TRAJECTORY

CONTENTS

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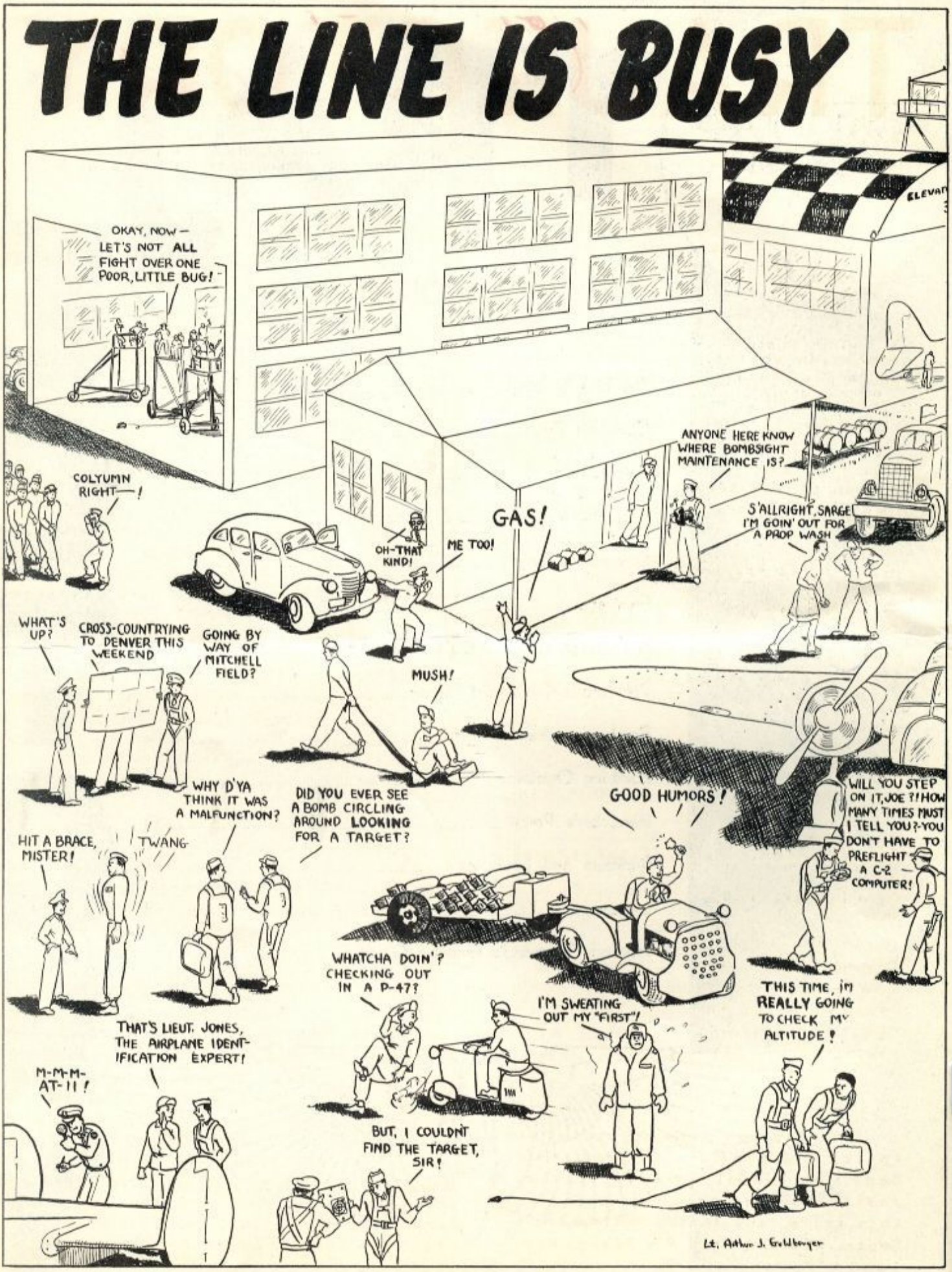
THE LINE IS BUSY



TRAINING AIDS

About 75 B. C., there lived an aged philosopher, whose contributions to posterity consisted, for the most part, of some prettily-worded axiomatic expressions. Before he booted the well known bucket, he preset a dropping angle, synchronized for rate, and grunted the following to his worshipping disciples: 'Crede quod habes, et habes.'

We've taken the trouble of checking the above quotation. Rumor hath it that, the modern age man would interpret it as: 'Believe that you have it, and you have it!'

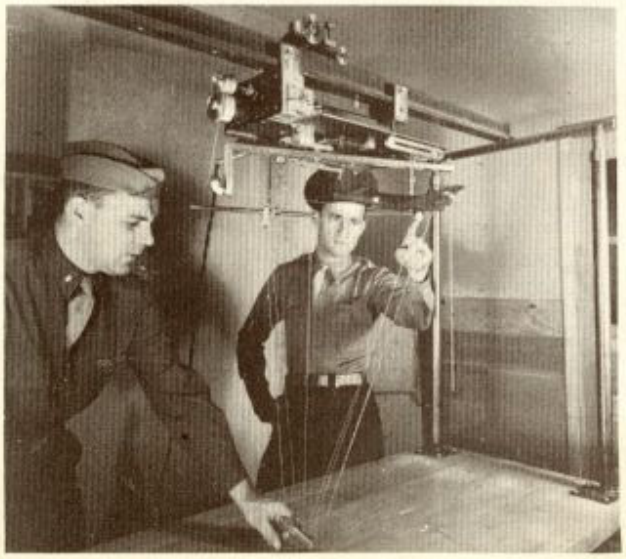
Wishful thinking is a wonderful thing -- it bespeaks a beautiful imagination. But it also denotes a lack of guts. So, we go on record as firm disbelievers in the honorable philosopher's sage advice -- where it concerns bombing especially.

Here is TRAJECTORY, on its second lap. No one can make us believe that the ideas and devices described on these pages are the results of hopeful cogitation. Men saw enough need or use for something to extend themselves above the call of everyday chores.

Nuts to you, philosopher! Read on, Macduff!

Albuquerque

Most of you Bombardiers have no doubt seen this Theory of Bombing Trainer operate. That is, if you are an ardent movie fan. This device, designed at Albuquerque by Lt. Eugene V. Shelton and Lt. William E. Purich, and developed by Captain Roy G. Walker was shown in the picture 'Bombardier.'



It is believed that this trainer will demonstrate all of the bombing problems which are taught in the Causes of Errors and Analysis classes.

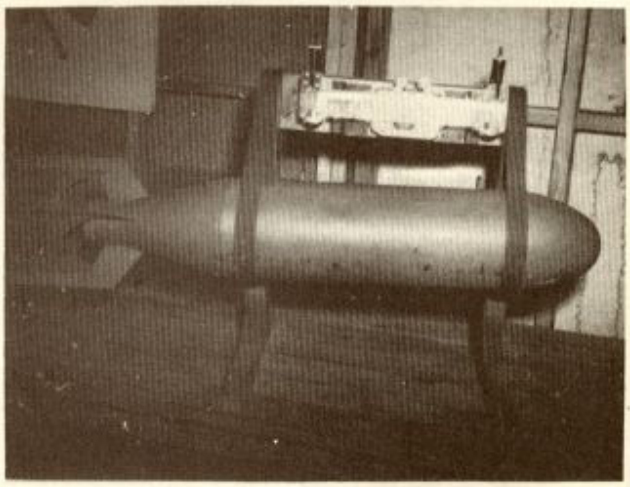
The model airplane and bomb, through a 'Rube Goldberg' system of slides, pulleys and wires, demonstrate the Bombing Problem virtually in its entirety.

Kirtland Field is producing eight of these trainers for distribution to each of the Bombardier schools. The first unit is expected to be ready for delivery by the end of November.

Childress

A mock-up of a bomb rack which can be placed on the instructor's desk has proved quite helpful in teaching the working principles of the A-2 release and the B-7 shackle.

