

**Middle East Review  
March 20-23, 2017**



**Wellbore Positioning  
Technical Section**

**Jonathan Lightfoot  
ISCWSA Program Chair 2016-2017  
ISCWSA CHAIR 2018-2019**

**OCCIDENTAL OIL & GAS CORP.  
WORLDWIDE DRILLING & COMPLETIONS  
CENTRAL DRILLING GROUP (CDG)  
GLOBAL DIRECTIONAL DRILLING SPECIALIST  
PERFORMANCE DRILLING COMMUNITY OF PRACTICE LEADER**

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45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

**Wellbore Positioning Technical Section**



The Industry Steering Committee on Wellbore  
Survey Accuracy (ISCWSA)

# Middle East ISCWSA Review March 20-23, 2017



Wellbore Positioning  
Technical Section

**Presentation given to Qatar Petroleum and Occidental Oil & Gas Petroleum in Oman and Qatar as Outreach to the ISCWSA Members and Directional Drilling Support Teams in the Middle East**

**ISCWSA Members may take this Presentation and use it as desired to provide additional ISCWSA outreach to those in your region or within your own Company or SPE Group.**

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- **MEETING PURPOSE**
- **ISCWSA INTRODUCTION**
- **WEBSITE**
- **SUB-COMMITTEES**
- **DOCUMENTS & PUBLICATIONS**
- **CURRENT WORK**
- **FUTURE INITIATIVES**
- **QUESTIONS**

# MEETING PURPOSE

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

- **PROVIDE EDUCATION OUTREACH TO REGIONAL ISCWSA & SPE MEMBERS**
- **MENA REGION IS THE 2<sup>ND</sup> LARGEST GLOBAL MEMBERSHIP REGION**
- **SHARE ISCWA TECHNICAL TRAINING RESOURCES & TECHNICAL INFORMATION**

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***"The primary aim of this group is to produce and maintain standards for the industry relating to wellbore survey accuracy. To set standards for terminology and accuracy specifications. Establish a standard framework for modelling and validation of tool performance. Raise awareness & understanding of wellbore survey accuracy issues across the industry."***

# WEBSITE: [www.iscwsa.net](http://www.iscwsa.net)

Middle East Review  
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Jonathan Lightfoot  
ISCWSA Program Chair

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## ISCWSA

Greetings from the Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA),  
affiliated with the SPE Wellbore Positioning Technical Section

The 45th general meeting of the ISCWSA will be held in the World Forum venue, Churchillplein 10, 2517 JW, The Hague, The Netherlands. The meeting is held in conjunction with the SPE/IADC Drilling Conference and exhibition which is hosted by the same venue. Please click on this link to register online and Download the meeting schedule here.

The main meeting will be held on Friday, March 17th, with sub-committee meetings held March 15th and 16th. If you are a member of a sub-committee, we will be grateful if you can plan to attend. If you are interested in serving on a committee, contact the sub-committee chairperson. A contact list is available on the ISCWSA sub-committee tab.

If you or your organization can offer sponsorship for portions of the meetings (such as coffee breaks, lunches, meeting rooms etc.), please contact Son Pham, ISCWSA Chairperson. We are indebted to the many past sponsors who have contributed to sustain our technical community work which has been running for over 20 years and we look forward to continuing our good work for many years to come.

Best Regards,  
The ISCWSA Committee

Meeting Minutes Elected ISCWSA Officers Sub-Committees Docs & Publications

The ISCWSA is affiliated to the SPE as the Wellbore Positioning Technical Section and has a web site with the SPE at: [www.spe.org](http://www.spe.org)  
Note: The ISCWSA does not approve tool error models for supplier specific survey tools.  
More information on the ISCWSA may be obtained from the ISCWSA Committee Chair Person:  
Son Pham - Chairperson

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## ISCWSA

### The Industry Steering Committee on Wellbore Survey Accuracy

**MISSION -**

*"The primary aim of this group is to produce and maintain standards for the industry relating to wellbore survey accuracy. To set standards for terminology and accuracy specifications. Establish a standard framework for modelling and validation of tool performance. Raise awareness & understanding of wellbore survey accuracy issues across the industry."*

**ABOUT -**

The ISCWSA work has resulted in the publication of technical papers, leading technical work shops, multiple SPE "Hits and Misses" workshops, the Wellbore Positioning e-book, anti-collision papers and API project. We have comprehensive cross-industry, international representation with regular attendance from a wide variety of service companies, operators, and consultants, academia and software companies.

The Industry Steering Committee on Wellbore Survey Accuracy was founded to dispel the confusion and secrecy commonly associated with wellbore surveying and to enable the industry to produce consistent, reliable estimates of survey-tool performance in today's wells. We achieve these goals through the production and maintenance of standards covering the construction and validation of tool error models.

Work focused initially on Measurement While Drilling systems. They provide a large proportion of the total directional survey data world-wide and, because of their similarities between suppliers, are more amenable to specification standardisation than other types of survey tool.

There is no formal membership enrolment to join the ISCWSA and its meetings are open to all who wish to attend. The committee generally holds twice yearly meetings and has held 45 meetings internationally to date. The ISCWSA is also affiliated with the Society of Petroleum Engineers, as the SPE Wellbore Positioning Technical Section.

**ISCWSA Elected Committee Members -**

- Son Pham, Conoco Phillips: Chair Person
- Andy McGregor, Tech21: Director at large and Error Model Chair
- Jonathan Lightfoot, Occidental Oil and Gas Corporation: Program Chair
- Ludovic Macresy, Pathcontrol: Director at large
- Chad Hanak, SuperiorQC: Secretary
- Anas SIKAL, Pathcontrol: Director at large
- Robert Wylie, xnDrilling: Treasurer
- Phil Harbidge, Independent: Webmaster
- Carol Mann, Dynamic Graphics Inc: Director at large and Education Chair
- Steve Sawaryn, Independent: Collision Avoidance Chair

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Son Pham - Chairperson

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Wellbore Positioning Technical Section



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Survey Accuracy (ISCWSA)

# MEETING MINUTES ONLINE ARCHIVE PORTAL

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

Meeting Minutes

- ▶ [ISCWSA meeting 45 - The Hague, Netherlands - 17th March 2017](#)
- ▶ [ISCWSA meeting 44 - Glasgow, Scotland UK - 22nd September 2016](#)
- ▶ [ISCWSA meeting 43 - Fort Worth, Texas, USA, 4th March 2016](#)
- ▶ [ISCWSA meeting 42 - Houston, Texas USA 1st October 2015](#)
- ▶ [ISCWSA meeting 41 - London, UK 20th March 2015](#)
- ▶ [ISCWSA meeting 40 - Amsterdam, Netherlands 30th October 2014](#)
- ▶ [ISCWSA meeting 39 - Long Beach, California, USA 9th May 2014](#)
- ▶ [ISCWSA meeting 38 - New Orleans, Louisiana, USA 3rd October 2013](#)
- ▶ [ISCWSA meeting 37 - Paris, France - 8th March 2013](#)

45<sup>th</sup> General Meeting  
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Wellbore Positioning Technical Section



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Survey Accuracy (ISCWSA)

# MEETING MINUTES – 44<sup>TH</sup> MEETING GENERAL MEETING ARCHIVE

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

## Meeting Minutes

▶ ISCWSA meeting 45 - The Hague, Netherlands - 17th March 2017

▶ ISCWSA meeting 44 - Glasgow, Scotland UK - 22nd September 2016

ISC44\_minutes

00\_ISCW44\_MeetingProgram

01\_ISC44\_SonPham\_Conoco\_Phillips\_Introduction

02\_ISC44\_JonathanLightfoot\_Oxy\_ProgramOverview

03\_ISC44\_LenDuncan\_MagVar\_Past-Present-Future

04\_ISC44\_CiaranBeggan\_BGS-GeomagModeling

05\_ISC44\_SteveSawaryn\_Independent\_Consultant\_Collision\_Avoidance\_Subcommittee\_update

