



Mission Operations Directorate
Expedition Vehicle Division

Decision Making Training in the Mission Operations Directorate

Improving Space Operations Workshop
April 30- May 1, 2013
DI/USA William O'Keefe

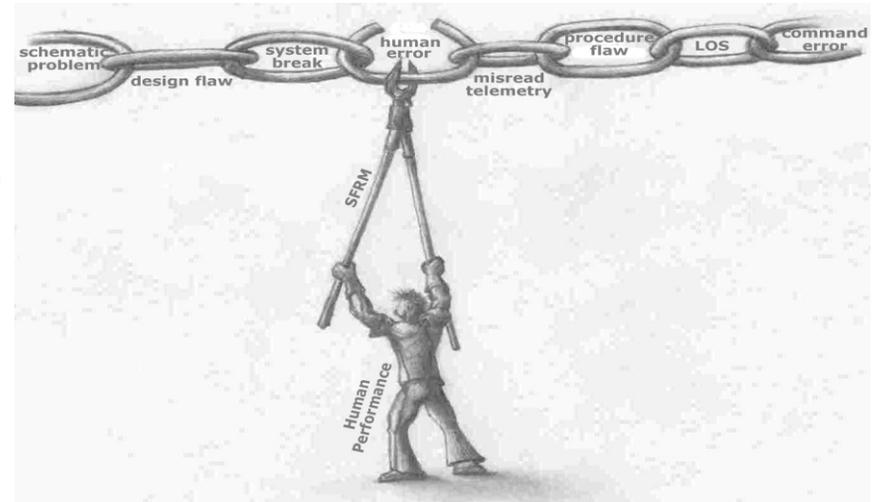
Overview

- Space Flight Resource Management (SFRM)
- Training for Problem Solving/ Decision Making
- Training for Risk Assessment
- Moonbase Table-Top ‘simulations’
- Team Problem Solving
- Training Challenges

