

Right answers. Right now.



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Missile Flight Test Planning and Analysis with STK

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System Test & Evaluation Performance Analysis Lab (STEPAL)

- **Supports GMD and MDA**
 - Chartered in 2002 as a GMD asset
 - Mission: Ensure test executability
 - Issues found early reduce impacts on budget/schedule
 - All GBI intercept tests and selected other MDA flight tests
 - Success led to expanded role
 - Missile Defense System performance predictions
 - Operational support
 - Test execution support
 - Analysis of options and concepts

STK — A STEPAL enabler

- **Broad use in STEPAL**
- **Test planning**
 - When can I see it? Where? For how long? Sun a factor?
 - Where to put mobile assets?
 - What's the aspect angle? Link margins good?
 - Give me pictures/animations
- **Test operations and post-event analysis**
 - When safe to launch?
 - Was flight nominal? Deviations?
 - Give me pictures/animations

“STEPAL uses STK the way I envisioned it would be used.”

Paul Graziani, 2008

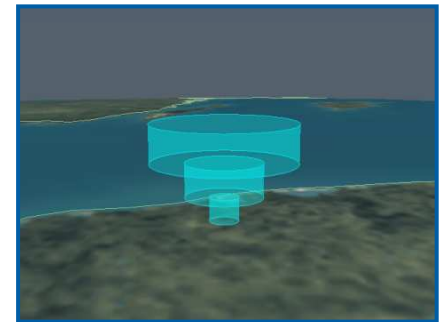
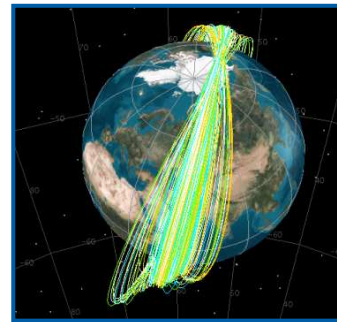
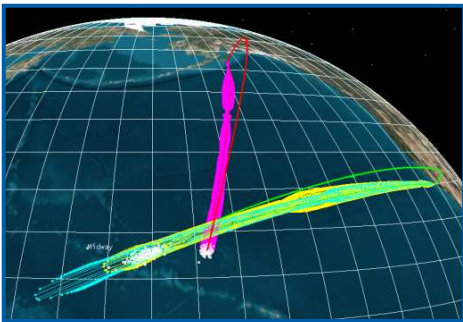
Initially acquired for visualization

- **Enhances comprehension of complex dynamics**
- **Improves analysis execution**
 - Real-time sanity checking of work
 - Stimulates ideas for innovative analysis techniques
 - Enables capitalization on serendipity observations
- **Aids communication and decision-making**
 - Products are timely, correct and look good
 - *“Much of STEPAL’s work went to the President, essentially unchanged.”* - LTG Obering, Former Director MDA

Maximizes value STEPAL delivers to customer

Analysis capability realized a greater benefit

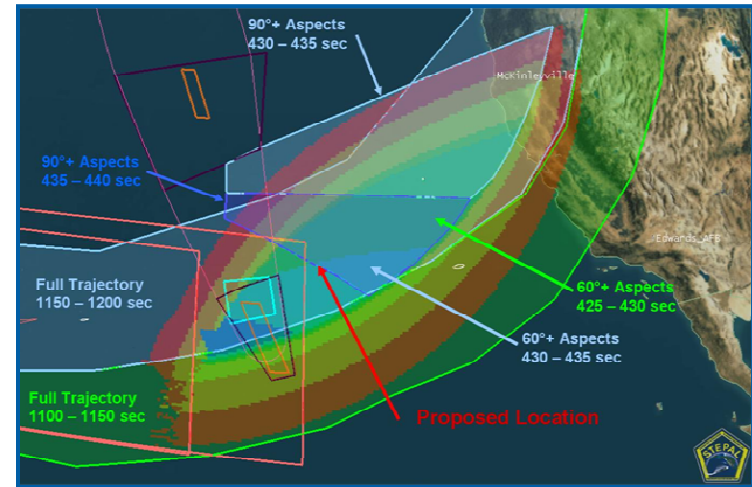
- **STK analysis content in most STEPAL products**
- **Key functionality examples**
 - Timing & geometric analyses (Access, Chains)
 - Asset location optimization (Coverage (2D & 3D))
 - Link analyses (Comm)
 - GPS navigation quality predictions (NTK, Components)
 - Graphics & animations (Snap Frame, Camera Control)