06\_Updated\_ISC44\_JonBang\_Gyrodatta\_Combined\_Wellbore\_Surveys\_IPM\_SPE178826

07\_ISC44\_GiorgioPattarini\_Stavanger\_Uni\_MagneticMud

08\_ISC44\_PatrickAlken\_NOAA\_GeomagModeling

09\_ISC44\_Prof\_Giles\_Hammond\_Gravitational\_Physics\_Glasgow\_Uni

10\_ISC44\_Prof\_AngusJamieson\_AJC\_Dave\_McRobbie\_DistinguishedMemberAward

11\_ISC44\_AndyMcGregor\_Tech21\_ErrorModelCommittee\_update

12\_ISC44\_PeteClark\_Chevron\_OWSG\_Update\_API-RP78

13\_ISC44\_Prof\_AngusJamieson\_AJC\_MWD\_a\_New\_Approach

14\_ISC44\_RobertWylie\_TreasurersUpdate

15\_ISC44\_CarolMann\_DGI\_Educational\_Subcommittee\_update

16\_ISC44\_ChadHanak\_SuperiorQC\_East\_West\_Exclusion\_Zones

17\_ISC44\_Phil\_Harbidge\_Schlumberger\_Webmaster\_Update

▶ ISCWSA meeting 43 - Fort Worth, Texas, USA, 4th March 2016

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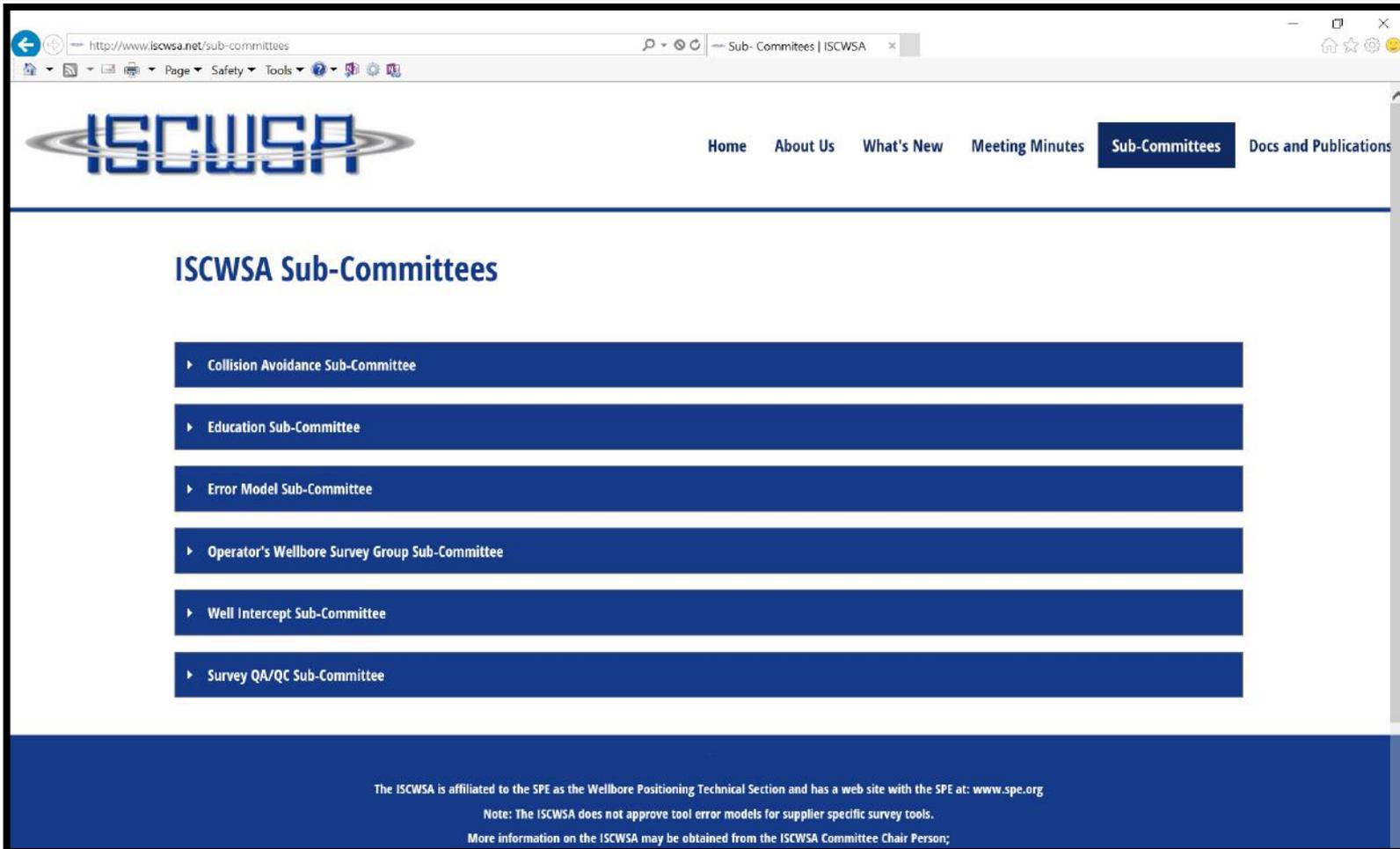
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# ISCWSA SUB-COMMITTEES

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair



The screenshot shows a web browser window with the URL <http://www.iscwsa.net/sub-committees>. The page features the ISCWSA logo and a navigation menu with links for Home, About Us, What's New, Meeting Minutes, Sub-Committees (highlighted), and Docs and Publications. The main content area is titled "ISCWSA Sub-Committees" and lists six sub-committees, each with a right-pointing arrow icon:

- ▶ Collision Avoidance Sub-Committee
- ▶ Education Sub-Committee
- ▶ Error Model Sub-Committee
- ▶ Operator's Wellbore Survey Group Sub-Committee
- ▶ Well Intercept Sub-Committee
- ▶ Survey QA/QC Sub-Committee

At the bottom of the page, there is a footer with the following text:

The ISCWSA is affiliated to the SPE as the Wellbore Positioning Technical Section and has a web site with the SPE at: [www.spe.org](http://www.spe.org)  
Note: The ISCWSA does not approve tool error models for supplier specific survey tools.  
More information on the ISCWSA may be obtained from the ISCWSA Committee Chair Person;

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# SUB-COMMITTEE – COLLISION AVOIDANCE – WEB PORTAL

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

## Collision Avoidance Sub-Committee

**Mission Statement** - Develop and describe good practice in collision avoidance management, and promote its adoption in the well construction industry.

The work group has produced several documents which are revised periodically and are available on this site (see "Collision Avoidance Docs and Publications").

Please contact the Sub-Committee chair [Steve Sawaryn](#) if you would like to contribute to the Collision Avoidance Work Group.

