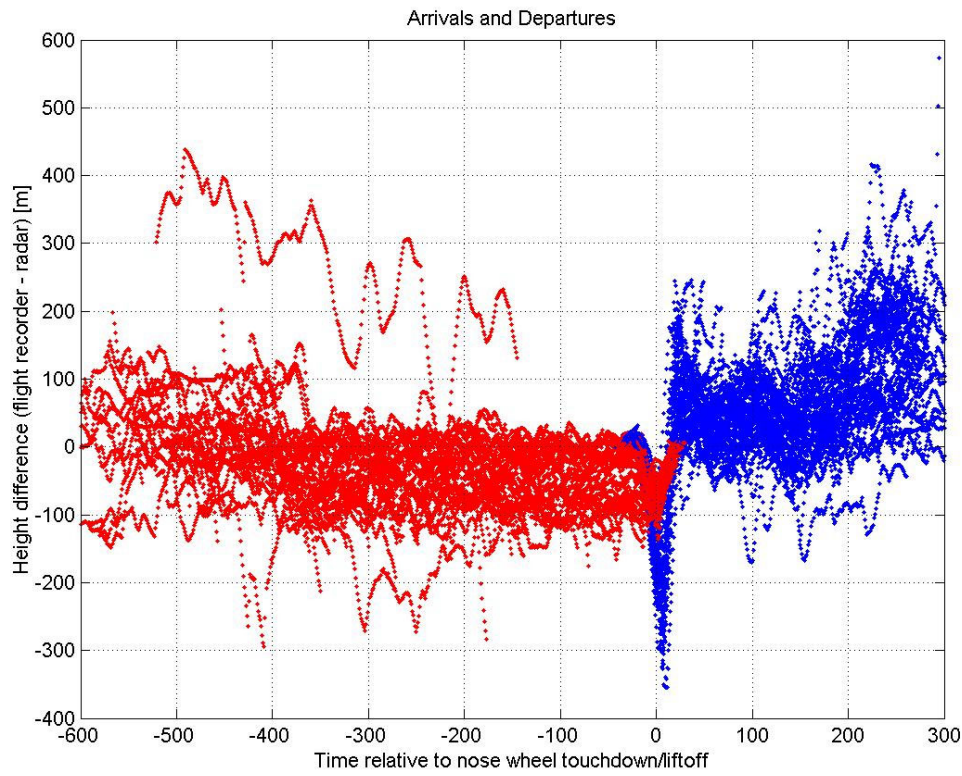


## 2 Flight profiles

The figures below compare the altitude given in the flight records and reported by the radar tracking system. Only three randomly selected flights are shown for each operation. Thick lines represent flight record data, while thin lines represent data reported by the radar tracking system. The altitudes of both sources have been adjusted by setting the altitude at the runway to zero.



The figure below shows the difference between the reported altitude for all 70 flights. Red dots represent arrivals, while blue dots represent departures. The data show that the average deviation is approximately  $-50$  m for arrivals, and approximately  $50$ – $100$  m for departures.



The average deviation may be due to time delay in the altitude reported by the radar tracking system. A time adjustment of approximately  $1.5 - 3$  seconds applied to the radar data results in better agreement.