SPE Wellbore Positioning Technical Section

Collision Avoidance Work Group

4th meeting, Drumossie Hotel, Inverness, 22nd April 2008

Present:
Darren Aklestad, Bill Allen, Andy Brooks, Bjorn Bruun, Jerry Codling, Steve Grindrod, Stein Havardstein, Angus Jamieson, Shola Okewunmi, Wayne Phillips, Torgeir Torkildsen, Harry Wilson, Dave McRobbie, Anas Sikal for Regis Studer

Apologies:
Regis Studer, Jim Towle

Lexicon maintenance
Harry Wilson said that, although out of vogue nowadays, the words *dependent* and *independent* had often been used as alternatives to *correlated* and *uncorrelated*. It was agreed that the terminology persists in some documentation and therefore should be included in the lexicon. Torgeir Torkildsen pointed out that the terms are more properly *statistically* dependent and *statistically* independent.

No other input was received.

Bibliography maintenance
Andy Brooks had noted a recent publication that he thought was probably relevant, and promised to provide a reference.

No other input was received.

Current Common Practice document
Comments on the original draft had been received from Darren Aklestad and Regis Studer, and these were reviewed by the group.

Agreed not to include discussion of software implementations, but did agree to include a comment about significance of appropriate interpolation interval.

Torgeir suggested that we have figures describing the types of rule. Agreed and will be included in final draft. Regis had requested an additional diagram relating to the P type rule in which both uncertainties are displayed. It was felt that fulfilling Torgeir's request would achieve this.

Some deficiencies in the existing P type rule figures were noted and will be corrected. Specifically, the use of well centerlines infers a parallel well situation, and also that there is a lack of explanatory text.

It was agreed that Regis' request for inclusion of examples of the magnitude of typical surface uncertainty was outside the scope of the document.

It was also agreed to change the word *anti-correlated* to negatively correlated, and add a statement that the necessary mathematics for calculation of relative uncertainty are described in SPE 67616.

Regis had suggested that an example would help, but there was a concern that this would require a similar level of detailed explanation throughout the document. Harry proposed that we concentrate on publishing the document now and leave examples, if required, for rev B. Bill Allen seconded the proposal.

In discussing the section on inclusion of bias, those companies who include it do so only when it reduces proximity. Jerry codling will provide some clarification on how bias in currently managed.

Regarding the Comparison section, Bjorn Bruun requested that the diameter symbol be explained or replaced by text.

Harry promised to circulate a draft based on what had been agreed, and publish before the next meeting.

StatoilHydro Research Project
Bjorn Bruun reported that the Masters student is now running Monte Carlo simulations to evaluate collision probability using both normal and normal inverse Gaussian distributions for the magnetic reference field terms. Results should be available by the next meeting.

New Methods
Angus described the expansion factor that he had presented at the last meeting. He identified situations where the method gave more realistic looking results than the pedal curve radius method. Angus thinks that the method produces a result that comes close to being able to be mapped to probability. Wayne and Harry had reservations about this latter claim, but agreed that it looked like an improved method for use in R type rules. Jerry commented that a similar method could be used with a single relative uncertainty ellipsoid.

Andy Brooks reviewed the following methods of calculating probability of collision; John Thorogood's SPE 20908 and SPE 23941/23942, Hugh Williamson's paper "Towards Risk Based Separation Rules" with subsequent modifications, and the ExxonMobil patent US5901795. Harry noted that Andy's own earlier work, described in SPE 36863, could have been included.

Andy said that he had recently been looking at a new method of calculating probability of collision, and had had a paper on it accepted by SPE for presentation at ATCE as a poster session.

Jerry Codling then presented his "Grand Unified Theorem" which was also to be presented at the main SPE WP TS meeting the following day.

New Methods (cont'd)
His goal is to define a minimum allowable separation distance that is valid in all geometries, by uniting a variety of existing methods. He demonstrated that SF rules are probably appropriate in parallel well situations, but that risk based methods are more appropriate for high angles of incidence. Jerry's method accounts for the angle of incidence with an effective increase in the wellbore diameters, referred to by Jerry as the thickening factor.

Jerry identified a couple of problems associated with current error model predictions; the assumption of normal error distribution and concern regarding the validity of misalignment and sag terms and term values.

The presentation will be included in the minutes of the main meeting.

Discussion of future Group activity
Harry requested suggestions for what tasks the Group might take on next. Bill suggested the production of standard proximity examples, similar to the position uncertainty example results provided in the error model papers; example proximity scenarios with specified collision avoidance rules applied to them. This would help software vendors test their implementation of such functionality, a facility Bill felt the operating companies would welcome. Harry thought that it might be difficult to produce a comprehensive set, but this is something for consideration at he next meeting.

Harry asked if it was suitable for the Group to make recommendations regarding current practice, e.g. that a properly implemented P type rule was superior to the other types and (acknowledging the fact that R type rules are most widely used) define which R type variables are recommended by the Group. Angus was enthusiastic about recommending a standard R type rule, feeling that many Operators would welcome such guidance and their adoption of it would drive standardization.

Harry suggested that we should publish the document in its currently limited form, and that increasing the scope of the document to include strengths and weaknesses should be the ongoing task of the Group. This was agreed, and further that the scope should be increased to include mention of other known and proposed methods that were not necessarily currently in use.

Any other business
Harry said that the plan is to meet again the day before the next SPE WPTS meeting. Agenda items already identified are a presentation by Andy of his paper which will have been presented at ATCE, consideration of whether to generate some standard results for collision avoidance calculations, and reworking of the Current Common Practice document to include strengths and weakness and the addition of less common methods.