### Collision Avoidance Sub-Committee Docs and Publications

### Download Last Minutes of Meeting

#### Previous meetings:

Minutes of the 17th meeting, and work group document links below, Amsterdam, Holland 31-10-2014

No minutes published for the 16th meeting

Minutes of the 15th meeting, New Orleans USA 02-Oct-2013

Minutes of the 14th meeting, Paris, France 07-Mar-2013

Minutes of the 13th meeting, San Antonio, Texas, USA 10-Oct-2012

Minutes of the 12th meeting, Edinburgh, Scotland, UK, 9-May-2012

Minutes of the 11th meeting, Denver Colorado, USA, 3-Nov-2011

Minutes of the 10th Meeting, Copenhagen, Denmark, 3-Mar-2011

Minutes of the 9th Meeting, Florence, Italy, 22-Sep-2010

Minutes of the 8th Meeting, Austin, USA, 2-Mar-2010

Minutes of the 7th Meeting, New Orleans, USA, 7-Oct-2009

Minutes of the 6th Meeting, Amsterdam, The Netherlands, 19-Mar-2009

Minutes of the 5th Meeting, Denver, USA, 24-Sep-2008

Minutes of the 4th Meeting, Inverness, Scotland, 22-Apr-2008

Minutes of the 3rd Meeting, Anaheim, USA, 14-Nov-2007

Minutes of the 2nd Meeting, Rijswijk, The Netherlands, 22-Feb-2007

Minutes of the 1st Meeting, San Antonio, USA, 27-Sep-2006

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# DOCUMENTS & PUBLICATIONS

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http://www.iscwsa.net/docs-and-publications

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## Docs & Publications

- ▶ [ISCWSA SPE Technical Section Constitution](#)
- ▶ [Position Uncertainty Bibliography \(2010\)](#)
- ▶ [Collision Avoidance Sub-Committee](#)
- ▶ [Education Sub-Committee Joint Industry Project e-book](#)
- ▶ [Error Model Sub-Committee](#)

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Son Pham - Chairperson

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# DOCUMENTS & PUBLICATIONS

## POSITION UNCERTAINTY BIBLIOGRAPHY

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### Docs & Publications

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Monday, March 20, 2017

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# DOCUMENTS & PUBLICATIONS COLLISION AVOIDANCE SUB-COMMITTEE

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- ▶ [Collision Avoidance Sub-Committee](#)

Fundamentals of Successful Well Collision Avoidance Management Released 8 Jan 14  
Recommendation Against Minimum Allowable Separation Distance (MASD) Dispensation for HSE Risk Wells (Jan-2014)  
Standard set of wellpaths for evaluating clearance scenarios 5 Nov 13  
Current Common Practice in Collision Avoidance Calculations Oct 2013  
Collision Avoidance Lexicon 2011 English  
Collision Avoidance Lexicon 2011 Chinese  
Current Common Practice in Collision Avoidance Calculations 2011 Chinese  
Collision Avoidance Bibliography 2010  
IADC1997\_Torkildsen\_General\_error\_model  
IKUreport1996\_Bang\_General\_error\_model

Please contact the ISCWSA webmaster for any documents or change suggestions for this page

- ▶ [Education Sub-Committee Joint Industry Project e-book](#)

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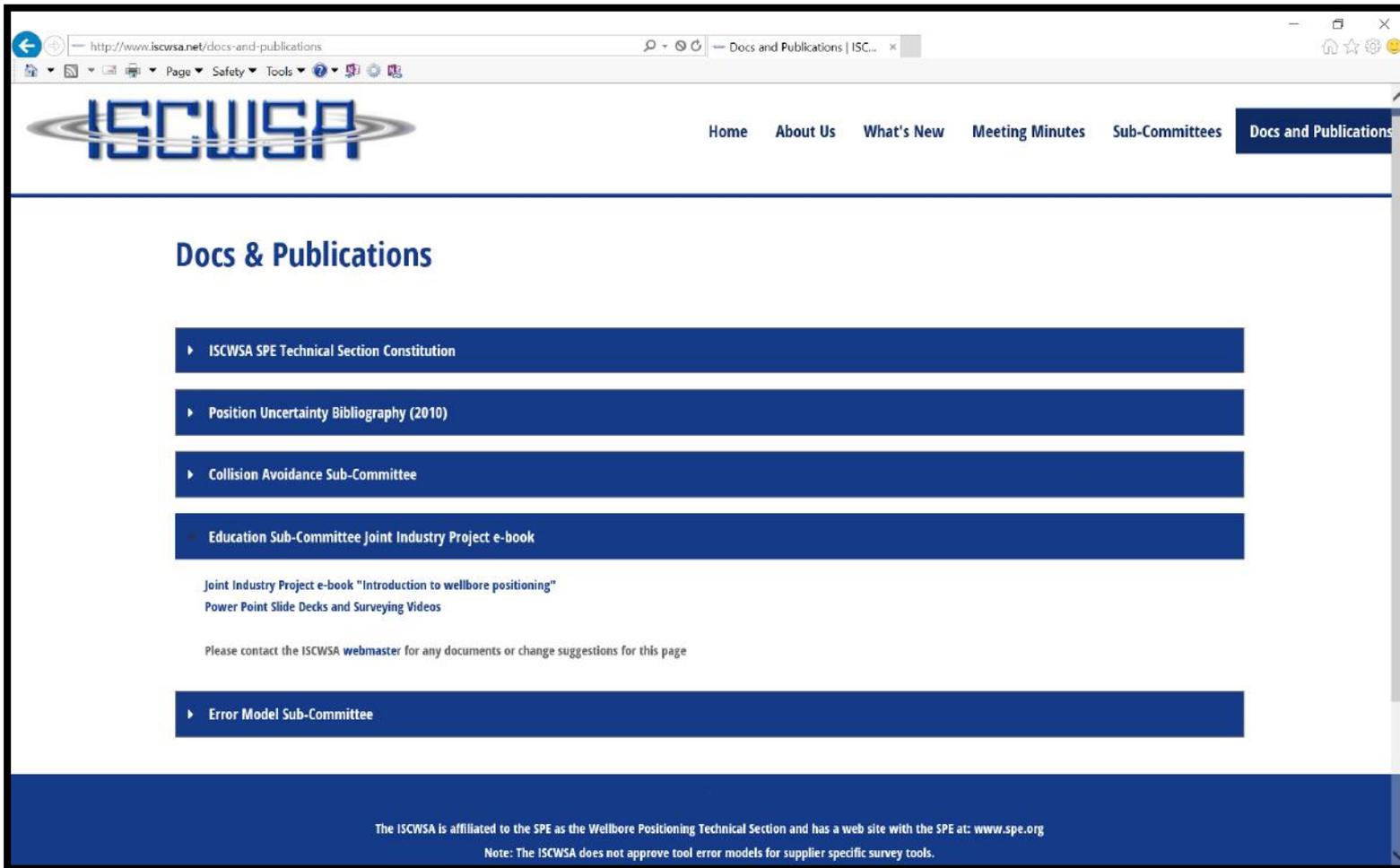
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# DOCUMENTS & PUBLICATIONS EDUCATION SUB-COMMITTEE

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- ▶ [Position Uncertainty Bibliography \(2010\)](#)
- ▶ [Collision Avoidance Sub-Committee](#)
- ▶ [Education Sub-Committee Joint Industry Project e-book](#)
  - Joint Industry Project e-book "Introduction to wellbore positioning"
  - Power Point Slide Decks and Surveying Videos
- Please contact the ISCWSA webmaster for any documents or change suggestions for this page
- ▶ [Error Model Sub-Committee](#)

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# DOCUMENTS & PUBLICATIONS - eBook Introduction to Wellbore Positioning

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The screenshot shows a web browser window with the URL <https://www.uhi.ac.uk/en/research-enterprises/res-themes/wellbore-positioning/download/>. The page header includes the University of the Highlands and Islands logo and navigation links for Current Students, Staff, Alumni, and Gaidhlig. Below the header are four main menu items: COURSES, STUDY WITH US, CAMPUSES, and RESEARCH. The main content area features a breadcrumb trail: home > research > introduction to wellbore positioning - download. The title 'Introduction to wellbore positioning - download' is prominently displayed. A paragraph of text explains that this is an industry standard publication accepted by the ISCWSA board, published through the UHI Research Office. It includes a 'Please note' section stating that the publication will be updated as technology changes. Below this, the title 'Introduction to Wellbore Positioning (V06.02.17) - pdf, 11MB' is shown, along with the 'LATEST VERSION: V06.02.17'. A link is provided for details of the course, developed by the University of the Highlands and Islands in partnership with the Society of Petroleum Engineers (SPE) Technical Section for Wellbore Positioning. A large image of the eBook cover is displayed, featuring the title 'INTRODUCTION TO WELLBORE POSITIONING' and 'An ISCWSA Initiative'. The cover art shows an offshore oil rig at sea. At the bottom of the screenshot, a 'Copyright notice' section is visible, containing the text: 'This eBook is provided, and may be used, free of charge. Selling this eBook in its entirety, or extracts from it, is prohibited. Obtain permission from the author before redistribution. In all cases this copyright notice and details of the authors and contributors (pages 1 & 2) must remain intact.'