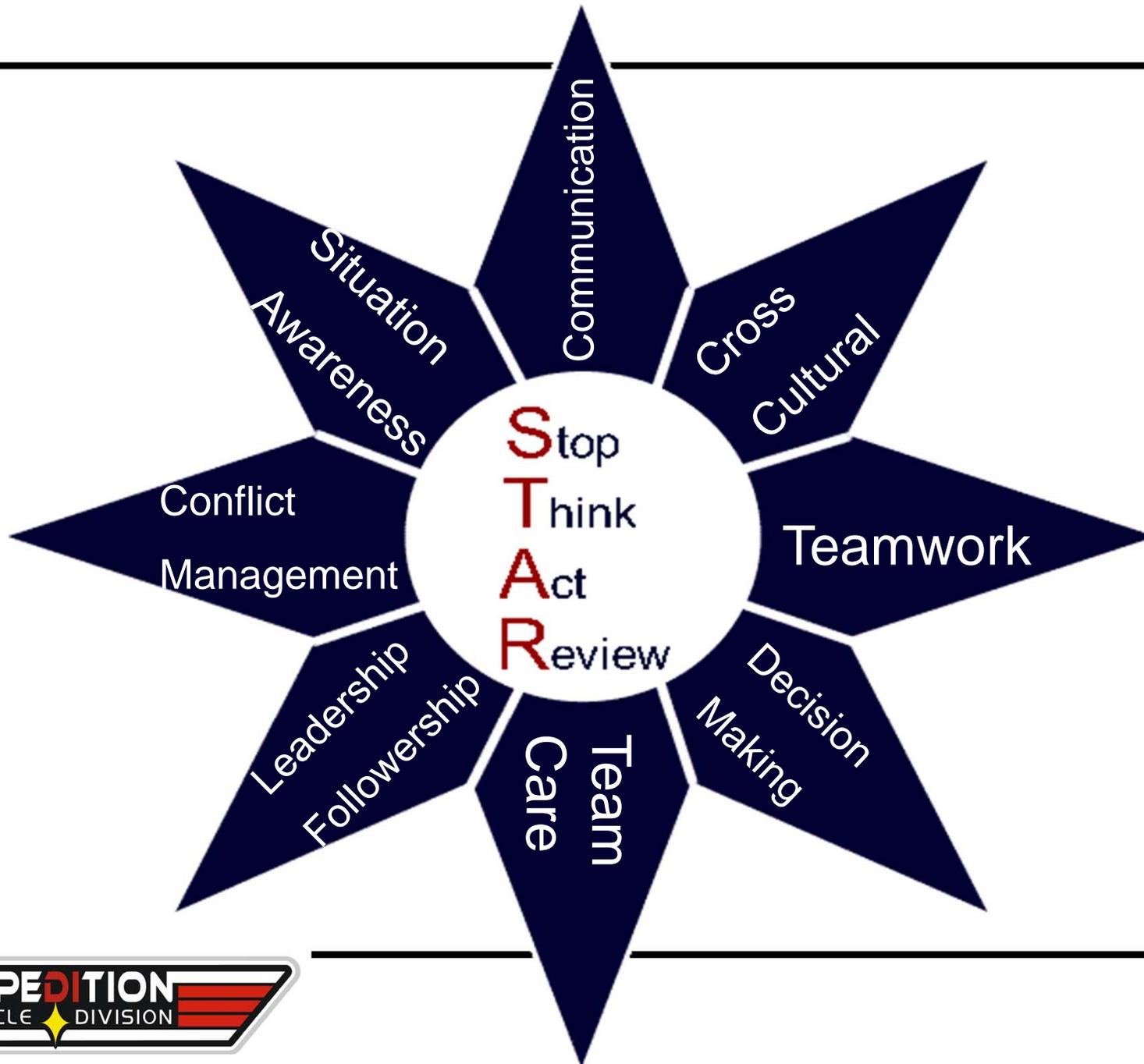


Space Flight Resource Management (SFRM)

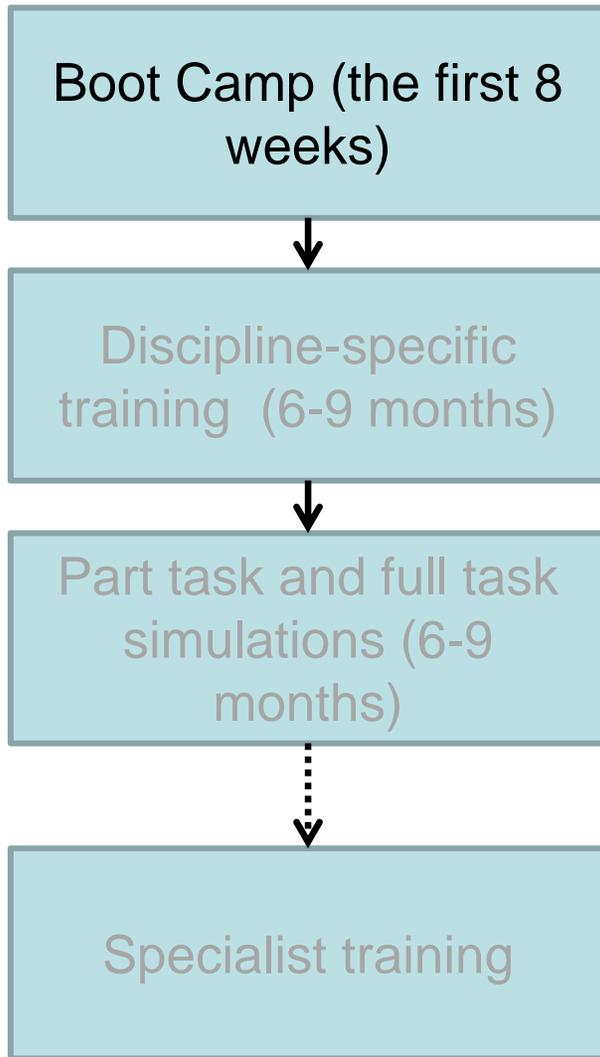
- A set of inter-related team skills designed to break the error chain
- Allows the individual to be an effective member of the team
- SFRM, if used during ‘slow’ periods, may prevent needing SFRM during time-critical periods
- Time affects how you use SFRM