The device is 28 inches high, 22 inches wide and 24 inches deep, and weighs only about 10 pounds. It has an A-2 release and a plexi-glass model B-7 shackle so mounted as to support an empty practice bomb. A screw driver can cause activation of the shackle to release the bomb which

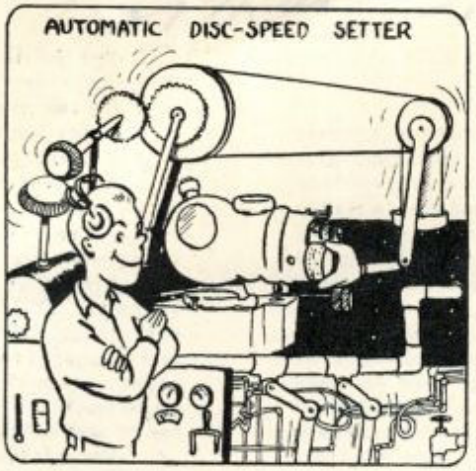


is caught by canvas straps attached to the rack.

As the housing of the B-7 shackle is made of plexi-glass, the student can easily see its working parts in operation.

Credit: Lt. Roy Dawson

C. E. PEE-WEE



Deming

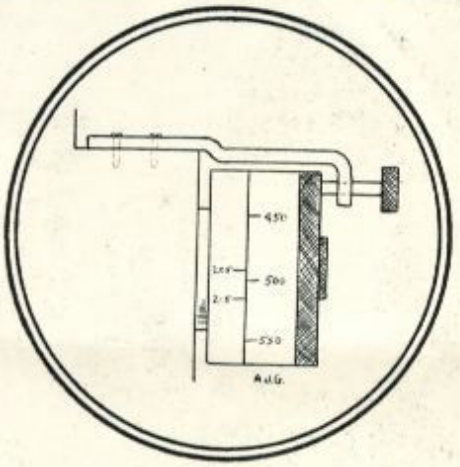
A memorandum, that answers about 95% of the questions arising from disallowed malfunctions or penalties affixed for dry runs, has been distributed to all the students and instructors of Deming Bombardier School by the Statistical Department of the post. It explains in detail what steps should be taken in case of a malfunction; what and where to report a dry run on his 12-C or 12-E.

Many malfunctions have been disallowed, and many penalties affixed for dry-runs due to either ignorance in not reporting, or improperly reporting of these discrepancies. Thus by this single sheet memorandum, the students and instructors definitely know what the score is - the proper procedure in reporting, and the consequences of failing to or improperly making a report.

Midland

The disc speed drum, with its precisely correct setting so laboriously adjusted by endless tachometer readings, need no longer be carefully avoided. Bombardiers need not detour around the drum any more in order to get at the rate knobs. He needn't pencil-mark his setting either, nor 'sweat out' deciphering which of the several marks cluttering up the face of the drum belongs to him.

A disc speed drum lock has been devised at MAAF. It consists merely of an arm, screwed into the sight-head, and protruding out over the drum. The end of the arm is L-shaped, and runs down the



drum's side. A thumb set screw on the 'L' end can be tightened to hold the drum in position after the desired setting is made.

Oh, well. Another good excuse for a wild bomb gone to hell.

Credit: Lt. W. L. Burling

A more practical method for setting drift on the A-2 Trainer has been developed at Midland. A unit, consisting of a drift scale, and a pointer connected to the solenoid by a ½ inch tubing and a series of metal rods, has been adopted in cutting to a minimum the amount of personnel necessary for the operation of a bombing trainer.

The drift scale with its easily movable pointer is mounted on the left side of the Bombardier on the 'top story' of the trainer. Immediately after bombs away, the Bombardier merely reads the drift on the sight and nonchalantly turns the pointer to the same amount of drift.

This type of drift mechanism has been used with very satisfactory results. It not only is inexpensive, but because of its simplicity, maintenance is at a minimum.

Credit: Capt. Allen Zien, Bomb Trainer Officer

Training Aids, con't

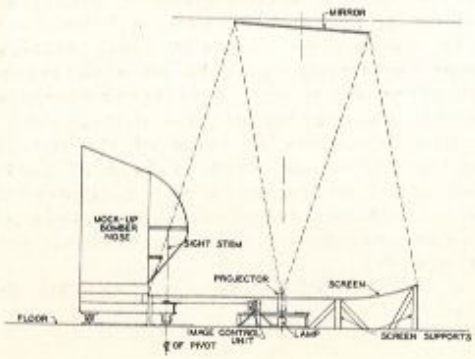
McKaba Trainer

The completion of the McKaba Bombing Trainer promises to revolutionize Bombardier training, giving students an opportunity to experience problems as encountered in the air long before he is taken aloft. The McKaba Bombing Trainer approximates actual flight conditions so realistically that a number of men have been affected by vertigo while making runs in it.

Its effectiveness has been illustrated by hand-picking test students who were classed as mediocre or failing, and training them on this device. They were able to take the transitional step from ground to air with ease, and were very nearly ready to solo on their first flying mission. In both procedure and bombing accuracy, these students were head and shoulders above their classmates.

The trainer consists of a bomber-nose mock-up

containing all of the rack controls, switches, and instruments found in the airplane simulated. The trainer is stationary but is pivoted so that course corrections are made through an AFCE unit from the stabilizer gyro. Thus it is a one-man trainer, the Bombardier is his own pilot. A moving terrain image is projected onto a screen below and in front of the bomber-nose. The terrain image moves over the screen toward the bomber mock-up, and is coordinated with the trainer-nose. The projection unit is placed below the screen and the image is transmitted through a small aperture to a ceiling mirror which reflects it to the screen. The use of a ceiling mirror doubles the projection distance permitting the use of a simple lens system to obtain the desired image size.



The drift mechanism is so designed that the instructor may pre-set a drift angle into the trainer. On the completion of an accurate bombing run this drift angle will be shown on the drift scale of the bombsight.

All switches - racks, bomb bays, etc. - must be in the proper position before a release can be made. Train bombing may be done by the use of an intervalometer.

A regular bombing mission can be made on this trainer. It is complete in every detail, including everything from obtaining the altitude, air speed, and target from a flight board, preflighting the sight, computing the altitude and true air speed, to actually making releases and plotting the impacts and other data on a 12-C.

The altimeter is driven by a reversible motor at 1000 feet per minute, and the temperature gauge is driven at a normal rate of 2 degrees a minute. Both altimeter and temperature gauge can be controlled by the instructor. The impact of the bomb is simulated by a point-flash of light, transmitted through a small translucent section of the screen directly below the sight, at the correct position. It is automatically compensated for drift and crosstrail; a control on the instructor's panel operates the amount of trail necessary.

An interphone system is used to communicate between the Bombardier and the instructor. Airplane noise and machine-gun fire may be introduced into the system.

The Bombardier, given suitable maps and photos, and 'briefed' on the area to be flown over, and the target to be bombed, may then maneuver the airplane across various check-points on the pro-

jected terrain image to an 'initial point.' He then turns in the correct direction to come over the target for a bombing run. This gives the student valuable background in pilotage and trains him in the use of check-points.

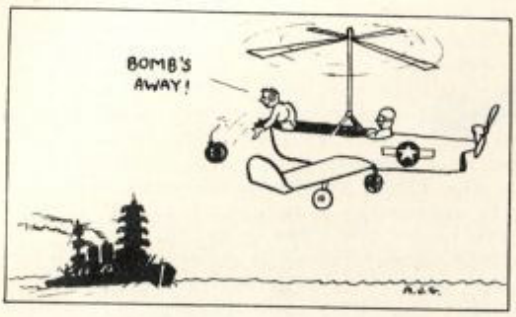
Another feature of this trainer is that the trainer and flight instruction may be brought concretely into the Ground school. A trainer set up in a classroom allows an instructor to demonstrate flight bombing to a large circle of students. Also problems may be brought to the Ground School, and the solutions worked out and explained in detail.

The trainer can be used to good advantage in the standardization of bombing procedure. Both students and instructors may be taken through a complete trainer mission and their procedure checked and possibly improved.