Keeps STEPAL prepared to serve customers

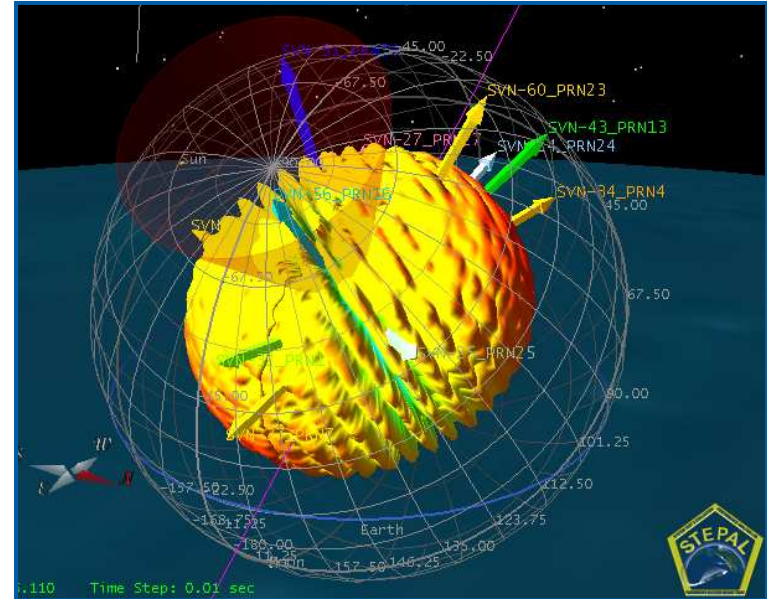
Test planning and optimization analysis

- **From where should airborne sensor support test?**
- **Optimize competing requirements**
 - Desired aspect angle
 - Maximum time at desired aspect
 - Maximize desired trajectory viewing
 - Avoid safety keep out regions
- **Options limited by sensor constraints**
- **Similar analyses for land-based, airborne and surface test assets**
 - Optics
 - Radar
 - Data links



Test execution support

- **When will GPS navigation accuracy permit safe launch?**
- **Test day GPS constellation modeled**
 - Missile trajectory and attitude flown
 - Receiving antenna pattern modeled
 - Links analyzed over time per criteria
 - Collectively analyzed
 - Nav solution quality determined
 - IIP uncertainty determined
 - Go/NoGo recommendations issued
- **Used by range for launch window opening**



Inadequate GPS navigation solution closes launch window for safety reasons

17:xx	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59

Test execution and operational support

- **How can debris hazards be minimized?**



- **Debris risk and mitigation analysis**
- **Population density map overlay on STK**
- **Orbit or missile trajectory trace**
- **Event timing or trajectory variables**
 - Avoidance of dense population areas
 - Alter intercept geometry to reduce risks
- **Determine when and where to engage**

COTS flexibility

- **Customer requests change...always needed now**
 - Don't always match out-of-box STK capability
 - Insufficient time for traditional manual approach
- **STK's flexibility and adaptability is the answer**
- **Custom tools and utilities**
 - Creation of multiple objects from LLA lists
 - Multi-function controls, reconfiguration, scenario tracking
 - Creation and editing of model articulation files
 - Post-processing STK and NTK output
 - Auto generation of Go/No-Go tables

STK expands STEPAL's capability

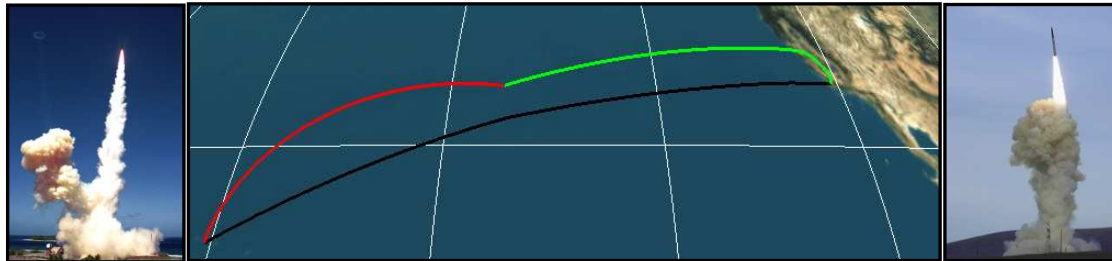
Reliable technical backup

- **AGI stands behind products/customers**
- **Virtual presence provides reliable technical backup**
- **AGI personnel responsive to calls for help**
 - Challenging tasks require advanced techniques
 - Suggest work-arounds
 - Responsive to needed features
 - Access to company experts
 - Calls to Support answered by a person right away

AGI people help STEPAL be successful

Summary

- **STK helped STEPAL establish and grow support to MDA**
 - “New kid on block” in 2002
 - Needed timely, correct and good-looking products
 - Initially acquired for visualization...
 - Allows STEPAL to aid communication and decisions
- **Analysis capability realized a greater benefit ...**
 - Keeps STEPAL prepared to serve customers
- **Flexibility and technical support...**
 - Lets STEPAL quickly address new, challenging, unconventional tasks



STK is essential to the STEPAL mission

Questions?

STK – A business enhancement

- **STK support by SAIC (an AGI business partner)**
 - Developer of AGI Missile Modeling Tools
- **Support of missile defense customers**
- **STEPAL support**
 - Defined requirements for initial STK purchase
 - Trained STEPAL personnel
 - Provided on-site support since 2002
 - Provide in-house STK assistance and training

STK expands business potential

STK: A winning combination!