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As this publication develops we will post any version update information below:

**VERSION: V06.02.17**

**Updates from the below version include;**

Renumbering references to figures in the body of the document to match the number in the figures.

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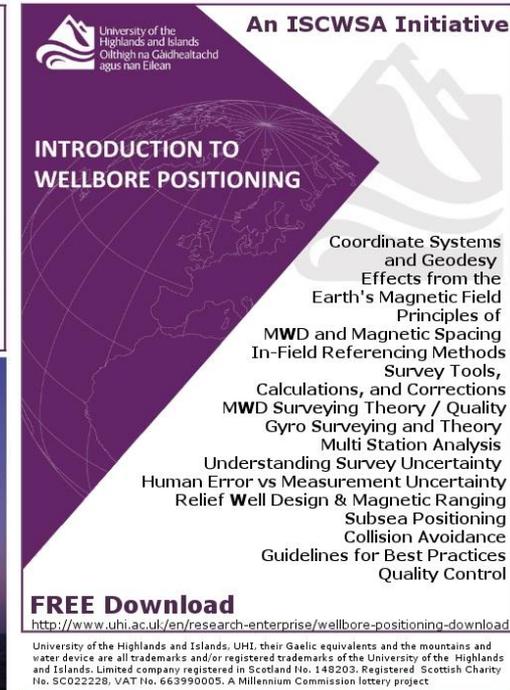
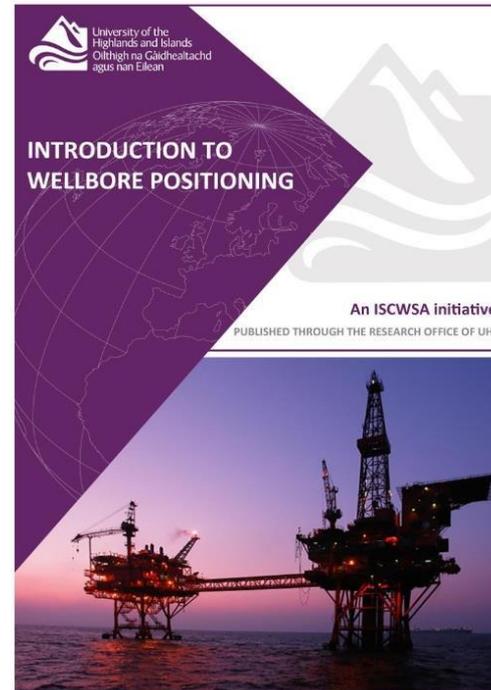
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Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore  
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- E-book
  - Flyer – SPE Book Store
  - 20,000+ Downloads
  - 2 New Chapters



# DOCUMENTS & PUBLICATIONS EDUCATION SUB-COMMITTEE - YOUTUBE

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

The screenshot shows the YouTube channel page for the Wellbore Positioning Technical Section (ISCWSA). The browser address bar shows the URL: https://www.youtube.com/channel/UCPTHzZDPPxZD-FF7BbnqrTg. The page features the channel's logo, which includes the SPE International logo and the text 'Wellbore Positioning Technical Section' and 'ISCWSA'. Below the logo, the channel name 'Program Chair' is displayed with a 'Subscribe' button showing 2 subscribers. A description reads: 'This is the Industry Steering Committee on Wellbore Survey Accuracy YouTube Channel.' Under the 'Created playlists' section, there is a playlist titled 'Wellbore Positioning' with 3 videos: 'Making the Most of Borehole Surveying' (1:10:47), 'Wellbore Surveying Competency Programme' (6:14), and 'Drilling Rig' (34:35). The 'Subscriptions' section shows four channels: 'The White House' (964K subscribers), 'Society of Petroleum Engineers' (4.3K subscribers), 'thinkuhi' (296 subscribers), and 'Angus Jamieson' (6 subscribers). The footer of the page includes the YouTube logo, language settings (English), content location (Oman), restricted mode (Off), history, and help links. The date 'Monday, March 20, 2017' is visible in the bottom right corner of the browser window.

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Wellbore Positioning Technical Section



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# DOCUMENTS & PUBLICATIONS - Video Making the Most of Wellbore Surveying

Middle East Review  
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Jonathan Lightfoot  
ISCWSA Program Chair

https://www.uhi.ac.uk/en/research-ent... Docs and Publicat... Surveying Sum...

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Oithigh na Gàidhealtachd agus nan Eilean

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## Surveying Summary Video

### "Making the Most of Borehole Surveying" with Prof Angus Jamieson.

The Society of Petroleum Engineers Technical section for Wellbore Positioning, (ISCWSA) is pleased to offer the following presentations in cooperation with the University of the Highlands and Islands (UHI) for unrestricted use in the Oil and Gas Industry. These presentations are free to download and use but not to distribute. They cannot be offered for sale and the university and the ISCWSA cannot accept any liabilities in the use of these. The presentation is available in full directly below, with each individual section available to watch separately below that.

Download the presentation powerpoint (16.4Mb)

Download the presentation powerpoint as a pdf (6.6Mb)

Want more information? Please see our free to download ebook 'Introduction to Wellbore Positioning', co-written by Professor Jamieson, by clicking the link at the bottom of the navigation panel left or follow this [Link to the viewing and download page](#)

**Full video:**

Energy Research Centres

Resource Assessment

Marine Renewable Energy

- 1 Making the Most of Borehole Surveying  
thinkuhi
- 2 Wellbore Surveying Competency Programme  
thinkuhi
- 3 Drilling Rig  
Angus Jamieson

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Wellbore Positioning  
Program Chair - 2/3 videos

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thinkuhi
- 2 Wellbore Surveying Competency Programme  
thinkuhi
- 3 Drilling Rig  
Angus Jamieson

Wellbore Surveying Competency Programme

thinkuhi

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161 views

Video titles in player:  
- Collision Avoidance part 1  
- Collision Avoidance part 2  
- Simulation Exercise - Drilling a Gate  
- Survey Improvement Techniques  
- Sag Correction Techniques  
- Misalignment Correction  
- Stretch & Thermal Correction  
- Short Collar Magnetic Correction  
- Multi Station Analysis Magnetic Correction

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# DOCUMENTS & PUBLICATIONS EDUCATION SUB-COMMITTEE - YOUTUBE

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

The screenshot shows a YouTube video player with the following content:

- Video Title:** Making the Most of Borehole Surveying
- Channel:** thinkuhi (296 subscribers)
- Views:** 4,259
- Upload Date:** Mar 22, 2013
- Category:** Education
- License:** Standard YouTube License

The video content features a diagram illustrating wellbore positioning errors. The diagram shows a red wellbore axis and a green uncertainty ellipse. Text overlays explain the effects of different errors:

- "The inclination error creates a high side dimension of the uncertainty ellipse."
- "The azimuth error creates a lateral dimension."
- "But the measured depth error creates a third component along the axis of the wellbore."

The video player interface includes a search bar, navigation icons, and a playlist on the right side titled "Wellbore Positioning" with 1/3 videos listed.

