

Metrics for your FT SMS



Design and implementation of metrics for your flight test
Safety Management System

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Objective

FTSW '19 Theme

Data To Assure Success – the key enabler to
Safety Assurance in Flight Test...

how do we really know we're executing our
tests safely? ...

“close-the-loop” on safety management

Take Aways

SMS in FT:

- Ideas
- Road map
- Methods to try

Why SMS

Regulatory requirement

Best practice

Why is it safer?

- Methodical, no oversights
- Constrain risk by exclusion
- Assurance
 - continual improvement

Flight Test SMS

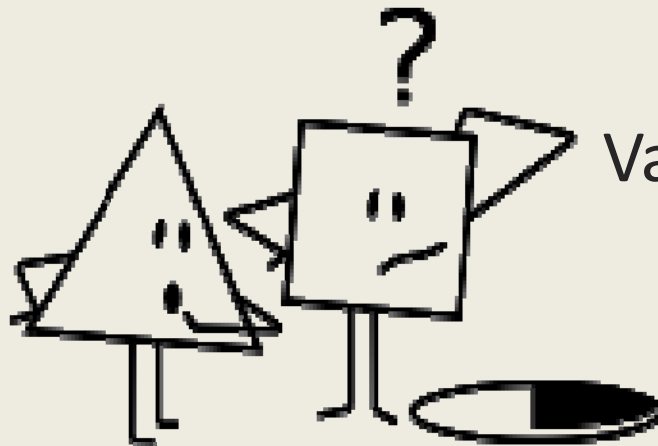
“OK – I want one.”

FT SMS audit protocol

http://www.flighttestsafety.org/images/Flight_Test_SMS_Audit_Protocols_FTSC_Submission.pdf

Application of SMS to FT

VMC vs. all-weather
Variable vs. Fixed config.
etc. ...



SMS Assurance

<https://www.faa.gov/about/initiatives/sms/explained/components/>



*In your SMS,
leading indicators are
your KPIs*

Good KPIs

FT Safety Officer
KPIs

3

- Minimal** – less work
- Effective** – no noise
- Traceable** – to safety outcome
- Unbiased** – leading indicator



R. Kaplan and D. Norton,
"The Balanced Scorecard — Measures that Drive Performance"
Harvard Business Review, February 1992.



M. Schrage and D. Kiron,
"Leading With Next-Generation Key Performance Indicators,"
MIT Sloan Management Review, June 2018.

M. Schrage, "Anatomy of Effective KPIs,"
MIT Sloan Management Review, 2018.

KPI ... what?