Credit: Major E. McKaba, Special Projects Office

Roswell

During the trainer time specifically designated for rate synchronization for the student, a method that affords a greater number of runs is being used at Roswell. It's an 'oldie', but nonethe-less, a time saver. In place of running the trainer toward a stationary bug, the procedure is reversed, and the bug run towards the stationary trainer. The rate of closure is just as easily



established in the sight, and the system requires only the manual replacement of the target after each run. This permits more runs per student for rate synchronization, but necessitates the proper working condition of the bug's steering (front) wheel to insure a straight run. Remember that true synchronization cannot be accomplished on a simultaneously moving and curving target.

Credit: 1st Lt. W.H. McDowell, Bomb Trainer Officer

A meek voice over the interphone informs the pilot, 'Dry run, Sir. The optics blacked-out several times, and the gyro wouldn't hold a level. Would you check the voltmeter, and also see if the necessary switches are on, Sir? The gyro doesn't seem to be getting enough juice.' Frustrated attempts by the throttle-jockey fails to locate the source of trouble. After three more dry runs, the ship heads for home. A check on the ground reveals that everything is hunky-dorey. Runs, however, aren't made on the ground. Two or three more similar missions in the same ship with no better results, but with the same, 'Everything checks out O.K., Sir' on the ground makes the pilot wonder if he shouldn't start taking Jumbo's little liver pills.

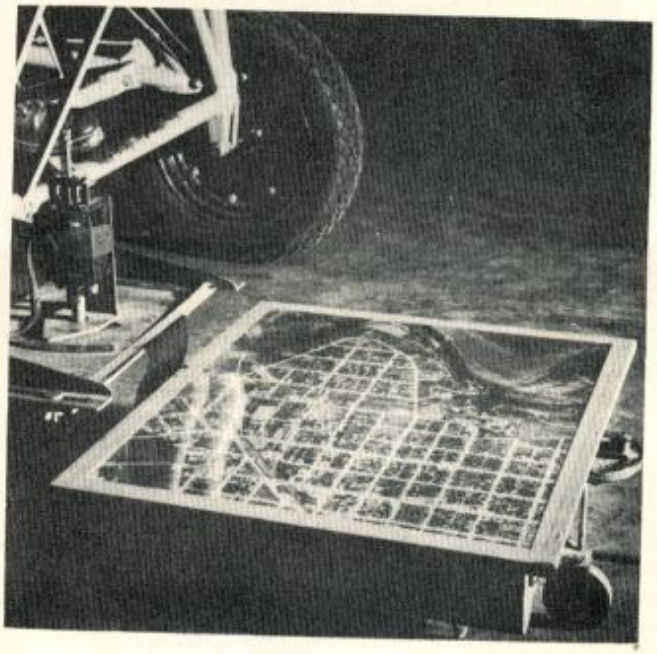
In irradicating this type of trouble, Roswell has attached an ordinary voltmeter onto a male and female cannon plug in order to check the actual voltage of gyros that fail to turn up properly at high altitudes. The connection is made in a manner that allows it to be used either for the sight head alone or connected between bomb circuit and the stabilizer itself.

Credit: 1st Lt. E. S. Bailey, Research Department

San Angelo

Receiving very little or no opportunity to actually synchronize, or bomb actual military targets, is a phase of training of the student that has to be postponed until the Bombardier gets 'over there.' Consequently, many missions on enemy targets have been unsuccessful due to Gyro Johnny's laying his 'eggs' in the wrong place because the object bombed looked - so he thought at the time - exactly like the assigned target, or he spent too much time locating the objective that the plane had passed over it before he found its location.

San Angelo has taken a definite step in giving Gyro Johnny an opportunity to simulate bombing of combat-type targets (bridges, power plants, industrial plants, etc.) on the bombing trainer, and to develop his ability to distinguish an assigned combat type target from the buildings and other installations normally found surrounding it. This is accomplished by affixing aerial photograph 'blowups' of a variety of targets to wooden frame secured to the top of the bug. A small scale photograph of the target 'blowup' is placed on the trainer. The student is briefed on the assigned



targets - primary and secondary - to be bombed. After the student has acquired a requisite amount of proficiency, he may be directed to shift his attack to one of the secondary targets, using evasive action as directed.

The target aerial photograph 'blowups' (20 in. by 24 in.) are covered with a sheet of plexiglass, or by three or four coats of airplane 'dope.' The plunger will register the impact on the plexiglass, or the 'dope' covering by means of a relatively fresh sheet of carbon paper. A strip of plexiglass scaled to the proportions of the photograph, is used to measure the circular error of the impacts.

The use of an actual time of fall of twelve seconds and trail of ten mils are suggested by San Angelo. It is not recommended that this aid be used in simulating low altitude bombing from the lower platform.

Prepared by: Dept. of Training, SAAAFBS, San Angelo, Texas

Victorville

Since the AT-11 is used to train Bombardiers - not pilots - it has been sought to make the bombing platform as nearly perfect as possible so that the bomb impact would be indicative of the Bombardier's skill rather than that of the pilot's ability to keep the ship at the desired altitude and airspeed.

It has been seen by all pilots and Bombardiers using the AT-11 that the pilot essentially must use both hands in maintaining constant altitude and airspeed by a continuous operation of the throttles and elevator control - manual or automatic. In both the present installations, the elevator centering knob is available to the right hand only. This position necessitates the use of the right hand for both adjusting the centering knob to maintain proper altitude, and adjusting the throttles to maintain proper airspeed.

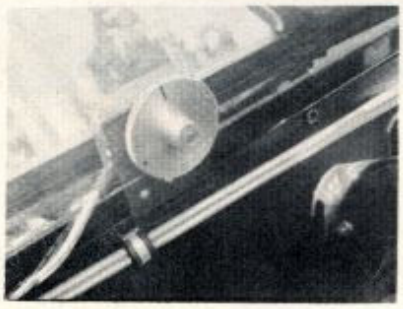
Other alternatives that our 'chauffer' might employ while using the C-1 autopilot are:

(1) Maintain altitude with the centering knob, with secondary emphasis on airspeed,

(2) Maintain airspeed with secondary emphasis on altitude,

(3) Leave the automatic elevator control disengaged and fly the ship on automatic aileron and rudder, but control the elevator manually. This is the common practice which results in waste of 1/3 of the equipment.

To make life easier for our 'glamorized chauffer,' and enable him to maintain the desired altitude and airspeed, when using the three axes of the C-1, Victorville has developed a C-1 auxiliary elevator control. The auxiliary elevator control is a simple potentiometer, either wire wound or carbon, mounted on the window ledge on the side of the control column. The potentiometer is wired directly to the Junction box. It is mounted in such a position that the pilot can employ his left hand in maintaining altitude with the auxiliary knob, while his right hand is devoted solely to maintaining airspeed with the throttles. This allows him to use both hands in operating the ship--a distinct advantage over the present C-1 setup in the AT-11's where the throttles and elevator centering knob is available to the right hand only.



With this control, it is common to make bombing approaches with variations as little as 10 feet in altitude. Not only has it proved successful in AT-11's, but also in our large bombers. A model similar to those used in Victorville's ships was installed in a B-17F, and was flown in formation as close as 50 feet to other ships in the flight.

Thus with the pilot operating the auxiliary elevator control with the left hand and the throttles with his right, a more accurate bombing approach will be made, with a minimum of work and and a maximum of satisfaction.

Credit: I. Brown, 1st Lt., Air Corps

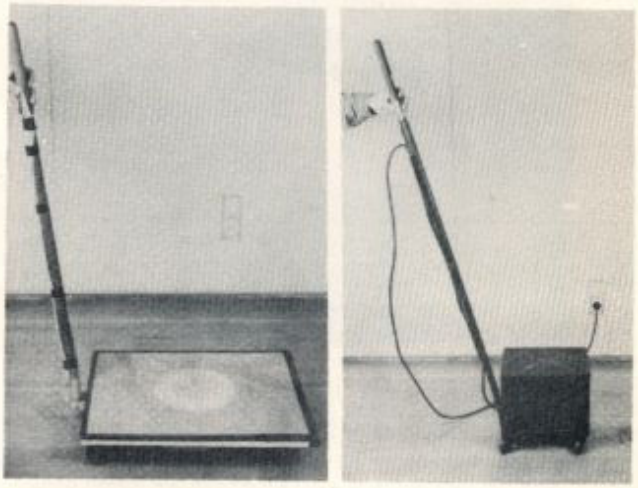
Oh would I were, where I would be,
There would I be where I am not.
For where I am I could not be,
And where I could be, I cannot!