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# 45<sup>TH</sup> General Meeting Program - Recap

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March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

- **THE HAGUE**
- **MARCH 17**
- **SUB-COMMITTEE MEETINGS**
  - **OWSG**
  - **WELL INTERCEPT**
  - **EDUCATION**
  - **ERROR MODEL**
  - **COLLISION AVOIDANCE**
- **65 ATTENDEES**



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45<sup>th</sup> General Meeting  
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Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore  
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## Sub-Committee Meetings

Day 1 - OWSG & Collision  
 Avoidance Meeting  
 Wednesday  
 March 15, 2017

Day 2 - Sub-Committee Meetings for  
 Collision Avoidance, Error Model Maintenance, Well  
 Intercept and Education - Thursday  
 March 16, 2016

### Room A

Operator's Wellbore Survey  
 Group (OWSG) Meeting  
 10:30 am - 11:45 pm

Lunch 11:45 am - 1:00 pm

Collision Avoidance  
 1:15 pm - 5:00 pm

### Room A

Collision Avoidance  
 8:30 am - 11:45 am

Lunch 11:45 am - 1:00 pm

Error Model  
 Maintenance  
 1:15 pm - 5:00 pm

### Room B

Well Intercept  
 8:30 am - 11:45 am

ISCWSA Group Lunch  
 11:45 am - 1:00 pm

Education  
 1:15 pm - 5:00 pm

### ISCWSA

45<sup>th</sup> General Meeting

Friday

March 17, 2017

Introduction, Keynote & AC Rules  
 Committee Update  
 8:30 am to 10:00 am

SME Industry Talks & Well Intercept  
 Committee Update  
 10:20 am to 11:40 am

Group Lunch 11:40 am - 12:40 pm  
 GARM 2013 Announcement

Guest Speaker - Jon Curtis - SPE Drilling  
 Uncertainty Prediction TS  
 12:40 pm - 1:40 pm

Technical Talks, Error Model Maint. &  
 OWSG/API RP78 Update  
 1:40 pm to 2:50 pm

Technical Talk & Officer/Committee  
 Updates - Education, Website, Treasury  
 & Secretary  
 Closing Comments  
 3:10 pm to 5:00 pm

# General Meeting Program - Recap

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

Activity	Presenter(s)	Title	From	To
<b>Introduction</b>	Jonathan Lightfoot (Occidental Oil & Gas Corp.) ISCWSA Program Chair	Welcome, & Introduction	8:30	8:35
<b>Program Agenda</b>		Schedule and Program Review	8:35	8:40
<b>Keynote Presentation</b>	Steve Sawaryn (Consultant)	Collision Avoidance Management Principles, SPE 184730 Review	8:40	9:40
<b>Sub-Committee Update</b>	Steve Sawaryn (Consultant)	Sub-Committee Activity Report: <b>Collision Avoidance</b>	9:40	10:00
<b>Coffee Break &amp; Technical Posters</b>			<b>10:00</b>	<b>10:20</b>
<b>Technical Presentation</b>	Harald Bolt (ICT Europe Ltd.)	What Depth? Review of wireline and drill pipe derived along-hole depth determination and how this relates to API RP-78 Depth QA-QC report. Introduction of a proposed method for driller's depth measurement improvement.	10:20	10:50
<b>Technical Presentation</b>	Marc Willerth (Magnetic Variation Services LLC)	Correcting stationary MWD surveys using high-resolution inclination measurements	10:50	11:20
<b>Sub-Committee Update</b>	Chad Hanak, (Superior QC)	Sub-Committee Activity Report: <b>Well Intercept</b>	11:20	11:40
<b>Lunch &amp; Technical Posters</b>			<b><u>Lunch Sponsored by Petrolink</u></b>	<b>11:40</b>
<b>Technical Poster Session</b>	Manoj Nair, A. Chulliat, A. Woods, P. Alken, B. Meyer, R. Saltus - NOAA's National Centers for Environmental Information, CIRES and University of Boulder Benny Poedjono - Oilfield Services, Houston, TX	<b>Quantifying the Uncertainty of High-Resolution Geomagnetic Reference Models</b>	<b>10:00 - 10:20</b> <b>12:00 - 12:40</b> <b>14:50 - 15:10</b>	

# General Meeting Program - Recap

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

<b>Guest Speaker</b>	Jon Curtis Chair of the Drilling Uncertainty Prediction Technical Section (DUPTS)	SPE Technical Section Chair to provide a Drilling Uncertainty Prediction Technical Section Overview and Update	<b>12:40</b>	<b>13:40</b>
<b>Sub-Committee Update</b>	Steve Grindrod (Copsegrove Developments Ltd)	Sub-committee activity Report: <b>Error Model Maintenance</b>	13:40	14:00
<b>Technical Presentation</b>	Ross Lowden (Schlumberger)	MEMS GWD System Feld Test Comparisons	14:00	14:30
<b>Sub-Committee Update</b>	Pete Clark (Chevron)	Sub-Committee Activity Report: <b>Operator Wellbore Survey Group (OWSG) &amp; Update on API RP78</b>	14:30	14:50
<b>Coffee Break &amp; Technical Posters</b>			<b>14:50</b>	<b>15:10</b>
<b>Sub-Committee Update</b>	Carol Mann (Dynamic Graphics, Inc.)	Sub-committee Activity Report: <b>Education</b>	15:10	15:30
<b>Technical Presentation</b>	Jon Bang (Gyrodatta)	Quantification of Wellbore Collision Probability by Novel Analytic Methods	15:30	16:00
<b>Administration</b>	Phil Harbidge (Schlumberger)	<b>Webmaster's Report</b>	16:00	16:20
<b>Administration</b>	Robert Wylie (Consultant)	<b>Treasurer's Report</b>	16:20	16:40
<b>Administration</b>	Chad Hanak (Superior QC)	<b>Secretary's Report</b>	16:40	16:50
<b>Administration</b>	Jonathan Lightfoot (Occidental Oil & Gas Corp.)	<b>Closing Statement from the Chair</b>	16:50	17:00
<b>Meeting Adjourn / Wrap-up</b>			<b>17:00</b>	

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45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore  
Survey Accuracy (ISCWSA)

# Survey Results – Future Topics

Rank	Topic	Total Score	Very Important Topic –	Good Topic –	Topic OK, Low Interest –	Not a good topic –	Total Respondents –
1	New Wellbore Surveying Technologies	310	19	16	0	1	36
2	Advanced MWD Corrections (MS / IFR1 / IFR2)	305	18	14	4	0	36
3	Error Model Development & Management	305	17	16	3	0	36
4	Continuous MWD Surveying to improve TVD Uncertainty and Wellbore Position	302.5	20	11	4	1	36
5	Collision Avoidance Management Principles	297.5	17	15	3	1	36
6	Case Study - Root Cause and Corrective Action for a Well Collision	292.5	16	15	4	1	36
7	Continuous MWD Surveying to improve Azimuth Uncertainty and Wellbore Position	287.5	16	13	6	1	36
8	Overview of MWD Corrections during and after the drilling process	285	14	16	5	1	36
9	Combined Surveys to Reduce Uncertainty	285	12	20	3	1	36
10	Depth Corrections & Quality Control	277.5	14	13	8	1	36
11	Well Intercept Practices (Relief, P&A, Avoid Twin)	275	12	16	7	1	36
12	Education & Industry Outreach	272.5	11	17	7	2	36
	Wellbore Positioning Software Developments	267.5	8	21	6	1	36
	Inclination-Only Practices and Wells with No Surveys	260	10	12	14	1	36
	Geodesy & Surface Location Uncertainty	260	8	18	9	1	36
	Using Data Analytics for Synthetic Modeled Surveys	260	10	18	5	3	36
	Survey Database and Records	257.5	8	17	10	1	36
	Geomagnetic Model Technology	255	7	16	13	1	36
	East / West Laterals Uncertainty	252.5	7	17	11	1	36
	Risk Management & Management of Change	250	9	12	14	1	36
	In-Field Referencing	245	5	20	9	2	36
	MEMS Gyro Surveying	242.5	6	17	11	2	36
	Earth-Rate Gyro Surveying	240	5	16	14	1	36
	Unmanned MWD Surveying	227.5	3	19	11	3	36
	In-Hole Referencing	225	3	18	12	3	36

# ISCWSA Distinguished Service Award 2<sup>nd</sup> Recipient

45<sup>th</sup> General Meeting  
The Hague  
The Netherlands

Congratulations Steve  
Your Contributions to the ISCWSA  
and SPE WPTS are Truly  
Appreciated!