ISS SFRM Model



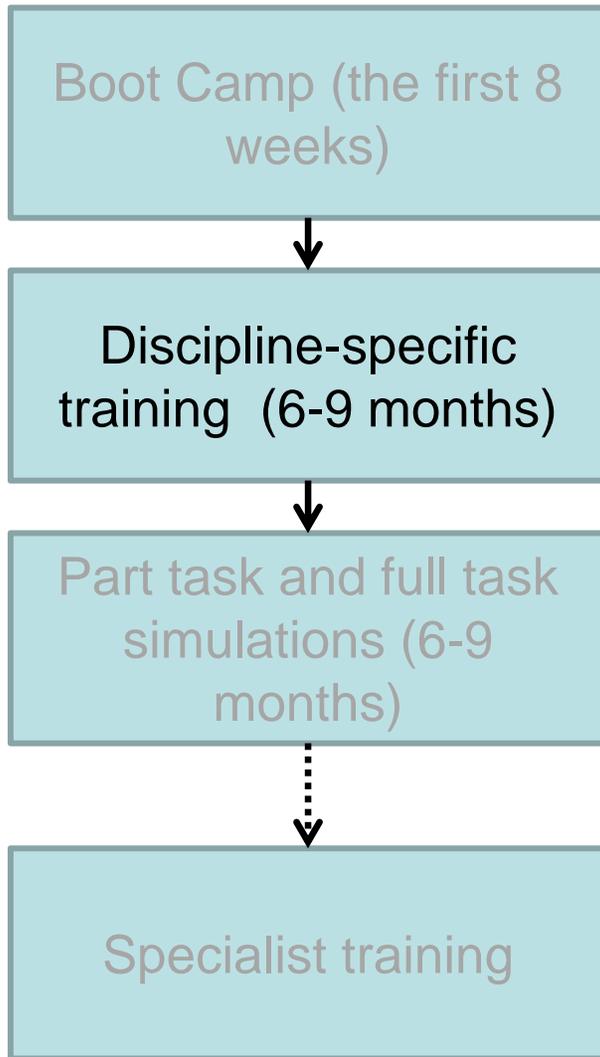
Space Flight Resource Management (SFRM)



- SFRM Skills
 - Moonbase_1.1
 - Situation Awareness
 - STAR
 - Active Listening
 - Moonbase_1.2
- + Culture and Safety lessons



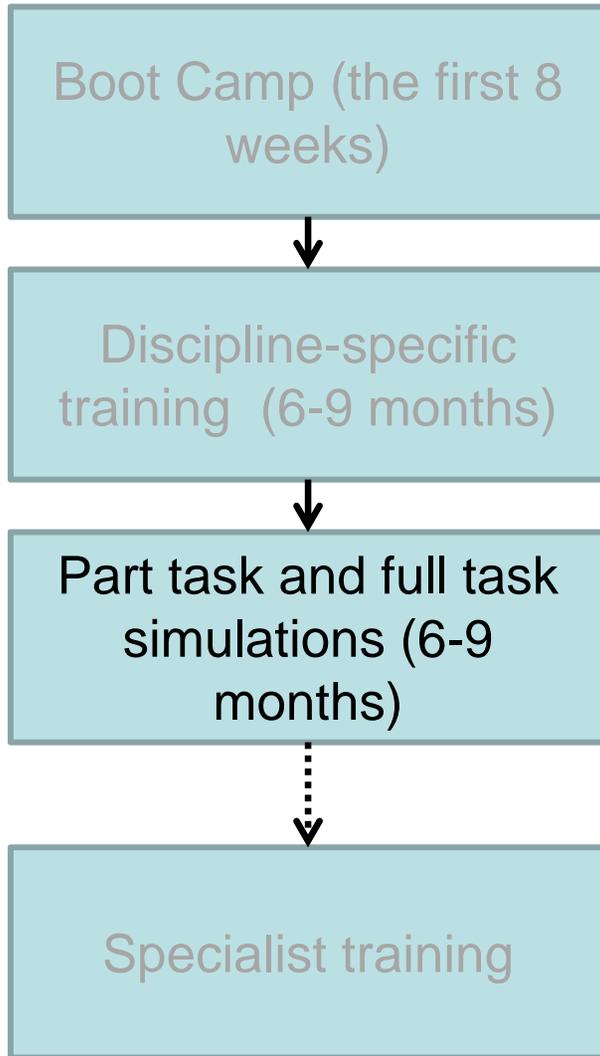
Space Flight Resource Management (SFRM)