Such might be the wail of the cadets whose plans for a weekend in town were changed to a confined one to the post because of a low percentage in photographs. However, the students at Victorville get to see a lot of dear old Los Angles, due to a special course of instruction in the use of the A-4 camera. For the past four months, a 'photo trainer' simulating photographic conditions in the air has been used at Victorville.

Each class of cadets, besides a two hour lecture on bomb spotting photography, is given instruction while actually taking pictures on the 'photo trainer.'

A platform has been scaled to simulate the rear of an AT-11 including a camera hatch. The day trainer uses a 20 x 24 inch print of a target area mounted on a movable base. The trainer is pushed across the floor at the same speed that a plane actually approaches a target at 11,000 feet. When directly under the camera hatch, one of several flashlight bulbs, (mounted under the print serving as impact points) is lighted for one second. After each impact the cadet uses the same method of spacing between each run as on regular bombing missions.

The night trainer uses a 12 inch square box, 8 inches deep also mounted on a movable base. The target is in the form of a cross, the same as a record target, five holes on each leg of the cross. Illumination for the target lights is furnished by four 25 watt bulbs. As in the day target, flash light bulbs serve as impacts. Six switches, located on the handle of the 'target bug' enable the operator to select the desired impact. There is even a 1,000 foot wild impact for the wise guy who knows all about bomb spotting photography.



The body position while photographing and the handling of the camera are checked. The lighting is so arranged that the cadets must set the camera lens and frame speed the same as used on a mission - either day or night.

Each cadet shoots three day and three night impacts. After four cadets have been on the trainer the film is developed. The film is shown to each individual, and graded on number of impacts, aiming spacing, and amount of film used. The individual student is then instructed on his particular weakness.

Credit: 1st Lt. Lloyd M. Harwood, Bombardier Photo Officer

Instructional METHODS AND TECHNIQUE

Weather Course

The Bombardier is a jack-of-all trades. He specializes in bombing, and takes a personal hand in almost every other phase of air-crew training. The result is that he has his fingers in practically every aeronautical pie.

Childress Army Air Field, capitalizing on a flexible schedule, has instituted a new development in teaching weather to Bombardier Cadets. Four forecasters or meteorologists are assigned to the cadet operations buildings. Before each navigation mission, students are given a thorough briefing on weather conditions. Whenever the 'stuff' closes in necessitating a cancellation of bombing or navigational missions, lectures are given emphasizing reasons for such cancellation. Such an arrangement makes weather a more interesting subject to the student, enabling him to learn by actual observation.

Cadet Tour of Ordnance

Ever observe a little boy after his proud daddy gave him a shiny new watch? A few moments of listening to the tick-tock, wondering what makes the hands go 'round then, the inevitable conclusion. A clang indicates the removal of the back; a short silence; then a number of twangs of released springs and the noise of metallic objects scattering on the floor. No longer do the hands go 'round. A delicate crimson suffuses the formerly pale cheeks where daddy applies the resounding whacks.

Major John Strange, Ordnance Officer at San Angelo AAF, needn't rely on corporal punishment--mishandling of bombs is nipped in the bud. For purposes of familiarization with Ordnance Activities, each cadet at SAAAF spends 2 hours on a conducted tour designed to show him full inspection, loading, fuzing, arming, and handling procedures. Cadets are led through the Ordnance warehouses and armament shops. They see a demonstration of the nature of dangerous explosive charges, and are returned to the line serious but wiser men.

Several valuable points are impressed upon the student.

(1) The extreme care used in preparing bombs for use.

(2) The importance of observing safety precautions.

(3) General understanding of the duties of the Ordnance Dept.--usually more or less obscure and clothed in secrecy to many.

Four - Engine Pilot Course

Roswell AAF has had a wide diversity of chores. What with having been--at various stages--a twin engine advanced pilot school a B-25 transitional school, a glider school, and (now) a B-17 four engine transitional school--in addition to the Bombardier set-up, RAAF can speak from experience. The necessity for high Bomber-Pilot coordination, as a result, has been readily apparent.

A short course, containing primarily, the principal fundamentals of bombing, is given the four-engine pilots and students. Bombing Theory,

M-Series nomenclature and C-1 Pilot are taught. They also receive one hour's practice setting up the C-1 Pilot on an electrical mock-up. In addition, four hours instruction on the bomb trainers are given under the guidance of qualified Bombardiers. The trainer time is divided into 2 hours of bombsight and 2 hours of P.D.I.

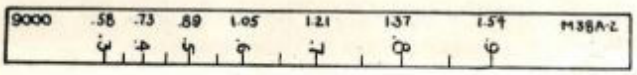
Dry runs in B-17's are made after the ground work is completed. Day and night missions, both manually and en Auto-Pilot, give ye pilot a pretty fair idea of the need for thorough and complete teamwork.

Tangent Scales for ABC

At Big Spring Bombardier School, the AB Computer has been introduced and is used on many synchronous bombing missions.

New tangent scales were made for each altitude beginning with 3500 feet and increasing every 500 feet to 12,500 feet. These new scales include the usual tangent readings for presetting the rate index. A novel addition is an accompanying scale used to preset the telescope index to allow the Bombardier a maximum 40 second run.

This Big Spring system, incidentally, may be some assistance regarding a suggestion received by the editor from one of the schools. It was recommended that adequate tangent scales be secured for the AB Computer, so it could be used on all missions. The tangents can be determined for any altitude by use of the equation: tan of dropping angle = G.S. x ATF - T + Alt. Work the equation for every 10 mph of G.S. and fit the tangents to the ground speed scale on the ABC.



Use a bit of scotch tape or adhesive, paste the 'home-cooked' tangent scale on the ABC, and your problem is solved.

Preparation for Personal Affairs

Victorville has taken a definite step in preparing cadets for their officer-to-be life. A two hour course, entitled 'Preparation of Personal Affairs' is given, offering more than the ordinary run of the mild lectures.

A pamphlet was compiled to supplement the course. Contained in its twenty-one pages are answers to the many puzzling questions beclouding the mind of the newly commissioned officer. It presents sound advice on financial and military affairs, and includes suggestions on the management of personal records and papers. A check list of preparedness for military service covers Life Insurance, Allotments, beneficiary and agent Designation, Property and estate matters, personal 201 File, final preparation for overseas duty, information and advice to families.

On the inside of the covers are 'pockets' where a personal 201 file may be kept. In the event of sudden transfer of overseas duty, the pamphlet can be turned over to the individual's beneficiary and family. After completion of the course, each file is checked--usually by the Legal Assistance Officer. Thus the student has taken his first step toward a rational and reasonable management of his approaching complexities.

Community Sing

Favorable comment has led us to believe that the TRAJECTORY has started out on the right foot. Its pages contain training aids of all descriptions. Included, also, are tips on instruction, news and data pertinent to bombing training, and feature articles and illustrations designed to enliven the 'readability'.

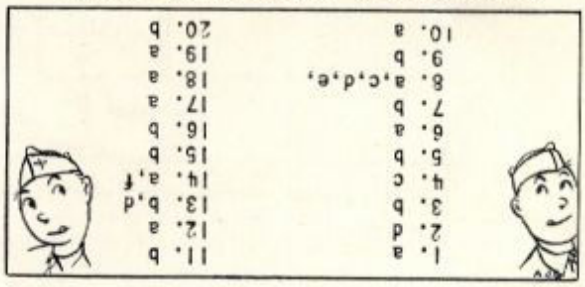
Bear in mind that TRAJECTORY was not conceived to be merely the product of individual effort. We of the staff are but representatives - the magazine is yours. Through the Associate Editor for TRAJECTORY, appointed at each school, YOU are the one responsible for the great majority of of the magazine's contents.