45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

Wellbore Positioning Technical Section

# KEY TECHNICAL PAPERS – OWSG ERROR MODELS

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair



IADC/SPE-178843-MS

## OWSG Standard Survey Tool Error Model Set for Improved Quality and Implementation in Directional Survey Management

S. J. Grindrod, Copegrove Developments Ltd; P. J. Clark, Chevron Energy Technology Company; J. D. Lightfoot, Occidental Petroleum Corporation; N. Bergstrom, Devon Energy Corporation; L. S. Grant, Noble Energy, Inc.

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This paper was prepared for presentation at the IADC/SPE Drilling Conference and Exhibition held in Fort Worth, Texas, USA, 1–3 March 2016.

This paper was selected for presentation by an IADC/SPE program committee following review of information contained in an abstract submitted by the author(s). Contents of the paper have not been reviewed by the International Association of Drilling Contractors or the Society of Petroleum Engineers and are subject to correction by the author(s). The material does not necessarily reflect any position of the International Association of Drilling Contractors or the Society of Petroleum Engineers, its officers, or members. Electronic reproduction, distribution, or storage of any part of this paper without the written consent of the International Association of Drilling Contractors or the Society of Petroleum Engineers is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of IADC/SPE copyright.

### Abstract

Understanding wellbore position and the associated uncertainty is fundamental to all drilling operations and reservoir management. Without consistency in predicting to known uncertainties, activities involving positional uncertainty, such as risk mitigations for collision avoidance, cannot be performed reliably with known confidence. For the first time, industry has a common controlled set of uncertainty models thus allowing for transparency in error estimation. Reservoir targeting and subsurface hazard avoidance can be compromised resulting in unrealized stranded reserves and/or intersection of faulted, undesirable formation. Overly optimistic estimations can result in wellbore collisions where the risk of collision is assumed to be very low or can result in a missed well intersection during relief well first ranging point operation. Conversely, overly conservative estimations can result in excessive targeting constraints or directional control requirements.

An analysis of industry survey of error codes being utilized across companies was performed, both vast inconsistencies and significant gaps were realized. A case for action was determined and a collaborative work group was formed under the Operator Wellbore Survey Group (OWSG). OWSG is a subcommittee of the SPE Wellbore Positioning Technical Section (SPE-WPTS). The SPE-WPTS originated as the Industry Steering Committee on Wellbore Surveying Accuracy (ISCWSA), which affiliated to the SPE and became a Technical Section.

It was determined that many of the error codes being utilized in industry were based on survey tool error models established in SPE 67616 and SPE 90408, but there were uncontrolled changes, miss matched versions, and alterations in error assumptions (that were not vetted) being unknowingly utilized. Inspection revealed that the error models, although loosely based on ISCWSA, were varied across both service and operator companies and in some cases were varied internal to individual companies.

The collaborative work group was established to develop a Standard Survey Tool Error Model Set based on the SPE 67616 and SPE 90408 publications, the current work of the ISCWSA error model subcommittee and with contributions from industry's leading subject matter experts. The result of the



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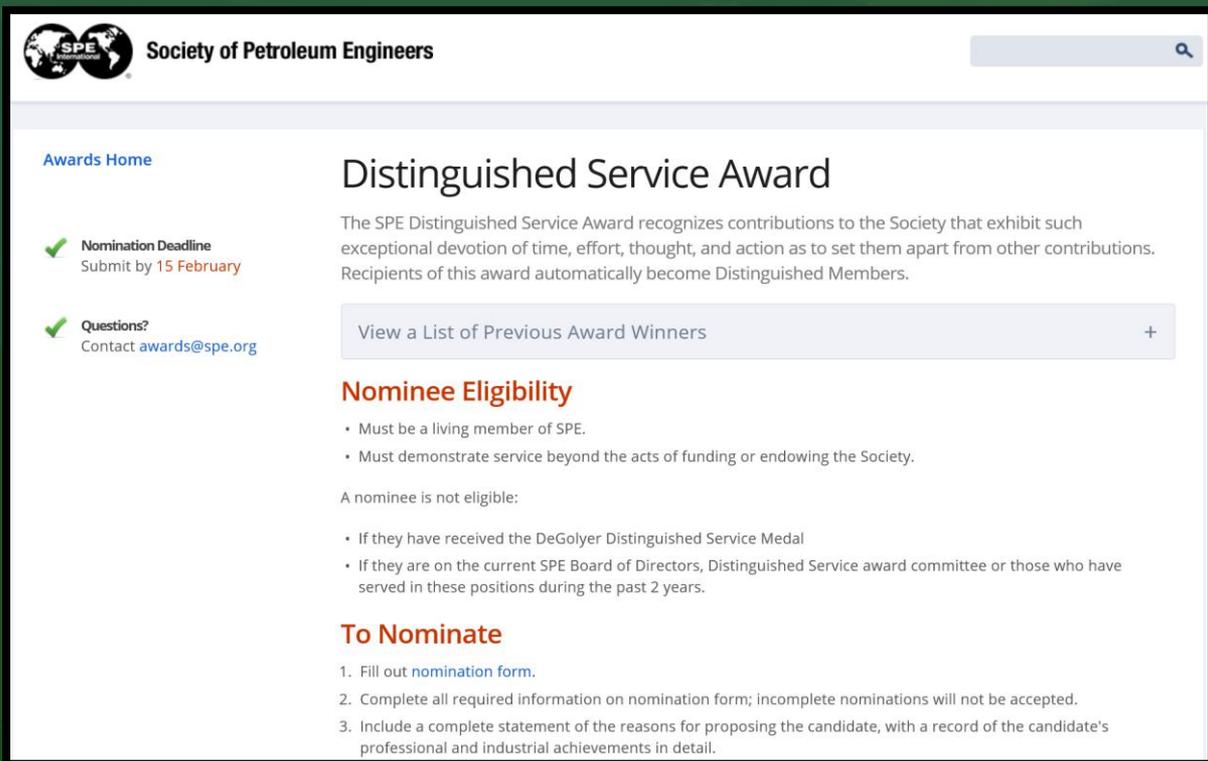
45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA)

# SPE Distinguished Service Award Nominations



The screenshot shows the SPE website's 'Distinguished Service Award' page. At the top left is the SPE logo and the text 'Society of Petroleum Engineers'. A search bar is on the top right. Below the header, there's a 'Awards Home' link. On the left side, there are two green checkmark icons: one for 'Nomination Deadline' with the text 'Submit by 15 February' and another for 'Questions?' with the text 'Contact awards@spe.org'. The main content area has the title 'Distinguished Service Award' and a paragraph explaining the award: 'The SPE Distinguished Service Award recognizes contributions to the Society that exhibit such exceptional devotion of time, effort, thought, and action as to set them apart from other contributions. Recipients of this award automatically become Distinguished Members.' Below this is a button that says 'View a List of Previous Award Winners' with a plus sign. Underneath is a section titled 'Nominee Eligibility' with two bullet points: 'Must be a living member of SPE.' and 'Must demonstrate service beyond the acts of funding or endowing the Society.' This is followed by the text 'A nominee is not eligible:' and two more bullet points: 'If they have received the DeGolyer Distinguished Service Medal' and 'If they are on the current SPE Board of Directors, Distinguished Service award committee or those who have served in these positions during the past 2 years.' The final section is 'To Nominate' with three numbered steps: '1. Fill out nomination form.', '2. Complete all required information on nomination form; incomplete nominations will not be accepted.', and '3. Include a complete statement of the reasons for proposing the candidate, with a record of the candidate's professional and industrial achievements in detail.'

