

Effectiveness of Simulation- Based Training: Evidence and Outcomes

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Desired Benefits of Simulation-Based Training

- ✦ Risk to patients is reduced
- ✦ Training addresses a wide range of relevant knowledge, skills, and attitudes (KSAs)
- ✦ Training is more widely available
- ✦ Training is more consistent and interference is reduced
- ✦ Transfer to real situation is increased
- ✦ Assessment is more consistent and skill-oriented
- ✦ Cost is reduced

What are We Looking For?

Kirkpatrick's Four Levels of Evaluation

Level	Description	Evaluation
<i>(Is the training good?)</i>		
1	Surveys	Did the trainees like it?
2	Assessments	Did the trainees learn?
<i>(Does the training have the desired effect?)</i>		
3	Transfer	Are there behavioral changes?
4	Benefits	Are there clinical outcomes?



Example Successes: Military and Aviation Training

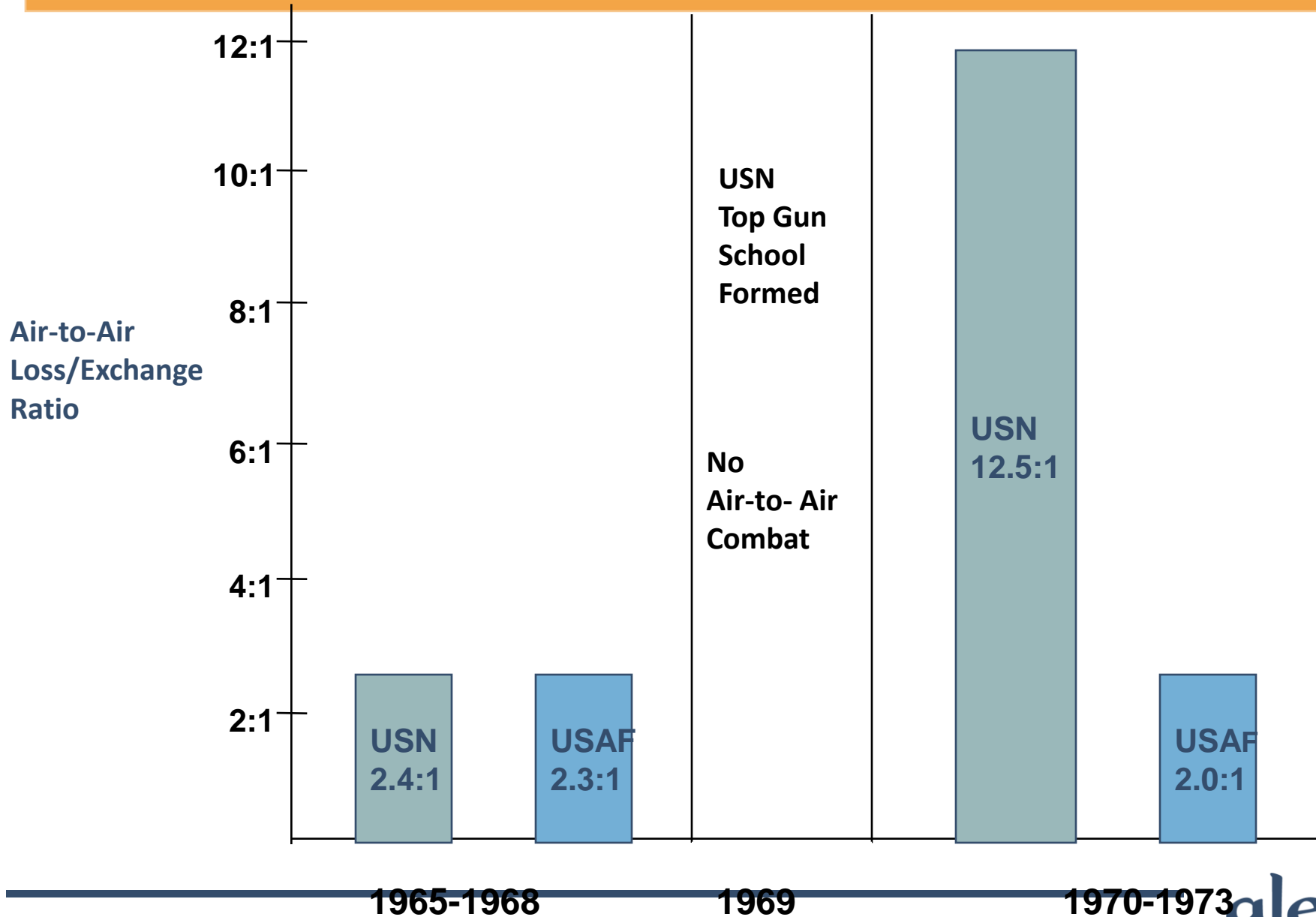
Flight Simulators



Why Flight Simulators are Effective

- ✦ They accurately replicate the important features of the cockpit experience
- ✦ Simulators are less costly and more available than real aircraft
- ✦ Aircraft behavior is consistent and predictable