SMS Metrics

Systems

Theoretic

Accident

Model

Process

identifies points
of control



<http://psas.scripts.mit.edu/home/>

Leveson (2011). *Engineering a Safer World*

Put KPI here

Addresses complexity

Identifies points of control

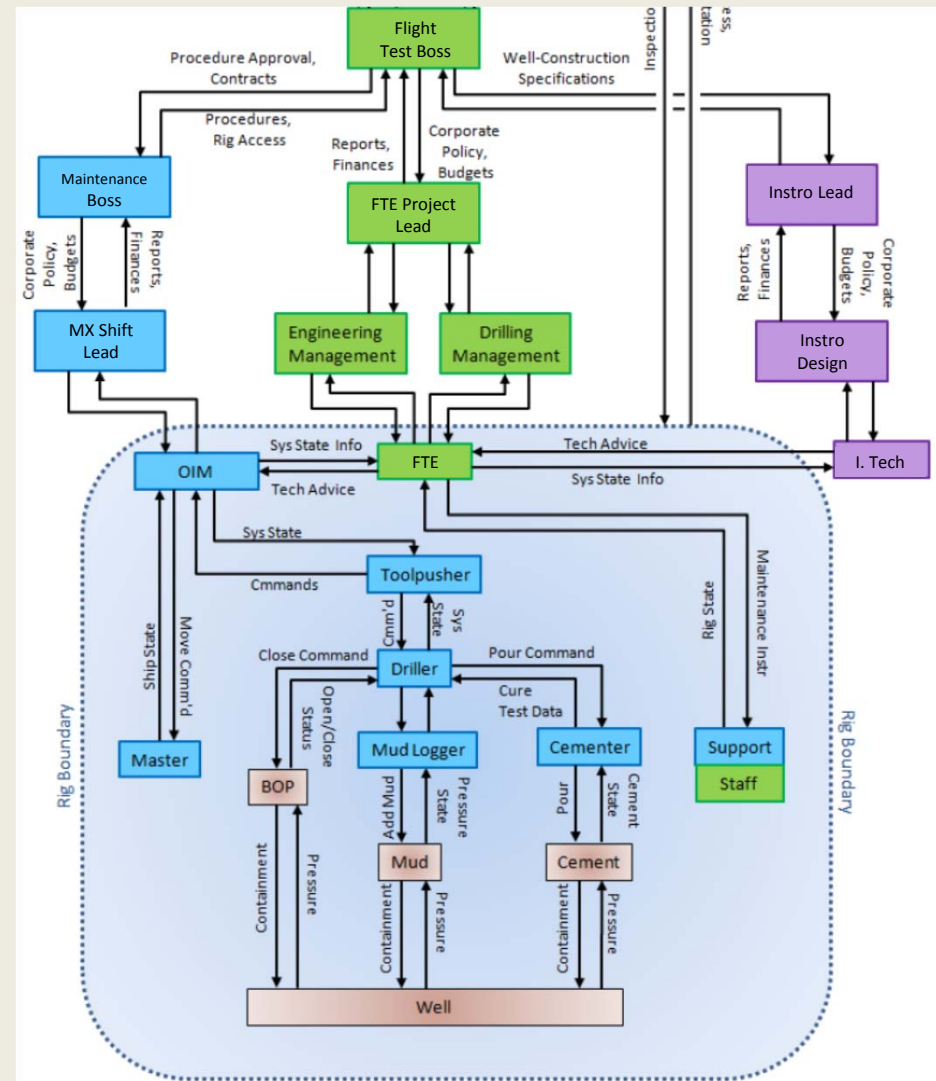
Process

Step	Action
1	Define system boundary – your FT organization, to the point of organizational control
2	STPA hazard analysis on that model - Focus on process, - NOT functional reliability
3	Assign KPI, the leading indicators - Points of control - Especially to assumed input conditions

Example step 1

Control structure
diagram

- Control action
- Feedback



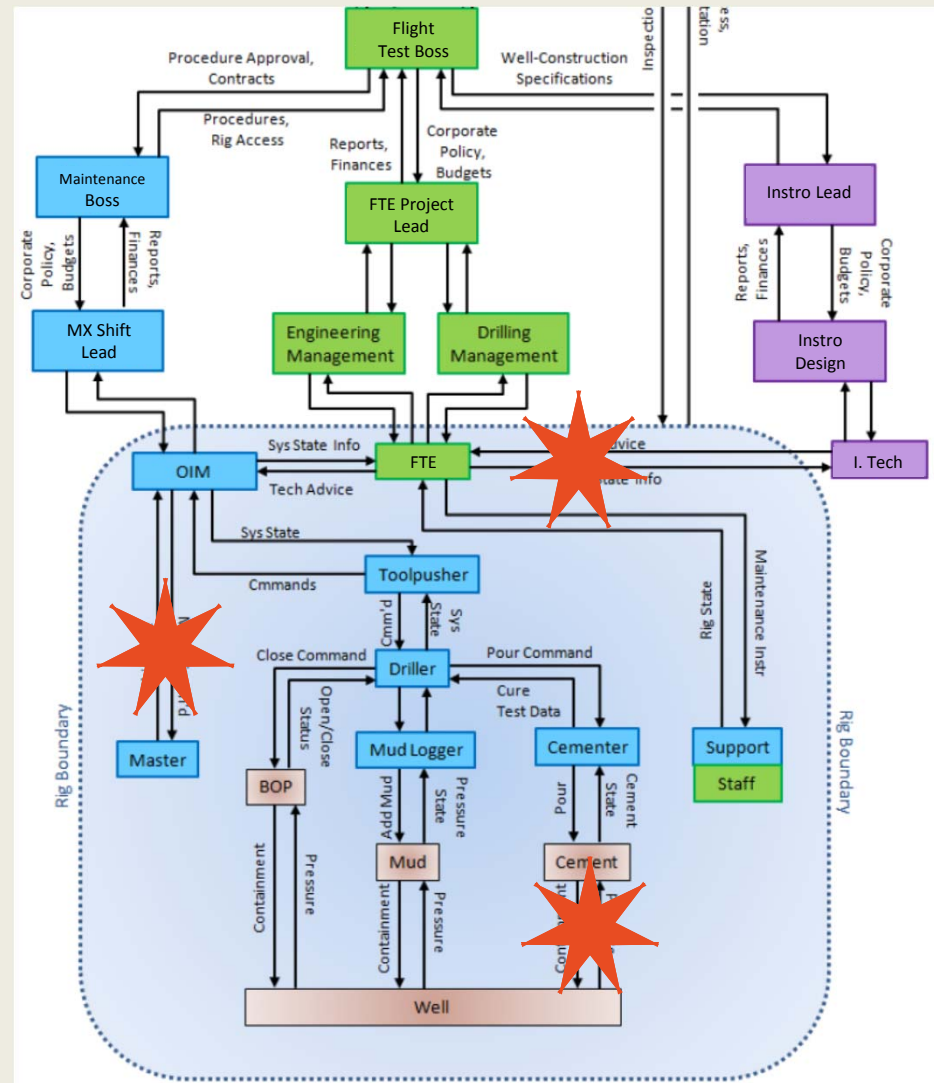
Example step 2

Leveson, N. (2014). A Systems Approach to Risk Management Through Leading Safety Indicators. MIT.

