Minutes of the Second Meeting of the

Industry Steering Committee on Wellbore Survey Accuracy

RF-Rogalands Research, Stavanger
12 March 1996

Those present:

Hugh Williamson (Chairman and Minutes)	BP Exploration
Graham McElhinney	Halliburton
Frank Innes	Halliburton
Alasdair Macrae	SDC
Fred Watson	SDC/Applied Navigation Devices
Brett Van Steenwyk	SDC/Applied Navigation Devices
Tim Price	SDC/Applied Navigation Devices
Koen Noy	Gyrodata
David Roper	Sysdrill
Leif Jensen	Statoil
Roger Ekseth	Statoil
Mike Newal	Geoservices
Gordon Shiells	Sperry-Sun
Wayne Phillips	Anadrill
Harry Wilson	Baker Hughes INTEQ
George Halsey	RF Rogaland Research
Jon Bang	IKU
Ivar Haarstad	IKU
Torgeir Torkildsen	IKU
Mike Pollard	Saga Petroleum
Arne Enoksen	NPD
Alewyn van Asperen	Shell International
Steve Page	Geolink
Erik Cayeux	Geomatics

1 Introduction

The Chairman welcomed those present and thanked George Halsey for organising the venue.

2 Actions from last meeting

2.1 Distribution of Shell Borehole Survey Manual

Alewÿn van Asperen explained that the Manual had only recently been completed by Shell so that it was inappropriate to distribute it generally at this time. However, elements of it might be contributed to the work of the Group as it progresses.

2.2 Review of "Survey Error Propagation"

Detailed review of the document will be postponed until it can be done in context, when the work-scope of the Group is better defined.

2.3 Publicity

Thanks to contacts made by Ken Weeks, the meeting had been advertised in the 26 Feb issue of the Oil & Gas Journal. The magazine's Drilling Editor (Keith Rappold) had asked for more information on the Group from the Chairman and had been sent the minutes of the previous meeting.

A paragraph describing the Group and its work had been submitted to the SPE via John Thorogood for publication in the Journal of Petroleum Technology.

A letter describing the Group had been sent by Brett Van Steenwyk to the Director of NADET (National Advanced Drilling and Excavation Technologies Institute).

Gordon Shiells had approached several companies suggesting they include a brief description of the Group and its work in their newsletters.

2.4 Liaison with the Advanced Wells Forum

Mike Pollard, the AWF contact for the Wellbore Position Monitoring project proposal had been contacted and was present at the meeting.

2.5 Measure of MWD sensor accuracy

No progress had been reported from the original action item. Work already done in this area by Graham McElhinney will likely be contributed to the Group at the appropriate time in its work.

2.6 Article in Petroleum Engineering International MWD comparison tables

An article to accompany the tables had been jointly drafted by Harry Wilson and Hugh Williamson, circulated to members, and onpassed to INTEQ's representative on the IMS Committee. The IMS supply the PEI with data for the comparison tables, and it is expected that the article will appear accompanying the tables in May.

3 Presentations of work ongong in other groups

Several presentations were made describing ongoing initiatives in wellbore survey analysis. A set of overheads from all the presentations will be circulated to the Group prior to the next meeting:

Actions:
- Presenters to send or fax Hugh Williamson copies of their overheads
- Hugh Williamson to include overheads with responses to questionnaires (see below)

3.1 Advanced Wells Forum

Mike Pollard described the Advanced Wells Forum. It is a group of Operators with the objectives of facilitating the development, demonstration and commercialisation of technologies critical to the success of "Advanced" wells. Members of the Forum will propose and consider supporting individual pieces of work, which will form part of the Advanced Wells Project.

One of these pieces of work, proposed by Mike himself, concerns "Wellbore Position Uncertainty". The work will investigate and quantify directional survey uncertainty, surface location uncertainty and seismic uncertainty. This multi-disciplinary approach is required for a rigorous treatment of quantitative risk analysis and target definition.