- ISCWSA DSA Recipients who meet the Nominee Eligibility requirements will be Nominated for The SPE Distinguished Service Award

# KEY TECHNICAL PAPERS – OWSG ERROR MODELS

Middle East Review  
March 20-23, 2017  
Jonathan Lightfoot  
ISCWSA Program Chair

Indexes of the Survey Tool Model Sets A-E are included in Appendices 1–5.

Set Name	Description	Reviewed by SME?	Application
A (Standard)	A minimum of 22 additional sets		
B (Extended)	22 additional sets		
C (Contractor)	Model sets supplied		
D (Template)	Contact ISG publications		
E (Other)	Provide examples of Survey Tool Model Sets		

Model Selection Guide							
Level [1]		Level [2]			Level [3]		
Heading [1]	Next Level	Heading [2]	Next Level	Model Reference	Heading [3a]	Next Level	
Depth Reference		Tool Type			Magnetic Tool	Model Reference	
No. of Options (2)		No. of Options (6)			No. of Options (5)		
Fixed	[2]	Magnetic	[3a]		MWD	[4a]	BGGM (Default)
Floating		Gyro	[3b]		Dipmeter	n/a	A018Ma + FI IFR1 (IFR)
		Utility	[3c]		EMS	[4a]	IFR2 (IFR)
		Inc. Only	[3d]		Camera Based	n/a	A024Ma + FI A025Ma + FI HRGM
		Extended (E)	n/a		Contractor (C)	n/a	C400M + FI IGRF/WMM
		Template (D)	n/a				D001 Ga D002 Ga D003 Ga D004 Ga D005 Ga D006 Ga

... Or			... Or		
Heading [3b]	Next Level	Model Reference	Heading [4b]	Next Level	Model Reference
Gyro Tool			Gyro Contractor		
Options (6)			Options (3)		
Gyro MWD	n/a	A019Ga + FI	Baker Hughes	n/a	C100G C105G C110G C115G
Gyro Compass	n/a	A020Ga + FI	GyroData	n/a	C200G C205G C210G C215G C220G C225G C230G C235G C240G C245G C250G
Hybrid	n/a	A021Ga + FI	SDI	n/a	C500G C505G C510G
Inertial Guidance	n/a	B021Ga			
Camera Based	n/a	A022Ga + FI A023Ga + FI			
Contractor (C)	[4b]				

... Or		
Heading [3e]	Next Level	Model Reference
Utility		
No. of Options (4)		
Unknown	n/a	A029Ua + FI
No Data (Blind)	n/a	A026Ua + FI
Blind+Tread	n/a	B022Ua
Zero Error	n/a	A030Ua

... Or		
Heading [3d]	Next Level	Model Reference
Inclination Only		
No. of Options (2)		
Actual	n/a	A027Ua + FI
Planned	n/a	A028Ua + FI

# KEY TECHNICAL PAPERS – MGMT & PRINCIPLES



SPE/IADC  
**DRILLING CONFERENCE AND EXHIBITION**

14-16 March 2017 | The Hague, The Netherlands



## SPE 184730-MS Well Collision Avoidance Management and Principles

On behalf of the SPE

- Well Collision Avoidance Management and Principles
  - Introduction
    - HSE Risk Wells
    - Well Collision Frequency
    - Leading Indicators
  - Minimum Allowable Separation Distance (MASD)
    - Separation Factor
  - Collision Avoidance Elements
  - MASD Dispensations
  - Workflows
    - Planning
    - Execution
  - Further Work
  - Conclusions
  - Recommendations
  - References

SPE/IADC-184730-MS

### Well Collision Avoidance Management and Principles

S. J. Sawaryn, Consultant

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This paper was prepared for presentation at the SPE/IADC Drilling Conference and Exhibition held in The Hague, The Netherlands, 14-16 March 2017.

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#### Abstract

The well collision avoidance management and principles presented in this paper are a culmination of the work and consensus of industry experts from both operators and service companies in the SPE Wellbore Positioning Technical Section (WPTS). This is not a new subject, but current guidance is disparate, company specific and occasionally contradictory. As a result, the guidance can be difficult to understand and implement. A further aim was to drive standardization of the well collision avoidance rules, process and nomenclature throughout the industry. Standardisation improves efficiency and reduces implementation errors.

The consequences of an unplanned intersection with an existing well can range from financial loss to a catastrophic blow-out and loss of life. The process of well collision avoidance involves rules that determine the allowable well separation, the management of the associated directional planning and surveying activities and assurance and verification. The adoption of a particular minimum allowable separation rule, no matter how conservative, does not ensure an acceptably low probability of collision. Many other factors contribute, such as the level of compliance by office and rig personnel with collision avoidance procedures, and the completeness and correctness of the directional database. These factors are all connected.

The material is split into eight sections, each dealing with a critical element in the collision avoidance process. Examples are presented to highlight good implementation practice. This aligned approach will dispel some of the current confusion in the industry over well collision avoidance; improve efficiency when planning and executing wells and build industry focus on the associated collision risks when drilling. The Technical Section is also supporting the current development of API RP78.

This is the first of two papers. The second paper will cover the minimum allowable separation rule and its application, assurance and verification.

#### Introduction

The SPE Wellbore Positioning Technical Section (WPTS) was established as an SPE Technical Section in 2004. Prior to this it was referred to as the Industry Steering Committee on Wellbore Survey Accuracy (ISCWSA). The ISCWSA was founded in 1995 to address both the use and accuracy of directional survey instruments. Although this acronym is still in common use, the section's remit has expanded to address other related issues such as collision avoidance, well intercepts and industry education, (De Wardt et al., 2013).

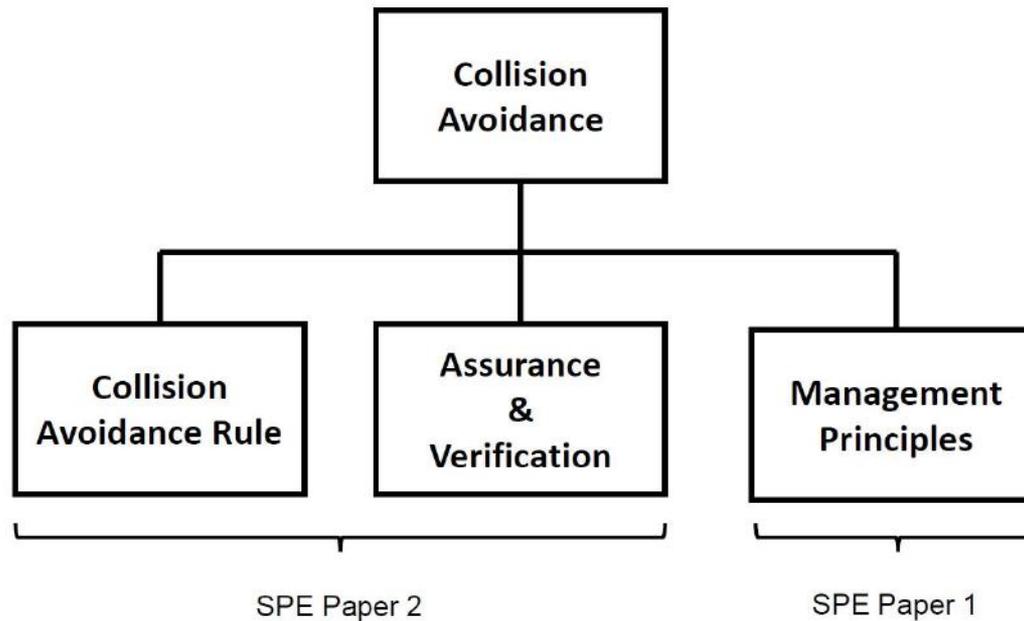


# KEY TECHNICAL PAPERS – CA WORK

## Work Structure

Well Collision  
Avoidance

4



44<sup>th</sup> General Meeting  
September 22<sup>nd</sup>, 2016  
Glasgow, Scotland, UK



Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore  
Survey Accuracy (ISCWSA)

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45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

Wellbore Positioning Technical Section



The Industry Steering Committee on Wellbore  
Survey Accuracy (ISCWSA)

# Educational Subcommittee Update

- 2018 Distinguished Lecturer Nomination
  - Steve Sawaryn



## Distinguished Lecturer

Each year, SPE selects a group of professionals, nominated by their peers, to share their knowledge and expertise with SPE members through visits to local sections.