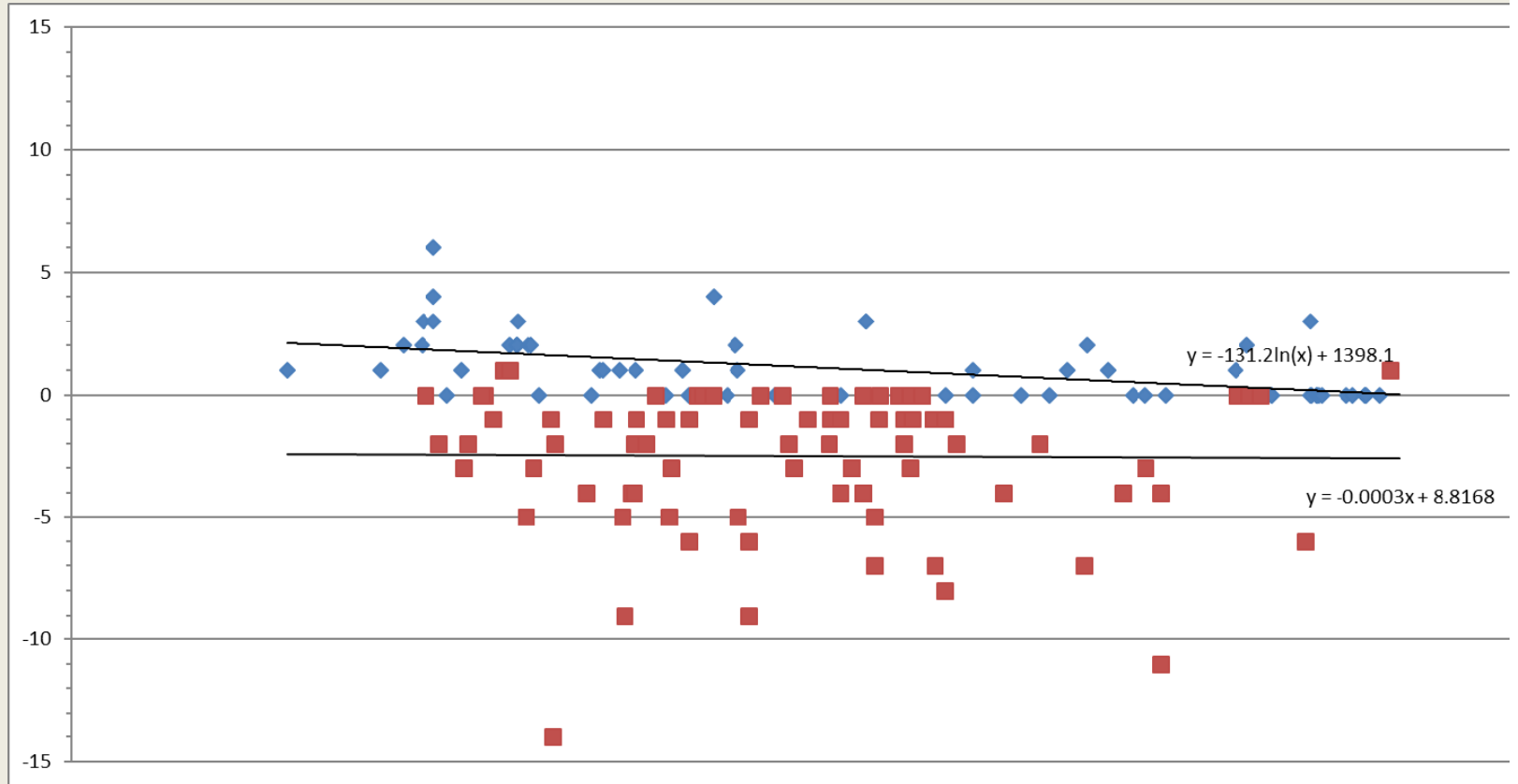
Control Action	Not Providing Causes Hazard	Providing Causes Hazard	Too early / late, out of order	Stopped too soon, applied too long
Test plan peer review	Absent peer review does not assure hazard identification [H-4.1]	Poor quality review fails to ensure adequate standard. [H-4.2] Poor quality review generates false sense of security. [H-4.3]	Review of obsolete version fails to address intended test configuration or conditions [H-4.4]	Review fails to address scope of intended test. [H-4.5] Review is incomplete at commencement of test, failing to address the scope of the intended test. [H-4.6]

Example step 3

Targets for KPIs
pick ~ 3



Baseline



Take Aways

“Data to assure success in SMS”

1. Leading indicators
 - KPI best practices
 - Start with ~ 3
2. Target KPI with STAMP
3. Baseline off yourself

Questions



First A330 – A330 AAR at night

References

- Kaplan, R. & Norton, D. (1992) *The Balanced Scorecard — Measures that Drive Performance*. Harvard Business Review, February 1992.
- Leveson, N. (2014) *A Systems Approach to Risk Management Through Leading Safety Indicators*. MIT
- Leveson (2011). *Engineering a Safer World*. MIT
- FTSC FT SMS audit protocol, http://flighttestsafety.org/images/Flight_Test_SMS_Audit_Protocols_FTSC_Submission.pdf
- Schrage, M. & Kiron, D. (2018). *Leading With Next-Generation Key Performance Indicators*. MIT Sloan Management Review, June 2018.
- Schrage, M. (2018) *Anatomy of Effective KPIs*. MIT Sloan Management Review, 2018.