"Top Gun" School



Naval IT Training Evaluation

Objective: 16 weeks of simulation-based, “intelligent” training to produce graduates who are superior to technicians with 7 years of IT experience in the Navy.

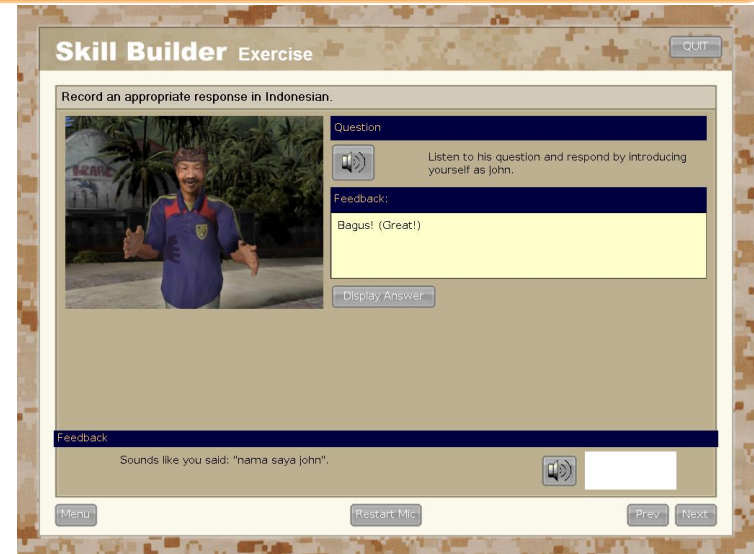
Evaluation Results: Troubleshooting Skill

Test group	Problems attempted	Problems verified	Correctly solved	Rated excellent	Rated harmful	Solutions tested
Fleet professionals	95	81 (83%)	79 (83%)	46 (48%)	18 (19%)	73 (77%)
Trainees	102	99 (97%)	99 (97%)	89 (87%)	8 (8%)	97 (95%)

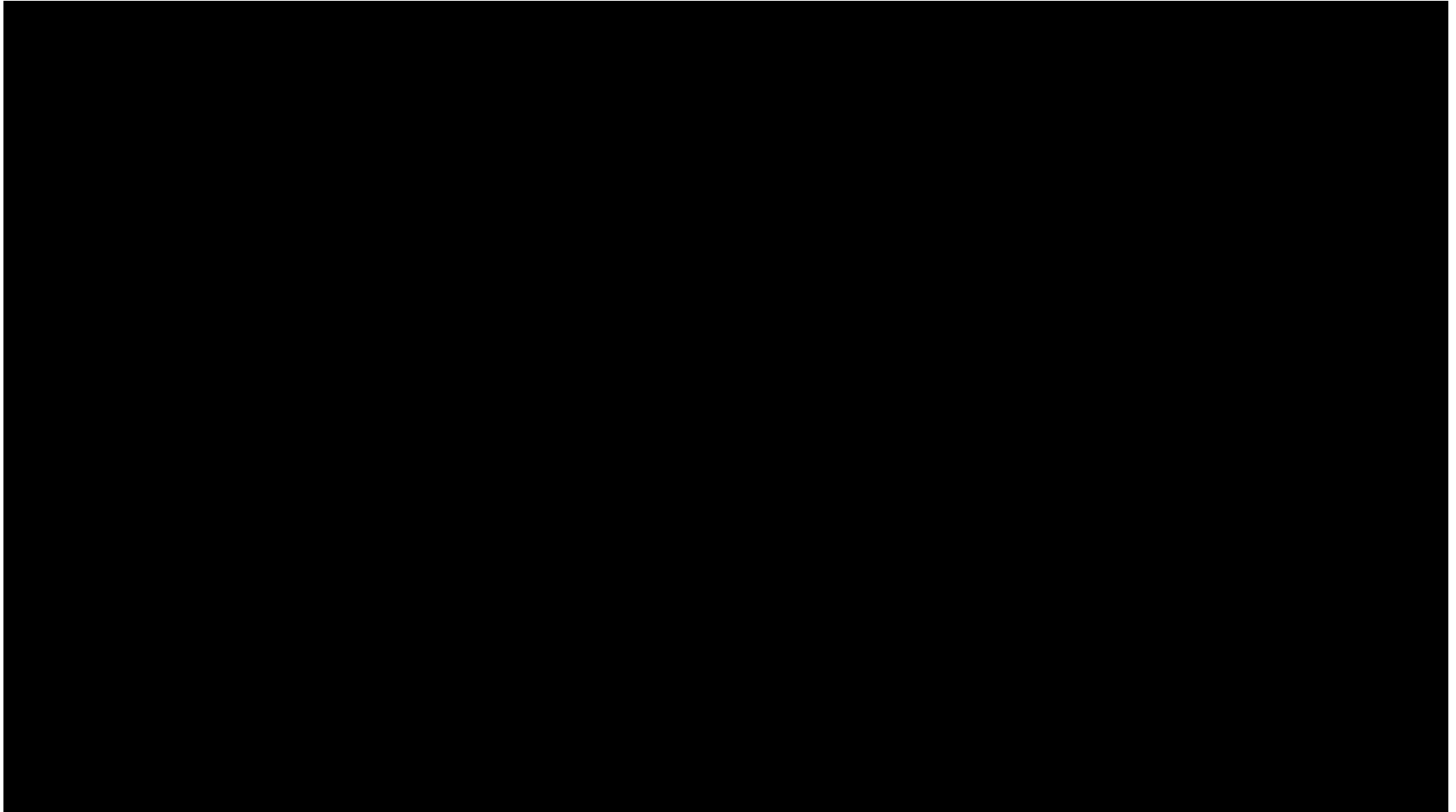
All differences statistically significant at $p < 0.01$