# NEW INDUSTRY STANDARDS (API RP-78) WELLBORE POSITIONING RECOMMENDED PRACTICE



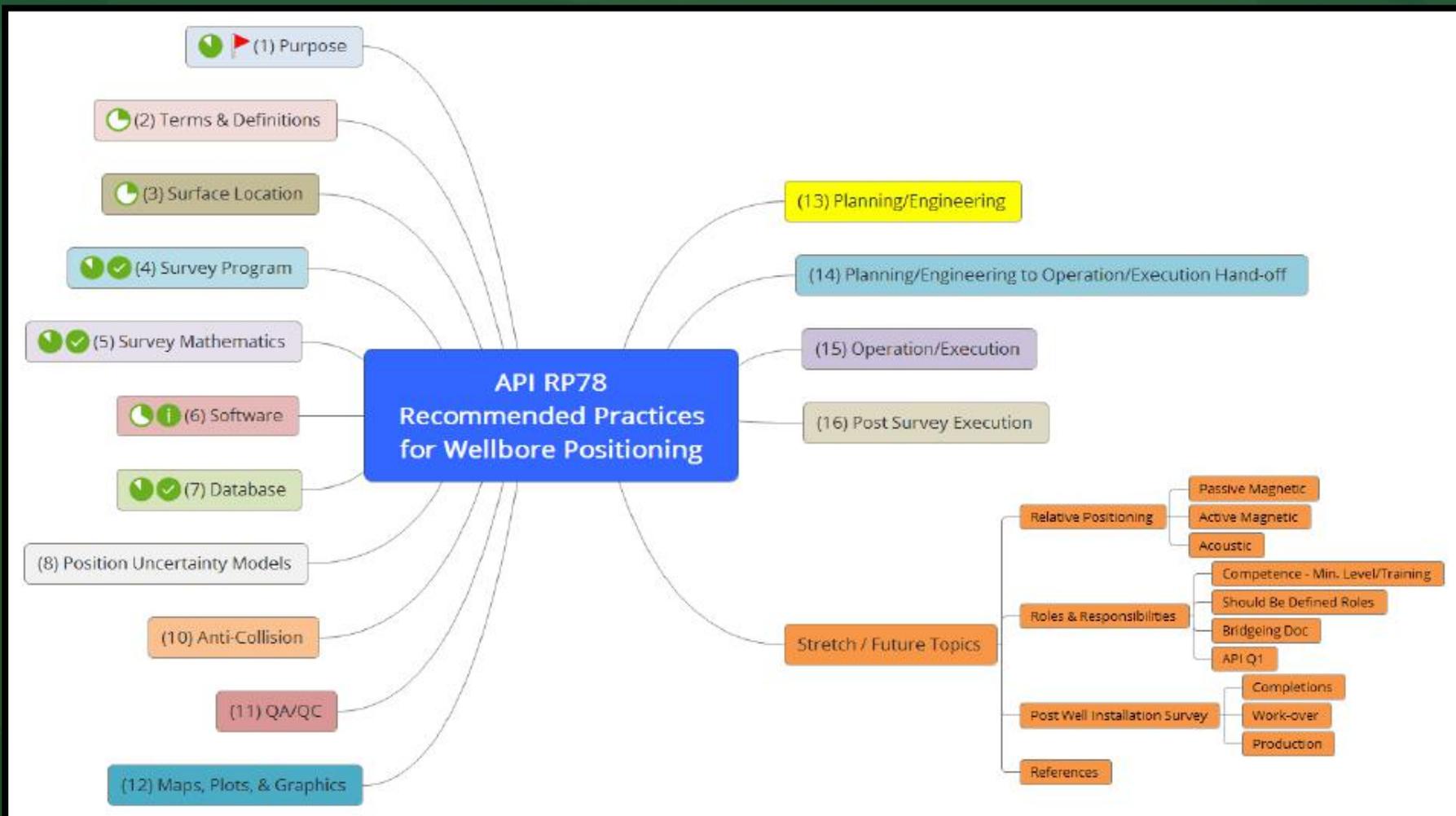
- Comprehensive Industry Standard
  - Forward, Introduction, Scope, Purpose
  - Surface Coordinates
  - Survey Program
  - Survey Mathematics
  - Software
  - Database
  - Positional Uncertainty
  - Anti-Collision
  - Quality Assurance/ Quality Control
  - Maps & Plots
  - Planning & Engineering
  - Transition & Handover
  - Operations & Execution
  - Directional Survey Records
  - Terms & Definitions
  - Bibliography
- Annexes

**What Should Be Done?**  
**(Performance-Based)**  
Min. Requirements  
Proven Engineering Practice

**Not Who?**  
**Not How?**  
**Not Why?**  
**(Not Prescriptive)**

- ❖ **Prescriptive standard – typically prescribes materials, design, and construction methods without stating goals and objectives (“how”)**
- ❖ **Performance-based standard – expresses desired characteristics of the final product, service, or activity rather than requirements for the processes to produce it (“what”)**

# API RP 78 Overview



# API RP-78 – Surface Coordinates (Sub-Section)

## WELLBORE POSITIONING RECOMMENDED PRACTICE



### • Surface Coordinates

- Introduction to Well Origin Coordinates
- Unique Well Identification System
- Horizontal Coordinates & CRS Definition
- Geographic & Projected Coordinates
- Precision & Resolution
- Coordinate Transformations & Scale factor
- Grid Convergence & Magnetic Declination
- Vertical Coordinates & System Definition
- Ground Level and Subsidence
- Zero Measured Depth point & Well Depth Reference Points
- Well Reference Point Positional Uncertainty
- Site and Slot coordinates
- Local and Global Uncertainty
- Offset wells database checks
- Staking Procedure and Boundary Monumentation
- Location Plats



### Compliance with Industry Standards

- ❖ All API documents are voluntary unless imposed by regulation, contract, or company procedures
- ❖ The document type does not determine compliance

# FUTURE ISCWSA WORK

- API RP 78 WELLBORE POSITIONING
- UNIFIED COLLISION AVOIDANCE RULE
- NEW ERROR MODELS
  - MWD+HRGM+MS
  - XCL
  - Dual Inc
- EDUCATION / OUT REACH
- 46<sup>TH</sup> ATCE – SAN ANTONIO
- SPE WEBINARS – JUNE
- SPE ATW – HITS & MISSES
- SPE ATW – RESERVES UNCERTAINTY
- MENA - ADIPEC SPE WPTS TOPICAL LUNCHEON
- 2<sup>ND</sup> SPE PAPER
  - UNIFIED COLLISION AVOIDANCE RULE
  - ASSURANCE & VERIFICATION
  - OCTOBER 2017

# THANK YOU

# QUESTIONS?

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45<sup>th</sup> General Meeting  
March 17<sup>th</sup>, 2017  
The Hague, The Netherlands

Wellbore Positioning Technical Section