But, we'd like to broaden the scope, and again we turn to you. There are doubtless many personal comments that you, as an instructor or a cadet, have to make on the overall Bombing Training picture. Out-of the-ordinary occurrences, anecdotes, suggestions, individual ideas, gripes, discussions, criticisms, memories, ---'smatter of fact, what we're asking for is your time and energy to contribute to an 'Open Forum'. Call it what you will: 'The Bombardier Speaks', or 'Voice of the Egg-layer'; one thing is certain ... a running commentary on any interesting bombing subject by those concerned with bombing will definitely be of value to all.

So let's hear from you. Address your documents to Editor, % TRAJECTORY, AAFIS(B), Midland Army Air Field, Midland, Texas. We'll do the rest.

TRAJECTORY is of Bombardiers, by Bombardiers, and for Bombardiers. We intend to keep the 'by' uppermost, and that's where you come in.

Answers to Bombardier Brain Busters



FRUSTRATION
or
Training Command Lament

If I had a shiny gun
I could have a world of fun,
Speeding bullet through the brains...
Of the folk who give me pains.

Or had I some poison gas
I could make the moments pass,
Bumping off a number of
People whom I do not love.

But I have no lethal weapon --
Thus does Fate our pleasure step on!
So they still are quick and well
Who should be, by rights, in hell.

Dorothy Parker

A MESSAGE TO OUR O.T.U. BOMBARDIERS

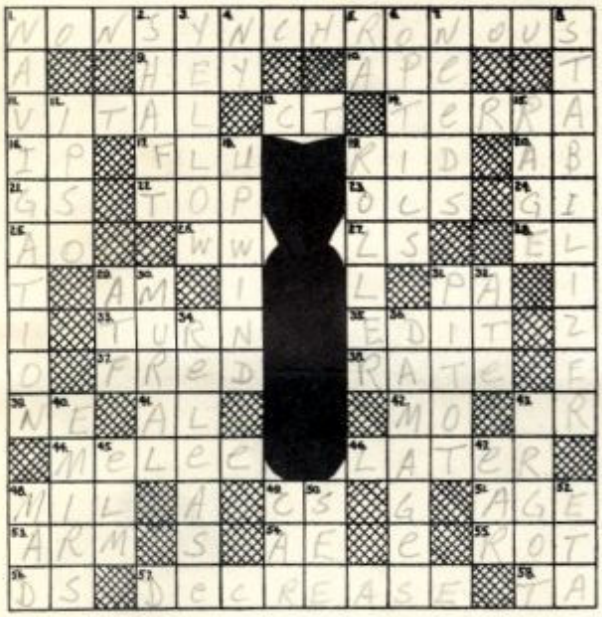
Most of TRAJECTORY's space has been devoted to accomplishments and ideas fostered in Cadet Bombardier Schools. We realize, however, that bombing training covers multitudes of phases, therefore we do not want any step-children or orphans wandering about on the loose.

You men in Operational Training are the last cog, precision cut and polished, in the long series of gears of the bombing war machine. Your training is closer to actual combat. The bombing you do is more advanced; the scope of your navigational hops is greatly widened; teamwork has become a concrete item; for now you are on your own - a member of an Air Crew. You have your own ship - your own greenhouse. Experience has dealt you all manners of hands. Because of them, the space between the ears carries more knowledge; the fingers have become tooled in their dexterity; the necessity for your wide diversity of chores has become apparent. Thus you are fast becoming the "pappies" of Bombardier Cadets; you are reaching the stage of fatherhood.

By the fruits of your experience, you could strengthen the training program. Remember you'll "be there. followed by more." We as well as you want those "more" to be as proficient as possible. They will come to you later as replacements, and as separate units. They'll be right along side of you, whether its Hitler's junk heap of Hirohito's scrap pile, you're bombing. Tips, comments, or experiences that have removed some of the fallacies and uncertainties you had as a cadet, would undoubtedly remove similar doubts in the minds of the students following you. With your help, those that follow will be capable of accomplishing the job set before them.

The EDITORS

Bombardier Crossword Puzzle



ACROSS

1. *A combat mission flown with the optic motor turned off necessitates the Bombardier using a -------- procedure.*
9. *Exclamation*
10. *Missing link*
11. *Important*
13. *When drift is present you must fly a ---- distance upwind to secure a hit.*
14. *Earth*
16. *Initial Point*
17. *Sickness*
19. *Eliminate*
20. *Degree*
21. *Ground Speed*
22. *If the lateral bubble is 'off' to the right, the ---- of the optics is off to the left.*
23. *Officers Candidate School*
24. *Government Issue*
25. *Airdrome Officer*
26. *World War*
27. *.-.. ...*
28. *Letter*
29. *Part of verb 'to be'*
31. *Father*
33. *The ---- knob has a 1:1 ratio*
35. *Supervise a publication*
37. *Masculine name*
38. *A Bombardier synchronizes for ----*
39. *North east*
41. *Air lag*
42. *Missouri*
43. *Comparative*
44. *Fracas*
46. *Too small a dropping angle results in a ---- release*
48. *Unit of proportionate measurement*
49. *Par of the course is 230*
51. *Era*
53. *Prepare the bomb for detonation*
54. *Yes*
55. *Decompose*
56. *Disc Speed*
57. *On a heading into the wind, the ground speed is slower, and the Bombardier must ---- the dropping angle.*
58. *Trail Angle*

1. *The science of directing or guiding an aircraft to designated objectives.*
2. *The dove tail is aligned and locked to the stabilizer by means of a pin through the sight stem ----*
3. *A color*
4. *New York*
5. *Range Angle*
6. *The link-to-cradle-connecting arm stabilizes the ----.*
7. *Has great use for.*
8. *The bombsight's azimuth unit.*
12. *Expression in law.*
15. *Ire*
18. *With left drift, you fly to the right, or ---- of the target.*
19. *What unit transmits drive to the spline gear?*
29. *Actual time of fall*
30. *Painting*
31. *Origination of most instrument readings.*
32. *Consumed*
34. *The sighting angle is coincidental with the dropping angle at the point of ----------.*
36. *Harms*
40. *Persian Chieftains*
43. *Drug*
45. *Tree*
47. *Organ of hearing*
48. *Angry*
49. *Auto*
50. *Look*
52. *Estimated time of arrival*

(Answer In Next Month's Issue)

Bombardier Brain Busters

1. Using the M-Series Bombsights, (M-7) if the sighting angle is changed from 30 degrees to 60 degrees, how many degrees will the mirror be rotated?
   a. 10 degrees b. 15 degrees c. 30 degrees
   d. 45 degrees e. 60 degrees

2. What kind of a curve should be obtained when indicated air speed is plotted against calibrated air speed?
   a. Sine curve b. Hyperbola c. Parabola
   d. Straight line e. Spiral

3. Using the M-Series bombsights (M-7) it is impossible to set up a correct course if the drift gear clutch has more spring tension than the autopilot clutch.
   a. True b. False

4. In engaging the C-1 autopilot, the 10 minute warm up period is used to:
   a. Allow the potentiometers to heat up.
   b. Permit the pilot to reach his altitude.
   c. Allow the gyros to erect.
   d. Allow the servo motors to reach full rpm.