- Problem Solving for Operators
 - Risk Assessment
 - Personal Plan
 - Moonbase_Adapting Priorities
 - Moonbase_Problem Solving
- + SFRM embedded in technical lessons (?)



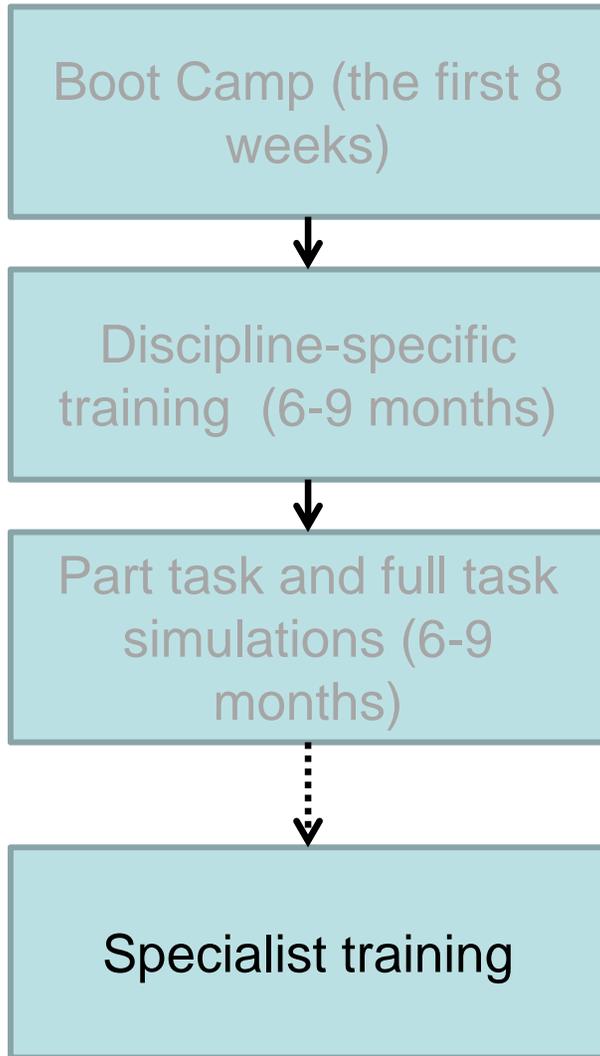
Space Flight Resource Management (SFRM)



- SFRM embedded in simulation scripts; debriefed at end
- Part task training teaches individual skills, introduces team skills
- Full task training teaches team skills in full team, full mission context