Operational Language and Culture

- ✦ Game-based foreign language and culture training
- ✦ Part-task training in communication skills
- ✦ Practice simulated missions, interacting with virtual host nationals



Example Final Assessment



Marine Corps Center for Lessons Learned Study

3rd Battalion/7th Regiment completed 2007 tour of duty in Iraq, without any combat casualties

✦ First Marine battalion achieving this level of success

Marine Corps Center for Lessons Learned interviewed officers, surveyed Marines upon returning from Iraq

Findings:

✦ 2 marines in each squad trained 40 hrs with Tactical Iraqi

✦ Knowledge of Iraqi language and culture contributed directly to mission success

• E.g., enabled marines to develop rapport with populace



Results from Medical Training

Laparoscopy Simulator Study

- ✦ 100 medical students completed 6 tasks 3x on MIST-VR simulator
- ✦ Students compared against 12 experienced and 12 inexperienced laparoscopic surgeons
- ✦ Metrics: time to complete task, economy of movement, economy of diathermy use
- ✦ Results compared to experienced surgeons:
 - ✦ Students performed with same economy of diathermy, error, & right instrument
 - ✦ Students' speed increased with trials, but was slower than experienced surgeon group

Diabetes Self-Care Study

- ✦ 59 diabetes patients, ages 8-16
- ✦ Experimental group (n=31): played game with diabetes content
- ✦ Control group (n=28): played entertainment game
- ✦ Results for experimental group vs. control group:
 - ✦ Improved communication with parents ($p < 0.025$)
 - ✦ Improved self-care behaviors ($p < 0.003$)
 - ✦ Marginally improved self-sufficiency ($p < 0.07$)
 - ✦ Marginally fewer unscheduled doctor visits ($p < 0.08$)

References

Brown, S.J., Lieberman, D.A., Gemeny, B.A., Fan, Y.C., Wilson, D.M., & Pasta, D.J. (1997). Educational video game for juvenile diabetes: Results of a controlled trial. *Medical Informatics* 22(1), 77-89.

Maran, N.J. & Glavin, R.J. (2003). Low- to high-fidelity simulation: A continuum of medical education? *Medical Education* 37 (Suppl. 1): 22-28.

Marine Corps Center for Lessons Learned (2008). Tactical Language and Culture Training System: Survey of 63 Marines. MCCLL Technical Report.

Orlansky, J., Dahlman, C.J., Hammon, C.P., Metzko, J., Taylor, H.L., Youngblut, C. (1994). *The value of simulation for training*. Tech report, Institute for Defense Analyses.

Roman, P.R. & Brown, D. (2008). Games – just how serious are they? Proceedings of I/ITSEC. Arlington, VA: NTSA.