5. Using the M-Series Bombsights (M-7), the torque unit keeps the stabilizer gyroscope spin axis horizontal to the earth at all times.
   a. True b. False

6. It is possible to synchronize for rate as long as a constant heading is maintained regardless of the drift of the fore and aft cross hair.
   a. True b. False

7. There is no minimum altitude for engaging the C-1 automatic pilot.
   a. True b. False

8. The instruments which the Bombardier should be able to calibrate are:
   a. Altimeter b. Artificial Horizon c. Compass
   d. Airspeed Indicator e. Free Air Temp. Gauge
   f. Drift Meter

9. Given data in which the correct trail is set into the sight but the drift set into the sight is greater than the actual drift. In order to compute RCCT, which is given by the equation RCCT = T(1-cos (Drift Angle), which drift should be used?
   a. The drift set in the sight
   b. The drift that should have been set in

10. When (1) the M-Series Bombsight is used (2) Trail is set into the cross trail mechanism (3) The trail plate on the trainer is in the proper position and (4) The sight is properly synchronized for drift and rate, the type A-2 Bombing Trainer is so designed that it will compensate for the cross trail tilt of the optical system.
   a. True b. False

11. The correction for air speed compression error is always -2 degrees C.
   a. True b. False

12. The dropping angle is always the angle between the line of sight and the vertical at the instant of release.
   a. True b. False

13. Indicated altitude corrected for scale and installation error is termed:
   a. True altitude d. Calibrated altitude
   b. Pressure altitude e. Absolute altitude
   c. Indicated altitude f. Bombing altitude

14. What two values are set under the free arm of of the C-2 and AN-94 computer?
   a. Bombing Altitude d. Pressure Altitude
   b. Flight Temperature e. Runway Elevation
   c. Indicated Altitude f. Mean Temperature

15. Synchronizing with extended vision set in the M-Series Bombsight (M-7) will always cause the bomb to fall short.
   a. True b. False

16. The type AN-94 and C-2 Altitude Correction Computation Computers are designed to apply the necessary corrections for temperature and density of the air column between flight level and sea level, to obtain the bombing altitude when the pressure altitude above sea level is known.
   a. True b. False

17. The bombsight measures trail along track.
   a. True b. False

18. In case too little trail is set into the cross trail mechanism when there is a wind from the left the deflection error will be to the right.
   a. True b. False

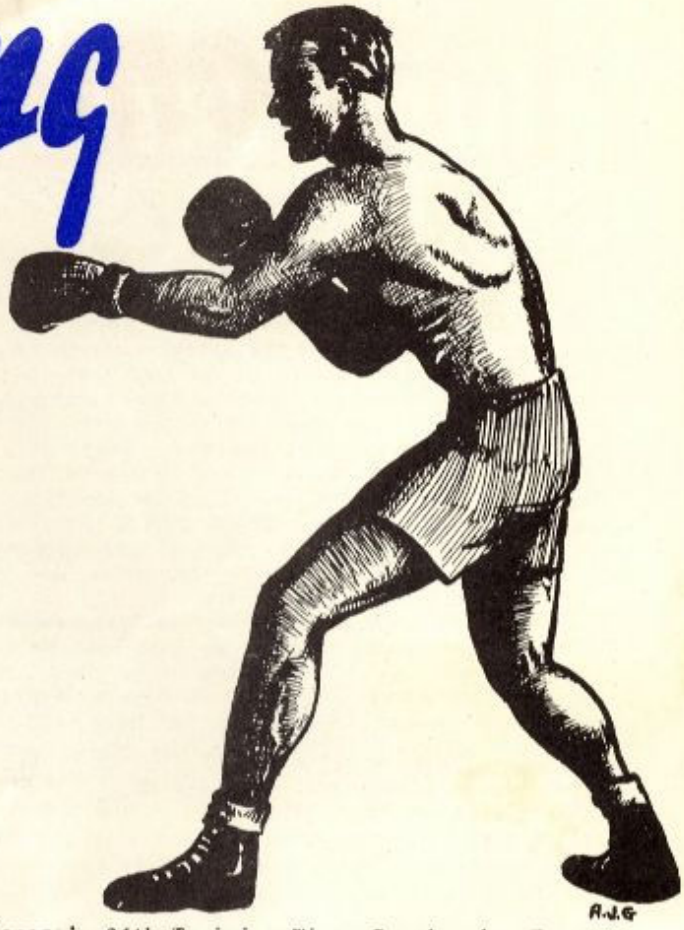
19. The installation error which is found when using the Alidade method of instrument calibration is a static pressure error.
   a. True b. False

20. The bomb impact is trail distance behind the airplane and is measured along the airplane's track.
   a. True b. False

Answers on page 8

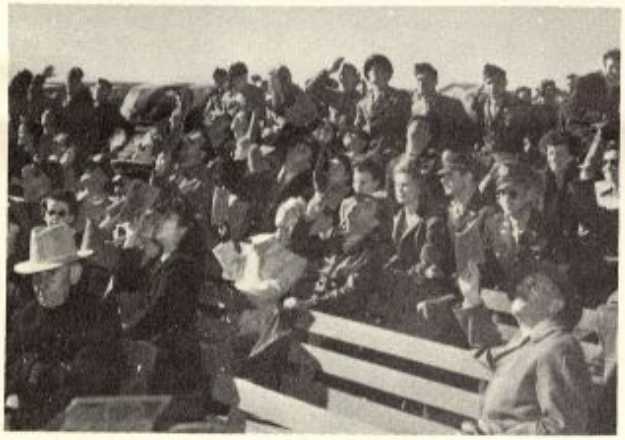
Do you have any choice "stickers" you'd care to share with other Bombardiers? Any questions -the answers to which we should know, or are interesting additions to the Bombardiers' stock of knowledge- would be heartily welcome for future "Bombardier Brain Buster" pages. All contributions should include complete answers and source of information where necessary.

Bombing OLYMPICS



A large crowd of spectators braved a cold morning wind at Deming Army Air Field on November 7, to witness the Eighth Bombing Olympics - the last open to the public.

The performance by the student Bombardiers was one of the best, if not the best, given thus far. One can well realize, after watching a meet, exactly what the newspapers mean when they describe the leveling of a roller-bearing plant or an air-



TAKE YOUR LAST LOOK AT CIVILIAN OLYMPIC SPECTATORS. FROM NOW ON, ONLY MILITARY ONLOOKERS WILL BE PERMITTED TO WITNESS FUTURE BOMBING CONTESTS.

plane factory in Nazi-held Europe by our precision 'egg-layers.'

The results of the meet were announced late Sunday afternoon. For the second successive time, Big Spring, again using the Sperry sight, took first place, with Roswell second and Deming third.

A squadron of B-24's from Biggs Field, gave the crowd a thrill by pattern bombing the Olympic target. P-47 Thunderbolts, imitating enemy planes, zoomed at the formation in realistic fighter interception during the bombing run. Scheduled to bomb the target after the meet, but due to an alarm clock malfunction on the part of the bugle boy, and a fast dwindling gasoline supply, the 24's were compelled to interrupt proceedings during the last flight of contestants and bomb the target long before the last student Bombardier's bomb had fallen.

Present at the meet were Maj. Gen. Ralph Cousins, Commanding General, WFTC, Santa Ana, Calif.; and Brig. Gen. Isiah Davies, Commanding General, 34th Training Wing, San Angelo, Texas.

Of interest to the Bombardiers, was the displaying of the latest Sperry bombsight in the Olympics Operations. Known as the Sperry S-1, M-2, the sight will be used for instructional purposes at IS(B). (A detailed article on the S-1, M-2, will be given in the December issue of TRAJECTORY.)

The placing of the individual schools at the meet were, (1) Big Spring, (2) Roswell, (3) Deming, (4) Childress, (5) San Angelo, (6) Albuquerque, (7) Midland, (8) Victorville.

THE COVETED PICKLE BARREL BEING AWARDED TO LT. CAPRARO, REPRESENTING THE BIG SPRING WINNERS, BY COL. GREGORY, DIRECTOR OF TRAINING AT DAAF. COL. MURPHY, COMMANDING OFFICER, LOOKS ON.

Following is the *revised* schedule of the future Bombing Olympics:

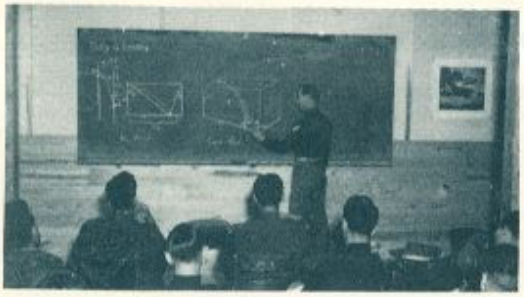
			San Angelo	30 Jan.	1944
Carlsbad	28 Nov.	1943	Albuquerque	20 Feb.	1944
Childress	19 Dec.	1943	Big Spring	12 Mar.	1944
Roswell	9 Jan.	1944	Victorville	2 April	1944

The INSTRUCTOR'S PERCH

The Cadet enters the 'Theory of Bombing' class for the first time, and is royally welcomed, introduced to the standard Bombing Problem diagram on the blackboard, and told to glue it to his memory. Next day, he shakes hands with the likewise standard Cross Trail diagram, and informed that this, too, is an ultra important part of things Bombing. Then comes the rather ticklish job of correlating the two. There have been occasions where instructors don't even bother to assay an attempt. They probably figure that Joe Cadet should know--from pure intimation, perhaps--that the cross trail diagram is a 'picture' from directly above, and the Bombing problem is a profile view.