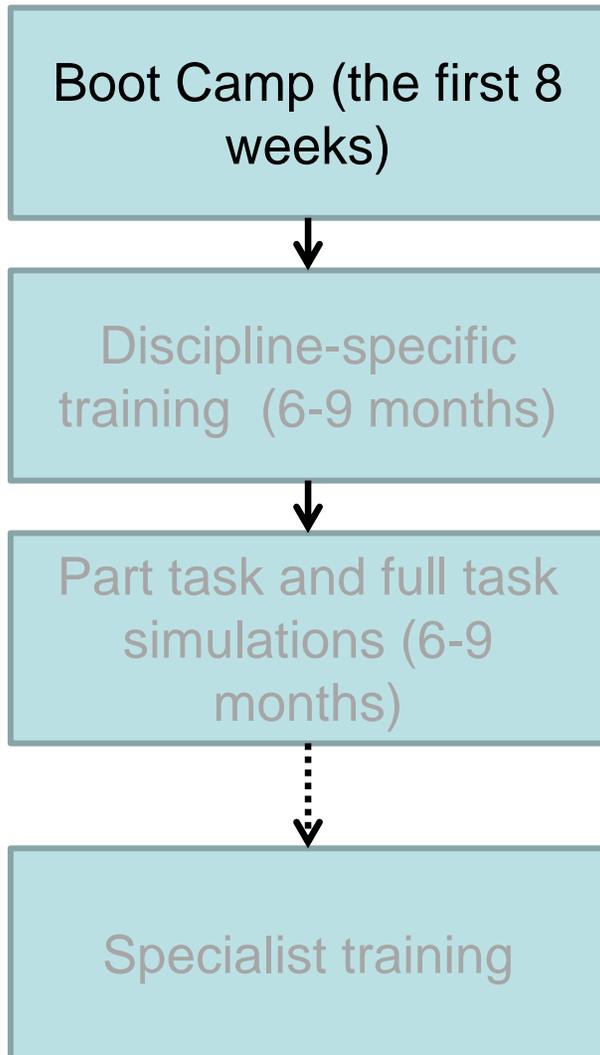
Space Flight Resource Management (SFRM)



- Team Problem Solving lesson in Specialist flow
- SFRM embedded in simulation scripts; debriefed at end
- Full task training teaches team skills in full team, full mission context



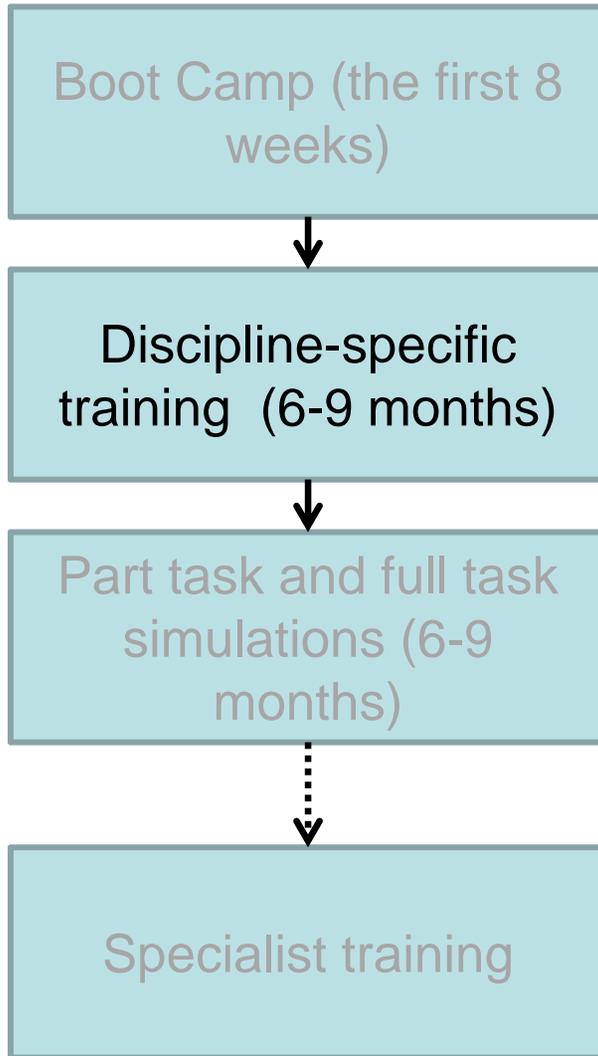
Training for Problem Solving/ Decision Making