3.2 IKU Petroleum Research

Jon Bang described a new methodology being developed by IKU for survey error propagation, work which is being sponsored by Norsk Hydro and Saga Petroleum. He presented a method for deriving a position covariance matrix from the variances of and correlation between all the measurements which contribute to defining well position. The generality of the method will enable it to model both directional and inertial tools, and to incorporate uncertainties in both the surface location and gravity/magnetic reference frames.

3.3 RF - Rogalands Research

George Halsey described the work that RF-Rogalands had done in wellbore survey in the past. This included the establishment of a definitive survey in their U-2 test well and the subsequent use of the well, by both operators and survey companies, for proving and refining the performance of survey tools. He suggested that the drilling of the U-4 well would make the facility more attractive to the industry as a centre for testing and validating new tools.

3.4 Shell International

Alewÿn van Asperen stressed that survey error models are only a part of a larger industry requirement. Without a Quality System governing the use of survey tools and analysis of survey data, any error models claiming to predict position uncertainty will be of little practical use.

3.5 Statoil

Roger Ekseth presented some proposals on what problems the Group should tackle and what its aims should be. He suggested that the development of an agreed means of error propagation was not a priority, since all alternatives were likely to be based on the accepted covariance methodology with a greater or lesser reliance on simplifying assumptions. Instead, he stressed the need for the Industry to secure uniform final results. Thus the emphasis of the Group's work should be on specifying standards for the creation and qualification of error models.

4 Future direction of the Group and its work

The way in which the Group should work, and the problems it should try and tackle, were discussed at length. It became clear that different members of the Group had widely differing expectations of it, and represented companies which could benefit from its work in a variety of ways. It was agreed that some expressment of commitment to the Group from each company would facilitate discussion, although the point was made that some companies had already shown considerable commitment through the time and costs incurred through attending the meetings.

It was felt that members could not properly decide on long-term objectives, or support long-term work, without clarifying their respective positions. It was therefore decided to circulate a questionnaire to each company represented at the meeting. There was general and rapid agreement on the questions to be posed, viz.:

- What are the potential benefits of the Steering Committee to your Company ?
- What type of resources would your Company be willing to commit to help realise these benefits ?

It was felt that, with the position of each company clarified, the future work (and possibly the membership) of the Group would be easier to decide.

Actions:
- Hugh Williamson to circulate questionnaire to members by 15 Mar.
- Members (one per Company) to reply (by fax or e-mail) by 31 Mar.
- Hugh Williamson to compile and circulate responses to all members by 14 Apr.

In addition to discussing the longer-term direction of the Group, many members felt that it should start work immediately on tackling some of the (apparently) straightforward problems of definitions and standards which currently bedevil the Industry. It was felt that this work was in line with the original reasons behind the Group's formation. It was further argued that success in these areas would not only be valuable in itself, but would lend early credibility to the Group, and build confidence in its members that it could indeed reach consensus on non-trivial issues.

Action:
- David Roper to draft and circulate, prior to or at the next meeting, a document proposing:
    - definitions of standard terms such as accuracy, precision, inclination and depth.
    - a standard means of expressing position uncertainty
    - a standard mathematical notation for use by the Group in future transactions

The Group also felt that it could make some immediate progress towards defining an MWD error model.

Actions:
- Wayne Phillips to compile and circulate, prior to or at the next meeting, a list of the sources of error affecting solid state magnetic survey systems.
- Members to contribute to this list from their own work and experience.

5 Next Meeting

The date and venue of the next meeting was provisionally set for 10 May in Houston. Several companies offered their facilities as possible venues.

Actions:
- Members to advise on the suitability of this date (and availability of a venue) when responding to the questionnaire.
- Hugh Williamson to advise members of the final date and venue of the meeting by 14 Apr.

6 Distribution of Minutes

These minutes will be distributed, in the first instance, to meeting attendees and in addition to:

John Thorogood, BP Exploration
Ken Weeks, KRW Associates
John Turvill, Halliburton
Steve Mullin, Baker Hughes INTEQ
Tim Hanson, Enterprise Oil
Keith Rappold, Oil & Gas Journal