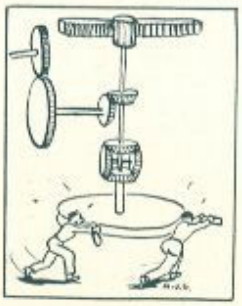
How easy a solution is the mere transforming of these two standard diagrams into one, by the simple expediency of reverting to 'perspective' diagrams! The instructor need not be an artist. Anyone can draw a three-dimensional box. All the Bombing Problem consists of is a huge box-or block-of air, crossed by several definite lines; Alt., AR, Trail, Cross Trail, Trajectory, Dropping Angle, RCCT, etc.

Diagrams are meant to aid in teaching. When a series of them are so presented as to confuse rather than clarify, the prime purpose has been

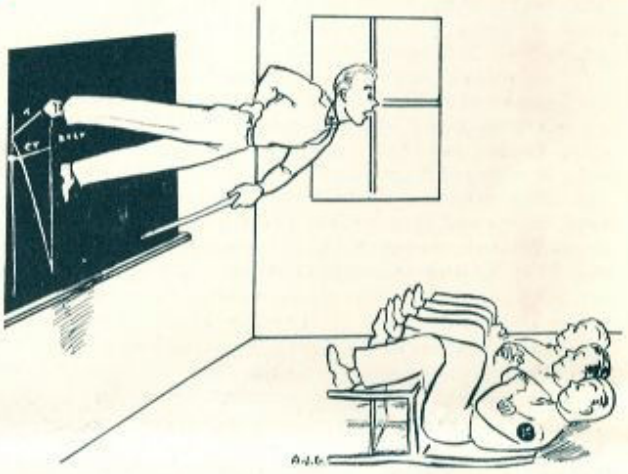


lost in the shuffle. In explaining the problem on the blackboard, why not use the three-dimensional, perspective diagram so that cadets can honestly see 'what the score is'?

A deal more can be said about finer blackboard illustrating. Remember the old 'stick-rick' man? His anatomy is drawn with straight lines, a circled head, toothpick-like fingers, joints bending at awkward angles. It is easy to imagine this conglomeration of lines as a man--we ourselves are men! But how can a series of straight lines, circles, and squares be transferred to a mental image of something a cadet has never seen? To wit: chalked drawings of the internal mechanism of the bombsight, or the servo motor, or what have you?



We suggest just a little diligent application in future diagrametic drawings. Make the racks, bevels, pinions, shafts, cams, slides, et al really resemble the working part--piece them together with as much of an eye towards perspective and three-dimensions as possible, and we guarantee you won't have to spray your throat after each class lecture. Three-dimensional, perspective diagrams are the nearest thing to realism. A good picture is worth a thousand words-or are you *that* long winded?



...Cross Trail Diagram...a "picture" from above...

It has been the experience of many instructors, claims Capt. H. R. HOWELL of Victorville, to teach course synchronization by having the student observe the stabilizer brush (P.D.I.) constantly with the idle eye.

In doing this, the Cadet can guard against

overcorrecting if he makes the following his policy: (1) Never apply a large course correction unless the stablizer brush is near the center. (2) The brush should be on dead center when a small correction is desired.

This procedure precludes the possibility of needless corrections. The student can better control the amount of necessary correction when double gripping, making certain to crank in a small correction when that is all that is needed.

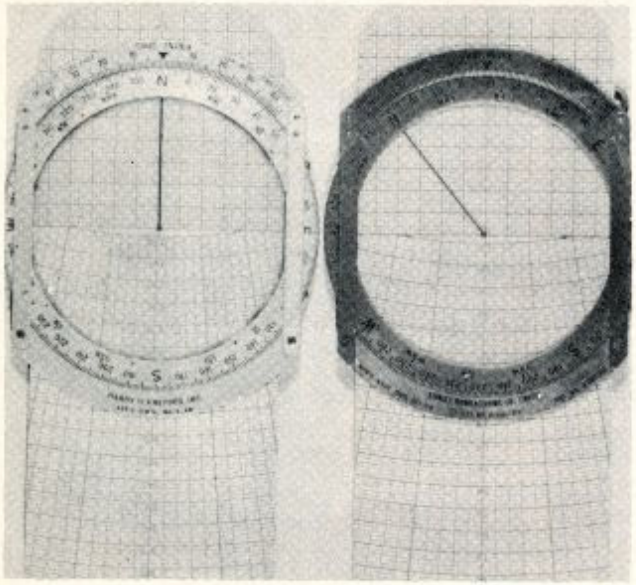
Instructor's Perch, con't

Add this new and renovated conversion method for Bombing Analysis, to your present stock. When your Bombing Tables aren't available, and you're too lazy to concentrate on mathematical solutions, you can use the old, steadfast E6-B to convert tangents to degrees of dropping angles and vice versa. This, incidentally, should be a welcome addition to all branches of the Sperry Sight training departments. A known tangent can be readily converted to a dropping angle in degrees and perset into the Sperry bombsight, where previously, a mathematical metamorphosis was necessary. Here's how it's done:

Remove the slide of the E6-B and reinsert it so the 'rectangular grid' section is in an upside down position at the top of the plotting disc. (The rectangular grid is on the side opposite that generally used for double drift solutions. Its grid lines are squared and at right angles, while all other lines on the slide are either converging or curved.) Place the zero position directly beneath the grommet, rotate the disc so that North is under True Index, and draw a line from the grommet to north.

The vertical (center) line of the grid from zero to 20 you'll note consists of ten spaces. So, if your known tangent is .8, count eight spaces to the left along the horizontal '20' line. (The values, remember, that you assign each space are arbitrary. From zero to the horizontal line marked *40*, there are twenty spaces, and you would have to count *sixteen* spaces to the left if your known tangent is .8. Elementary proportion, friend.)

OKAY, let's assume that your known tangent *is* .8. Rotate the disc counter-clockwise until the grommet-north line is over a point 8 units left of center along the '20' line (or 16 units along the '40' line). Read the resulting angle in degrees under the True Index. Your answer should be 39 degrees.



The operation can be worked from tangents to degrees, or from degrees to tangents, depending on which of the two is the known quantity.

This discovery was developed by Lt. Col. J. G. RUSSELL, Major G. D. GREER, Lt. R. E. POCOCK, and Lt. H. E. NORDEEN, all of the staff of the Army Air Forces Instructors School (Bombardier).

BRICKBATS AND BOUQUETS

We try to keep fresh material and new ideas appearing monthly for the many readers of TRAJECTORY. But there's nothing like really knowing exactly what appeals to you the most. This is the second published issue of TRAJECTORY, and by now, opinions and complaints have probably formed on your very lips.

If we are to present the articles, illustrations, features, etc. that you desire, we must know what your inclinations are. Probably the best way would be for you to relax into downy cushions with a copy of TRAJECTORY, absorb its every detail, then write us a letter telling us your frank opinions. (Remember, you can't use the mails for defamation of character!) We are honestly looking forward to these suggestions and criticisms after each issue.

The EDITORS

Deming, New Mexico

Dear Editor:

Just received one of the first copies of TRAJECTORY. I certainly did enjoy reading the article "The Historian Speaks". I suggest that an article be published on the Supervisory Personnel of each Bombardier School, as to who they are and maybe an extra line as to what they do. This would certainly aid all the so-called "Old Timers" of the bombing business in keeping up with their friends.

I thought the AB Computer should have been listed under Training Aids. Your paragraph on the ABC was fairly well written, but the sentence, "He places this true air speed on the ABC and sets it for the compass heading of the dry run", is vague to me. Also, the ABC should not be called an ABC Computer. If one says ABC Computer, he says Computer twice. In case you should ever place the ABC under Training Aids and explain it more fully, be sure and give Capt. Benny Klose, formerly of the 8th Air Force, part credit for it.