- SFRM Skills : Decision Making is
 - The cognitive process leading to selecting a course of action, including an **assessment of options and risks**.
- STAR (Stop-Think-Act-Review)
 - Generic PS/ DM model
 - Situation Assessment
 - How is it different/ same?
 - What are the critical circumstances?
 - How is the assessment validated?
 - Course of Action Selection
 - Evaluating options against critical circumstances
 - Traded against benefits, costs and risks



Training for Problem Solving/ Decision Making



Problem Solving for Operators

- Mission Control Center specific PS/DM model
 - Modeled after how experienced flight controllers solved problems
- Provides them with ‘17 Questions’ for them to answer
 - 9 questions for Situation Assessment
 - 8 questions for Course of Action Selection



9 Questions for Situation Assessment

Failure

1. Can you recognize and (dis)confirm the failure?

Impact

2. Any immediate crew actions required for safety?
3. What functionality/ capability has been affected?
4. What are the immediate impacts?
5. What are the near-future impacts?
6. What are the Times-to-Effect?
7. What are the critical circumstances?
8. How have you checked your assessment?
9. What is your immediate goal?



8 Questions for CoA Selection

Workarounds

1. Is there an existing course of action?
2. What are the options?
3. What are the risks of each option?
4. What are the Benefit/ Cost/ Risk trades?
5. What is your contingency plan?
6. What is your Plan of Action?
7. How have you checked your plan?
8. What is your next goal?



Training for Risk Assessment

- Mentioned in all SFRM lessons
- Demonstrated, practiced and received feedback during Moonbase Table Top simulations
- Risk Assessment lesson
 - Operational risk; not project/ program risk
 - Risk that something may deviate from expectations
 - Evaluated at current state, end state and during workaround
 - Evaluated at technical/ human/ process/ environmental levels
 - Traded as part of benefit/ cost/ risk trades



Moonbase Table Top Simulations

- “Paper simulation”
 - Planning session stressing SFRM
 - Training run
 - Debrief stressing SFRM
- Players must work together
- Risk is introduced by their actions
 - Players know that their actions may constitute a benefit, a cost, or a **future** risk
- Changes to the ‘rules’ occur randomly
 - Forces the players to re-evaluate/ re-do their plan



Team Problem Solving for Specialists

- Specialists solve problems, make decisions and manage risk in a multi-team structure
 - They are simultaneously a leader, follower and co-worker
 - Their situation assessment (including risk) is fed up, down and sideways to build the team's situation assessment
 - The team's situation assessment provides context and direction for the specialist
 - Same is true for CoA selection/ planning
 - Team's situation assessment and planning is constantly re-evaluated/ re-cycled as circumstances change



Training Challenges

- SFRM has a cultural aspect that needs to be trained
- SFRM classes just generate the model and terminology
- SFRM is learned in context during technical lessons and simulations
- **Good** feedback is essential
- Everyone values SFRM training until ...
- SFRM training must constantly change



Training Challenges

- Requires commitment from top down
- You need a champion
- It is harder to do than technical training
- It is especially hard if your instructors and ‘operators’ work in different organizations
- Needs to be ‘designed in’ and not ‘added on’
- Just because your ‘experts’ can do good SFRM doesn’t mean they can teach it



Summary

- MOD's SFRM/ PS/ DM/ RA training program:
 - Classroom lessons to introduce the model and terminology
 - Part & full task simulations in increasing context to allow them to practice and receive feedback
 - The 'final' model must train how experts solve problems in real life
 - 17 Questions helps them ask the right questions
 - SFRM allows them to develop the answers as a team

