SPE Wellbore Positioning Technical Section

Collision Avoidance Work Group

6th meeting, Hilton Hotel, Amsterdam, 19th Mar 2009

Present:
Darren Aklestad, Yussef Amghar, Jon Bang, Andy Brooks, Bjorn Bruun, Jerry Codling, Steve Grindrod, Stein Havardstein, Angus Jamieson, Simon McCulloch, Wayne Phillips, Benny Poedjono, Ludovic Macresy, Shola Okewunmi, Anas Sikal, Harry Wilson (group leader).

Apologies:
Bill Allen, Torgeir Torkildsen.

Introduction
Two new members were introduced; Simon McCulloch of Maersk Qatar and Youssef Amghar of TOTAL who replaces Regis Studer.

Maintenance of existing documents

Revision tracking
Harry suggested that there was no need for a formal revision numbering system to be applied to the documents produced by the Work Group, and that it might be more useful to merely reissue the documents at the end of each year, dating them with the upcoming year. This would be done whether or not any changes were made to the documents.

It was agreed that this was a better method and would be adopted for the reissue at the end of 2009.

Lexicon
No additions were requested.

Bibliography
Andy and Harry had identified 3 SPE papers and a magazine article that warranted inclusion. Simon asked whether magnetic ranging papers are included. Harry said that this had been discussed at an early meeting of the Group and it had been decided to remove ranging papers from the bibliography. Simon felt that there was justification for including them in the collision avoidance section. This was agreed that ranging papers that dealt with collision avoidance should be included.

Harry reminded the Group of Hugh Williamson's suggestion that we should only cite peer reviewed papers. The Group had previously decided that the bibliography should not be limited to peer reviewed papers, but that such papers should be highlighted in some way. It was agreed that the next update would segregate peer reviewed papers from the others.

Wayne suggested that the Group's own Current Common Practice document should be included in the bibliography. Agreed.

Stein pointed out that the current layout made it difficult to read. It was agreed to insert line breaks.

Angus asked if geosteering papers were also relevant. It was agreed that they were, but, as for ranging, only if directly relevant to collision avoidance.

Action: Harry to update bibliography by year end.

Collision Avoidance Calculations - Current Common Practice
It had been decided at the previous meeting that recommendations should be strengthened. Harry pointed out that the current version included recommendations, but suggested that since R type rules are in widespread use, it would be beneficial to provide a summary of the recommendations relating to the R type.

The Group then reviewed Section 2, item by item, with the following results:
Summary of recommendations

1. Do not use horizontal plane for scanning (2.1)
2. Use an error model that is capable of quantifying significant variables and which can be validated against QC parameters derived from the model (e.g. ISCWSA model). (2.3)
3. Do not use the bias term for drillstring interference. (2.3)
4. The ellipse radius should be based on the pedal curve or closest approach method. (2.4)
5. For the specified depth on the reference well, identify minimum R, not minimum S or minimum E (2.2, 2.4)
6. Include hole dimensions, preferably by subtracting the sum of the hole dimensions from S. (2.5)
7. Include the well reference/surface location uncertainty with the appropriate correlation. (2.8)
8. Compute relative uncertainty, using the rho 3 correlation coefficient. (2.9)

Modifications to the exiting text were also identified.

Item	comment
2.4	Labels to be added to the graphics
2.6	Add table of probabilities to section
2.6	Clarify varying probability by axis
2.7	Update based on work of Probability team
2.9	Reword reference to negatively correlated
2.10	Reword reference to accounting for mistakes
2.11	Include findings of Probability team
3.0	Fix note d

During this discussion, several questions arose which were deferred because they were not strictly related to the calculations and therefore not relevant to this document. Harry pointed out that they were highly relevant to the task of the Process Management team, and should be raised again when the team's draft report is discussed at a later meeting.

Action: Harry to update document and distribute for review by end of August.

Task Teams

Two small teams had been set up at the previous meeting; one, led by Bill Allen, to consider what could be said about process management, and one, led by Andy Brooks, to look at ways of estimating probability of intersection, including the most appropriate distributions to use.

Process Management Team

Team leader, Bill Allen was unable to attend. In his absence, Harry reported that the team had not found time to make any significant progress. However, Bill had started on a draft document which it was hoped would be ready for discussion within the Group in October.

Harry described the objective of the Team as addressing the qualifying statement made in the introduction to the Collision Avoidance Calculations - Current Common Practice:

The adoption of a particular minimum allowable separation rule, no matter how conservative, does not ensure acceptably low probability of collision. Many other factors contribute, including the level of compliance by office and rig personnel with collision avoidance procedures, and the completeness and correctness of the directional database.

Harry asked if everyone agreed that this was something that would be beneficial to the Industry and therefore worth pursuing. Benny felt that procedures are so specific to the operating circumstances and the Operators' risk acceptance that it might be difficult to provide guidance on this subject. However, the consensus was that there were basic good practices that applied in almost all circumstances and that it was a worthwhile task to define them.

Probability Team

Andy presented progress to date. Published methods had been assessed; SPE papers 20908, 23941/2, 36484, 92554, 101719, and 116155, US patent 5901795, and two methods previously presented to the Collision Avoidance Work Group by Angus Jamieson (minutes ISCWSA 28) and Jerry Codling (minutes ISCWSA 27).

It was agreed that Hugh Williamson's method described in SPE 36484 was valid in all cases except when the two wells are very near to parallel. The method would be improved by expressing it as a 2D integral over a finite interval along the reference well. In parallel well situations, the method used must consider a finite encounter length and either attitude uncertainty or variation in position uncertainty.

Methods that could be further evaluated for effectiveness in the parallel case include SPE 23941/2 and 116155, and the Jamieson and Codling methods. It was also noted that Monte Carlo modeling will be required to evaluate any candidate method, and does offer a solution in itself if computational difficulties and computer processing limitations can be overcome.

The phenomenon of probability dilution (in which a point is reached where probability of collision decreases as position uncertainty increases) had been considered, but the team had no recommendation on how to manage it with respect to collision avoidance.

The team also looked at alternative distributions. They found that very few suitable heavy tailed functions exist and all introduce computation complexity which may make them impractical for implementation.

Andy said that the team thought that it had achieved all that was practicable given the time and resource limitations. Selection and development of a method would probably have to be done on a commercial basis.

Any Other Business

It was agreed that the Group should work to deliver Process Management recommendations, and that once the task was complete the Group would cease to meet routinely, and only reconvene if and when a related topic or task required it.