Major Harve H. Johnson
C. O. 2nd. Tng. Gp.
DAAF

"The complaints about our ABC faux pas in the October issue rolled in like a tidal wave. Our cry of "uncle" seems inappropriate. Okay, no more Automatic Bombing Computer Computer!

Midland, Texas

Dear Editor:

TRAJECTORY is a hell of a note-worthy publication - well written, cleverly illustrated, distinctly professional. As a fellow Bombardier, I believe TRAJECTORY to be the first successful attempt to pleasantly elevate our rank and file into a unified fraternal group and raise the standard of pride and professionalism in our highly essential work.

Your "Training Aids" section is to be complimented for stealing the show in your October issue. This section will definitely present an incentive for our instructors and associated personnel to accomplish work above and beyond the call of regular duty.

Capt. Joseph M. Beseda,
Training Sqdn. 3

THE BOMBING TRAINING COMMAND'S GRIDIRON GREMLINS

NAME	HOME	HOME STATION	GRAD.	FOOTBALL EXPERIENCE
ROY L. ANDERSON JR. 1ST LT B.		A	SEPT. '42	HB UNIVERSITY OF NEVADA
JOHN KIMBROUGH 1ST LT P.		A		FB TEXAS A. & M.
HARVEY JOHNSON 1ST LT P.		A		QB MISSISSIPPI STATE
ROBERT L. BEELEY JR. 2ND LT B.		A		G UNIVERSITY OF KENTUCKY
CLEO S. MADDOX 1ST LT B.	KOKOMO, IND.	A		HB UNIVERSITY OF INDIANA
JACK T. KEMPER 1ST LT B.		A	OCT. '42	T SAN JOSE STATE
RUSSEL E. SHIVELY F/O B.	DALLAS, TEX.	A		T TEXAS COLLEGE OF MINES
JOHN H. WAY 2ND LT B.		A		E BRADLEY TECH
CONNIE SPARKS CAPT P.		A		QB TEXAS CHRISTIAN UNIV.
HARRY C. ARMSTRONG 1ST LT. B.	SANTA BAR. CAL.	A	A '42-5	CR '36-'38 U. S. C.
MERRILL B. SHARP 2ND LT B.	OXNARD CAL	A	A 43-11	RHB '36-'39 CALIF. A & M.
DUNCAN OBEE 1ST LT B.	DAYTON, O.	C	SA 43-1	C '39-'41 UNIV. OF DAYTON
JASPER A. WESTBROOK CAPT P.	WACO, TEX.	C	SEPT '41	HB '36-'38 LOUISIANA TECH
LOUIS E. LONG 1ST LT B.	GAIL, TEX.	BS	A JUNE '42	HB '35-'37 WASH. & LEE UNIV.
OLIVER R. HOLBROOK JR. 1ST LT B.	SAN ANT, TEX.	BS	M 42-13	FB '38-'39 S. M. U.
RICHARD C. GARRETT 1ST LT B.	LOOKSVILLE, W.V.	BS	M 42-13	G '38-'40 MORRIS HARVEY COLL.
KEITH N. LYSINGER 2ND LT P		BS	ELL. 43-I	E '39-'40 KEARNY ST. TEACHERS. C.
JACK P. BROWN 2ND LT P	JACKSONVILLE, ILL.	BS	ELL. 43-F	'38 ILLINOIS COLLEGE
JAMES B. FRANK 1ST LT B.	BEV. HILLS, CAL	BS	M 42-16	'37-'41 COLUMBIA UNIV.
LLOYD W. WOODIWISS 1ST LT B.	OSAGE, IA.	BS	M 42-13	FB LUTHER COLLEGE
THOMAS C. MOSER 2ND LT B.	WARREN, O.	BS	BS 43-6	RHB MOUNT UNION COLLEGE
RALPH B. WAGNER 2ND LT B.	HARVARD, ILL.	BS	BS 43-6	G '35-36 UNIV. OF WIS.
JAMES S. HARDING 1ST LT B.	ASHLAND, WIS.	BS	M 42-14	HB '35-'36 CARROLL COLLEGE
MILO K. WARNER JR. 1ST LT B.	TOLEDO, O.	BS	M 42-14	G '37-'39 KENYON COLLEGE
HENRY J. JOLINK 2ND LT P.	EDGERTON, MINN	BS	APRIL '43	G '39-'41 CENTRAL COLLEGE (IA)
JOHN W. WOFFINGTON 2ND LT B.	SAN JOSE, CAL	BS	BS 43-7	HB '37-'40 UNIV. OF IDAHO
KERMIT W. HARDY 2ND LT B.	OAK LAWN, ILL.	BS	BS 43-6	RHB '33-'35 UNIV. OF ILLINOIS
LEONARD BROWN 2ND LT B.	LOS ANG., CAL.	D	D 43-11	HB '39-'40 U.C.L.A.
RICHARD G. BADER 2ND LT B.	FLUSHING, N.Y.	D	D 43-6	QB '39- MAINE UNIVERSITY
ADAM F. ZALONKA CAPT B.	POTTSVILLE, PA.	M (CIS)	LOWRY, Nov. 40.	T '35-'38 ST. TEACHERS COLL. (PA.)
HAROLD P. ROGERS 1ST LT GS.	KENT, O.	M (CIS)	O.T.S. MAY '43	HB '20-'24 ILLINOIS COLLEGE
WILLIAM A. RILEY 2ND LT P.	SAN FR., CAL	M	APRIL '43	QB. '39-'40 UNIV. OF OREGON
JAMES R. OTTO 1ST LT B	HUMBOLDT, TEX.	M	M 42-17	T '39-'41 UNIV. OF IOWA
CLIFFORD G. LONG 2ND LT B.	ALA. CEN., N.Y.	M	M 43-1	G '38-'40 UNIV. OF ILLINOIS
ELMER B MCKNIGHT 2ND LT B.	LITTLEFIELD, TEX.	M	M 42-16	E '39-'41 ST. MARY'S UNIV.
CHARLES W. SMITH 2ND LT B	SANTA CRUZ, CAL	V	V 43-5	G '37-'39 SAN JOSE ST. COLL.
DAVID BLUM 2ND LT B.	B'KLYN., N.Y.	V	V 43-1	3 YRS VARSITY, B'KLYN COLLEGE
ANDREW ROSEN 2ND LT B.		V	V 43-2	VARSITY - OHIO STATE UNIV.
MARTIN H. STEHLING 1ST LT B.		V	V 42-13	VARSITY - SCHREINER INST., TEX.
MORRIS D. KENDRICK 1ST LT B.		V	V 42-13	VARSITY - BOSY JR. COLL., ALA.
EDWARD G. STELMACH 1ST LT B.		V	V MAY '42	VARSITY - MISSOURI UNIV.
JOHN M. HOGG 1ST LT B		V	V 43-5	VARSITY - AURORA COLL., ILL.
IVERSON R. AULTMAN 2ND LT B.		V	V SEPT '42	VARSITY - ERSKINE COLL., GA.
STANLEY B. LOBRED 2ND LT B.	LOUISVILLE, KY.	R	R 43-1	G '40-'41 HANOVER COLL., IND.
FRANK M. DOSS 2ND LT B	NASHVILLE, TENN	R	R 42-17	E '36-'37 U. OF LOUISVILLE
JOHN B. FOLEY 2ND LT B	CLEVELAND, O.	R	R 43-10	QB '39 NOTRE DAME
EINO SARKKINEN CAPT P	FAIRPORT HTS., O.	SA	OCT '41	FB '38-'40 OHIO STATE UNIV.
OLIVER WARD CAPT B	GREENSBORO, ALA.	SA	M 42-14	FB '38-'40 LOUISIANA STATE U

EXPLANATION OF SYMBOLS: B-BOMBARDIER; P-PILOT; A-ALBUQUERQUE; BS-BIG SPRING; C-CHILDRESS; D-DEMING; M-MIDLAND; R-ROSWELL; SA-SAN ANGELO; V-VICTORVILLE; CIS-INSTRUCTORS SCHOOL (BOMBARDIER); GS-GROUND INSTRUCTOR; QB-QUARTERBACK; FB-FULLBACK; HB-HALFBACK; E-END; T-TACKLE; G-GUARD; CR-CENTER.